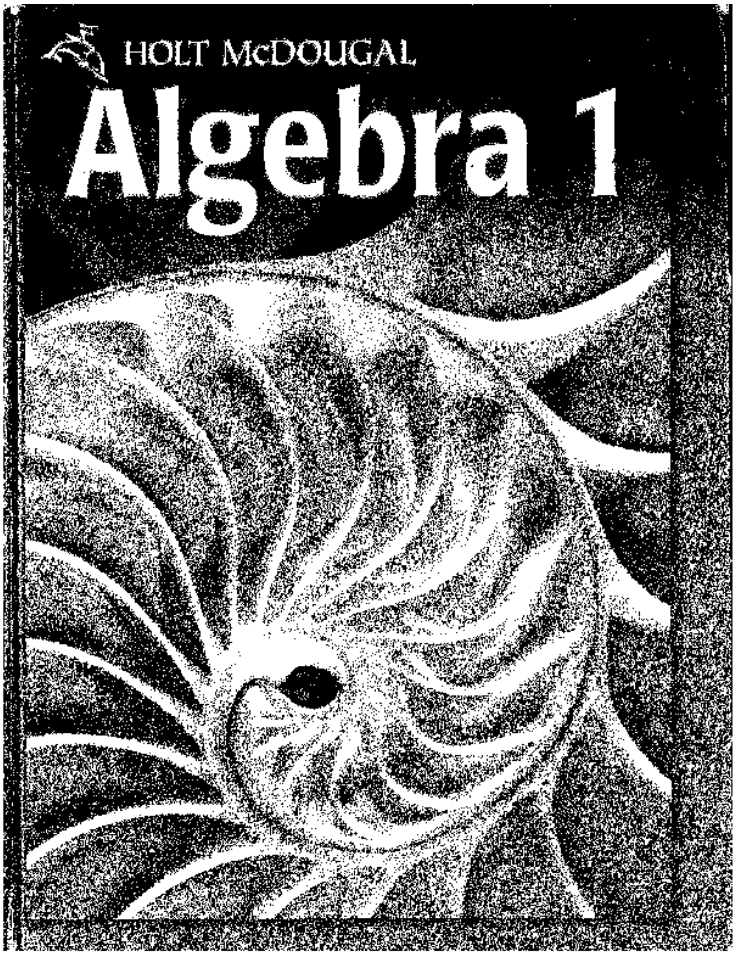
NAME_____HOUR___

IF THIS WORKBOOK IS FOUND PLEASE RETURN IT TO

MR. SCHIESEL

THANK YOU



ALGEBRA 1 SEMESTER 2 WORKBOOK

MR. SCHIESEL
ALGEBRA 1
WORKBOOK

TABLE OF CONTENTS

Symbols

$\overleftrightarrow{AB}$	line AB	$^\circ$	degree
$\overrightarrow{AB}$	ray AB	$\cong$	is congruent to
$\overline{AB}$	segment AB	$\sim$	is similar to
AB	the distance from A to B	$\parallel$	is parallel to
$\angle ABC$	angle ABC	$\perp$	is perpendicular to
$m\angle A$	the measure of $\angle A$	$\vec{v}$	vector v
$\overset{\frown}{AB}$	arc AB	$\overrightarrow{AB}$	vector AB
$\triangle ABC$	triangle ABC	π	pi
$\square ABCD$	parallelogram $ABCD$	A'	A prime
$\odot A$	circle A	$A \rightarrow A'$	A maps to A prime

Table of Measures

METRIC

Length

1 kilometer (km) = 1000 meters (m)
1 meter = 100 centimeters (cm)
1 centimeter = 10 millimeters (mm)

Capacity and Volume

1 liter (L) = 1000 milliliters (mL)

Mass

1 kilogram (kg) = 1000 grams (g)
1 gram = 1000 milligrams (mg)

CUSTOMARY

Length

1 mile (mi) = 1760 yards (yd)
1 mile = 5280 feet (ft)
1 yard = 3 feet
1 foot = 12 inches (in.)

Capacity and Volume

1 gallon (gal) = 4 quarts (qt)
1 quart = 2 pints (pt)
1 pint = 2 cups (c)
1 cup = 8 fluid ounces (fl oz)

Weight

1 ton = 2000 pounds (lb)
1 pound = 16 ounces (oz)

TIME

1 year (yr) = 365 days (d)
1 year = 12 months (mo)
1 year = 52 weeks (wk)
1 week = 7 days

1 day = 24 hours (h)
1 hour = 60 minutes (min)
1 minute = 60 seconds (s)

Geo

Formulas

Perimeter

Rectangle	$P = 2b + 2h$ or $P = 2\ell + 2w$
Square	$P = 4s$

Circumference

Circle	$C \approx \pi d$ or $C \approx 2\pi r$

Area

Rectangle	$A = bh$ or $A = \ell w$
Parallelogram	$A = bh$
Square	$A = s^2$
Triangle	$A = \frac{1}{2}bh$
Trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$
Rhombus	$A = \frac{1}{2}d_1d_2$
Kite	$A = \frac{1}{2}d_1d_2$
Circle	$A = \pi r^2$
Regular polygon	$A = \frac{1}{2}aP$
Equi $\triangle$	$A = \frac{s^2\sqrt{3}}{4}$

Surface Area

Prism	$S = Ph + 2B^*$
Cube	$S = 6s^2$
Cylinder	$S = 2\pi rh + 2\pi r^2$
Pyramid	$S = \frac{1}{2}P\ell + B^*$
Cone	$S = \pi r\ell + \pi r^2$
Sphere	$S = 4\pi r^2$

Volume

Prism	$V = Bh^*$
Cube	$V = s^3$
Cylinder	$V = Bh^*$ or $V = \pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh^*$
Cone	$V = \frac{1}{3}Bh^*$ or $V = \frac{1}{3}\pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$

*B represents the area of the base of a solid figure.

Trigonometry

Sine	$\sin A = \frac{\text{opposite leg}}{\text{hypotenuse}}$
Cosine	$\cos A = \frac{\text{adjacent leg}}{\text{hypotenuse}}$
Tangent	$\tan A = \frac{\text{opposite leg}}{\text{adjacent leg}}$

Other

Diameter	$d = 2r$	Slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Pythagorean Theorem	$a^2 + b^2 = c^2$	Slope-intercept form	$y = mx + b$
Angle sum of an n-gon	$180°(n - 2)$	Point-slope form	$y - y_1 = m(x - x_1)$
Euler's Formula	$V - E + F = 2$		

Midpoint Formula	$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Distance Formula	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint Formula in three dimensions	$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$
Distance Formula in three dimensions	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$

Symbols

Relation Symbols

$<$	is less than
$>$	is greater than
$\leq$	is less than or equal to
$\geq$	is greater than or equal to
$\neq$	is not equal to
$\approx$	is approximately equal to
$\cong$	is congruent to
$\sim$	is similar to

Real Numbers

$\mathbb{R}$	the set of real numbers
$\mathbb{Q}$	the set of rational numbers
$\mathbb{Z}$	the set of integers
$\mathbb{W}$	the set of whole numbers
$\mathbb{N}$	the set of natural numbers

Geometry

$\angle ABC$	angle ABC
$m\angle ABC$	the measure of angle ABC
$\triangle ABC$	triangle ABC
$\overline{AB}$	segment AB

Other

$\pm$	plus or minus
$\lvert -4 \rvert$	the absolute value of -4
$\{$	system
π	pi; $\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$
$\varnothing$	empty set
$f(x)$	function notation; f of x
a_n	the nth term of a sequence
$n!$	n factorial
$P(\text{event})$	the probability of an event

Table of Measures

METRIC

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1 meter = 100 centimeters (cm)
1 centimeter = 10 millimeters (mm)

Capacity and Volume

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1 year = 12 months (mo)
1 year = 52 weeks (wk)
1 week = 7 days

1 day = 24 hours (h)
1 hour = 60 minutes (min)
1 minute = 60 seconds (s)

Formulas

Perimeter

Rectangle $P = 2\ell + 2w$ or $P = 2(\ell + w)$

Circumference

Circle $C = \pi d$ or $C = 2\pi r$

Area

Rectangle $A = \ell w$ or $A = bh$

Triangle $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$

Trapezoid $A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1 + b_2)h}{2}$

Circle $A = \pi r^2$

Linear Functions

Slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope-intercept form $y = mx + b$

Point-slope form $y - y_1 = m(x - x_1)$

Standard form $Ax + By = C$

Quadratic Equations

Standard form $ax^2 + bx + c = 0$

Quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Discriminant $b^2 - 4ac$

Percents

Percent proportion $\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$

Surface Area

Cube $S = 6s^2$

Cylinder $S = 2\pi hr + 2\pi r^2$

Cone $S = \pi r\ell + \pi r^2$

Sphere $S = 4\pi r^2$

Volume

Prism or cylinder $V = Bh^*$

Pyramid or cone $V = \frac{1}{3}Bh^*$

Sphere $V = \frac{4}{3}\pi r^3$

*B represents the area of the base of a solid figure.

Other

Pythagorean Theorem $a^2 + b^2 = c^2$

Distance formula $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Midpoint formula $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Distance traveled $d = rt$

Simple interest $I = prt$

Compound interest $A = P\left(1 + \frac{r}{n}\right)^{nt}$

Exponential growth $y = a(1 + r)^t$

Exponential decay $y = a(1 - r)^t$

Half-life $A = P(0.5)^t$

Direct variation $y = kx$

Inverse variation $y = \frac{k}{x}$

Trigonometry

For an acute angle A of a right triangle: $\sin A = \frac{\text{opp.}}{\text{hyp.}}$ $\cos A = \frac{\text{adj.}}{\text{hyp.}}$ $\tan A = \frac{\text{opp.}}{\text{adj.}}$

Sequences

nth term of an arithmetic sequence $a_n = a_1 + (n - 1)d$

nth term of a geometric sequence $a_n = a_1 r^{n-1}$

X	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Mr. Schiesels quick reference Algebra 1 and Algebra Lab

SCHOOL WEBSITE: http://www.wcs.k12.mi.us/shhs/

MY SCHOOL WEBPAGE:

http://www.wcskids.net/SHHS/staff_websites/schiesel/schiesel.htm

BOOK WEBSITE: go.hrw.com

DIRECT BOOK WEBPAGE: http://my.hrw.com/index.jsp

USERNAME FOR BOOK (GEOMETRY): SCHIESEL (must be capital letters)

USERNAME FOR BOOK (ALGEBRA 1): SCHIESEL1 (must be capital letters)

PASSWORD FOR BOTH BOOKS: 98765

EMAIL: sschiesel@wcskids.net

PHONE NUMBER: 586 825-2700 ext. 14404

ROOM NUMBER: D-04

PREP PERIOD:4th Hour (Mondays-Fridays 10:29-12:04

All current grades available through power school.

All current assignments available through my school webpage, under the appropriate course link.

Schedule:
1st hour (Algebra 1)
2nd hour (Algebra 1)
3rd hour (Algebra 1)
4th hour (Prep)
5th hour (Algebra 1)
6th hour (Algebra 1)

2015-16 Traditional School Year Calendar

August

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23/30	24/31	25	26	27	28	29

September

		1	T	T	4	5
6	7	X	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	X	26
27	28	29	30			

October

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	X	17
18	19	20	21	22	23	24
25	26	27	28	29	X	31

November

1	2	3	4	5	6	7
8	9	10	11	12	X	14
15	16	17	18	19	20	21
22	23	X	25	26	27	28
29	30					

December

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	X	19
20	21	22	23	24	25	26
27	28	29	30	31		

January

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	X	23
24/31	25	26	27	28	29	30

February

	1	2	3	4	5	6
7	8	9	10	11	X	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29					

March

		1	2	X	4	5
6	7	8	9	10	X	12
13	14	15	16	17	18	19
20	21	22	23	X	25	26
27	28	29	30	31		

April

					X	2
3	4	5	6	7	8	9
10	11	X	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May

1	2	3	4	5	X	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	X	28
29	30	31				

June

			1	2	3	4
5	6	7	8	9	10	11
12	13	X	X	X	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

T	Teacher Work Day
HS	High School Half Day
X	All Students Half Day
	No School
	Conferences
	Count Days

Sept. 8 K-12 Half day - No PM ECSE
Sept. 9 K-12 Full day all students - 1/2 Day ECSE report at regular times
Sept. 25 K-12 Half Day - No AM ECSE; PM ECSE Reports in AM
Oct. 7 Official Student Count Day
Oct. 16 K-12 Half Day - No PM ECSE
Oct. 30 K-12 Half Day - No AM ECSE; PM ECSE Reports in AM
Nov. 3 No School - District Inservice
Nov. 13 K-12 Half Day - No PM ECSE
Nov. 23 K-12 Full Day - Evening (PTC) Parent Teacher Conferences
Nov. 24 K-12 Half Day - No AM ECSE; PM ECSE Reports in AM
Afternoon and Evening (PTC) Parent Teacher Conferences
Nov. 25-27 No School - Thanksgiving Break
Dec. 18 K-12 Half Day - No PM ECSE
Dec. 21-Jan. 1 Holiday Break
Jan. 4 Classes Resume
Jan. 18 No School - Dr. Martin Luther King, Jr. Day
Jan. 20 9-12 Half day - High School Exams 1&2
Jan. 21 9-12 Half day - High School Exams 3&4
Jan. 22 K-12 Half Day No AM ECSE; PM ECSE Reports in AM;
High School Exams 5&6
Feb. 10 Supplemental Student Count Day
Feb. 12 K-12 Half Day - No PM ECSE
Feb. 15-19 No School - Winter Break
Feb. 22 Classes Resume
March 3 K-12 Half Day No AM ECSE; PM ECSE Reports in AM
Afternoon & Evening (PTC) Parent Teacher Conferences
March 11 K-12 Half Day - No PM ECSE
March 24 K-12 Half Day - No PM ECSE
March 25 No School
April 1 K-12 Half Day - No AM ECSE; PM ECSE Reports in AM
April 4-8 No School - Spring Break
April 11 Classes Resume
April 12 HS ONLY 9-12 Half Day (SAT Testing)
May 6 K-12 Half Day - No PM ECSE
May 26 Full Day - Senior Exams 3 & 4
May 27 K-12 Half Day No AM ECSE; PM ECSE Reports in AM; Senior Exams 5 & 6
May 30 No School - Memorial Day
May 31 Full Day - Senior Exams 1 & 2
June 14 9-11 Half Day - High School Only - Exams 1 & 2
June 15 9-11 Half Day - High School Only - Exams 3 & 4
June 16 K-12 Half Day - 9 - 11 Exams 5 & 6; No AM ECSE; PM ECSE Reports in AM

K-5 Elementary Trimester Marking Periods

1st Trimester 09/08/2015 - 11/13/2015

2nd Trimester 11/16/2015 - 02/12/2016

3rd Trimester 02/22/2016 - 06/16/2016

6-12 Secondary Marking Periods

1st Marking Period 09/08/2015 - 10/30/2015

2nd Marking Period 11/02/2015 - 1/22/2016

3rd Marking Period 1/25/2016 - 04/01/2016

4th Marking Period 4/11/2016 - 6/16/2016

Report Cards

11/12/2015	6-12	Q1	Rpt Cards Go Home
11/17/2015	K-5	T1	Rpt Cards Go Home
11/23 & 24, 2015 - K-12 Parent Teacher Conferences (PTC)			
2/04/2016	6-12	Q2	Rpt Cards Go Home
3/01/2016	K-5	T2	Rpt Cards Go Home
4/18/2016	6-12	Q3	Rpt Cards Go Home
6/16/2016	K-5	T3	Rpt Cards Go Home
Week of 06/20/16	6-12	Q4	6th-12th Rpt Cards Mailed Home

Revised: 6/30/2015

Mr. Schiesel's
Rules and Procedures for
Algebra / Algebra Lab

Classroom Rules for Success

1. Always give your best effort.
2. Come to class on time and ready to learn. Be in your seat when the bell rings, and have all the necessary materials to complete the assignment(s) for the day. Complete bell work assignment when you come into class.
3. Be respectful and kind to others. Do not eat, drink, or chew gum in the classroom.
4. Listen carefully to directions.
5. Obey all WCS and SHHS rules and guidelines that are fully detailed in the "Student Code of Conduct".

Supplies

Spiral Notebook w/Perforated Edge or loose leaf paper
No. 2 Pencils and Eraser
Black or Blue Ink Pen
Red Ink Pen
Textbook
TI-Nspire or TI-Nspire CX Calculater (Not CAS)
1 ½" (or Larger) 3 Ring Binder with Four Dividers

Daily Procedures and Attendance Policies

Students will turn in homework daily. Homework will be corrected on a daily basis during class, although the student is not expected to have the correct answer the day we check the homework, they are expected to have the correct answer the following day in class.

If students need specific handouts to complete their make-up work, extra copies are available in the crate labeled with the class title, and in the folder labeled with the date they were absent.

Students have two days for every day they were absent to make-up work assigned the day of their absence. For example, if a student is absent on a Tuesday, make-up work is due Thursday.

Homework

Students can expect to have homework every night.

Passes

Students will be given hall passes as long as it is an appropriate time during the class. Students are asked to take care of any personal items during their 5 minute passing time. Passes will only be given to students that have filled out the pass in their **own** agenda. No exceptions will be made no agenda, no pass. It is a requirement by SHHS that students must always carry their agenda with them at all times. It is suggested that they be used sparingly and in emergency situations only.

Late Assignments

In general, homework assignments should always be turned in on time. In some cases however extenuating circumstances may arise and prevent you from completing the required work. Late Assignments will be graded at 75% credit, and must be turned in within 2 days of the original due date of the assignment.

Notebooks
Students will use their 3 ring binder in my class to assist in keeping their work organized, and to aid in preparing for tests and quizzes. The dividers should be labeled as follows: Tests/Quizzes, Bell work, Homework, and Notes.

Calculators
It is not required that students have their own calculators, however it is strongly recommended that students do purchase their own. The calculators that the math department is recommending are TI-Nspire Calculators. If a student does not have their own calculator the student will be provided with one to use, but only at school. The school issued calculators are the TI-Nspire.

Quizzes and Tests
If students are absent on the day of a quiz or a test, it is their responsibility to see me and make arrangements to make it up, or it will become a zero in the grade book.

Cheating and Plagiarism
There is no excuse for cheating. Students that are caught cheating will receive a zero for the assignment. If it is a major assignment or test, students may risk failing the card marking. Other possible consequences include, but are not limited to, administrative action, a phone call home, after-school detention, or additional class work.

Plagiarism is a form of cheating, and can be defined by Webster's dictionary as "the unauthorized use of the language and thoughts of another author and the representation of them as one's own." In other words, all work should be each student's original thoughts, words, and ideas.

Grading
All grades are aligned with the WCS grading scale, which are divided into categories and will contain work graded on a percentage scale. The categories are listed in descending order, dependent on percent for that category.

1. Assessments/Lab Reports/Projects - 75%
2. Homework/Labs/Participation – 25%

Additional Help
I am available before and after school for students that need any additional help. It is the students' responsibility to schedule any necessary appointments to receive additional help. Typically I am at school 20-30 minutes early and stay 20-30 minutes after everyday. I am also available during 4th period and my number is (586) 825-2700 ext. 14404 in room D-04, and my e-mail address is SSchiesel@mail.wcs.k12.mi.us

4th Hour runs 10:29-12:04 (Monday through Friday)

Lesson plans are available on my school webpage at:
http://www.wcskids.net/SHHS/staff_websites/schiesel/schiesel.htm

CONTRACT FOR SUCCESS

As you begin this semester, it is important to take time and reflect on what you would like to accomplish and receive in this class. Please take time to discuss the classroom rules and procedures, and complete your "Contract for Success" at home with your parents/guardians.

Below, list three goals or skills that you would like to master in this class over the course of the semester.

1. _____
2. _____
3. _____

What will you need to do in order to achieve your goals?

_____

_____

_____

I have read over Mr. Schiesels' classroom rules and procedures and discussed them with my parents/guardians. I understand the rules and expectations for the class, and I understand what I need to do in order to succeed.

Student Name (Print):_____Hour:_____Date:_____

Student Signature:_____

I have read over Mr. Schiesels' classroom rules and procedures and discussed them with my student. He or she understands the rules and expectations for the class, and understands what he or she needs to do in order to succeed.

Parent Name (Print):_____E-mail:_____

Home #:_____Work #:_____Cell #:_____

Best method for contact?_____Best time for contact?_____

Parent Signature:_____Date:_____

Warren Consolidated Schools

Creating Dynamic Futures through Student Achievement, High Expectations, and Strong Relationships

ADMINISTRATION BUILDING

31300 Anita
Warren, MI 48093
586.825.2400

1.888.4WCS.KIDS
www.wcskids.net
Text WCSKIDS to 57780

Dear Parents and Partners in Education,

At this time, I would like to take the opportunity to formally introduce myself to you. I am a graduate of the University of Detroit Mercy, where I earned a Bachelor of Arts Degree in Mathematics and General Science, as well as my certification in Secondary Education. I also earned my Masters Degree in Curriculum and Instruction from the same University.

As an educator, it is my goal to provide my students with the motivation and the skills that are necessary for their present and future success in life. I have the highest expectations for all my students, and although I do not demand perfection, I do demand every student's best effort. I expect my students to take pride in, and responsibility for the work that they are assigned.

Attached, you will find a copy of my classroom policies and procedures. I encourage you to look them over and discuss them with your student. Please review and sign the "Contract for Success," and then return it to school with your student. Should you have any questions and concerns, I hope that you will not hesitate to contact me. I believe that communication between parents and educators is a critical and essential element to student success. Please expect to receive periodic phone calls and progress reports from me regarding your student's progress. I can be reached by phone at (586) 825-2700 ext. 14404 during fourth period. If I am not available to answer, please leave me a message on my voice mail, and I will return your call as soon as possible. In addition, I can be reached via email at sschiesel@mail.wcs.k12.mi.us

Thank you for your valuable time and cooperation. In closing, I would like to affirm my belief that every child has the potential to be something extraordinary. With your help and support, I look forward to watching your child realize his or her potential in my classroom.

Sincerely,

Mr. Steven Schiesel

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

Name _____ Date _____ Class _____

LESSON 6-1

Review for Mastery

Integer Exponents

Remember that 2^3 means $2 \times 2 \times 2 = 8$. The base is 2, the exponent is positive 3. Exponents can also be 0 or negative.

	Zero Exponents	Negative Exponents	Negative Exponents in the Denominator
Definition	For any nonzero number x, $x^0 = 1$.	For any nonzero number x and any integer n, $x^{-n} = \frac{1}{x^n}$.	For any nonzero number x and any integer n, $\frac{1}{x^{-n}} = x^n$.
Examples	$6^0 = 1$ $\left(\frac{1}{2}\right)^0 = 1$	$5^{-3} = \frac{1}{5^3}$ $2^{-4} = \frac{1}{2^4}$	$\frac{1}{8^{-2}} = 8^2$ $\frac{1}{2^{-4}} = 2^4$
0^0 and 0^{-n} are undefined.			

Simplify 4^{-2}.

4^{-2}

$\frac{1}{4^2}$ *Write without negative exponents.*

$\frac{1}{4 \cdot 4}$ *Write in expanded form.*

$\frac{1}{16}$ *Simplify.*

Simplify $x^2y^{-3}z^0$.

$x^2y^{-3}z^0$

$\frac{x^2z^0}{y^3}$ *Write without negative exponents.*

$\frac{x^2(1)}{y^3}$ $z^0 = 1$.

$\frac{x^2}{y^3}$ *Simplify.*

Fill in the blanks to simplify each expression.

1. 2^{-5}

$2^{-5} = \frac{1}{2^{\square}}$

$\frac{1}{2^5} = \frac{1}{\square}$

$= \_\_\_\_\_$

2. 10^{-3}

$10^{-3} = \frac{1}{10}$

$\frac{1}{10^3} = \frac{1}{\square}$

$= \_\_\_\_\_$

3. $\frac{1}{5^{-4}}$

$\frac{1}{5^{-4}} = 5^{\square}$

$5^{\square} = \square$

$= \_\_\_\_\_$

Simplify.

4. $5y^{-4}$ _____

5. $\frac{8}{a^{-3}}$ _____

6. $9x^3y^{-2}$ _____

7. $\frac{x^3}{x^{-1}y}$ _____

8. $\frac{b^2}{a^{-1}b^3}$ _____

9. $5x^{-4}y^2$ _____

Name _____ Date _____ Class _____

LESSON 6-1

Review for Mastery

Integer Exponents continued

Evaluate $a^{-3}b^4$ for $a = 5$ and $b = 2$.

$a^{-3}b^4$	
$(5^{-3})(2^4)$	*Substitute.*
$\frac{2^4}{5^3}$	*Write without negative exponents.*
$\frac{16}{125}$	*Simplify.*

When evaluating, it is important to determine whether the negative is raised to the power.

Evaluate $-x^{-2}$ for $x = 10$.

The negative is not raised to the power.

$-x^{-2}$	
-10^{-2}	*Substitute.*
$-\frac{1}{10^2}$	*Write without negative exponents*
$-\frac{1}{10 \cdot 10}$	*Write in expanded form.*
$-\frac{1}{100}$	*Simplify.*

Evaluate $(-x)^{-2}$ for $x = 10$.

The negative is raised to the power.

$(-x)^{-2}$	
$(-10)^{-2}$	*Substitute.*
$\frac{1}{(-10)^2}$	*Write without negative exponents*
$\frac{1}{(-10) \cdot (-10)}$	*Write in expanded form.*
$\frac{1}{100}$	*Simplify.*

Evaluate each expression for the given value(s) of the variable(s).

10. x^2y^0 for $x = -2$ and $y = 5$

11. a^3b^3 for $a = 4$ and $b = 2$

12. $\frac{z^3}{y^{-2}}$ for $z = 2$ and $y = 5$

13. $-a^3b^{-4}$ for $a = 2$ and $b = -1$

14. $\frac{n^{-2}}{m^{-4}}$ for $m = 6$ and $n = 2$

15. $(-u)^2v^{-6}$ for $u = 2$ and $v = 2$

Name _____ Date _____ Class _____

LESSON 6-1

Practice A

Integer Exponents

Simplify.

1. $3^{-2} = \frac{1}{3^2} = \frac{1}{\_\_ \cdot \_\_} = \frac{1}{\_\_}$

2. $2^{-4} = \frac{1}{2^4} = \frac{1}{\_\_ \cdot \_\_ \cdot \_\_ \cdot \_\_} = \frac{1}{\_\_}$

3. $(-3)^{-3} = \frac{1}{(\_\_)^3} = \frac{1}{\_\_ \cdot \_\_ \cdot \_\_} = \frac{1}{\_\_\_\_}$

4. $(-1)^{-5} = \frac{1}{(\_\_)^5} = \frac{1}{\_\_ \cdot \_\_ \cdot \_\_ \cdot \_\_ \cdot \_\_} = \frac{1}{\_\_} = \_\_$

5. $-(7.2)^0$ _____

6. $(4)^{-3}$ _____

Evaluate each expression for the given value(s) of the variable(s).

7. x^{-2} for $x = 3$

$(3)^{-2} = \frac{1}{(\_\_)^2} = \frac{1}{\_\_}$

8. m^0n^{-3} for $m = 2$ and $n = 3$

$(\_\_)^0 (\_\_)^{-3} = (\_\_) \cdot \frac{1}{(\_\_)^3}$

$= \_\_\_\_$

9. $5r^{-4}$ for $r = -2$

$5(\_\_)^{-4} = 5 \cdot \frac{1}{(\_\_)^{-}}$

$= 5 \cdot \frac{1}{\_\_ \cdot \_\_ \cdot \_\_ \cdot \_\_}$

$= 5 \cdot \frac{1}{\_\_\_\_} = \_\_\_\_$

Simplify.

10. $4x^{-3}$ _____

11. $\frac{5}{b^{-2}}$ _____

12. $\frac{m^3n^{-4}}{p^0}$ _____

13. $\frac{k^{-4}}{2}$ _____

14. $\frac{f^4}{g^{-1}}$ _____

15. $\frac{r^6t^0}{s^{-2}}$ _____

16. The weight of a silver charm is 2^{-2} grams. Evaluate this expression. _____

17. There are about 10^4 different species of birds on Earth. Just over 10^3 of them are threatened. Evaluate both expressions. _____

Name _____ Date _____ Class _____

LESSON 6-1

Practice B

Integer Exponents

Simplify.

1. $5^{-3} = \frac{1}{\_\_\_} = \frac{1}{\_\_\_}$

2. $2^{-6} = \frac{1}{\_\_\_} = \frac{1}{\_\_\_}$

3. $(-5)^{-2}$ _____

4. $-(4)^{-3}$ _____

5. -6^0 _____

6. $(7)^{-2}$ _____

Evaluate each expression for the given value(s) of the variable(s).

7. d^{-3} for $d = -2$ _____

8. a^5b^{-6} for $a = 3$ and $b = 2$ _____

9. $(b - 4)^{-2}$ for $b = 1$ _____

10. $5z^{-x}$ for $z = -3$ and $x = 2$ _____

11. $(5z)^{-x}$ for $z = -3$ and $x = 2$ _____

12. $c^{-3}(16^{-2})$ for $c = 4$ _____

Simplify.

13. t^{-4} _____

14. $3r^{-5}$ _____

15. $\frac{s^{-3}}{t^{-5}}$ _____

16. $\frac{h^0}{3}$ _____

17. $\frac{2x^{-3}y^{-2}}{z^4}$ _____

18. $\frac{4fg^{-5}}{5h^{-3}}$ _____

19. $\frac{14a^{-4}}{20bc^{-1}}$ _____

20. $\frac{a^4c^2e^0}{b^{-1}d^{-3}}$ _____

21. $\frac{-3g^{-2}hk^{-2}}{-6h^0}$ _____

22. A cooking website claims to contain 10^5 recipes. Evaluate this expression. _____

23. A ball bearing has diameter 2^{-3} inches. Evaluate this expression. _____

Name _____ Date _____ Class _____

LESSON 6-2

Review for Mastery

Rational Exponents

To simplify a number raised to the power of $\frac{1}{n}$, write the *n*th root of the number.

Simplify $216^{\frac{1}{3}}$.

$216^{\frac{1}{3}} = \underbrace{\sqrt[3]{216} = 6}$

Think: What number, when taken as a factor 3 times, is equal to 216?

$6^3 = 6 \times 6 \times 6 = 216,$ so $\sqrt[3]{216} = 6.$

When an expression contains two or more expressions with fractional exponents, evaluate the expressions with the exponents first, then add or subtract.

Simplify $81^{\frac{1}{2}} + 32^{\frac{1}{5}}$.

$$\begin{aligned} 81^{\frac{1}{2}} + 32^{\frac{1}{5}} &= \sqrt{81} + \sqrt[5]{32} \\ &= 9 + 2 \\ &= 11 \end{aligned}$$

Simplify each expression.

1. $64^{\frac{1}{2}}$ _____

2. $1000^{\frac{1}{3}}$ _____

3. $1^{\frac{1}{5}}$ _____

4. $256^{\frac{1}{4}}$ _____

5. $32^{\frac{1}{5}}$ _____

6. $49^{\frac{1}{2}}$ _____

7. $8^{\frac{1}{3}} + 16^{\frac{1}{2}}$ _____

8. $121^{\frac{1}{2}} + 27^{\frac{1}{3}}$ _____

9. $32^{\frac{1}{5}} + 1^{\frac{1}{2}}$ _____

10. $81^{\frac{1}{4}} - 16^{\frac{1}{4}}$ _____

11. $144^{\frac{1}{2}} - 125^{\frac{1}{3}}$ _____

12. $625^{\frac{1}{4}} - 0^{\frac{1}{2}}$ _____

Name _____ Date _____ Class _____

LESSON 6-2

Review for Mastery

Rational Exponents continued

A fractional exponent may have a numerator other than 1. To simplify a number raised to the power of $\frac{m}{n}$, write the *n*th root of the number raised to the *m*th power.

Simplify $125^{\frac{4}{3}}$.

$125^{\frac{4}{3}} = \left(\sqrt[3]{125}\right)^4 = (5)^4 = 625$

To find $\sqrt[3]{125}$, think: what number, when taken as a factor 3 times, equals 125?

$5^3 = 5 \times 5 \times 5 = 125$, so $\sqrt[3]{125} = 5$.

Simplify $64^{\frac{5}{6}}$.

$64^{\frac{5}{6}} = \left(\sqrt[6]{64}\right)^5 = (2)^5 = 32$

To find $\sqrt[6]{64}$, think: what number, when taken as a factor 6 times, equals 64?

$2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$, so $\sqrt[6]{64} = 2$.

Simplify each expression.

13. $4^{\frac{3}{2}}$ _____

14. $16^{\frac{3}{4}}$ _____

15. $32^{\frac{2}{5}}$ _____

16. $1^{\frac{3}{5}}$ _____

17. $27^{\frac{4}{3}}$ _____

18. $100^{\frac{3}{2}}$ _____

19. $8^{\frac{2}{3}}$ _____

20. $81^{\frac{5}{4}}$ _____

21. $128^{\frac{3}{7}}$ _____

22. $16^{\frac{5}{4}}$ _____

23. $49^{\frac{3}{2}}$ _____

24. $8^{\frac{8}{3}}$ _____

Name _____ Date _____ Class _____

LESSON 6-2

Practice A

Rational Exponents

Match each expression with a fractional exponent to an equivalent radical expression. Write the correct letter on the answer blank.

1. $x^{\frac{1}{2}}$ _____ A. $\left(\sqrt{x}\right)^3$
2. $x^{\frac{1}{3}}$ _____ B. $\sqrt{x}$
3. $x^{\frac{2}{3}}$ _____ C. $\left(\sqrt[3]{x}\right)^2$
4. $x^{\frac{3}{2}}$ _____ D. $\sqrt[3]{x}$

Simplify each expression. All variables represent nonnegative numbers.

5. $49^{\frac{1}{2}}$ _____
6. $81^{\frac{1}{4}}$ _____
7. $1^{\frac{1}{3}}$ _____
8. $8^{\frac{1}{3}} + 100^{\frac{1}{2}}$ _____
9. $16^{\frac{3}{4}}$ _____
10. $27^{\frac{2}{3}}$ _____
11. $1^{\frac{2}{5}}$ _____
12. $8^{\frac{5}{3}}$ _____
13. $\sqrt{x^{16}}$ _____
14. $\sqrt{x^6 y^8}$ _____
15. $\sqrt[4]{m^{16} n^4}$ _____
16. $\left(x^2\right)^{\frac{1}{2}} \sqrt[3]{x^3}$ _____

17. Given a square with area x, you can use the formula $d = 1.4x^{\frac{1}{2}}$ to estimate the length of the diagonal of the square. Use the formula to estimate the length of the diagonal of a square with area 100 cm^2.

_____

Name _____ Date _____ Class _____

LESSON 6-2

Practice B

Rational Exponents

Simplify each expression. All variables represent nonnegative numbers.

1. $27^{\frac{1}{3}}$ _____

2. $121^{\frac{1}{2}}$ _____

3. $0^{\frac{1}{3}}$ _____

4. $64^{\frac{1}{2}} + 27^{\frac{1}{3}}$ _____

5. $16^{\frac{1}{4}} + 8^{\frac{1}{3}}$ _____

6. $100^{\frac{1}{2}} - 64^{\frac{1}{6}}$ _____

7. $1^{\frac{1}{5}} + 49^{\frac{1}{2}}$ _____

8. $25^{\frac{3}{2}}$ _____

9. $32^{\frac{3}{5}}$ _____

10. $16^{\frac{3}{4}}$ _____

11. $1^{\frac{5}{6}}$ _____

12. $121^{\frac{3}{2}}$ _____

13. $\sqrt[5]{y^5}$ _____

14. $\sqrt{x^4y^{12}}$ _____

15. $\sqrt[3]{a^6b^3}$ _____

16. $(x^{\frac{1}{2}})^4\sqrt{x^6}$ _____

17. $(x^{\frac{1}{3}}y)^3\sqrt{x^2y^2}$ _____

18. $\dfrac{(x^{\frac{1}{4}})^8}{\sqrt[3]{x^3}}$ _____

19. Given a cube with volume V, you can use the formula $P = 4V^{\frac{1}{3}}$ to find the perimeter of one of the cube's square faces. Find the perimeter of a face of a cube that has volume 125 m^3.

_____

Name _____ Date _____ Class _____

LESSON 6-3

Review for Mastery

Polynomials

A **monomial** is a number, a variable, or a product of numbers and variables with whole-number exponents. A **polynomial** is a monomial or a sum or difference of monomials.

The degree of the monomial is the sum of the exponents in the monomial.

Find the degree of $8x^2y^3$.

$8x^2y^3$ *The exponents are 2 and 3.*

The degree of the monomial is $2 + 3 = 5$.

Find the degree of $-4a^6b$.

$-4a^6b$ *The exponents are 6 and 1.*

The degree of the monomial is $6 + 1 = 7$.

The degree of the polynomial is the degree of the term with the greatest degree.

Find the degree of $2x^4y^3 + 9x^5$.

$\underbrace{2x^4y^3}_{7} + \underbrace{9x^5}_{5}$

Degree of the polynomial is 7.

Find the degree of $4ab + 9a^3$.

$\underbrace{4ab}_{2} + \underbrace{9a^3}_{3}$

Degree of the polynomial is 3.

The **standard form of a polynomial** is written with the terms in order from the greatest degree to the least degree. The coefficient of the first term is the **leading coefficient.**

Write $5x + 6x^3 + 4 + 2x^4$ in standard form.

$\underbrace{5x}_{1} + \underbrace{6x^3}_{3} + \underbrace{4}_{0} - \underbrace{2x^4}_{4}$ *Find the degree of each term.*

$2x^4 + 6x^3 + 5x + 4$ *Write the terms in order of degree.*

The leading coefficient is 2.

Find the degree of each monomial.

1. $7m^3n^5$ _____
2. $6xyz$ _____
3. $4x^2y^2$ _____

Find the degree of each polynomial.

4. $x^5 + x^5y$ _____
5. $4x^2y^3 + y^4 + 7$ _____
6. $x^2 + xy + y$ _____

Write each polynomial in standard form. Then give the leading coefficient.

7. $x^3 - 5x^4 - 6x^5$ _____ _____
8. $2x + 5x^2 - x^3$ _____ _____
9. $8x + 7x^2 - 1$ _____ _____

Name _____ Date _____ Class _____

LESSON 6-3

Review for Mastery

Polynomials continued

Polynomials have special names based on their degree and the number of terms they have.

Degree	0	1	2	3	4	5	6 or more
Name	Constant	Linear	Quadratic	Cubic	Quartic	Quintic	6th degree…

Terms	1	2	3	4 or more
Name	Monomial	Binomial	Trinomial	Polynomial

Classify $7x^4 + 5x + 3$ according to its degree and number of terms.

$7x^4 + 5x + 3$ is a quartic trinomial.

Degree: 4
Terms: 3

Polynomials can be evaluated.

A ball is thrown straight up in the air from a height of 4 feet at a speed of 65 feet per second. The height of the ball in feet is given by $-16t^2 + 65t + 4$ where t is the time in seconds. How high is the ball after 2 seconds?

Evaluate for $t = 2$.

$$-16t^2 + 65t + 4$$

$$-16(2)^2 + 65(2) + 4$$ Substitute 2 for t.

$$-16(4) + 65(2) + 4$$

$$-64 + 130 + 4$$ Follow the order of operations to simplify.

$$70$$

After 2 seconds, the ball is 70 feet high.

Classify each polynomial according to its degree and number of terms.

10. $7x^2 - 5x$

11. $b^3 + 2b^2 - 4b + 1$

12. A ball is thrown straight up in the air from a height of 6 feet at a speed of 80 feet per second. The height of the ball in feet is given by $-16t^2 + 80t + 6$ where t is the time in seconds. What is the height of the ball after 3 seconds?

Name _____ Date _____ Class _____

LESSON 6-3

Practice A

Polynomials

Find the degree and number of terms of each polynomial.

1. $4w^2$
   Degree: _____
   Terms: _____
2. $9x^3 + 2x$
   Degree: _____
   Terms: _____
3. $4p^5 - p^3 + p^2 + 11$
   Degree: _____
   Terms: _____

Fill in each blank with *monomial*, *binomial*, or *trinomial*.

4. A _____ is a polynomial with three terms.
5. A _____ is a polynomial with one term.
6. A _____ is a polynomial with two terms.

Write each polynomial in standard form.
Then, give the leading coefficient.

7. $12 + 3x^2 - x$ _____ _____
8. $g^4 - 2g^3 - g^5$ _____ _____
9. $k^2 + k^4 - k^3 + 1$ _____ _____

First, classify each polynomial by its degree (*linear*, *quadratic*, *cubic*, or *quartic*).
Then, classify it by its number of terms (*monomial*, *binomial*, or *trinomial*).

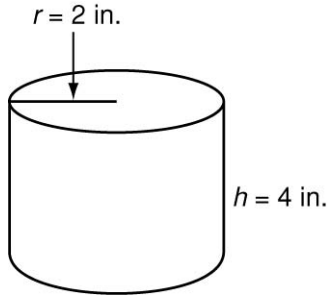
10. $109z^2$ _____
11. $3x + 11$ _____
12. $b^3 - 2 + 2b^4$ _____

13. Complete the table by evaluating the polynomial for each value of z.

Polynomial	$z = 0$	$z = 1$	$z = 2$	$z = -1$	$z = -2$
$2z + 3z^2 - 3$		2			5

14. The surface area of a cylinder is approximated by the polynomial $6r^2 + 6rh$, where r is the radius and h is the height of the cylinder. Find the approximate surface area of the cylinder at right.

_____



Name _____ Date _____ Class _____

LESSON 6-3

Practice B

Polynomials

Find the degree and number of terms of each polynomial.

1. $14h^3 + 2h + 10$ _____ _____

2. $7y - 10y^2$ _____ _____

3. $2a^2 - 5a + 34 - 6a^4$ _____ _____

Write each polynomial in standard form. Then, give the leading coefficient.

4. $3x^2 - 2 + 4x^8 - x$ _____ _____

5. $7 - 50j + 3j^3 - 4j^2$ _____ _____

6. $6k + 5k^4 - 4k^3 + 3k^2$ _____ _____

Classify each polynomial by its degree and number of terms.

7. $-5t^2 + 10$ _____ _____

8. $8w - 32 + 9w^4$ _____ _____

9. $b - b^3 - 2b^2 + 5b^4$ _____ _____

Evaluate each polynomial for the given value.

10. $3m + 8 - 2m^3$ for $m = -1$ _____

11. $4y^5 - 6y + 8y^2 - 1$ for $y = -1$ _____

12. $2w + w^3 - \frac{1}{2}w^2$ for $w = 2$ _____

13. An egg is thrown off the top of a building. Its height in meters above the ground can be approximated by the polynomial $300 + 2t - 4.9t^2$, where t is the time since it was thrown in seconds.

    a. How high is the egg above the ground after 5 seconds?

    _____

    b. How high is the egg above the ground after 6 seconds?

    _____

Name _____ Date _____ Class _____

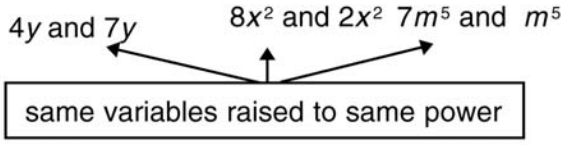
LESSON 6-4

Review for Mastery

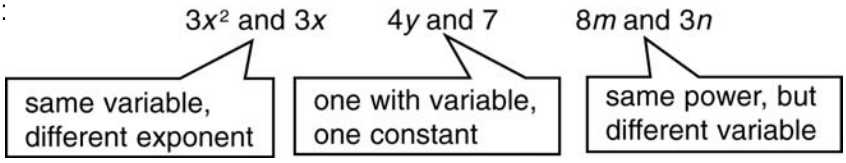
Adding and Subtracting Polynomials

You can add or subtract polynomials by combining like terms.

The following are like terms:



The following are not like terms:



Add $3x^2 + 4x + 5x^2 + 6x$.

$\underline{3x^2} + \underline{\underline{4x}} + \underline{5x^2} + \underline{\underline{6x}}$	*Identify like terms.*
$\underline{3x^2} + \underline{5x^2} + \underline{\underline{4x}} + \underline{\underline{6x}}$	*Rearrange terms so that like terms are together.*
$8x^2 + 10x$	*Combine like terms.*

Add $(5y^2 + 7y + 2) + (4y^2 + y + 8)$.

$(\underline{5y^2} + \underline{\underline{7y}} + \underline{\underline{2}}) + (\underline{4y^2} + \underline{y} + \underline{\underline{8}})$	*Identify like terms.*
$(\underline{5y^2} + \underline{4y^2}) + (\underline{\underline{7y}} + \underline{y}) + (\underline{\underline{2}} + \underline{\underline{8}})$	*Rearrange terms so that like terms are together.*
$9y^2 + 8y + 10$	*Combine like terms.*

Determine whether the following are like terms. Explain.

1. $4x$ and x^4 _____
2. $5y$ and $7y$ _____
3. $2z^3$ and $4x^3$ _____

Add.

4. $2y^2 + 3y + 7y + y^2$ _____
5. $8m^4 + 3m - 4m^4$ _____
6. $12x^5 + 10x^4 + 8x^4$ _____
7. $(6x^2 + 3x) + (2x^2 + 6x)$ _____
8. $(m^2 - 10m + 5) + (8m + 2)$ _____
9. $(6x^3 + 5x) + (4x^3 + x^2 - 2x + 9)$ _____
10. $(2y^5 - 6y^3 + 1) + (y^5 + 8y^4 - 2y^3 - 1)$ _____

Name _____ Date _____ Class _____

LESSON 6-4

Review for Mastery

Adding and Subtracting Polynomials continued

To subtract polynomials you must remember to add the opposite.

Find the opposite of $(5m^3 - m + 4)$.

$(5m^3 - m + 4)$

$-(5m^3 - m + 4)$ *Write the opposite of the polynomial.*

$-5m^3 + m - 4$ *Write the opposite of each term in the polynomial.*

Subtract $(4x^3 + x^2 + 7) - (2x^3)$.

$(4x^3 + x^2 + 7) - (2x^3)$

$(4x^3 + x^2 + 7) + (-2x^3)$ *Rewrite subtraction as addition of the opposite.*

$(\underline{4x}^3 + x^2 + 7) + (\underline{-2x}^3)$ *Identify like terms.*

$(\underline{4x}^3 - \underline{2x}^3) + x^2 + 7$ *Rearrange terms so that like terms are together.*

$2x^3 + x^2 + 7$ *Combine like terms.*

Subtract $(6y^4 + 3y^2 - 7) - (2y^4 - y^2 + 5)$.

$(6y^4 + 3y^2 - 7) - (2y^4 - y^2 + 5)$

$(6y^4 + 3y^2 - 7) + (-2y^4 + y^2 - 5)$ *Rewrite subtraction as addition of the opposite.*

$(\underline{6y}^4 + \underline{\underline{3y}}^2 - \underline{\underline{\underline{7}}}) + (\underline{-2y}^4 + \underline{\underline{y}}^2 - \underline{\underline{\underline{5}}})$ *Identify like terms.*

$(\underline{6y}^4 - \underline{\underline{2y}}^4) + (\underline{\underline{3y}}^2 + \underline{\underline{y}}^2) + (\underline{\underline{\underline{-7}}} - \underline{\underline{\underline{5}}})$ *Rearrange terms so that like terms are together.*

$4y^4 + 4y^2 - 12$ *Combine like terms.*

Find the opposite of each polynomial.

11. $x^2 + 7x$ _____

12. $-3x^3 + 4x - 8$ _____

13. $-5x^4 + x^3 - 7x^2 - 3$ _____

Subtract.

14. $(9x^3 - 5x) - (3x)$ _____

15. $(6t^4 + 3) - (-2t^4 + 2)$ _____

16. $(2x^3 + 4x - 2) - (4x^3 - 6)$ _____

17. $(t^3 - 2t) - (t^2 + 2t + 6)$ _____

18. $(4c^5 + 8c^2 - 2c - 2) - (c^3 - 2c + 5)$ _____

Name _____ Date _____ Class _____

LESSON 6-4

Practice A

Adding and Subtracting Polynomials

Add or subtract.

1. $3x^3 + 4 + x^3 - 10$ _____
2. $6 - 12p^5 - 3p + 8 - 8p^5$ _____

Add.

3. $2m + 4$
   $+ m + 2$
   _____

4. $3y^2 - y + 3$
   $+ 2y^2 + 2y + 9$
   _____

5. $4z^3 + 3z^2 + 8$
   $+ 2z^3 + z^2 - 3$
   _____

6. $(10g^2 + 3g - 10) + (2g^2 + g + 9)$ _____
7. $(4x^3 - x^2 + 2x) + (3x^3 + x^2 + 4x)$ _____

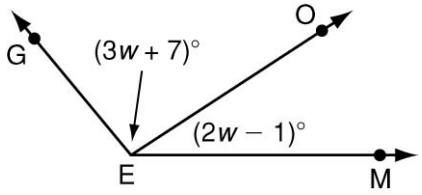
Subtract.

8. $12k + 3$
   $- (4k + 2)$
   _____

9. $6s^3 + 9s + 10$
   $- (3s^3 + 4s - 10)$
   _____

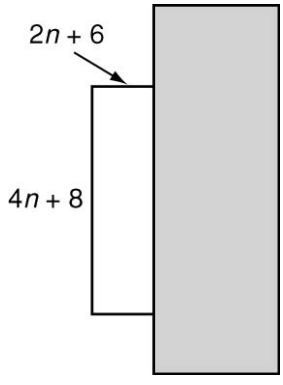
10. $15a^4 + 6a^2 + a$
    $- (6a^4 - 2a^2 + a)$
    _____

11. $(11b^2 + 3b - 1) - (2b^2 + 2b + 8)$ _____
12. $(c^3 - c^2 + 2c) - (-3c^3 - c^2 - 4c)$ _____
13. Write a polynomial that represents the difference between the measures of angle GEO and angle OEM.



_____

14. Becki is building an enclosure for her rabbits against the side of her house.



   a. Find the difference between the length and the width of the enclosure.

   _____

   b. Find the perimeter of the enclosure not including the side of the house.

   _____

   c. Find the perimeter of the enclosure if she built it in the yard with out the house as a wall.

   _____

Name _____ Date _____ Class _____

LESSON 6-4

Practice B

Adding and Subtracting Polynomials

Add or subtract.

1. $3m^3 + 8m^3 - 3 + m^3 - 2m^2$ _____

2. $2pg - p^5 - 12pg + 5g - 6p^5$ _____

Add.

3. $3k^2 - 2k + 7$
   $+ \quad k - 2$
   _____

4. $5x^2 - 2x + 3y$
   $+ 6x^2 + 5x + 6y$
   _____

5. $11hz^3 + 3hz^2 + 8hz$
   $+ 9hz^3 + hz^2 - 3hz$
   _____

6. $(ab^2 + 13b - 4a) + (3ab^2 + a + 7b)$ _____

7. $(4x^3 - x^2 + 4x) + (x^3 - x^2 - 4x)$ _____

Subtract.

8. $12d^2 + 3dx + x$
   $-(-4d^2 + 2dx - 8x)$
   _____

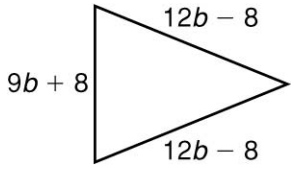
9. $2v^5 - 3v^4 - 8$
   $-(3v^5 + 2v^4 - 8)$
   _____

10. $-y^4 + 6ay^2 - y + a$
    $-(-6y^4 - 2ay^2 + y)$
    _____

11. $(-r^2 + 8pr - p) - (-12r^2 - 2pr + 8p)$ _____

12. $(un - n^2 + 2un^3) - (3un^3 + n^2 + 4un)$ _____

13. Antoine is making a banner in the shape of a triangle. He wants to line the banner with a decorative border. How long will the border be?



_____

14. Darnell and Stephanie have competing refreshment stand businesses. Darnell's profit can be modeled with the polynomial $c^2 + 8c - 100$, where c is the number of items sold. Stephanie's profit can be modeled with the polynomial $2c^2 - 7c - 200$.

    a. Write a polynomial that represents the difference between Stephanie's profit and Darnell's profit.

    _____

    b. Write a polynomial to show how much they can expect to earn if they decided to combine their businesses.

    _____

Name _____ Date _____ Class _____

LESSON 6-5

Review for Mastery

Multiplying Polynomials

To multiply monomials, multiply the constants, then multiply variables with the same base.

Multiply $(3a^2b)(4ab^3)$.

$(3a^2b)(4ab^3)$

$(3 \cdot 4)(a^2 \cdot a)(b \cdot b^3)$ *Rearrange so that the constants and the variables with the same bases are together.*

$12a^3b^4$ *Multiply.*

To multiply a polynomial by a monomial, distribute the monomial to each term in the polynomial.

Multiply $2x(x^2 + 3x + 7)$.

$2x(x^2 + 3x + 7)$

$(2x)x^2 + (2x)3x + (2x)7$ *Distribute.*

$2x^3 + 6x^2 + 14x$ *Multiply.*

Multiply.

1. $(-5x^2y^3)(2xy)$ _____
2. $(2xyz)(-4x^2yz)$ _____
3. $(3x)(x^2y^3)$ _____

Fill in the blanks below. Then finish multiplying.

4. $4(x - 5)$
   $(\square)x - (\square)5$ _____
5. $3x(x + 8)$
   $(\square)x + (\square)8$ _____
6. $2x(x^2 - 6x + 3)$
   $(\square)x^2 - (\square)6x + (\square)3$ _____

Multiply.

7. $5(x + 9)$ _____
8. $-4x(x^2 + 8)$ _____
9. $3x^2(2x^2 + 5x + 4)$ _____
10. $-3(5 - x^2 + 2)$ _____
11. $(5a^3b)(2ab)$ _____
12. $5y(-y^2 + 7y - 2)$ _____

Name _____ Date _____ Class _____

LESSON 6-5

Review for Mastery

Multiplying Polynomials continued

Use the Distributive Property to multiply binomials and polynomials.

Multiply $(x + 3)(x - 7)$.

$(\mathbf{x + 3})(x - 7)$

$\mathbf{x}(x - 7) + 3(x - 7)$ *Distribute.*

$(x)x - (x)7 + (3)x - (3)7$ *Distribute again.*

$x^2 - \underline{7x} + \underline{3x} - 21$ *Multiply.*

$x^2 - 4x - 21$ *Combine like terms.*

Multiply $(x + 5)(x^2 + 3x + 4)$.

$(\mathbf{x + 5})(x^2 + 3x + 4)$

$\mathbf{x}(x^2 + 3x + 4) + 5(x^2 + 3x + 4)$ *Distribute.*

$(x)x^2 + (x)3x + (x)4 + (5)x^2 + (5)3x + (5)4$ *Distribute again.*

$x^3 + \underline{3x^2} + \underline{\underline{4x}} + \underline{5x^2} + \underline{\underline{15x}} + 20$ *Multiply.*

$x^3 + 8x^2 + 19x + 20$ *Combine like terms.*

Fill in the blanks below. Then finish multiplying.

13. $(x + 4)(x - 5)$

$\square(x - 5) + \square(x - 5)$

_____

14. $(x - 2)(x + 8)$

$\square(x + 8) - \square(x + 8)$

_____

15. $(x - 3)(x - 6)$

$\square(x - 6) - \square(x - 6)$

_____

Multiply.

16. $(x - 2)(x - 3)$

_____

17. $(x - 7)(x + 7)$

_____

18. $(x + 2)(x + 1)$

_____

Fill in the blanks below. Then finish multiplying.

19. $(x + 3)(2x^2 + 4x + 8)$

$\square(2x^2 + 4x + 8) + \square(2x^2 + 4x + 8)$

_____

20. $(x + 2)(6x^2 + 4x + 5)$

$\square(6x^2 + 4x + 5) + \square(6x^2 + 4x + 5)$

_____

Name _____ Date _____ Class _____

LESSON 6-5

Practice A

Multiplying Polynomials

Multiply.

1. $(4x)(5x)$ _____

2. $(3x^2)(5x)$ _____

3. $(6y^2)(3y^3)$ _____

4. $3(5x + 7)$ _____

5. $4x(2x^2 + 7x + 3)$ _____

Fill in the blanks by multiplying the First, Outer, Inner, and Last terms. Then simplify.

6. $(x + 5)(x + 2)$

____ ____ ____ ____

F O I L

Simplify: _____

7. $(x + 4)(x - 3)$

____ ____ ____ ____

F O I L

Simplify: _____

Fill in the blanks below. Then simplify.

8. $(x + 3)(x^2 + 4x + 7) = x(x^2 + 4x + 7) + 3(x^2 + 4x + 7)$

Distribute: ____ ____ ____ + ____ ____ ____

Simplify: _____

9. $(2x - 1)(4x^3 - 3x^2 + 5) = 2x(4x^3 - 3x^2 + 5) + -1(4x^3 - 3x^2 + 5)$

Distribute: ____ _____ ____ + _____ ____ ____

Simplify: _____

10. **The length of a rectangle is 5 inches greater than the width.**

a. Write an expression for the width of the rectangle. _____

b. Write an expression for the length of the rectangle. _____

c. Write a simplified expression for the area of the rectangle. (Area = length × width) _____

d. Find the area of the rectangle when the width is 3 inches. _____

e. Find the area of the rectangle when the length is 9 inches. _____

Name _____ Date _____ Class _____

LESSON 6-5

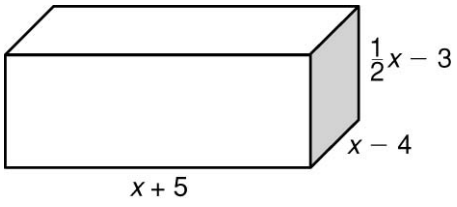
Practice B

Multiplying Polynomials

Multiply.

1. $(6m^4)(8m^2)$ _____
2. $(5x^3)(4xy^2)$ _____
3. $(10s^5t)(7st^4)$ _____
4. $4(x^2 + 5x + 6)$ _____
5. $2x(3x - 4)$ _____
6. $7xy(3x^2 + 4y + 2)$ _____
7. $(x + 3)(x + 4)$ _____
8. $(x - 6)(x - 6)$ _____
9. $(x - 2)(x - 5)$ _____
10. $(2x + 5)(x + 6)$ _____
11. $(m^3 + 3)(5m + n)$ _____
12. $(a^2 + b^2)(a + b)$ _____
13. $(x + 4)(x^2 + 3x + 5)$ _____
14. $(3m + 4)(m^2 - 3m + 5)$ _____
15. $(2x - 5)(4x^2 - 3x + 1)$ _____

16. **The length of a rectangle is 3 inches greater than the width.**
    a. Write a polynomial that represents the area of the rectangle. _____
    b. Find the area of the rectangle when the width is 4 inches. _____
17. **The length of a rectangle is 8 centimeters less than 3 times the width.**
    a. Write a polynomial that represents the area of the rectangle. _____
    b. Find the area of the rectangle when the width is 10 centimeters. _____
18. Write a polynomial to represent the volume of the rectangular prism.



_____

Name _____ Date _____ Class _____

LESSON 6-6

Review for Mastery

Special Products of Binomials

A **perfect-square trinomial** is a trinomial that is the result of squaring a binomial.

$(a + b)^2 = a^2 + 2ab + b^2$

Square *a*. Square *b*. **Add** product of 2, *a*, and *b*.

$(a - b)^2 = a^2 - 2ab + b^2$

Square *a*. Square *b*. **Subtract** product of 2, *a*, and *b*.

Multiply $(x + 4)^2$.

$(x + 4)^2$	*a*: x
	b: 4
$x^2 + 2(x)(4) + 4^2$	*Middle term is added.*
$x^2 + 8x + 16$	*Simplify.*

Multiply $(4x - 3)^2$.

$(4x - 3)^2$	*a*: $4x$
	b: 3
$16x^2 - 2(4x)(3) + 3^2$	*Middle term is subtracted.*
$16x^2 - 24x + 9$	*Simplify.*

State whether each product will result in a perfect-square trinomial.

1. $(x + 5)(x + 5)$ _____
2. $(x + 2)(x - 2)$ _____
3. $(5x - 6)(5x - 6)$ _____

Fill in the blanks. Then write the perfect-square trinomial.

4. $(x + 7)^2$
   Square *a*: _____
   $2(a)(b)$: _____
   Square *b*: _____
   _____
5. $(x - 1)^2$
   Square *a*: _____
   $2(a)(b)$: _____
   Square *b*: _____
   _____
6. $(2x + 10)^2$
   Square *a*: _____
   $2(a)(b)$: _____
   Square *b*: _____
   _____

Multiply.

7. $(x - 8)^2$ _____
8. $(x + 2)^2$ _____
9. $(7x - 5)^2$ _____

Name _____ Date _____ Class _____

LESSON 6-6

Review for Mastery

Special Products of Binomials continued

When you multiply certain types of binomials, the middle term will be zero.

Multiply $(a + b)(a - b)$.

$(a + b)(a - b)$

$a(a - b) + b(a - b)$ *Distribute.*

$a^2 - ab + ab - b^2$

$a^2 - b^2$ *Combine like terms.*

This type of special product is called a **difference of squares.**

$(a + b)(a - b) = a^2 - b^2$

Square *a.* Subtract. Square *b.*

Multiply $(x + 4)(x - 4)$.

$(x + 4)(x - 4)$ *a:* x *b:* 4

$(x)^2 - (4)^2$

$x^2 - 16$ *Simplify.*

Multiply $(7 + 8x)(7 - 8x)$.

$(7 + 8x)(7 - 8x)$ *a:* 7 *b:* $8x$

$(7)^2 - (8x)^2$

$49 - 64x^2$ *Simplify.*

State whether the products will form a difference of squares or a perfect-square trinomial.

10. $(x + 10)(x - 10)$ _____

11. $(y + 6)(y + 6)$ _____

12. $(z - 3)(z - 3)$ _____

Fill in the blanks. Then write the difference of squares.

13 $(a + 7)(a - 7)$

Square *a*: _____

Square *b*: _____

_____

14. $(2 + m)(2 - m)$

Square *a*: _____

Square *b*: _____

_____

15. $(2x + 5)(2x - 5)$

Square *a*: _____

Square *b*: _____

_____

Multiply.

16. $(x + 8)(x - 8)$ _____

17. $(10 + x)(10 - x)$ _____

18. $(5x + 2y)(5x - 2y)$ _____

Name _____ Date _____ Class _____

LESSON 6-6

Practice A

Special Products of Binomials

Fill in the blanks below. Then simplify.

1. $(x + 5)^2$

$\square^2 + 2(\square)(\square) + \square^2$

_____

2. $(m + 3)^2$

$\square^2 + 2(\square)(\square) + \square^2$

_____

3. $(2 + a)^2$

$\square^2 + 2(\square)(\square) + \square^2$

_____.

Multiply.

4. $(x + 4)^2$

_____

5. $(a + 7)^2$

_____

6. $(8 + b)^2$

_____

Fill in the blanks below. Then simplify.

7. $(x - 10)^2$

$\square^2 - 2(\square)(\square) + \square^2$

_____

8. $(y - 6)^2$

$\square^2 - 2(\square)(\square) + \square^2$

_____

9. $(9 - x)^2$

$\square^2 - 2(\square)(\square) + \square^2$

_____

Multiply.

10. $(y - 7)^2$

_____

11. $(b - 11)^2$

_____

12. $(3 - x)^2$

_____

Fill in the blanks below. Then simplify.

13. $(x + 7)(x - 7)$

$\square^2 - \square^2$

_____

14. $(4 + y)(4 - y)$

$\square^2 - \square^2$

_____

15. $(x + 2)(x - 2)$

$\square^2 - \square^2$

_____

Multiply.

16. $(x + 8)(x - 8)$

_____

17. $(3 + y)(3 - y)$

_____

18. $(x + 1)(x - 1)$

_____

Name _____ Date _____ Class _____

LESSON 6-6

Practice B

Special Products of Binomials

Multiply.

1. $(x + 2)^2$ _____
2. $(m + 4)^2$ _____
3. $(3 + a)^2$ _____
4. $(2x + 5)^2$ _____
5. $(3a + 2)^2$ _____
6. $(6 + 5b)^2$ _____
7. $(b - 3)^2$ _____
8. $(8 - y)^2$ _____
9. $(a - 10)^2$ _____
10. $(3x - 7)^2$ _____
11. $(4m - 9)^2$ _____
12. $(6 - 3n)^2$ _____
13. $(x + 3)(x - 3)$ _____
14. $(8 + y)(8 - y)$ _____
15. $(x + 6)(x - 6)$ _____
16. $(5x + 2)(5x - 2)$ _____
17. $(10x + 7y)(10x - 7y)$ _____
18. $(x^2 + 3y)(x^2 - 3y)$ _____

19. Write a simplified expression that represents the...
    a. area of the large rectangle.

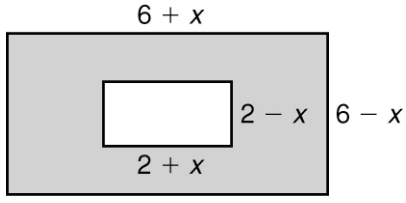
    _____

    b. area of the small rectangle.

    _____

    c. area of the shaded area.

    _____



20. The small rectangle is made larger by adding 2 units to the length and 2 units to the width.
    a. What is the new area of the smaller rectangle?

    _____

    b. What is the area of the new shaded area?

    _____

Name _____ Date _____ Class _____

Chapter 6

Exponents and Polynomials

Section A Quiz

Select the best answer.

1. Simplify 9^{-2}.

   A -81 C $\frac{1}{81}$

   B $-\frac{1}{81}$ D 81

2. Simplify $x^{-2}y^3$.

   F xy^{-6} H $\frac{y^3}{x^2}$

   G xy J $\frac{x^2}{y^3}$

3. Simplify $\frac{a^{-2}b^4}{c^{-3}}$ completely.

   A $a^2b^4c^3$ C $\frac{1}{a^2b^4c^3}$

   B $\frac{a^2b^4}{c^3}$ D $\frac{b^4c^3}{a^2}$

4. Simplify $\frac{1}{2^{-3}}$.

   F 8 H $\frac{1}{6}$

   G 6 J $\frac{1}{8}$

5. Simplify 3^4.

   A 9 C 81

   B 12 D 243

6. Simplify 11^{-2}

   F -121 H $\frac{1}{121}$

   G -22 J $\frac{1}{22}$

7. Simplify $(-3)^3$

   A -27 C $\frac{1}{27}$

   B -9 D $\frac{1}{9}$

8. Which expression below is NOT simplified?

   F $\frac{a^3}{b^2}$ H $m^{-2}n^4$

   G $-x^3y$ J $\frac{a}{-b}$

9. Simplify $x^3y^{-4}x^2$.

   A $\frac{x^5}{y^4}$ C x^2y^2

   B $\frac{x^6}{y^4}$ D xy

10. Simplify $9^{\frac{3}{2}}$.

    F 27 H 3

    G 9 J 1

11. Simplify $\left(\frac{2}{3}\right)^{-3}$.

    A $\frac{8}{27}$ C $\frac{9}{4}$

    B $\frac{4}{9}$ D $\frac{27}{8}$

12. Simplify $8^{\frac{4}{3}}$.

    F 4 H 16

    G 12 J 24

13. Simplify $64^{\frac{1}{3}}$.

    A 4 C 64

    B 16 D 128

14. Simplify $625^{\frac{1}{4}}$.

    F 4 H 6

    G 5 J 25

15. Simplify $81^{\frac{3}{4}}$.

    A 3 C 27

    B 9 D 729

16. Simplify $(x^{\frac{1}{3}})^6\sqrt[4]{x^4}$. All variables represent nonnegative numbers.

    F x^3 H $x^{2(x)}$

    G x^4 J x^6

Name _____ Date _____ Class _____

Chapter 6

Exponents and Polynomials

Section B Quiz

Select the best answer.

1. What is the degree of $-4xy^2z$?
   A 2 C 4
   B 3 D 5

2. What is the degree of $5x^2y^3 + 2x^2$?
   F 2 H 6
   G 5 J 7

3. What is the leading coefficient of $2x^2 + 5x^3 + 4x + 3$?
   A 2 C 4
   B 3 D 5

4. Which of the following is a cubic binomial?
   F $2x^3 + 4x$
   G $3x^2 + x$
   H $x^3 + 6x^2 + 2$
   J $x^4 + 3x^2 - 11$

5. Add $m^2 + 3m^2 + m$.
   A $4m^2 + m$ C $5m^5$
   B $3m^2 + m$ D $4m^4 + m$

6. Subtract $2xy^3 - 3xy^3$.
   F xy^3 H $-xy^3$
   G $-6xy^3$ J -1

7. Add $(4x^3 + 2x) + (8x^3 - 5x + 4)$.
   A $12x^3 - 3x + 4$
   B $12x^3 - 7x + 4$
   C $12x^3 + 3x + 4$
   D $12x^3 + 7x + 4$

8. Subtract $(9x^4 + x^2) - (6x^4 - 3x^2 - 8)$.
   F $3x^4 - 2x^2 + 8$
   G $3x^4 - 2x^2 - 8$
   H $3x^4 + 4x^2 + 8$
   J $3x^4 + 4x^2 - 8$

9. Multiply $(8a^3b^2)(2a^2b)$.
   A $16ab$ C $16a^5b^3$
   B $16a^6b^2$ D $16ab^8$

10. Multiply $2xy(x^3 - 3y^2)$.
    F $2x^4y - 6xy^3$
    G $2x^3y - 6xy^2$
    H $2x^4y + 6xy^3$
    J $2x^3y + 6xy^3$

11. Multiply $(x + 4)(x - 3)$.
    A $x^2 + 7x - 12$
    B $x^2 - x - 12$
    C $x^2 + x - 12$
    D $x^2 - 7x - 12$

12. Multiply $(x + 2)(3x^2 - 4x + 5)$.
    F $3x^3 + 2x^2 - 3x + 10$
    G $3x^3 - 4x^2 + 5x + 10$
    H $3x^3 - 2x^2 - 3x + 10$
    J $3x^3 + 10x^2 + 13x + 10$

13. The length of a rectangle is 5 less than the width. Which polynomial describes the area of the rectangle?
    A $w^2 + 5w$ C $5w^2$
    B $w^2 - 5w$ D $5w^2 - 5$

14. Which is NOT a perfect square trinomial?
    F $9a^2 - 42a + 49$
    H $24a^2 + 26a + 9$
    G $144a^2 - 96a + 16$
    J $100a^2 + 100a + 25$

15. Multiply $(3m + n^2)(3m - n^2)$.
    A $6m^2 - n^4$
    B $6m^2 - 6mn^2 + n^4$
    C $9m^2 - n^4$
    D $9m^2 - 6mn^2 - n^4$

Name _____ Date _____ Class _____

Chapter 6

Exponents and Polynomials

Chapter Test *Form B*

Select the best answer.

1. Which of the following is equivalent to 2^{-3}?

   A $(-2)(-2)(-2)$ C $\frac{1}{(2)(2)(2)}$

   B $-\frac{1}{(2)(2)(2)}$ D $(2)(2)(2)$

2. Evaluate $(3 + x)^{-2}$ for $x = -1$.

   F -4 H $\frac{10}{9}$

   G $\frac{1}{4}$ J 10

3. Simplify $4b^{-3}$.

   A $-64b^3$ C $\frac{1}{4b^3}$

   B $\frac{1}{64b^3}$ D $\frac{4}{b^3}$

4. Simplify 2^6.

   F 12 H 32

   G 16 J 64

5. Simplify $\left(\frac{1}{216}\right)^0$.

   A 0 C 6

   B 1 D 36

6. Simplify 4^{-4}.

   F -256 H $\frac{1}{256}$

   G $-\frac{1}{256}$ J 256

7. Simplify $256^{\frac{3}{4}}$.

   A 4 C 64

   B 16 D 128

8. Simplify $125^{\frac{2}{3}}$.

   F -5 H 25

   G 5 J 125

9. Simplify $\left(\frac{1}{3}\right)^{-4}$.

   A -3 C 9

   B $-\frac{1}{81}$ D 81

10. Simplify $\left(\frac{1}{64}\right)^{-\frac{1}{3}}$

    F $\frac{1}{8}$ H 4

    G $\frac{1}{4}$ J 8

11. Simplify $(-8)^{\frac{4}{3}}$.

    A -16

    B -2

    C 2

    D 16

12. Simplify $\left(\frac{4}{9}\right)^{-\frac{1}{2}}$

    F 81 H $\frac{3}{2}$

    G $\frac{4}{3}$ J $\frac{2}{9}$

13. Simplify $\left(\frac{5}{b^4}\right)^{-2}$.

    A $\frac{1}{25b^4}$ C $\frac{b^8}{25}$

    B $\frac{5}{b^6}$ D $-5b^2$

14. Simplify $\left(\frac{1}{6}\right)^{-3}$

    F 216 H $-\frac{1}{216}$

    G 36 J $-\frac{1}{36}$

15. Simplify $256^{\frac{1}{4}}$.

A 4 C 6

B 5 D 64

16. Simplify $64^{\frac{2}{3}}$.

F 2 H 16

G 8 J 512

17. Simplify $(x^{\frac{1}{2}})^4\sqrt[3]{x^3}$. All variables represent nonnegative numbers.

A x^2 C $x^{2(x)}$

B x^3 D x^9

18. When written in standard form, which polynomial has a leading coefficient of 5?

F $-7 + 6y + 5y^2$

G $x + 5$

H $x^2 - 5x^3 + 2x$

J $5y + 3y^2 - 4$

19. Classify the polynomial $3x^5 + 3$ according to its degree and number of terms.

A cubic binomial

B cubic trinomial

C quintic binomial

D quintic trinomial

20. Brett has 100 feet of fence with which to make a rectangular cage for his dog. The area of the cage in square feet is given by the polynomial $-w^2 + 50w$, where w is the width of the cage in feet. What is the area of the cage if the width is 8 feet?

F 114 ft^2 H 384 ft^2

G 336 ft^2 J 464 ft^2

21. Add $(2x^2 - 5x - 7) + (7x^2 + 3)$.

A $2x^2 + 2x - 4$

B $9x^2 - 5x - 4$

C $9x^2 - 2x - 7$

D $9x^4 - 5x - 4$

22. Subtract $(7a^2 - 3a) - (5a^2 - 5a)$.

F $2a^2 - 8a$ H 4

G $2a^2 + 2a$ J $12a^2 - 8a$

23. Multiply $(2x+1)(x-1)$.

A $3x$

B $2x^2 - 1$

C $2x^2 - x - 1$

D $2x^2 - 3x - 1$

24. A rectangle has width w and its length is 2 units shorter than 3 times the width, or $3w - 2$. Write a polynomial for the area of the rectangle.

F $3w^2 - 2$ H $4w - 2$

G $3w^2 - 2w$ J $8w - 4$

25. Multiply $(x - 5)(2x + 4)$.

A $-6x$ C $2x^2 - 20$

B $2x^2 - 26$ D $2x^2 - 6x - 20$

26. Multiply $(b + 3)(b^2 - 5b - 7)$.

F $b^3 - 5b^2 - 21$

G $b^3 - 2b^2 - 22b - 21$

H $3b^3 - 15b^2 - 21b$

J $4b^3 - 20b^2 - 28b$

27. Multiply $(2x + 7)^2$.

A $2x^2 + 7$ C $4x^2 + 14x + 49$

B $4x^2 + 49$ D $4x^2 + 28x + 49$

28. Which product results in $x^2 - 100$?

F $(x - 10)^2$

G $(x + 10)^2$

H $x(x - 100)$

J $(x + 10)(x - 10)$

Name _____ Date _____ Class _____

Chapter 6

Exponents and Polynomials

Chapter Test *Form A*

1. Simplify 3^{-2}.

2. Evaluate x^{-2} for $x = -6$.

3. Simplify $8a^0$.

4. Simplify 12^2.

5. Simplify 7^1.

6. Simplify 1^{-3}.

7. Simplify $25^{\frac{1}{2}}$.

8. Simplify $125^{-\frac{1}{3}}$.

9. Simplify $\left(\frac{1}{81}\right)^{-\frac{1}{2}}$.

10. Simplify $\left(\frac{1}{10}\right)^{-2}$

11. Simplify $256^{\frac{1}{4}}$.

12. Simplify $\left(\frac{1}{16}\right)^{-\frac{1}{2}}$

13. Simplify $\left(\frac{3}{4}\right)^{-2}$

14. Simplify 3^{-3}

_____

Simplify.

15. $36^{\frac{1}{2}}$

_____

16. $25^{\frac{3}{2}}$

_____

17. Simplify $\sqrt{x^2y^8}$. All variables represent nonnegative numbers.

_____

18. Write the polynomial $5x - 2x^3 + 8x^2 - 7$ in standard form.

_____

19. Classify the polynomial $4x^3 - x$ according to its degree.

_____

20. Evaluate $-2w^2 + 5$ for $w = 4$.

_____

21. Add $(x^2 + 7) + (4x^2 - 3)$.

_____

22. Subtract $(7a^3 + 5a) - (4a^3 + 4a)$.

_____

23. Multiply $(x+1)(x+1)$.

_____

24. A rectangle has width w and its length is 5 units less than the width, or $w - 5$. Write a polynomial for the area of the rectangle.

_____

Multiply.

25. $(x + 5)(x + 2)$

_____

26. $(b + 2)(b^2 + 5b + 6)$

_____

27. $(x - 5)(x + 5)$

_____

28. $(x + 3)^2$

_____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

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Name _____ Date _____ Class _____

LESSON 7-1

Review for Mastery

Factors and Greatest Common Factors

A prime number has exactly two factors, itself and 1. The number 1 is not a prime number. To write the **prime factorization** of a number, factor the number into its prime factors only.

Find the prime factorization of 30.

Choose any prime number that is a factor of 30. Then divide.

$5\overline{)30} \rightarrow 5\overline{)30}\ 6 \rightarrow 5\overline{)30}\ 2\overline{)6} \rightarrow 5\overline{)30}\ 2\overline{)6}\ 3 \rightarrow 5\overline{)30}\ 2\overline{)6}\ 3\overline{)3} \rightarrow 5\overline{)30}\ 2\overline{)6}\ 3\overline{)3}\ 1 \rightarrow 30 = 5 \cdot 2 \cdot 3$

Repeat the process with the quotient.

The prime factorization of 30 is $2 \cdot 3 \cdot 5$.

Find the prime factorization of 84.

$2\overline{)84}$
$2\overline{)42}$
$3\overline{)21}$
$7\overline{)7}$
1

Check by multiplying: $2 \cdot 2 \cdot 3 \cdot 7 = 84$

The prime factorization of 84 is $2 \cdot 2 \cdot 3 \cdot 7$ or $2^2 \cdot 3 \cdot 7$.

Fill in the blanks below to find the prime factorization of the given numbers.

1. $2\overline{)44}$
   $2\overline{)\square}$
   $\square\overline{)\square}$
   1

2. $2\overline{)56}$
   $2\overline{)\square}$
   $\square\overline{)\square}$
   1

3. $3\overline{)81}$
   $\square\overline{)\square}$
   $\square\overline{)\square}$
   1

_____ _____ _____

Write the prime factorization of each number.

4. 99
5. 75
6. 84

_____ _____ _____

Name _____ Date _____ Class _____

LESSON 7-1

Review for Mastery

Factors and Greatest Common Factors continued

If two numbers have the same factors, the numbers have common factors.

The largest of the common factors is called the **greatest common factor**, or GCF.

Find the GCF of 12 and 18.

Think of the numbers you multiply to equal 12.

$1 \times 12 = 12$
$2 \times 6 = 12$
$3 \times 4 = 12$

} The factors of 12 are: **1**, **2**, **3**, 4, **6**, 12

Think of the numbers you multiply to equal 18.

$1 \times 18 = 18$
$2 \times 9 = 18$
$3 \times 6 = 18$

} The factors of 18 are: **1**, **2**, **3**, **6**, 9, 18.

The GCF of 12 and 18 is 6.

Find the GCF of $8x^2$ and $10x$.

The factors of $8x^2$ are: **1**, **2**, 4, 8, ***x***, *x*

The factors of $10x$ are: **1**, **2**, 5, 10, ***x***

↓ ↓

2 ***x***

The GCF of $8x^2$ and $10x$ is $2x$.

Find the GCF of 28 and 44 by following the steps below.

7. Find the factors of 28. _____
8. Find the factors of 44. _____
9. Find the GCF of 28 and 44. _____

Find the GCF of each pair of numbers.

10. 15 and 20 _____
11. 16 and 28 _____
12. 24 and 60 _____

Find the GCF of each pair of monomials.

13. $4a$ and $10a$ _____
14. $15x^3$ and $21x^2$ _____
15. $5y^2$ and $8y$ _____

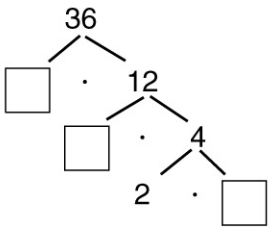
Name _____ Date _____ Class _____

LESSON 7-1

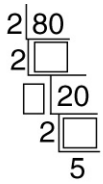
Practice A

Factors and Greatest Common Factors

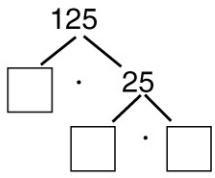
Complete the prime factorization of each number.

1. 

$3^2 \cdot 2^2$

2. 

$\square^4 \cdot \square$

3. 

_____

Find the GCF of each pair of numbers.

4. 15 and 40

_____

5. 8 and 32

_____

6. 36 and 48

_____

7. 50 and 75

_____

Find the GCF of each pair of monomials.

8. $12y^3$ and $15y^2$

_____

9. $3p^4$ and $4p$

_____

10. $18x^6$ and $24y^2$

_____

11. $14xy^2$ and $21y^3$

_____

Mrs. Graham is creating student envelopes for a math activity in her class. She has 64 problems written on pieces of blue paper and 48 problems written on pieces of red paper. She needs to sort the pieces of paper so that each envelope has the same number of pieces and no envelope has both red and blue pieces.

12. If Mrs. Graham puts the greatest possible number of papers in each envelope, how many papers will go in each envelope?

_____

13. How many envelopes can Mrs. Graham create if she puts the greatest possible number of papers in each envelope?

_____

Name _____ Date _____ Class _____

LESSON 7-1

Practice B

Factors and Greatest Common Factors

Write the prime factorization of each number.

1. 18 _____
2. 120 _____
3. 56 _____
4. 390 _____
5. 144 _____
6. 153 _____

Find the GCF of each pair of numbers.

7. 16 and 20 _____
8. 9 and 36 _____
9. 15 and 28 _____
10. 35 and 42 _____
11. 33 and 66 _____
12. 100 and 120 _____
13. 78 and 30 _____
14. 84 and 42 _____

Find the GCF of each pair of monomials.

15. $15x^4$ and $35x^2$ _____
16. $12p^2$ and $30q^5$ _____
17. $-6t^3$ and $9t$ _____
18. $27y^3z$ and $45x^2y$ _____
19. $12ab$ and 12 _____
20. $-8d^3$ and $14d^4$ _____
21. $-m^8n^4$ and $3m^6n$ _____
22. $10gh^2$ and $5h$ _____

23. Kirstin is decorating her bedroom wall with photographs. She has 36 photographs of family and 28 photographs of friends. She wants to arrange the photographs in rows so that each row has the same number of photographs, and photographs of family and photographs of friends do not appear in the same row.

    a. How many rows will there be if Kirstin puts the greatest possible number of photographs in each row?

    _____

    b. How many photographs will be in each row? _____

Name _____ Date _____ Class _____

LESSON 7-2

Review for Mastery

Factoring by GCF

The Distributive Property states: $a(b + c) = ab + ac$

Factoring by GCF reverses the Distributive Property:

$$ab + ac = a(b + c)$$

Factor $12x^3 + 21x^2 + 15x$. Check your answer.

Step 1: Find the GCF of all the terms in the polynomial.

The factors of $12x^3$ are: 1, 2, **3**, 4, 6, 12, ***x***, x, x

The factors of $21x^2$ are: 1, **3**, 7, 21, ***x***, x

The factors of $15x$ are: 1, **3**, 5, 15, ***x***

} The GCF is **$3x$.**

Step 2: Write terms as products using the GCF.

$12x^3 + 21x^2 + 15x$

$(3x)$ $4x^2$ + **$(3x)$**$7x$ + **$(3x)$**5

Step 3: Use the Distributive Property to factor out the GCF.

$3x(4x^2 + 7x + 5)$

***Check*:**

$3x(4x^2 + 7x + 5) = 12x^3 + 21x^2 + 15x$ ✓

Factor $5(x - 3) + 4x(x - 3)$.

Step 1: Find the GCF of all the terms in the polynomial.

The factors of $5(x - 3)$ are: 5, **$(x - 3)$**

The factors of $4x(x - 3)$ are: 4, x, **$(x - 3)$**

} The GCF is **$(x - 3)$**.

The terms are already written as products with the GCF.

Step 2: Use the Distributive Property to factor out the GCF.

$(x - 3)(5 + 4x)$

Factor each polynomial.

1. $20x^2 - 15x$
2. $44a^2 + 11a$
3. $24y - 36x$

_____ _____ _____

Factor each expression.

4. $5x(x + 7) + 2(x + 7)$
5. $3a(a + 4) - 2(a + 4)$
6. $4y(4y + 1) + (4y + 1)$

_____ _____ _____

Name _____ Date _____ Class _____

LESSON 7-2

Review for Mastery

Factoring by GCF continued

When a polynomial has four terms, make two groups and factor out the GCF from each group.

Factor $8x^3 + 6x^2 + 20x + 15$.

Step 1: Group terms that have common factors.

$$(8x^3 + 6x^2) + (20x + 15)$$

Step 2: Identify and factor the GCF out of each group.

$(8x^3 + 6x^2) + (20x + 15)$

GCF is **$2x^2$.** GCF is **5.**

$2x^2(4x + 3) + 5(4x + 3)$

Step 3: Factor out the common binomial factor.

$2x^2\mathbf{(4x + 3)} + 5\mathbf{(4x + 3)}$

GCF is **$(4x + 3)$.** $(4x + 3)(2x^2 + 5)$

***Check*:**

$(4x + 3)(2x^2 + 5)$

$4x(2x^2) + 4x(5) + 3(2x^2) + 3(5)$ *Use FOIL.*

$8x^3 + 20x + 6x^2 + 15$

$8x^3 + 6x^2 + 20x + 15$ *Rearrange terms.*

Factor each polynomial filling in the blanks.

7. $(18x^3 + 15x^2) + (24x + 20)$

GCF is ☐ GCF is ☐

☐ $(6x + 5) +$ ☐ $(6x + 5)$

(☐) $(6x + 5)$

8. $(10a^3 - 15a^2) + (12a - 18)$

GCF is ☐ GCF is ☐

☐ $(2a - 3) +$ ☐ $(2a - 3)$

(☐) $(2a - 3)$

Factor each polynomial by grouping.

9. $21x^3 + 12x^2 + 14x + 8$

10. $40x^3 - 50x^2 + 12x - 15$

Name _____ Date _____ Class _____

LESSON 7-2

Practice A

Factoring by GCF

Factor each polynomial. Check your answer.

1. $x^2 + 5x$

   $x(\_\_\_ + \_\_\_)$

2. $5m^3 + 45$

   $\_\_\_ (\_\_\_ + 9)$

3. $15y^3 + 20y^5 - 10$

   $\_\_\_ (3y^3 + 4\_\_\_ - \_\_\_)$

4. $10y^2 + 12y^3$

   _____

5. $-12t^5 + 6t$

   _____

6. $6x^4 + 15x^3 + 3x^2$

   _____

7. A golf ball is hit upward at a speed of 40 m/s. The expression $-5t^2 + 40t$ gives the approximate height of the ball after t seconds. Factor this expression. _____

8. The area of the Hillen family's television screen is $3x^2 + 24x$ in^2. Factor this polynomial to find expressions for the dimensions of their TV screen. _____

Factor out the common binomial factor in each expression.

9. $4d(d + 2) + 9(d + 2)$

   _____

10. $12(x - 5) + 7x(x - 5)$

    _____

Factor each polynomial by grouping.

11. $n^3 + 3n^2 + 4n + 12$

    $(n^3 + \_\_\_) + (4n + \_\_\_)$

    $n^2(n + \_\_\_) + 4(n + \_\_\_)$

    _____

12. $2x^3 + 5x^2 + 2x + 5$

    _____

Factor each polynomial by grouping and using opposites.

13. $2y^3 - 4y^2 + 6 - 3y$

    $(\_\_\_ - 4y^2) + (\_\_\_ - 3y)$

    $2y^2 (\_\_\_ - 2) + 3 (\_\_\_ - y)$

    $2y^2 (\_\_\_ - 2) + 3(-1) (\_\_\_ - 2)$

    $2y^2 (\_\_\_ - 2) - 3(y - \_\_\_)$

    _____

14. $4m^3 - 12m^2 + 15 - 5m$

    _____

Name _____ Date _____ Class _____

LESSON 7-2

Practice B

Factoring by GCF

Factor each polynomial. Check your answer.

1. $8c^2 + 7c$

2. $3n^3 + 12n^2$

3. $15x^5 - 18x$

4. $-8s^4 + 20t^3 - 28$

5. $6n^6 + 18n^4 - 24n$

6. $-5m^4 - 5m^3 + 5m^2$

7. A ball is hit vertically into the air using a paddle at a speed of 32 ft/sec. The expression $-16t^2 + 32t$ gives the ball's height after t seconds. Factor this expression.

8. The area of Margo's laptop computer screen is $12x^2 + 3x$ in^2. Factor this polynomial to find expressions for the dimensions of her computer screen.

Factor each expression.

9. $3m(m + 5) + 4(m + 5)$

10. $16b(b - 3) + (b - 3)$

Factor each polynomial by grouping.

11. $2x^3 + 8x^2 + 3x + 12$

12. $4n^3 + 3n^2 + 4n + 3$

13. $10d^2 - 6d + 35d - 21$

14. $12n^3 - 15n^2 - 8n + 10$

15. $5b^4 - 15b^3 + 3 - b$

16. $t^3 - 5t^2 + 10 - 2t$

Name _____ Date _____ Class _____

LESSON 7-3

Review for Mastery

Factoring $x^2 + bx + c$

When factoring $x^2 + bx + c$:

If c is positive	and b is positive	both factor are positive.
	and b is negative	both factor are negative.

Factor $x^2 + 7x + 10$. Check your answer.

$$x^2 + 7x + 10$$

Need factors of **10** that sum to **7**.

Factors of 10	Sum
1 and 10	11 ×
2 and 5	7 ✓

$(x + 2)(x + 5)$

Check:

$(x + 2)(x + 5) = x^2 + 5x + 2x + 10$

$= x^2 + 7x + 10$ ✓

Factor $x^2 - 9x + 18$. Check your answer.

$$x^2 - 9x + 18$$

Need factors of **18** that sum to **–9**.

Factors of 18	Sum
–1 and –18	–19 ×
–2 and –9	–11 ×
–3 and –6	–9 ✓

$(x - 3)(x - 6)$

Check:

$(x - 3)(x - 6) = x^2 - 6x - 3x + 18$

$= x^2 - 9x + 18$ ✓

Factor the trinomial by filling in the blanks below.

1. $x^2 + 10x + 16$

Need factors of ☐, that sum to ☐.

Factors	Sum
☐ and ☐	☐
☐ and ☐	☐
☐ and ☐	☐

2. $x^2 - 9x + 20$

Need factors of ☐, that sum to ☐.

Factors	Sum
☐ and ☐	☐
☐ and ☐	☐
☐ and ☐	☐

Factor each trinomial.

3. $x^2 + 13x + 12$

4. $x^2 + 15x + 50$

5. $x^2 - 13x + 36$

Name _____ Date _____ Class _____

LESSON 7-3

Review for Mastery

Factoring $x^2 + bx + c$ continued

When factoring $x^2 + bx + c$:

If c is negative	and b is positive	the larger factor must be positive.
	and b is negative	the larger factor must be negative.

Factor $x^2 + 8x - 20$. Check your answer.

$$x^2 + 8x - 20$$

Need factors of **–20** that sum to **8**.
(Make larger factor positive.)

Factors of –20	Sum
–1 and 20	19 ×
–2 and 10	8 ✓
–4 and 5	1 ×

$(x - 2)(x + 10)$

Check:

$(x - 2)(x + 10) = x^2 + 10x - 2x - 20$

$= x^2 + 8x - 20$ ✓

Factor $x^2 - 3x - 28$. Check your answer.

$$x^2 + 3x - 28$$

Need factors of **–28** that sum to **–3**.
(Make larger factor negative.)

Factors of –28	Sum
1 and –28	–27 ×
2 and –14	–12 ×
4 and –7	–3 ✓

$(x + 4)(x - 7)$

Check:

$(x + 4)(x - 7) = x^2 - 7x - 4x + 28$

$= x^2 - 3x + 28$ ✓

Factor the trinomial by filling in the blanks below.

6. $x^2 + x - 20$

Need factors of ☐, that sum to ☐.

Factors	Sum
☐ and ☐	☐
☐ and ☐	☐
☐ and ☐	☐

7. $x^2 - 3x - 4$

Need factors of ☐, that sum to ☐.

Factors	Sum
☐ and ☐	☐
☐ and ☐	☐

_____ _____

Factor each trinomial.

8. $x^2 + 3x - 18$

9. $x^2 - 5x - 14$

10. $x^2 + 4x - 45$

_____ _____ _____

Name _____ Date _____ Class _____

LESSON 7-3

Practice A

Factoring $x^2 + bx + c$

Factor each trinomial.

1. $x^2 + 5x + 6$

$(x + \ )(x + \ )$

2. $x^2 + 5x + 4$

$(x + \ )\ (x + \ )$

3. $x^2 + 9x + 20$

$(x + \ )\ (x + \ )$

4. $x^2 + 10x + 21$

5. $x^2 + 11x + 30$

6. $x^2 + 10x + 16$

7. $x^2 - 8x + 12$

8. $x^2 - 8x + 15$

9. $x^2 - 17x + 16$

$(x - \ )(x - \ )$

$(x - \ )\ (x - \ )$

$(x - \ )\ (x - \ )$

10. $x^2 - 12x + 27$

11. $x^2 - 15x + 44$

12. $x^2 - 13x + 40$

13. $x^2 + 6x - 40$

14. $x^2 + 2x - 3$

15. $x^2 + 4x - 32$

$(x + \ )(x - \ )$

$(x + \ )\ (x - \ )$

$(x + \ )\ (x - \ )$

16. $x^2 + 10x - 24$

17. $x^2 + 12x - 28$

18. $x^2 + 3x - 10$

$(x + \ )(x - \ )$

$(x + \ )\ (x - \ )$

$(x + \ )\ (x - \ )$

19. $x^2 - 2x - 15$

20. $x^2 - 8x - 20$

21. $x^2 - 2x - 48$

22. $x^2 - x - 12$

23. $x^2 - 2x - 3$

24. $x^2 - x - 2$

25. Factor $n^2 + 6n + 5$. Complete the tables to show that the original polynomial and the factored form describe the same sequence of numbers for $n = 0, 1, 2, 3$, and 4.

$(n + \ )(n + \ )$

n	$n^2 + 6n + 5$
0	$0^2 + 6(0) + 5 = 5$
1	
2	
3	
4	

n	$(n + \ )(n + \ )$
0	$(0 + \ )(0 + \ ) = 5$
1	
2	
3	
4	

Name _____ Date _____ Class _____

LESSON 7-3

Practice B

Factoring $x^2 + bx + c$

Factor each trinomial.

1. $x^2 + 7x + 10$ _____
2. $x^2 + 9x + 8$ _____
3. $x^2 + 13x + 36$ _____
4. $x^2 + 9x + 14$ _____
5. $x^2 + 7x + 12$ _____
6. $x^2 + 9x + 18$ _____
7. $x^2 - 9x + 18$ _____
8. $x^2 - 5x + 4$ _____
9. $x^2 - 9x + 20$ _____
10. $x^2 - 12x + 20$ _____
11. $x^2 - 11x + 18$ _____
12. $x^2 - 12x + 32$ _____
13. $x^2 + 7x - 18$ _____
14. $x^2 + 10x - 24$ _____
15. $x^2 + 2x - 3$ _____
16. $x^2 + 2x - 15$ _____
17. $x^2 + 5x - 6$ _____
18. $x^2 + 5x - 24$ _____
19. $x^2 - 5x - 6$ _____
20. $x^2 - 2x - 35$ _____
21. $x^2 - 7x - 30$ _____
22. $x^2 - x - 56$ _____
23. $x^2 - 2x - 8$ _____
24. $x^2 - x - 20$ _____

25. Factor $n^2 + 5n - 24$. Show that the original polynomial and the factored form describe the same sequence of numbers for $n = 0, 1, 2, 3$, and 4.

_____

n	$n^2 + 5n - 24$

n	

Name _____ Date _____ Class _____

LESSON 7-4

Review for Mastery

Factoring $ax^2 + bx + c$

When factoring $ax^2 + bx + c$, first find factors of a and c. Then check the products of the inner and outer terms to see if the sum is b.

Factor $2x^2 + 11x + 15$. Check your answer.

$2x^2 + 11x + 15 = (\square x + \square)(\square x + \square)$

Factors of 2	Factors of 15	Outer + Inner
1 and 2	1 and 15	$1 \cdot 15 + 2 \cdot 1 = 17$ ×
1 and 2	15 and 1	$1 \cdot 1 + 2 \cdot 15 = 31$ ×
1 and 2	5 and 3	$1 \cdot 3 + 2 \cdot 5 = 13$ ×
1 and 2	3 and 5	$1 \cdot 5 + 2 \cdot 3 = 11$ ✓

$(x + 3)(2x + 5)$

Check:

$(x + 3)(2x + 5) = 2x^2 + 5x + 6x + 15$

$= 2x^2 + 11x + 15$ ✓

Factor $3x^2 - 23x + 14$. Check your answer.

$3x^2 - 23x + 14 = (\square x + \square)(\square x + \square)$

Factors of 3	Factors of 14	Outer + Inner
1 and 3	–1 and –14	$1 \cdot (-14) + 3 \cdot (-1) = -17$ ×
1 and 3	–14 and –1	$1 \cdot (-1) + 3 \cdot (-14) = -42$ ×
1 and 3	–2 and –7	$1 \cdot (-7) + 3 \cdot (-2) = -13$ ×
1 and 3	–7 and –2	$1 \cdot (-2) + 3 \cdot (-7) = -23$ ✓

$(x - 7)(3x - 2)$

Check:

$(x - 7)(3x - 2) = 3x^2 - 2x - 21x + 14$

$= 3x^2 + 23x + 14$ ✓

1. Factor $5x^2 + 12x + 4$ by filling in the blanks below.

Factors	Factors	Outer + Inner
☐ and ☐	☐ and ☐	☐ • ☐ + ☐ • ☐ = ☐
☐ and ☐	☐ and ☐	☐ • ☐ + ☐ • ☐ = ☐
☐ and ☐	☐ and ☐	☐ • ☐ + ☐ • ☐ = ☐

_____

Factor each trinomial.

2. $3x^2 + 7x + 4$

3. $2x^2 - 13x + 21$

4. $4x^2 + 8x + 3$

_____ _____ _____

Name _____ Date _____ Class _____

LESSON 7-4

Review for Mastery

Factoring $ax^2 + bx + c$ continued

When *c* is negative, one factor of *c* is positive and one is negative. You can stop checking factors when you find the factors that work.

Factor $2x^2 + 7x - 15$. Check your answer.

$2x^2 + 7x - 15 = (\square x + \square)(\square x + \square)$

Factors of 2	Factors of –15	Outer + Inner
1 and 2	–3 and 5	$1 \cdot 5 + 2 \cdot (-3) = -1$ ×
1 and 2	3 and –5	$1 \cdot (-5) + 2 \cdot 3 = 1$ ×
1 and 2	–5 and 3	$1 \cdot 3 + 2 \cdot (-5) = -7$ ×
1 and 2	5 and –3	$1 \cdot (-3) + 2 \cdot 5 = 7$ ✓

$(x + 5)(2x - 3)$

Check:

$(x + 5)(2x - 3) = 2x^2 - 3x + 10x - 15$

$= 2x^2 + 7x - 15$

When *a* is negative, factor out –1. Then factor as shown previously.

Factor $-5x^2 + 28x + 12$. Check your answer.

$-5x^2 + 28x + 12$

$-1(5x^2 - 28x - 12) = -1(\square x + \square)(\square x + \square)$

Factors of 5	Factors of –12	Outer + Inner
1 and 5	–2 and 6	$1 \cdot 6 + 5 \cdot (-2) = -4$ ×
1 and 5	2 and –6	$1 \cdot (-6) + 5 \cdot 2 = 4$ ×
1 and 5	6 and –2	$1 \cdot (-2) + 5 \cdot 6 = 28$ ×
1 and 5	–6 and 2	$1 \cdot 2 + 5 \cdot (-6) = -28$ ✓

$-1(x - 6)(5x + 2)$

Check:

$-1(x - 6)(5x + 2)$

$= -1(5x^2 + 2x - 30x - 12)$

$= -1(5x^2 - 28x - 12)$

$= -5x^2 + 28x + 12$

Factor each trinomial.

5. $3x^2 - 7x - 20$ _____

6. $5x^2 + 34x - 7$ _____

7. $-2x^2 + 3x + 5$ _____

Name _____ Date _____ Class _____

LESSON 7-4

Practice A

Factoring $ax^2 + bx + c$

Factor each trinomial, where *c* is positive.

1. $5x^2 + 17x + 6$

   $(x + 3)(5x + \ \ )$

2. $4x^2 + 16x + 15$

   $(2x + \ \ )(2x + \ \ )$

3. $3x^2 + 17x + 20$

   _____

4. $6x^2 + 19x + 10$

   _____

5. $8x^2 + 18x + 7$

   _____

6. $8x^2 + 14x + 3$

   _____

7. $4x^2 - 33x + 8$

   $(4x - \ \ )(x - \ \ )$

8. $9x^2 - 27x + 14$

   $(3x - \ \ )(3x - \ \ )$

9. $6x^2 - 25x + 25$

   _____

10. $5x^2 - 22x + 8$

    _____

11. $21x^2 - 22x + 5$

    _____

12. $12x^2 - 25x + 12$

    _____

Factor each trinomial, where *c* is negative.

13. $10x^2 + 13x - 9$

    $(5x + \ \ )(2x - 1)$

14. $3x^2 + x - 4$

    $(3x + \ \ )(x - \ \ )$

15. $5x^2 + 7x - 6$

    _____

16. $4x^2 - 9x - 9$

    _____

17. $4x^2 - 12x - 7$

    _____

18. $6x^2 - 7x - 20$

    _____

Factor each trinomial, where *a* is negative.

19. $-5x^2 - 48x - 27$

    $-1(\_\_\_\_\_)$

    $-1(5x + \ \ )(x + \ \ )$

20. $-6x^2 + 11x - 4$

    $-1(2x - \ \ )(3x - \ \ )$

21. $-20x^2 + 7x + 6$

    _____

22. The area of a rectangle is $8x^2 + 14x + 3$. The length is $2x + 3$. The width is _____.

Name _____ Date _____ Class _____

LESSON 7-4

Practice B

Factoring $ax^2 + bx + c$

Factor each trinomial.

1. $2x^2 + 13x + 15$ _____
2. $3x^2 + 10x + 8$ _____
3. $4x^2 + 24x + 27$ _____
4. $5x^2 + 21x + 4$ _____
5. $4x^2 + 11x + 7$ _____
6. $6x^2 - 23x + 20$ _____
7. $7x^2 - 59x + 24$ _____
8. $3x^2 - 14x + 15$ _____
9. $8x^2 - 73x + 9$ _____
10. $2x^2 + 11x - 13$ _____
11. $3x^2 + 2x - 16$ _____
12. $2x^2 + 17x - 30$ _____
13. $8x^2 + 29x - 12$ _____
14. $11x^2 + 25x - 24$ _____
15. $9x^2 - 3x - 2$ _____
16. $12x^2 - 7x - 12$ _____
17. $9x^2 - 49x - 30$ _____
18. $6x^2 + x - 40$ _____
19. $-12x^2 - 35x - 18$ _____
20. $-20x^2 + 29x - 6$ _____
21. $-2x^2 + 5x + 42$ _____
22. The area of a rectangle is $20x^2 - 27x - 8$. The length is $4x + 1$. What is the width? _____

Name _____ Date _____ Class _____

LESSON 7-5

Review for Mastery

Factoring Special Products

If a polynomial is a perfect square trinomial, the polynomial can be factored using a pattern.

$$a^2 + 2ab + b^2 = (a + b)^2$$

$$a^2 - 2ab + b^2 = (a - b)^2$$

Determine whether $4x^2 + 20x + 25$ is a perfect square trinomial. If so, factor it. If not, explain why.

Step 1: Find a, b, then $2ab$.

$a = \sqrt{4x^2} = 2x$ *The first term is a perfect square.*

$b = \sqrt{25} = 5$ *The last term is a perfect square.*

$2ab = 2(2x)(5) = 20x$ *Middle term* $(20x) = 2ab$.

Therefore, $4x^2 + 20x + 25$ is a perfect square trinomial.

Step 2: Substitute expressions for a and b into $(a + b)^2$.

$(2x + 5)^2$

Determine whether $9x^2 + 25x + 36$ is a perfect square trinomial. If so, factor it. If not, explain why.

Step 1: Find a, b, then $2ab$.

$a = \sqrt{9x^2} = 3x$ *The first term is a perfect square.*

$b = \sqrt{36} = 6$ *The last term is a perfect square.*

$2ab = 2(3x)(6) = 36x$ *Middle term* $(25x) \neq 2ab$.

STOP

Because $25x$ does not equal $2ab$, $9x^2 - 25x + 36$ is not a perfect square trinomial.

Determine whether each trinomial is a perfect square. If so, factor it. If not, explain why.

1. $9x^2 + 30x + 100$

   $a =$ _____

   $b =$ _____

   $2ab =$ _____

   Factor or explain:

   _____

2. $x^2 - 14x + 49$

   $a =$ _____

   $b =$ _____

   $2ab =$ _____

   Factor or explain:

   _____

3. $25x^2 + 20x + 4$

   $a =$ _____

   $b =$ _____

   $2ab =$ _____

   Factor or explain:

   _____

Name _____ Date _____ Class _____

LESSON 7-5

Review for Mastery

Factoring Special Products continued

If a binomial is a difference of perfect squares, it can be factored using a pattern.

$$a^2 - b^2 = (a + b)(a - b)$$

Determine whether $64x^2 - 25$ is a difference of perfect squares. If so, factor it. If not, explain why.

Step 1: Determine if the binomial is a difference.

$64x^2 - 25$ *The minus sign indicates it is a difference.*

Step 2: Find a and b.

$a = \sqrt{64x^2} = 8x$ *The first term is a perfect square.*

$b = \sqrt{25} = 5$ *The last term is a perfect square.*

Therefore, $64x^2 - 25$ is a difference of perfect squares.

Step 3: Substitute expressions for a and b into $(a + b)(a - b)$.

$(8x + 5)(8x - 5)$

Determine whether $4x^2 + 25$ is a difference of perfect squares. If so, factor it. If not, explain why.

Step 1: Determine if the binomial is a difference.

$4x^2 + 25$ *The plus sign indicates a sum.*

STOP. The binomial is not a difference, so it cannot be a difference of perfect squares. It does not have a GCF either, so $4x^2 + 25$ cannot be factored.

Determine whether each binomial is a difference of perfect squares. If so, factor it. If not, explain why.

4. $25x^2 - 81$

   Difference? _____

   a = _____

   b = _____

   Factor or explain:

   _____

5. $30x^2 - 49$

   Difference? _____

   a = _____

   b = _____

   Factor or explain:

   _____

6. $4x^2 - 121$

   Difference? _____

   a = _____

   b = _____

   Factor or explain:

   _____

Factor.

7. $x^2 - 100$

   _____

8. $x^2 - y^2$

   _____

9. $9x^4 - 64$

   _____

Name _____ Date _____ Class _____

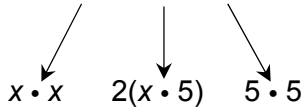
LESSON 7-5

Practice A

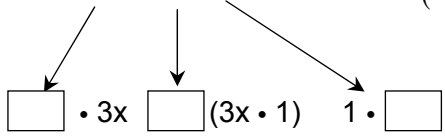
Factoring Special Products

Factor each perfect square trinomial by filling in the blanks.

1. $x^2 + 10x + 25 = (x + 5)\ (x + \square) = (\square + \square)^2$



2. $9x^2 + 6x + 1 = (3x + \square)(\square + 1) = (\square + \square)^2$



Factor each perfect square trinomial.

3. $x^2 - 18x + 81$ _____

4. $36x^2 + 24x + 4$ _____

Complete the following sentences.

5. $x^2 + 6x + 6$ is not a perfect square trinomial because

_____

6. $4x^2 + 12x + 36$ is not a perfect square trinomial because

_____

7. A square floor tile has an area of $(x^2 + 8x + 16)$ in^2. The side length of the tile is of the form $cx + d$, where c and d are whole numbers.

   a. Find an expression for the side length of the tile. _____

   b. Find an expression for the perimeter of the tile. _____

   c. Find the perimeter when $x = 8$ in. _____

Factor each binomial into the difference of two squares.

8. $x^2 - 9 = (x + \square)(x - \square)$

9. $4p^2 - 49 = (\square + \square)(\square - \square)$

10. $t^6 - 144$ _____

11. $16x^{10} - y^2$ _____

Complete the following sentences.

12. $25n^2 - 20$ is not a difference of perfect squares because

_____

13. $9m^4 + 1$ is not a difference of perfect squares because

_____

Name _____ Date _____ Class _____

LESSON 7-5

Practice B

Factoring Special Products

Determine whether each trinomial is a perfect square. If so, factor it. If not, explain why.

1. $x^2 + 6x + 9$

2. $4x^2 + 20x + 25$

3. $36x^2 - 24x + 16$

4. $9x^2 - 12x + 4$

5. A rectangular fountain in the center of a shopping mall has an area of $(4x^2 + 12x + 9)$ ft^2. The dimensions of the fountain are of the form $cx + d$, where c and d are whole numbers. Find an expression for the perimeter of the fountain. Find the perimeter when $x = 2$ ft.

Determine whether each binomial is the difference of perfect squares. If so, factor it. If not, explain why.

6. $x^2 - 16$

7. $9b^4 - 200$

8. $1 - m^6$

9. $36s^2 - 4t^2$

10. $x^2y^2 + 196$

Name _____ Date _____ Class _____

LESSON 7-6

Review for Mastery

Choosing a Factoring Method

Use the following table to help you choose a factoring method.

First factor out a GCF if possible. Then,

If binomial,	check for difference of squares.	yes no	Use $(a + b)(a - b)$. If no GCF, it cannot be factored.
If trinomial,	check for perfect square trinomial.	yes no	Factor using $(a + b)^2$ or $(a - b)^2$. If $a = 1$, check factors of c that sum to b. If $a \neq 1$, check inner plus outer factors of a and c that sum to b.
If 4 or more terms,			Try to factor by grouping.

Explain how to choose a factoring method for $x^2 - x - 30$. Then state the method.

- There is no GCF.
- $x^2 - x - 30$ is a trinomial.
- The terms a and b are not perfect squares, therefore this is not a perfect square trinomial.
- $a = 1$

Method: Factor by checking factors of c that sum to b.

Explain how to choose a factoring method for $2x^2 - 50$. Then state the method.

- Factor out the GCF: $2(x^2 - 25)$
- $x^2 - 25$ is a binomial.
- a and b are perfect squares. This is a difference of squares.

Method: Factor out GCF. Then use $(a + b)(a - b)$.

Explain how to choose a factoring method for each polynomial. Then state the method.

1. $x^2 + 14x + 49$ _____

2. $4x^2 - 40$ _____

3. $2x^2 + 8x + 6$ _____

Name _____ Date _____ Class _____

LESSON 7-6

Review for Mastery

Choosing a Factoring Method continued

It is often necessary to use more than one factoring method to factor a polynomial completely.

Factor $5x^2 - 5x - 60$ completely. Check your answer.

Step 1: Factor out the GCF.

$5x^2 - 5x - 60$

$5(x^2 - x - 12)$

Step 2: Choose a method for factoring.

- $x^2 - x - 12$ is a trinomial.
- It is not a perfect square.

Method: Find factors of c that will sum to b.

Step 3: Factor.

Factors of –12	Sum
2 and –6	–4 ×
3 and –4	–1 ✓

$(x + 3)(x - 4)$

Step 4: Write the complete factorization.

$5(x + 3)(x - 4)$

Check:

$5(x + 3)(x - 4) = 5(x^2 - 4x + 3x - 12)$

$= 5(x^2 - x - 12)$

$= 5x^2 - 5x - 60$ ✓

Factor $16x^2 - 36$ completely. Check your answer.

Step 1: Factor out the GCF.

$16x^2 - 36$

$4(4x^2 - 9)$

Step 2: Choose a method for factoring.

- $4x^2 - 9$ is a binomial.
- It is a difference of squares.

Method: Use $(a + b)(a - b)$.

Step 3: Factor.

$4x^2 - 9$

$a = 2x$, $b = 3$

$(2x + 3)(2x - 3)$

Step 4: Write the complete factorization.

$4(2x + 3)(2x - 3)$

Check:

$4(2x + 3)(2x - 3) = 4(4x^2 - 6x + 6x - 9)$

$= 4(4x^2 - 9)$

$= 16x^2 - 36$ ✓

Factor each polynomial completely.

4. $3x^2 - 300$

5. $4x^2 - 20x - 24$

6. $8x^2 - 40x + 50$

7. $-7x^2 - 21x + 28$

8. $8x^2 - 18$

9. $20x^2 + 50x + 30$

Name _____ Date _____ Class _____

LESSON 7-6

Practice A

Choosing a Factoring Method

Tell whether each polynomial is completely factored. If not, factor it.

1. $3(b^3 - 5)$

2. $2(n^3 + 4n^2)$

3. $8y(y^2 + 1)$

4. $(t - 6)(3t + 5)$

5. $2(m^2 + 10m + 9)$

6. $(2p - 8)(p + 3)$

Factor out a GCF. Then continue to factor by using other methods.

7. $45g^2 - 20$

8. $3w^3 + 30w^2 + 75w$

9. $12x^2y - 48xy + 48y$

10. $-3d^3 + 300d$

11. $2a^2 - 32$

12. $5m^2 - 5m - 60$

Factor completely.

13. $c^2 + 7c - 18$

14. $2x^2 + 8x + 6$

15. $f^3 - 3f^2 + 4f - 12$

16. $-6k^2 + 39k - 18$

17. $p^8 - m^4$

18. $2a(a^2 - 1) + 7(a^2 - 1)$

Name _____ Date _____ Class _____

LESSON 7-6

Practice B

Choosing a Factoring Method

Tell whether each polynomial is completely factored. If not, factor it.

1. $6(t^2 + 12)$

2. $5(m^2 + 9m)$

3. $2p(p^4 - 9)$

4. $(x - 8)(2x + 3)$

5. $3k^3(5k^2 + 19)$

6. $7(14g^4 - 4g + 10)$

Factor each polynomial completely.

7. $24x + 40$

8. $5r^3 - 10r$

9. $3x^3y + x^2y^2$

10. $-3a^2b + 12ab - 12b$

11. $5t^3 - 45t + 3t^2 - 27$

12. $2y^2 - 6y - 56$

13. $6a^3 + 39a^2 + 45a$

14. $x^3 - 9x$

15. $12n^3 - 48$

16. $3c^4 + 24c^3 + 48c^2$

17. $3d^3 + 4d - 2$

18. $10w^6 - 160w^2$

Name _____ Date _____ Class _____

Chapter 7

Factoring Polynomials

Section A Quiz

Select the best answer.

1. Which of the following is the prime factorization of 60?

   A $2^2 \cdot 3 \cdot 5$ C $3 \cdot 4 \cdot 5$

   B $2^2 \cdot 15$ D $2 \cdot 3 \cdot 5$

2. Which of the following could NOT be a prime factorization of any number?

   F 2 H 2^3

   G 7 J $3 \cdot 6$

3. What is the GCF of 12 and 32?

   A 2 C 6

   B 4 D 8

4. What is the GCF of $10x^2$ and $15x$?

   F 5 H 10

   G $5x$ J $10x$

5. What is the correct factorization of $6x^2 + 24x$?

   A $3x(2x + 8)$ C $6(x^2 + 4x)$

   B $3(2x^2 + 8x)$ D $6x(x + 4)$

6. What is the complete factorization of $8y^3 - 4y^2 + 10y$?

   F $y^3(8 - 4y + 10y)$

   G $y(8y^2 - 4y + 10)$

   H $2(4y^3 - 2y^2 + 5y)$

   J $2y(4y^2 - 2y + 5)$

7. What is the correct factorization of $5(x + 2) - 3x(x + 2)$?

   A $(5x + 10) - (3x^2 + 6x)$

   B $(5 - 3x)(x + 2)$

   C $(5x + 2)(-3x + 2)$

   D $(5 - 2x)(x + 3)$

8. Which is another way to write $(5 - x)$?

   F $x - 5$ H $-1(x - 5)$

   G $-1(5 - x)$ J $-5x$

9. What is the correct factorization of $x^2 + 13x + 30$?

   A $(x + 1)(x + 30)$ C $(x + 3)(x + 10)$

   B $(x + 2)(x + 15)$ D $(x + 5)(x + 6)$

10. What is the correct factorization of $x^2 - 11x + 18$?

    F $(x + 2)(x - 9)$ H $(x - 2)(x - 9)$

    G $(x - 2)(x + 9)$ J $(x + 2)(x + 9)$

11. What is the correct factorization of $x^2 - 2x - 15$?

    A $(x + 5)(x - 3)$ C $(x + 5)(x + 3)$

    B $(x - 5)(x + 3)$ D $(x - 5)(x - 3)$

12. What value of b would make $x^2 + bx - 24$ factorable?

    F 4 H 8

    G 5 J 12

13. What is the correct factorization of $3x^2 + 14x + 8$?

    A $(3x + 4)(x + 2)$ C $(3x + 8)(x + 1)$

    B $(3x + 2)(x + 4)$ D $(3x + 1)(x + 8)$

14. What is the correct factorization of $2x^2 + 3x - 5$?

    F $(2x + 5)(x - 1)$ H $(2x + 1)(x - 5)$

    G $(2x - 5)(x + 1)$ J $(2x - 1)(x + 5)$

15. What is the correct factorization of $-5x^2 + 9x + 2$?

    A $-1(5x - 1)(x + 2)$

    B $-1(5x + 1)(x - 2)$

    C $-1(5x - 2)(x + 1)$

    D $-1(5x + 2)(x - 1)$

16. The area of a rectangle is $12x^2 - 8x - 15$. The width is $(2x - 3)$. What is the length of the rectangle?

    F $(6x - 5)$ H $(2x - 3)$

    G $(6x + 5)$ J $(2x + 3)$

Name _____ Date _____ Class _____

Chapter 7

Factoring Polynomials

Section B Quiz

Select the best answer.

1. Which of the following is a perfect square trinomial?

   A $x^2 + 10x + 25$ C $x^2 + 10x + 20$

   B $x^2 + 5x + 10$ D $x^2 + 10x + 50$

2. Which value of b would make $16x^2 - bx + 25$ a perfect square trinomial?

   F 4 H 20

   G 5 J 40

3. What is the complete factorization of $x^2 - 8x + 16$?

   A $(x + 4)(x + 4)$ C $(x + 8)(x + 8)$

   B $(x - 4)(x - 4)$ D $(x - 8)(x - 8)$

4. The area of a square garden is $36x^2 - 60x + 25$. What is the perimeter of the garden if $x = 3$ feet?

   F 52 feet H 92 feet

   G 72 feet J 169 feet

5. What is the correct factorization of $9x^2 - 60xy + 100y^2$?

   A $(3x - 10y)(3x - 10y)$

   B $(3x + 10y)(3x + 10y)$

   C $(6x - 10y)(6x - 10y)$

   D $(6x + 10y)(6x + 10y)$

6. Which of the following binomials is a difference of squares?

   F $x^2 - 6$ H $4x^2 - 1$

   G $5x^2 - 10$ J $x^2 + 25$

7. What is the complete factorization of $25x^2 - 36$?

   A $(5x + 6)(5x + 6)$

   B $(5x - 6)(5x - 6)$

   C $(5x + 6)(5x - 6)$

   D $(6x + 5)(6x - 5)$

8. Which of the following polynomials is completely factored?

   F $(3x + 12)(x - 3)$ H $5x^3 - 4x$

   G $(4x + 9)(x + 5)$ J $(x^2 + 4)(x^2 - 4)$

9. Which method could be used to factor $9x^2 + 24x + 16$?

   A Factor out the GCF

   B Factor by grouping

   C Perfect square trinomial

   D Difference of squares

10. Which method could be used to factor $4x^2 - 50$?

    F Factor out the GCF

    G Factor by grouping

    H Perfect square trinomial

    J Difference of squares

11. What is the complete factorization of $x^4 - 1$?

    A $(x^2 + 1)(x^2 - 1)$

    B $(x + 1)^2 (x - 1)^2$

    C $(x^2 + 1)(x - 1)(x + 1)$

    D $(x + 1)(x + 1)(x - 1)(x + 1)$

12. What is the complete factorization of $4x^2 + 32x + 64$?

    F $4(x + 4)^2$ H $(2x + 8)^2$

    G $2(x + 4)(2x + 8)$ J $2(x + 4)^2$

13. Which of the following polynomials is unfactorable?

    A $25x^2 - y^2$ C $x^2 + 3x + 4$

    B $21x + 28$ D $x^6 - 1$

14. What is the complete factorization of $10x^3 - 35x^2 - 20x$?

    F $(2x + 1)(x - 4)$

    G $5x(2x^2 - 7x - 4)$

    H $5x(2x + 1)(x - 4)$

    J $x(2x + 1)(5x - 20)$

Name _____ Date _____ Class _____

Chapter 7

Factoring Polynomials

Chapter Test *Form B*

Select the best answer.

1. Which is the prime factorization of 120?

   A $2 \cdot 2 \cdot 2 \cdot 15$ C $3 \cdot 5 \cdot 8$

   B $2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$ D $10 \cdot 12$

2. Find the GCF of 42 and 70.

   F 7 H 196

   G 14 J 210

3. Find the GCF of $30x^2$ and $45x^5$.

   A $5x^2$ C $15x^2$

   B $5x^5$ D $15x^5$

4. Kyle is making flower arrangements for a wedding. He has 16 roses and 60 carnations. Each arrangement will have the same number of flowers, but roses and carnations will not appear in the same arrangement. If he puts the greatest possible number of flowers in each arrangement, how many arrangements can he make?

   F 4 H 19

   G 15 J 38

5. Factor $30y^3 - 6y^2 + 12y$ completely.

   A $y(30y^2 - 6y + 12)$

   B $3y(10y^2 - 2y + 4)$

   C $6(5y^3 - y^2 + 2y)$

   D $6y(5y^2 - y + 2)$

6. Factor $2n(n + 3) - 5(n + 3)$.

   F $(n - 3)(2n + 5)$

   G $(n + 3)(2n + 5)$

   H $(n + 3)(2n - 5)$

   J cannot be factored

7. Factor $6a^3 - 3a^2 + 8a - 4$ by grouping.

   A $(2a - 1)(3a^2 + 4)$

   B $(2a + 4)(3a^2 - 1)$

   C $(6a^3 - 3a^2)(8a - 4)$

   D cannot be factored

8. Factor $x^2 + 8x + 12$.

   F $(x + 1)(x + 12)$

   G $(x + 2)(x + 6)$

   H $(x + 3)(x + 4)$

   J cannot be factored

9. Factor $x^2 - 3x + 70$.

   A $(x - 10)(x + 7)$

   B $(x - 7)(x - 10)$

   C $(x + 5)(x + 14)$

   D cannot be factored

10. Factor $x^2 - 6x - 16$.

    F $(x - 2)(x - 8)$

    G $(x - 2)(x + 8)$

    H $(x + 2)(x - 8)$

    J cannot be factored

11. Which value of b would make $x^2 + bx - 30$ factorable?

    A -31 C 11

    B -17 D 13

12. Write the factored form of the polynomial that is modeled by this geometric diagram.

$12x^2$	$9x$
$4x$	3

    F $(x + 3)(12x + 1)$

    G $(2x + 3)(6x + 1)$

    H $(3x + 1)(4x + 3)$

    J $(12x^2 + 4x)(9x + 3)$

Name _____ Date _____ Class _____

Chapter 7

Factoring Polynomials

Chapter Test *Form B continued*

13. Factor $5x^2 + 39x + 54$.

A $(x + 2)(5x + 27)$

B $(x + 3)(5x + 18)$

C $(x + 6)(5x + 9)$

D cannot be factored

14. Factor $8a^2 - 10a - 7$.

F $(2a - 7)(4a + 1)$

G $(2a - 1)(4a + 7)$

H $(2a + 1)(4a - 7)$

J cannot be factored

15. Which value of c would NOT make $3x^2 + 5x + c$ factorable?

A -22 C 2

B -2 D 22

16. Determine whether $n^2 - 10n - 25$ is a perfect square trinomial. If so, choose the correct factorization.

F yes; $(n - 5)^2$

G yes; $(n + 5)^2$

H yes; $(n + 5)(n - 5)$

J no

17. Determine whether $16x^2 + 24x + 9$ is a perfect square trinomial. If so, choose the correct factorization.

A yes; $(4x - 3)^2$

B yes; $(4x + 3)^2$

C yes; $(4x + 3)(4x - 3)$

D no

18. Determine whether $p^2 - 36$ is a difference of two squares. If so, choose the correct factorization.

F yes; $(p - 6)^2$

G yes; $(p + 6)(p - 6)$

H yes; $(p + 18)(p - 18)$

J no

19. Determine whether $4x^2 - 10$ is a difference of two squares. If so, choose the correct factorization.

A yes; $(2x - 5)^2$

B yes; $(2x + 5)(2x - 5)$

C yes; $(2x + 10)(2x - 10)$

D no

20. The area of a square is represented by $9z^2 - 12z + 4$. Which expression represents the perimeter of the square?

F $3z - 2$ H $6z - 4$

G $3z + 2$ J $12z - 8$

21. Is $x(4x^2 + 8x + 12)$ completely factored? If not, what other factoring can occur?

A yes; the polynomial is completely factored.

B no; 4 can be factored from each term of the trinomial.

C no; the trinomial $4x^2 + 8x + 12$ can be factored into two binomials.

D no; 4 can be factored from each term of the trinomial AND the resulting trinomial can be factored into two binomials.

22. Completely factor $3x^4 - 15x^3 - 18x^2$.

F $x^2(3x + 2)(1x - 9)$

G $3(x^2 + 1)(x^2 - 6)$

H $3x^2(x + 1)(x - 6)$

J cannot be factored

23. Completely factor $3m^3 + 5m^2 - 12m - 20$.

A $(m^2 - 4)(3m + 5)$

B $(m - 2)^2(3m + 5)$

C $(m^2 + 4)(3m + 5)$

D $(m + 2)(m - 2)(3m + 5)$

Name _____ Date _____ Class _____

Chapter 7

Factoring Polynomials

Chapter Test *Form A*

1. Write the prime factorization of 36.

Find the GCF.

2. 8 and 28

3. $6x^2$ and $18x^5$

4. Marlon is putting his stamp collection in a new album. He has 20 stamps from Canada and 90 stamps from the U.S. Each page of the album will have the same number of stamps, but stamps from Canada and the U.S. will not appear on the same page. If he puts the greatest possible number of stamps on each page, how many pages will he use?

Factor.

5. $30y^3 - 50y$

6. $n(n - 3) + 8(n - 3)$

7. Factor $a^3 - 5a^2 + 2a - 10$ by grouping.

Factor each trinomial.

8. $x^2 + 10x + 21$

9. $x^2 - 3x - 10$

10. $x^2 + 16x - 55$

11. Find an integer value of b that makes $x^2 + bx - 15$ factorable, and then factor the trinomial.

$b =$

12. Write the polynomial modeled by this geometric diagram and then factor.

x^2	$10x$
$2x$	20

Factor each trinomial.

13. $7x^2 + 29x + 4$

14. $3a^2 - 4a - 7$

15. Determine whether each value of c makes $3x^2 + 7x + c$ factorable. If so, factor it.

$c = -2$ _____

$c = 2$ _____

Determine whether the trinomial is a perfect square. If so, factor it. If not, explain why.

16. $n^2 + 50n + 25$

17. $x^2 - 18x + 81$

Determine whether the binomial is a difference of two squares. If so, factor it. If not, explain why.

18. $p^2 - 30$

19. $x^2 - 100$

20. The area of a square in square feet is represented by $z^2 + 12z + 36$. Find an expression for the perimeter of the square. Then find the perimeter when $z = 4$ ft.

expression: _____

perimeter when $z = 4$ ft: _____

21. Tell whether $(8x - 5)(4x + 12)$ is completely factored. If not, factor it.

Factor each polynomial completely.

22. $5x^3 + 40x^2 - 100x$

23. $3m^4 - 48$

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

Name _____ Date _____ Class _____

LESSON 8-1

Review for Mastery

Identifying Quadratic Functions

There are three steps to identify a quadratic function from a table of ordered pairs.

Tell whether this function is quadratic. Explain.

x	y
–5	–191
–3	–59
–1	1
1	–11
3	–95

$-3-(-5)=+2$
$-1-(-3)=+2$
$1-(-1)=+2$
$3-1=+2$

$-59-(-191)=+132$
$1-(-59)=+60$
$-11-1=-12$
$-95-(-11)=-84$

$60-132=-72$
$-12-60=-72$
$-84-(-12)=-72$

Step 1: Check for a constant change in *x*-values. Calculate the second value minus the first.

Step 2: Find the first differences in *y*-values. If they are constant, the function is linear.

Step 3: Find the second differences in *y*-values. If the second differences are constant, then the function is quadratic.

This function is quadratic because the second differences are constant.

Tell whether each function is quadratic. Explain.

1.

x	*y*
–4	43
–1	16
2	7
5	16
8	43

$-1-(-4)=$ ____
$2-(-1)=$ ____
____ – ____ = ____
_____

$16-43=$ ____
$7-16=$ ____
____ – ____ = ____
_____

____ – ____ = ____
_____
_____

_____

2.

x	*y*
–2	12
–1	4
0	0
1	6
2	28

3.

x	*y*
–6	–18
–4	–14
–2	–10
0	–6
2	–2

Name _____ Date _____ Class _____

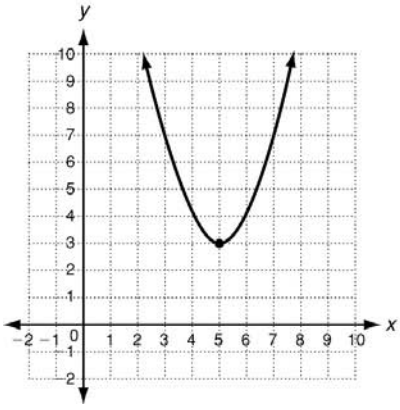
LESSON 8-1

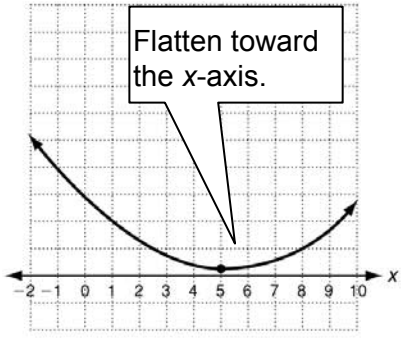
Review for Mastery

Identifying Quadratic Functions continued

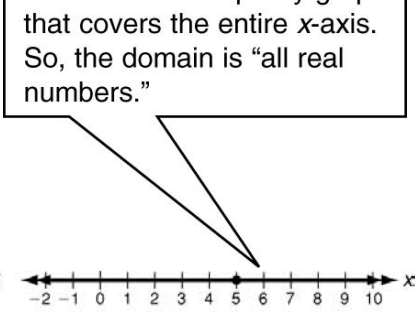
To find the domain of a quadratic function, "flatten" the parabola toward the *x*-axis. To find the range, "flatten" the parabola toward the *y*-axis. Then read the domain and range from the inequality graphs.

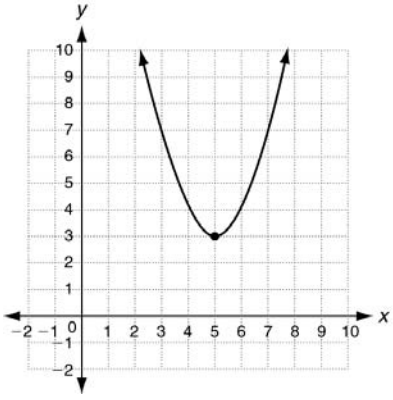
Find the domain and range.

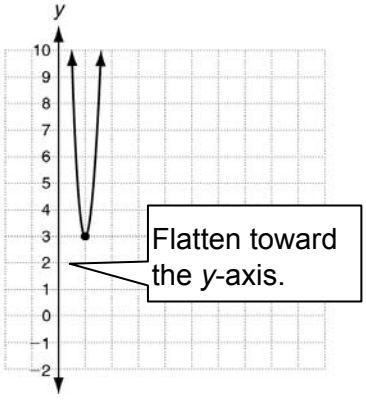


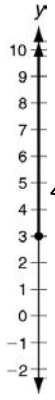


When the parabola is flat, it looks like an inequality graph that covers the entire *x*-axis. So, the domain is "all real numbers."









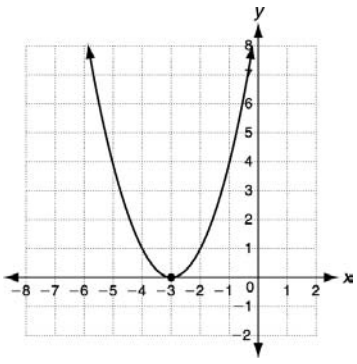
When the parabola is flat, it looks like an inequality graph with a solid point at 3, and all points above 3 are shaded. So, the range is "$y \geq 3$."

D: all real numbers

R: $y \geq 3$

Imagine "flattening" each parabola to find the domain and range.

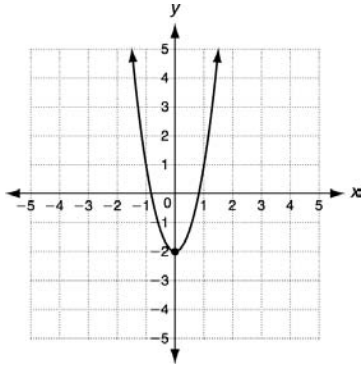
4.



D: _____

R: _____

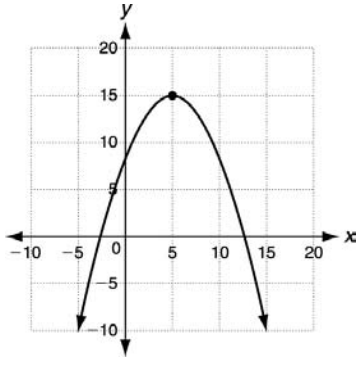
5.



D: _____

R: _____

6.



D: _____

R: _____

Name _____ Date _____ Class _____

LESSON 8-1

Practice A

Identifying Quadratic Functions

Tell whether each function is quadratic. Explain.

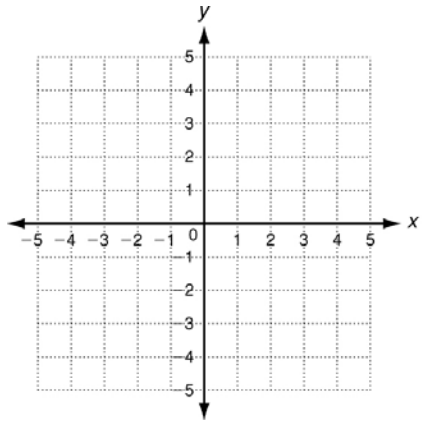
1.

x	1	2	3	4	5
y	0	3	8	15	24

2. $y + 5 = 2x^2$

3. Use the table of values to graph $y = x^2 - 4$.

x	$y = x^2 - 4$	(x, y)
−2		
−1		
0		
1		
2		

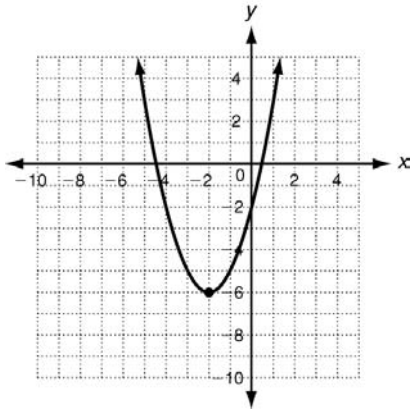


Tell whether the graph of each quadratic function opens upward or downward.

4. $y = -5x^2$

5. $y = 2x^2 + 7$

Use the graph of the quadratic function below for questions 6–8.



6. Identify the vertex of the parabola.

7. Give the minimum or maximum value.

8. Find the domain and range.

Name _____ Date _____ Class _____

LESSON 8-1

Practice B

Identifying Quadratic Functions

Tell whether each function is quadratic. Explain.

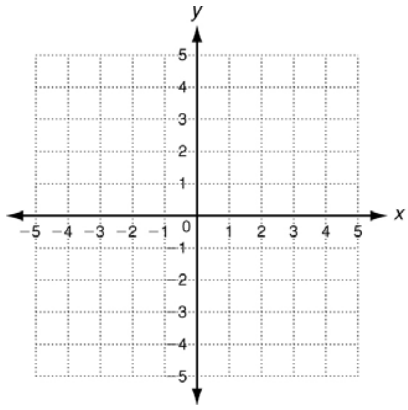
1. (0, 6), (1, 12), (2, 20), (3, 30)

2. $3x + 2y = 8$

Use a table of values to graph each quadratic function.

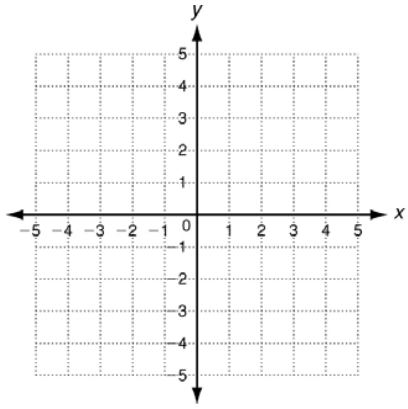
3. $y = -\frac{1}{2}x^2$

x	*y*



4. $y = 2x^2 - 3$

x	*y*



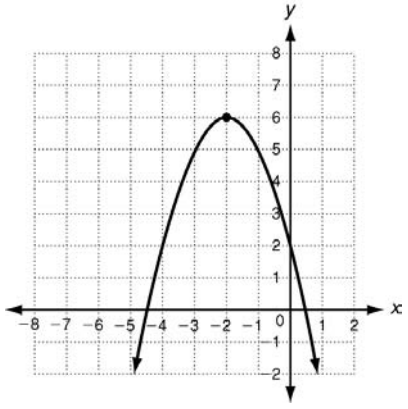
Tell whether the graph of each quadratic function opens upward or downward. Explain.

5. $y = -3x^2 + 5$

6. $-x^2 + y = 8$

For each parabola, a) identify the vertex; b) give the minimum or maximum value of the function; c) find the domain and range.

7.

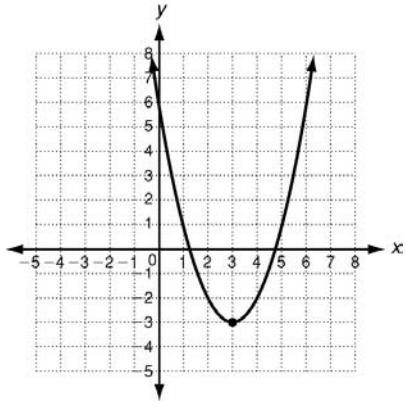


a. _____

b. _____

c. _____

8.



a. _____

b. _____

c. _____

Name _____ Date _____ Class _____

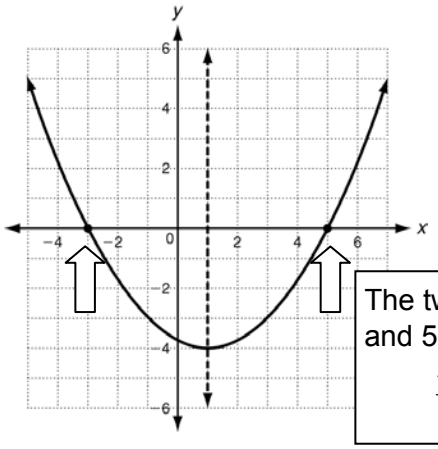
LESSON 8-2

Review for Mastery

Characteristics of Quadratic Functions

You find the **axis of symmetry** of a parabola by averaging the two zeros.
If there is only one zero or no zeros, use the *x*-value of the vertex.

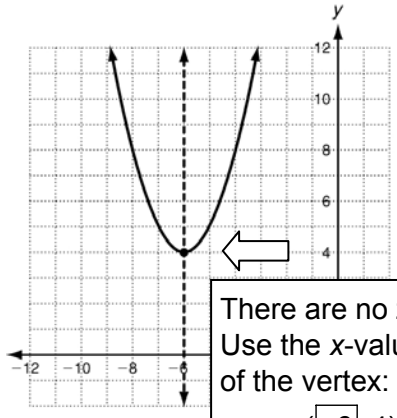
Find the axis of symmetry of each parabola.



The two zeros are −3 and 5. Average the zeros:

$$\frac{-3+5}{2} = \frac{2}{2} = \boxed{1}$$

The axis of symmetry is $x = 1$.



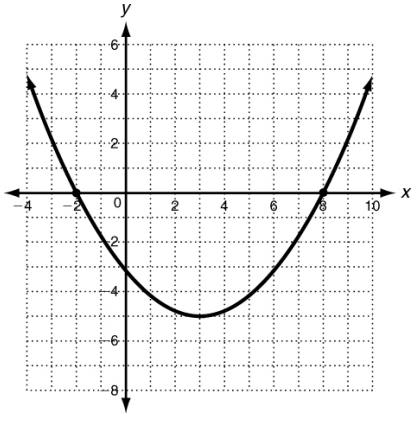
There are no zeros. Use the *x*-value of the vertex:

$(\boxed{-6}, 4)$

The axis of symmetry is $x = -6$.

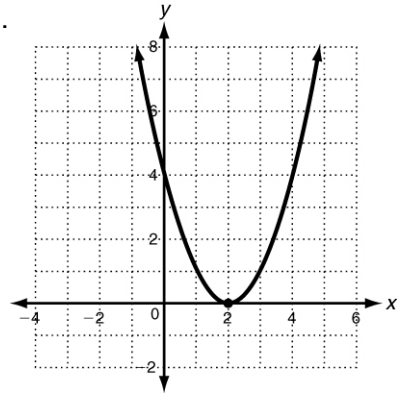
Find the axis of symmetry of each parabola.

1.



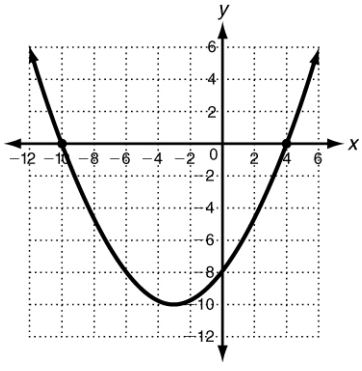
The axis of symmetry is _____.

2.



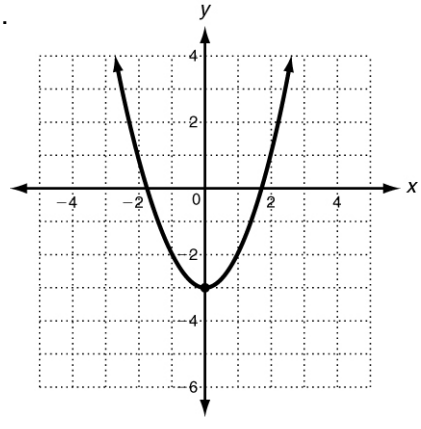
The axis of symmetry is _____.

3.



_____

4.



_____

Name _____ Date _____ Class _____

LESSON 8-2

Review for Mastery

Characteristics of Quadratic Functions continued

You find the axis of symmetry of a quadratic function with this formula:

axis of symmetry $x = \frac{-b}{2a}$

Find the axis of symmetry of the graph of $y = -2x^2 + 8x - 5$.

Step 1: Identify the coefficients.

$a = -2$ $b = 8$ $c = -5$

Step 2: Substitute a and b into the formula.

$$x = \frac{-(8)}{2(-2)} = \frac{-8}{-4} = 2$$

The axis of symmetry is $x = 2$.

The axis of symmetry always passes through the vertex. Once you know the axis of symmetry, you can find the vertex.

Find the vertex of $y = -2x^2 + 8x - 5$.

Step 1: The x-coordinate is the same as the axis of symmetry. $x = 2$ (see above)

Step 2: Substitute the x-coordinate to find the y-coordinate. $y = -2(2)^2 + 8(2) - 5$

$y = -8 + 16 - 5$

The vertex is (2, 3). $y = 3$

For 5 and 6, find the axis of symmetry of the function's graph.

5. $y = x^2 - 10x + 25$

$$x = \frac{-b}{2a} = \frac{-(\quad)}{2(\quad)} = \frac{\quad}{\quad} = \quad$$

The axis of symmetry is _____.

6. $y = -3x^2 + 6x + 5$

The axis of symmetry is _____.

For 7 and 8, find the vertex. (*Hint*: Refer back to problems 5 and 6.)

7. $y = x^2 - 10x + 25$

The x-coordinate is _____.

$$y = (\quad)^2 - 10(\quad) + 25 = \quad$$

The y-coordinate is _____.

The vertex is _____.

8. $y = -3x^2 + 6x + 5$

The vertex is _____.

9. Find the vertex of $y = 2x^2 + 12x - 9$.

_____

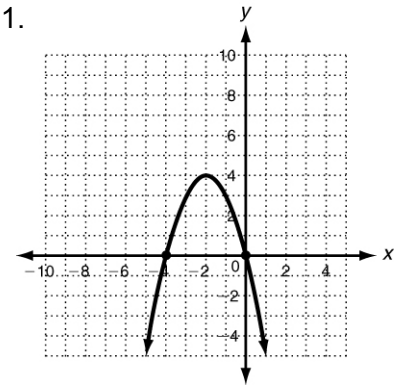
Name _____ Date _____ Class _____

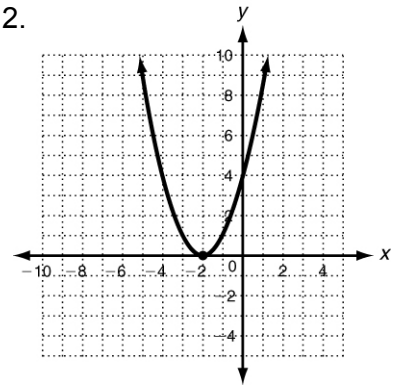
LESSON 8-2

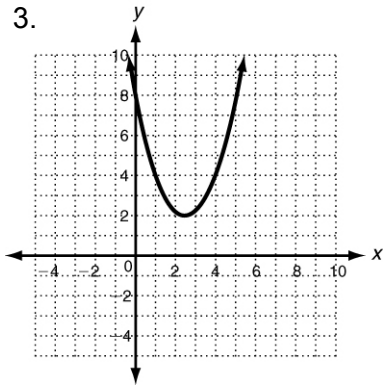
Practice A

Characteristics of Quadratic Functions

Find the zeros of each quadratic function from its graph.

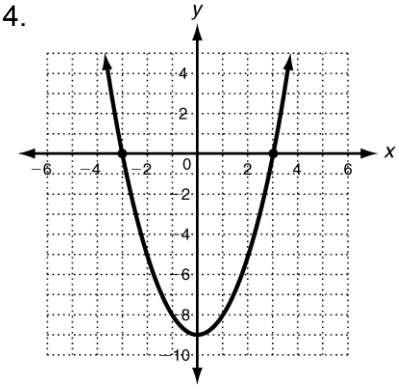
1. 

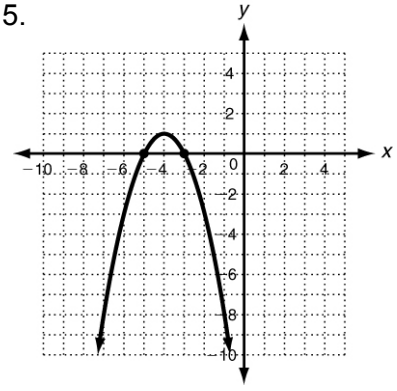
2. 

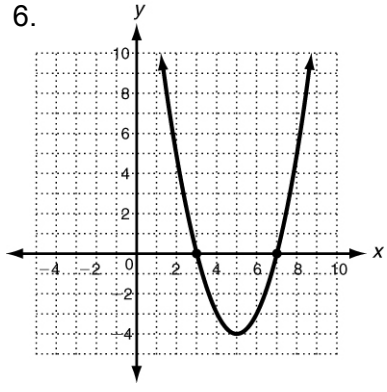
3. 

_____ _____ _____

Find the axis of symmetry of each parabola.

4. 

5. 

6. 

_____ _____ _____

Find the axis of symmetry and the vertex of each quadratic function by completing the following.

7. $y = x^2 + 8x + 12$

Find *a*: _____

Find *b*: _____

Find $-\frac{b}{2a}$. _____

Axis of symmetry: _____

Vertex: _____

8. $y = x^2 - 10x + 40$

Find *a*: _____

Find *b*: _____

Find $-\frac{b}{2a}$. _____

Axis of symmetry: _____

Vertex: _____

9. $y = 2x^2 - 8x - 3$

Find *a*: _____

Find *b*: _____

Find $-\frac{b}{2a}$. _____

Axis of symmetry: _____

Vertex: _____

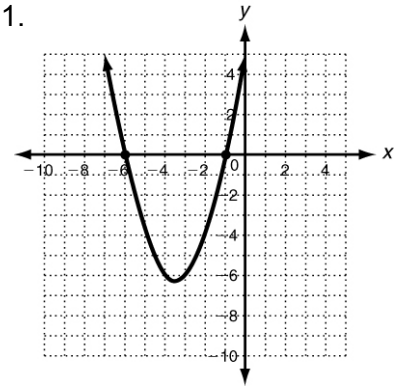
Name _____ Date _____ Class _____

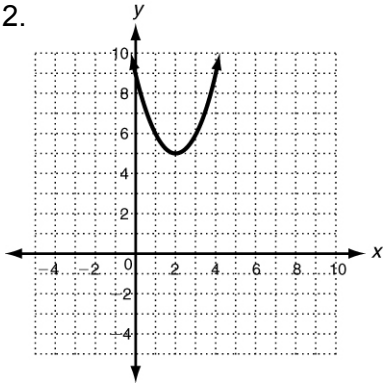
LESSON 8-2

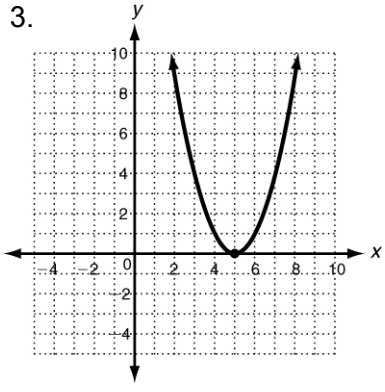
Practice B

Characteristics of Quadratic Functions

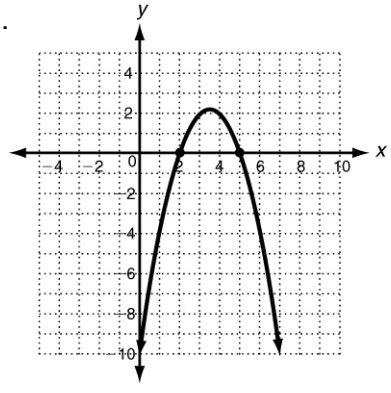
Find the zeros of each quadratic function from its graph.

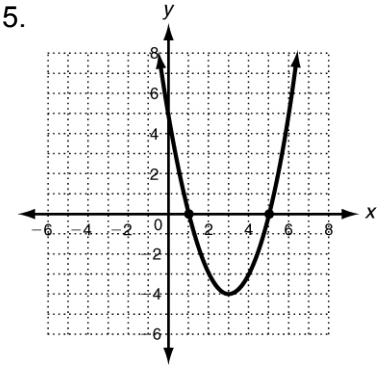
1. 

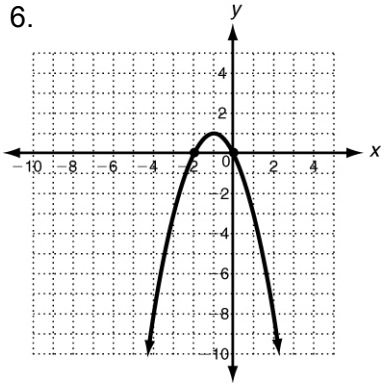
2. 

3. 

Find the axis of symmetry of each parabola.

4. 

5. 

6. 

For each quadratic function, find the axis of symmetry of its graph.

7. $y = 3x^2 - 6x + 4$

8. $y = -x^2 + 4x$

9. $y = 4x^2 + \frac{1}{2}x + 3$

Find the vertex of each parabola.

10. $y = 3x^2 - 6x - 2$

11. $y = 3x^2 + 12x - 10$

12. $y = x^2 + 2x - 35$

Name _____ Date _____ Class _____

LESSON 8-3

Review for Mastery

Graphing Quadratic Functions

You can use the axis of symmetry, vertex, and *y*-intercept to graph a quadratic function.

Graph $y = x^2 + 6x + 8$.

Step 1: Find the axis of symmetry.

$x = -\frac{6}{2(1)} = -3$ *Use* $x = -\frac{b}{2a}$

Graph the axis of symmetry, $x = -3$.

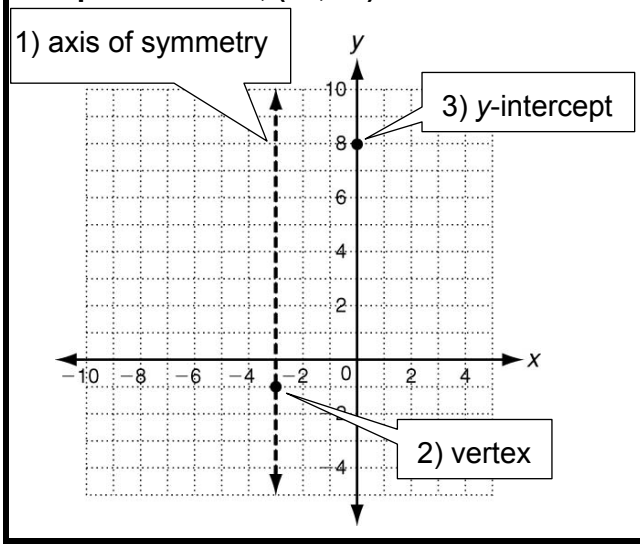
Step 2: Find the vertex.

$y = (-3)^2 + 6(-3) + 8$ *Substitute* –3 *for x*.

$y = 9 - 18 + 8$ *Simplify*.

$y = -1$

Graph the vertex, (–3, –1).



Step 3: Find the *y*-intercept.

$y = (0)^2 + 6(0) + 8$ *Substitute 0 for x in the original equation.*

$y = 8$ *Simplify*.

Graph (0, 8).

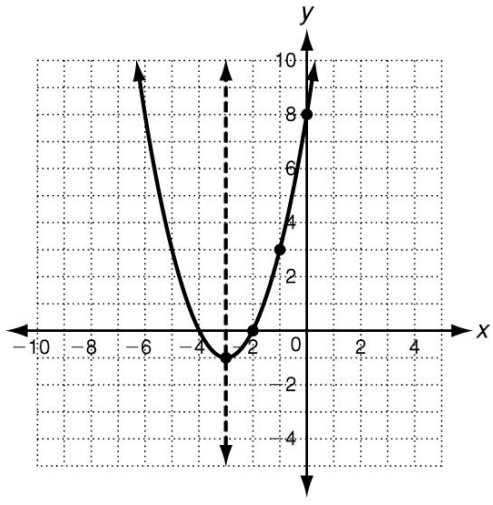
Step 4: Choose two *x*-values on the same side of the axis of symmetry as the point containing the *y*-intercept.

Use –2 and –1.

$y = (-2)^2 + 6(-2) + 8 = 0$ **Graph (–2, 0).**

$y = (-1)^2 + 6(-1) + 8 = 3$ **Graph (–1, 3).**

Step 5: Reflect those points and connect them with a smooth curve.



Graph $x^2 + 4x - 12$ by completing the following.

1. Find and graph the axis of symmetry.

   _____

2. Find and graph the vertex.

   _____

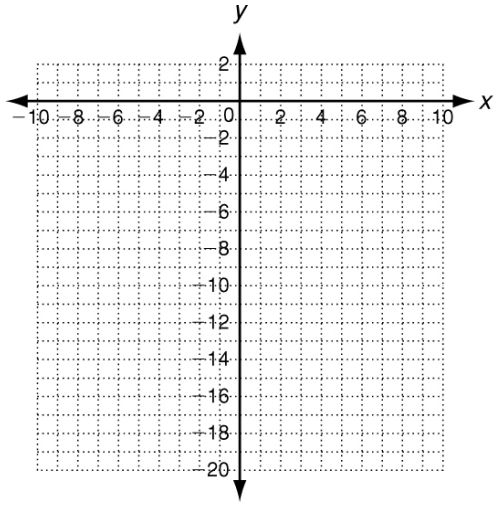
3. Find and graph the *y*-intercept.

   _____

4. Find and graph two more points.

   _____

5. Reflect the points and draw the graph.



Name _____ Date _____ Class _____

LESSON 8-3

Review for Mastery

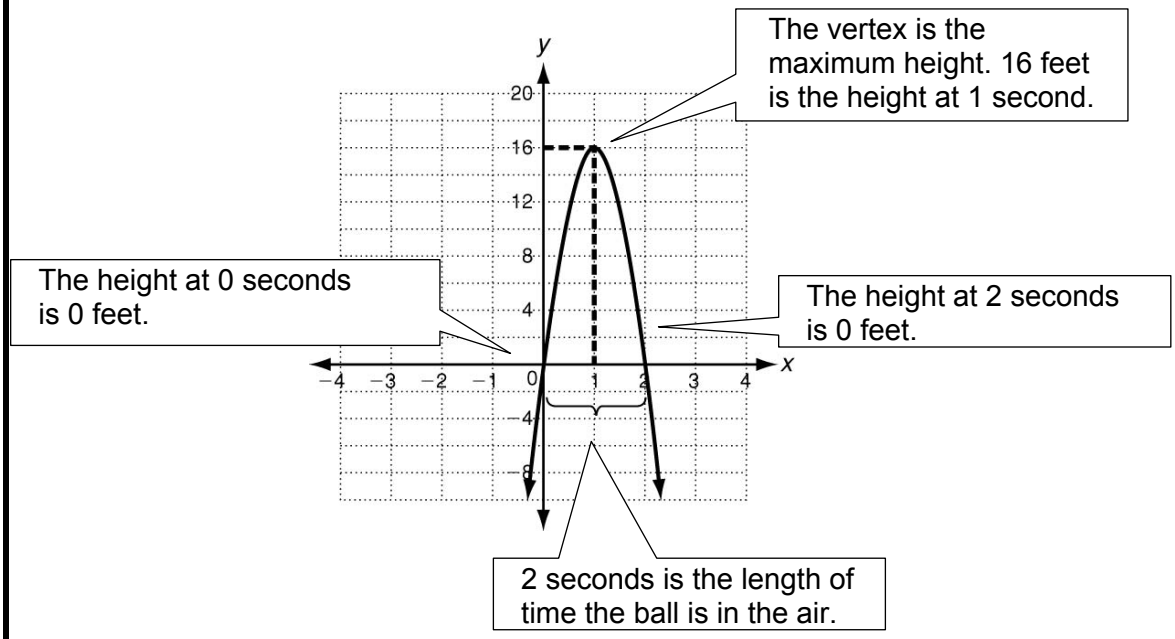
Graphing Quadratic Functions continued

Many real life situations involve quadratic functions. It is important to interpret the graphs correctly.

The height in feet of a soccer ball kicked in the air can be modeled by the function $f(t) = -16t^2 + 32t$. Find the ball's maximum height and the time it takes the ball to reach this height. Then find how long the ball is in the air.

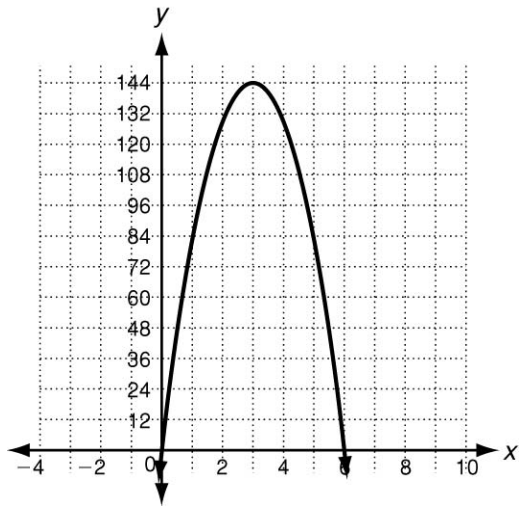
The graph shows the approximate height of the soccer ball after t seconds.

The x-axis is time t in seconds. The y-axis is the height h in feet.



The maximum height is 16 feet. It takes the ball 1 second to reach this height. The soccer ball is in the air for 2 seconds.

The height in feet of a rocket launched straight up in the air can be modeled by the function $f(t) = -16t^2 + 96t$. The graph is shown.



6. Find the time it takes the rocket to reach the maximum height.

_____

7. Find the rocket's maximum height.

_____

8. Find how long the rocket was in the air.

_____

Name _____ Date _____ Class _____

LESSON 8-3

Practice A

Graphing Quadratic Functions

Identify the following components of each quadratic function. Then graph the function.

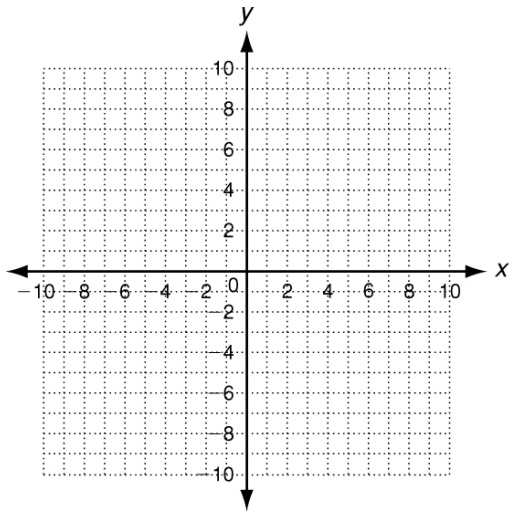
1. $y = x^2 + 2x - 3$

   axis of symmetry $x = -\frac{b}{2a}$: _____

   vertex $\left(-\frac{b}{2a}, y\right)$: _____

   y-intercept (*c*): _____

   two other points: _____



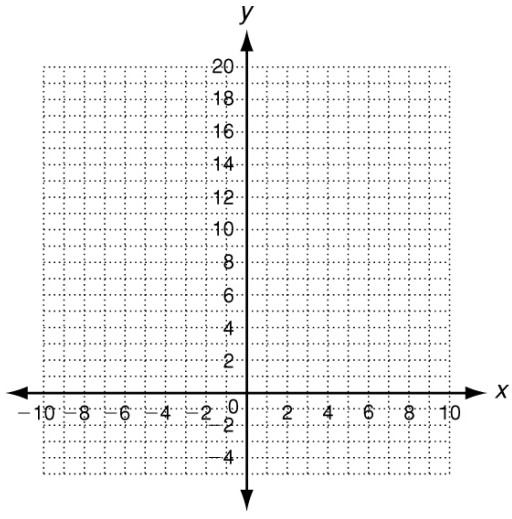
2. $y = -2x^2 - 8x + 10$

   axis of symmetry $x = -\frac{b}{2a}$: _____

   vertex $\left(-\frac{b}{2a}, y\right)$: _____

   y-intercept (*c*): _____

   two other points: _____

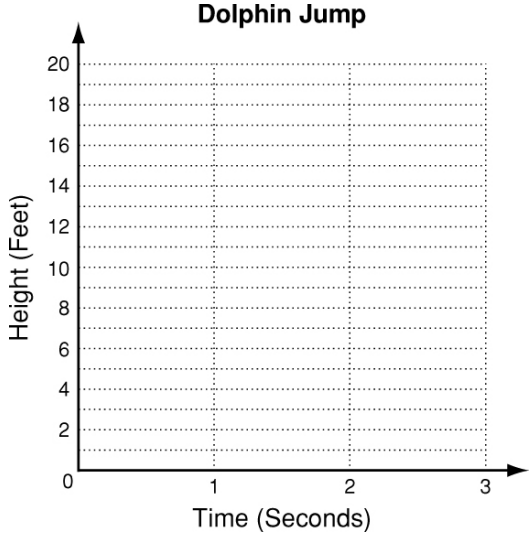


3. The height in feet of a dolphin as it jumps out of the water at an aquarium show can be modeled by the function $f(x) = -16x^2 + 32x$, where *x* is the time in seconds after it exits the water. Graph this function. Find the dolphin's maximum height and the time it takes to reach this height. Then find how long the dolphin is in the air.

   maximum height: _____

   time to reach maximum height: _____

   time in the air: _____



Name _____ Date _____ Class _____

LESSON 8-3

Practice B

Graphing Quadratic Functions

Graph each quadratic function.

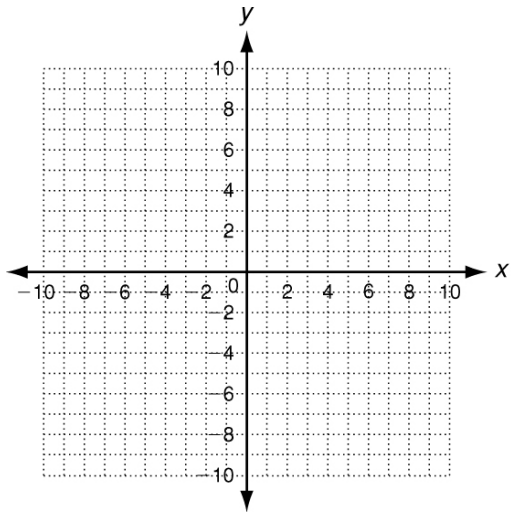
1. $y = x^2 + 4x - 4$

   axis of symmetry: _____

   vertex: _____

   y-intercept: _____

   two other points: _____



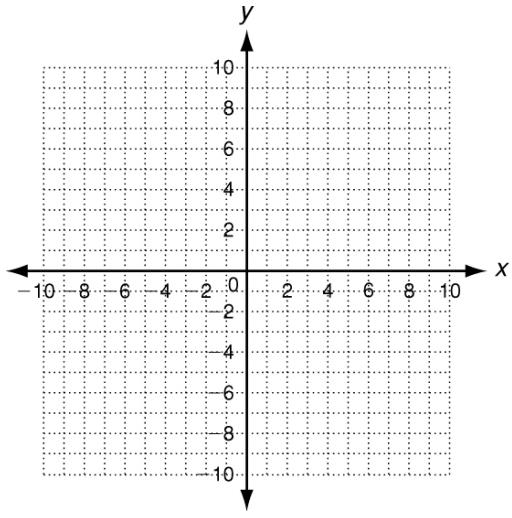
2. $y + 2x^2 - 4x - 6 = 0$

   axis of symmetry: _____

   vertex: _____

   y-intercept: _____

   two other points: _____

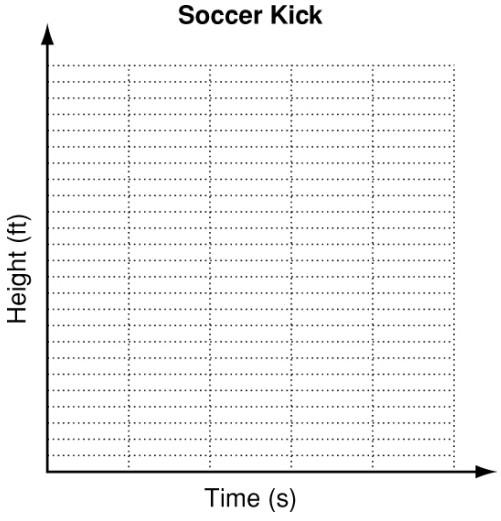


3. The height in feet of a soccer ball that is kicked can be modeled by the function $f(x) = -8x^2 + 24x$, where x is the time in seconds after it is kicked. Graph this function. Find the soccer ball's maximum height and the time it takes the ball to reach this height. Then find how long the soccer ball is in the air.

   maximum height: _____

   time to reach maximum height: _____

   time in the air: _____



Name _____ Date _____ Class _____

LESSON 8-4

Review for Mastery

Transforming Quadratic Functions

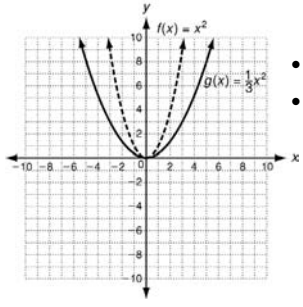
Compared to the function $f(x) = x^2$, a quadratic function will become narrower or wider depending on the value of a. It will translate up or down depending on the value of c.

For a quadratic function $f(x) = ax^2 + bx + c$:

If $\|a\| < 1$	graph is wider
If $\|a\| > 1$	graph is narrower
For any change in a, the vertex and axis of symmetry are the same.	

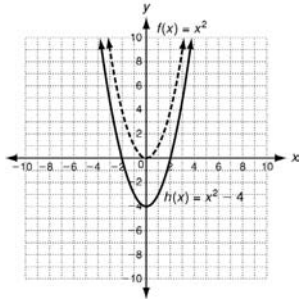
If $c > 0$	graph shifts up
If $c < 0$	graph shifts down
For any change in c, the vertex changes. The axis of symmetry is the same.	

Compare the graph of $g(x) = \frac{1}{3}x^2$ to $f(x) = x^2$.



- $g(x)$ is wider than $f(x)$.
- The vertex is the same.

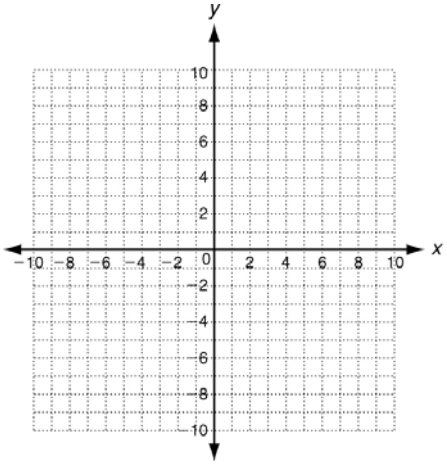
Compare the graph of $h(x) = x^2 - 4$ to $f(x) = x^2$.



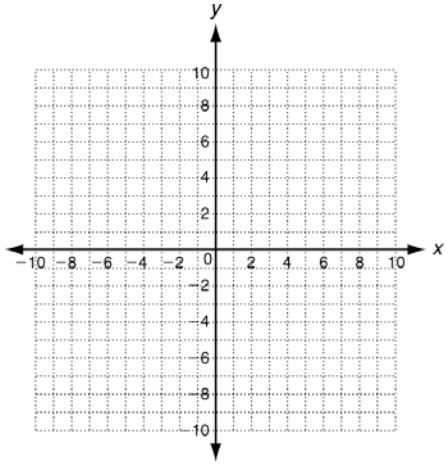
- $h(x)$ is translated down 4 units.
- The vertex of $f(x)$ is (0, 0). The vertex of $g(x)$ is (0, –4).

Compare the graphs of the functions below.

1. $f(x) = x^2$ and $g(x) = 2x^2$



2. $f(x) = x^2$ and $h(x) = x^2 + 5$



_____ _____

_____ _____

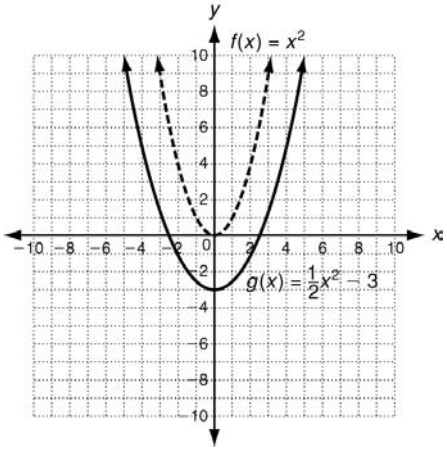
Name _____ Date _____ Class _____

LESSON 8-4

Review for Mastery

Transforming Quadratic Functions continued

Compare $g(x) = \frac{1}{2}x^2 - 3$ to $f(x) = x^2$ by graphing.

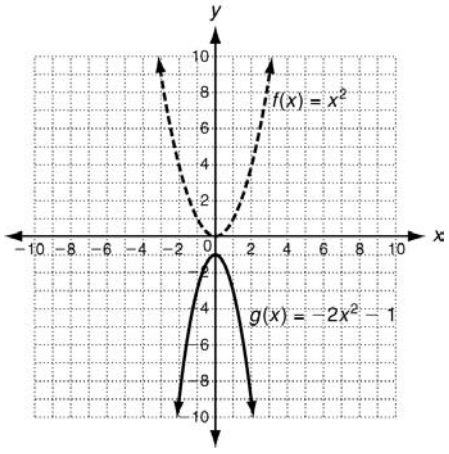


- The graph of $g(x)$ is wider than the graph of $f(x)$.
- The graph of $g(x)$ and $f(x)$ both open upwards.
- The axis of symmetry is the same.
- The vertex of $f(x)$ is (0, 0). The vertex of $g(x)$ is (0, –3).

Compare $g(x) = 3x^2 + 2$ to $f(x) = x^2$ without graphing.

- The graph of $g(x)$ is narrower than the graph of $f(x)$. $|3| > |1|$
- The graph of $g(x)$ and $f(x)$ both open upwards. *a is positive for both.*
- The axis of symmetry is the same. $-\frac{b}{2a} = 0$ *for both.*
- The vertex of $f(x)$ is (0, 0). The vertex of $g(x)$ is (0, 2). $g(x)$ *translated 2 units up*

3. Compare the graphs of $g(x) = -2x^2 - 1$ and $f(x) = x^2$.



Compare the functions below without graphing.

4. $g(x) = \frac{1}{4}x^2 + 4$ and $f(x) = x^2$

5. $h(x) = -5x^2 - 1$ and $f(x) = x^2$

Name _____ Date _____ Class _____

LESSON 8-4

Practice A

Transforming Quadratic Functions

Order the functions from narrowest graph to widest.

1. $f(x) = 5x^2$; $g(x) = 2x^2$

_____

2. $f(x) = \frac{1}{2}x^2$; $g(x) = -3x^2$; $h(x) = x^2$

_____

Compare the graph of each function with the graph of $f(x) = x^2$.

3. $g(x) = x^2 - 3$

width: _____

opens up or down: _____

_____

vertex: _____

_____

4. $g(x) = \frac{1}{5}x^2$

width: _____

opens up or down: _____

_____

vertex: _____

_____

5. $g(x) = 2x^2 + 4$

width: _____

opens up or down: _____

_____

vertex: _____

_____

6. $g(x) = -x^2 - 1$

width: _____

opens up or down: _____

_____

vertex: _____

_____

7. Two blocks are dropped, one from a height of 400 feet and the other from a height of 256 feet.

   a. Complete the two height functions.

   $h_1(t) = -16t^2 +$ _____

   $h_2(t) = -16t^2 +$ _____

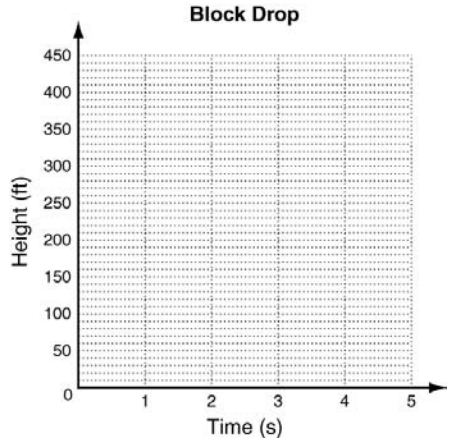
   b. Sketch and compare their graphs.

   _____

   _____

   c. Tell when each block reaches the ground.

   _____



Name _____ Date _____ Class _____

LESSON 8-4

Practice B

Transforming Quadratic Functions

Order the functions from narrowest graph to widest.

1. $f(x) = 3x^2$; $g(x) = -2x^2$

_____

2. $f(x) = \frac{1}{2}x^2$; $g(x) = 5x^2$; $h(x) = x^2$

_____

3. $f(x) = 4x^2$; $g(x) = -3x^2$; $h(x) = \frac{1}{4}x^2$

_____

4. $f(x) = 0.5x^2$; $g(x) = \frac{1}{4}x^2$; $h(x) = \frac{1}{3}x^2$

_____

Compare the graph of each function with the graph of $f(x) = x^2$.

5. $g(x) = 5x^2 + 10$ _____

_____

6. $g(x) = \frac{1}{8}x^2 - 3$ _____

_____

7. $g(x) = -3x^2 + 8$ _____

_____

8. $g(x) = -\frac{3}{4}x^2 + \frac{1}{4}$ _____

_____

9. Two sandbags are dropped from a hot air balloon, one from a height of 400 feet and the other from a height of 1600 feet.

   a. Write the two height functions.

   $h_1(t) =$ _____ $h_2(t) =$ _____

   b. Sketch and compare their graphs.

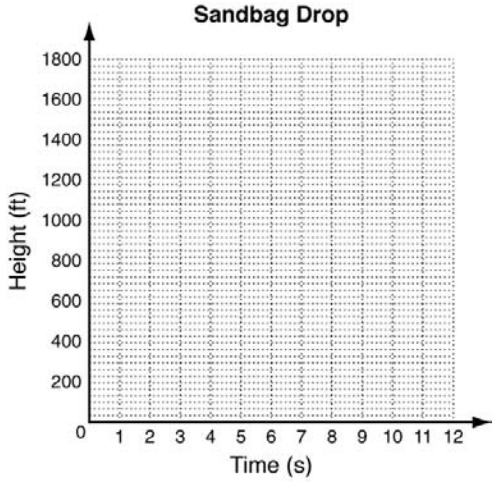
   _____

   _____

   c. Tell when each sandbag reaches the ground.

   _____

   _____



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LESSON 8-5

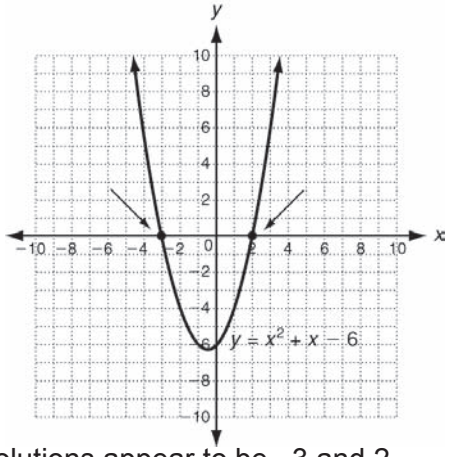
Review for Mastery

Solving Quadratic Equations by Graphing

You can find solutions to a quadratic equation by looking at the graph of the related function.

Find the solutions of $x^2 + x - 6 = 0$ from the graph of the related function.

Solutions occur where the graph crosses the x-axis.



The solutions appear to be –3 and 2.

Check:

$x = -3$

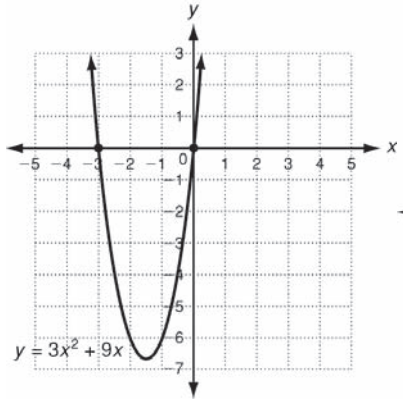
$x^2 + x - 6 = 0$	
$(-3)^2 + (-3) - 6$	0
$9 + (-3) - 6$	0
0	0

$x = 2$

$x^2 + x - 6 = 0$	
$(2)^2 + (2) - 6$	0
$4 + (2) - 6$	0
0	0

Find the solutions from each graph below. Then check your answers.

1. $3x^2 + 9x = 0$



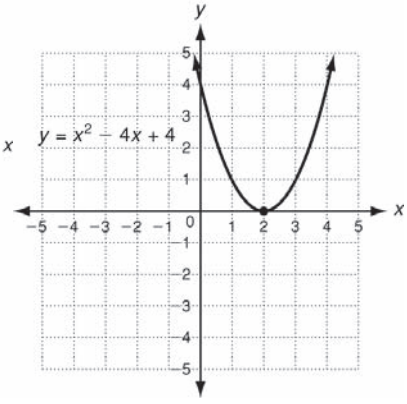
_____

Check:

$3x^2 + 9x = 0$

$3x^2 + 9x = 0$

2. $x^2 - 4x + 4 = 0$

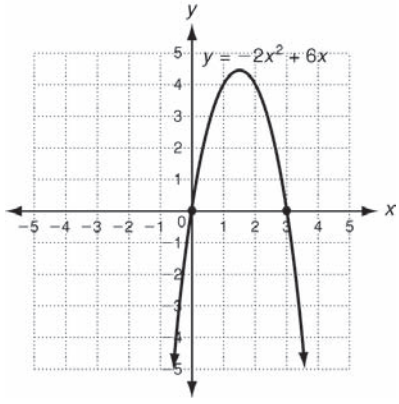


_____

Check:

$x^2 - 4x + 4 = 0$

3. $-2x^2 + 6x = 0$



_____

Check:

$-2x^2 + 6x = 0$

$-2x^2 + 6x = 0$

Name _____ Date _____ Class _____

LESSON 8-5

Review for Mastery

Solving Quadratic Equations by Graphing continued

It is possible to use a graphing calculator to find the solutions of a quadratic equation. Remember that using the trace key gives an estimate of the solutions.

A dancer leaps straight into the air. The quadratic function $y = -16x^2 + 8x$ models the dancer's height above the ground after x seconds. About how long is the dancer in the air?

Step 1: Write the related function.

$y = -16x^2 + 8x$

Step 2: Graph the function by using a graphing calculator.

Step 3: Use trace to estimate the zeros.

The solutions appear to be 0 and 0.5.

The dancer is in the air for about 0.5 seconds.

Use your graphing calculator to estimate each answer. Check your answer by plugging it back into the quadratic equation.

4. A rocket is launched from the ground. The quadratic function $y = -16x^2 + 56x$ models the rocket's height (in feet) above the ground after x seconds. About how long is the rocket in the air? _____

5. A firework is launched from the ground. The quadratic function $y = -4.9x^2 + 120x$ models the firework's height (in meters) above the ground after x seconds. About how long is the firework in the air? _____

6. A football is kicked from the ground. The quadratic function $y = -16x^2 + 90x$ models the football's height above the ground after x seconds. About how long is the football in the air? _____

Name _____ Date _____ Class _____

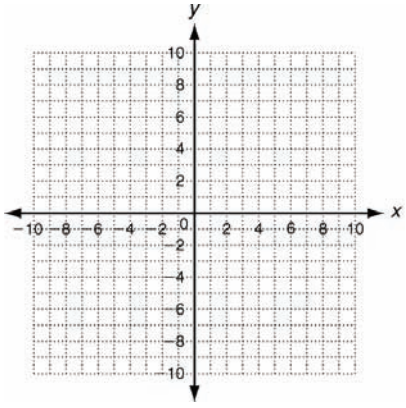
LESSON 8-5

Practice A

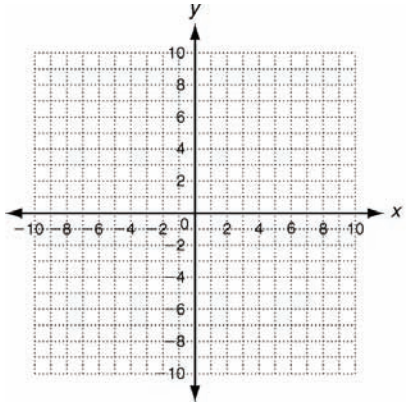
Solving Quadratic Equations by Graphing

Solve each quadratic equation by graphing the related function and finding the zeros.

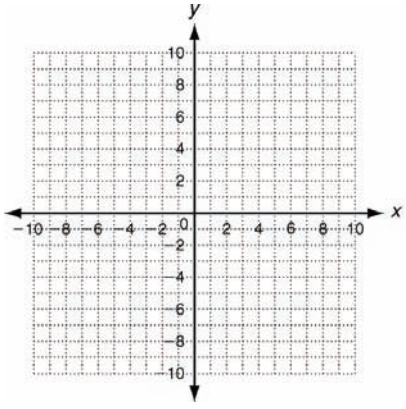
1. $x^2 - 4x + 4 = 0$



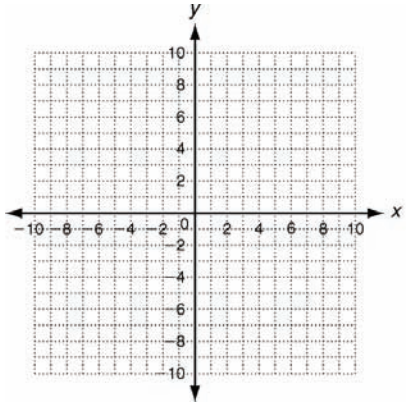
2. $x^2 + x = 6$



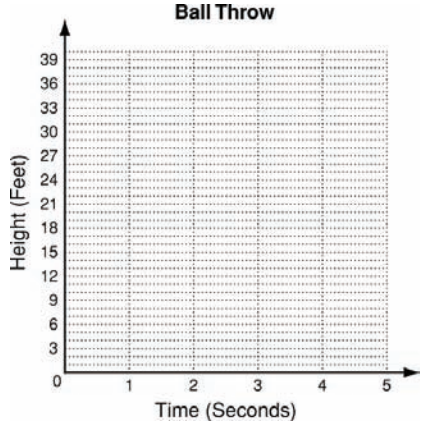
3. $x^2 = 1$



4. $7 + x^2 = 3x$



5. Gretchen throws a ball straight up in the air. The quadratic function $y = -16x^2 + 48x$ models the height in feet of the ball after x seconds. Use a graphing calculator to sketch the graph of this function. Use the zeros to find how long the ball is in the air.



Name _____ Date _____ Class _____

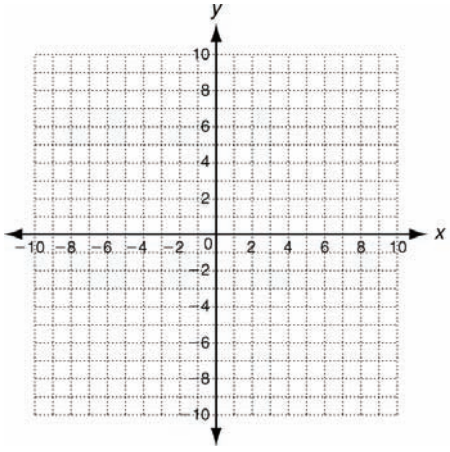
LESSON 8-5

Practice B

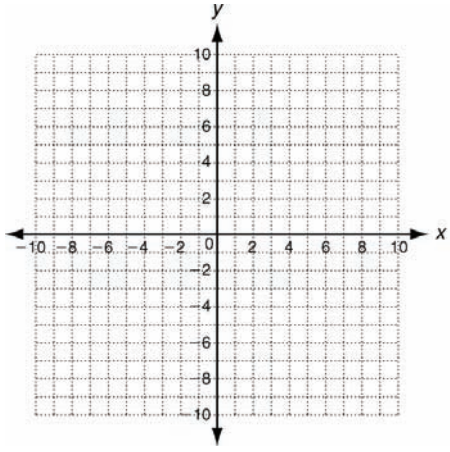
Solving Quadratic Equations by Graphing

Solve each equation by graphing the related function.

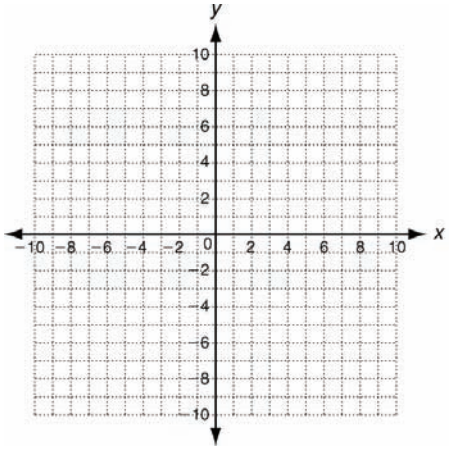
1. $x^2 - 6x + 9 = 0$



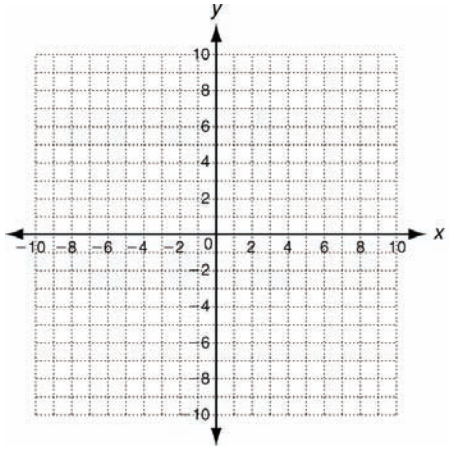
2. $x^2 = 4$



3. $2x^2 + 4x = 6$

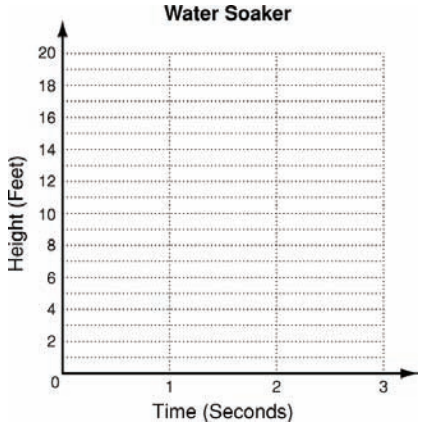


4. $x^2 = 5x - 10$



5. Water is shot straight up out of a water soaker toy. The quadratic function $y = -16x^2 + 32x$ models the height in feet of a water droplet after x seconds. How long is the water droplet in the air?

_____



Name _____ Date _____ Class _____

LESSON 8-6

Review for Mastery

Solving Quadratic Equations by Factoring

Quadratic Equations can be solved by factoring and using the Zero Product Property.

If the product of two quantities equals zero, at least one of the quantities must equal zero.

If $(x)\,(y) = 0$, then

$x = 0$ or $y = 0$

If $(x + 3)\,(x - 2) = 0$, then

$x + 3 = 0$ or $x - 2 = 0$

Use the Zero Product Property to solve $(x + 8)\,(x - 5) = 0$. Check your answer.

$(x + 8)\,(x - 5) = 0$

$x + 8 = 0$ or $x - 5 = 0$

$-8 \quad -8 \qquad +5 \quad +5$

$x = -8 \qquad x = 5$

Check

$x = -8$

$(x + 8)\,(x - 5) = 0$	
$(-8 + 8)\,(-8 - 5)$	0
$(0)\,(-13)$	0
0	0 ✓

$x = 5$

$(x + 8)\,(x - 5) = 0$	
$(5 + 8)\,(5 - 5)$	0
$(13)\,(0)$	0
0	0 ✓

Use the Zero Product Property to solve each equation by filling in the boxes below. Then find the solutions. Check your answer.

1. $(x - 6)\,(x - 3) = 0$

   ☐ $= 0$ or ☐ $= 0$

   _____

2. $(x + 8)\,(x - 5) = 0$

   ☐ $= 0$ or ☐ $= 0$

   _____

3. $3x(x - 7) = 0$

   ☐ $= 0$ or ☐ $= 0$

   _____

4. $(2x - 3)\,(x + 9) = 0$

   ☐ $= 0$ or ☐ $= 0$

   _____

5. $(5x - 1)\,(x + 2) = 0$

   _____

6. $(x + 4)\,(2 - x) = 0$

   _____

Name _____ Date _____ Class _____

LESSON 8-6

Review for Mastery

Solving Quadratic Equations by Factoring continued

Sometimes you need to factor before using the Zero Product Property.

Solve $x^2 + 4x - 5 = 0$ by factoring.

$$x^2 + 4x - 5 = 0$$
$$(x + 5)(x - 1) = 0$$

$x + 5 = 0$ or $x - 1 = 0$

$-5 \quad -5$ $\quad +1 \quad +1$

$x = -5$ $\quad x = 1$

Check:

$x = -5$

$x^2 + 4x - 5 = 0$	
$(-5^2) + 4(-5) - 5$	0
$25 - 20 - 5$	0
0	0 ✓

$x = 1$

$x^2 + 4x - 5 = 0$	
$(1^2) + 4(1) - 5$	0
$1 + 4 - 5$	0
0	0 ✓

Solve $3x^2 - 12x + 12 = 0$ by factoring.

$$3x^2 - 12x + 12 = 0$$
$$3(x^2 - 4x + 4) = 0$$
$$3(x - 2)(x - 2) = 0$$

$3 \neq 0$ or $x - 2 = 0$

$+2 \quad +2$

$x = 2$

Check:

$x = 2$

$3x^2 - 12x + 12 = 0$	
$3(2)^2 - 12(2) + 12$	0
$3(4) - 24 + 12$	0
$12 - 24 + 12$	0
0	0 ✓

Solve each quadratic equation by factoring.

7. $x^2 + x - 12 = 0$

8. $x^2 + 10x + 25 = 0$

9. $x^2 + 7x - 8 = 0$

10. $x^2 - 49 = 0$

11. $4x^2 + 25x = 0$

12. $5x^2 - 15x - 50 = 0$

13. $x^2 + 10x + 21 = 0$

14. $4 - x^2 = 0$

15. $3x^2 - 6x - 9 = 0$

Name _____ Date _____ Class _____

LESSON 8-6

Practice A

Solving Quadratic Equations by Factoring

1. Complete: If $ab = 0$, then _____ or _____.

Use the Zero Product Property to solve each equation. Check your answers.

2. $(x - 7)(x + 2) = 0$

   $x - 7 = 0$ or $x + 2 = 0$

   $x =$ _____ or $x =$ _____

3. $(x - 5)(x - 1) = 0$

   $x - 5 = 0$ or $x - 1 = 0$

   $x =$ _____ or $x =$ _____

4. $(x + 2)(x + 6) = 0$

5. $(3x - 4)(x - 3) = 0$

Factor each quadratic expression. Then, use the Zero Product Property to solve the equation.

6. $x^2 - 5x = 0$

   $x($_____$) = 0$

   $x = 0$ or (_____) $= 0$

   $x = 0$ or $x =$ _____

7. $x^2 + 3x + 2 = 0$

   $(x + 2)$ (_____) $= 0$

   $x + 2 = 0$ or (_____) $= 0$

   $x = -2$ or $x =$ _____

8. $x^2 - 6x - 27 = 0$

   $(x -$ _____$)(x +$ _____$) = 0$

   (_____) $= 0$ or (_____) $= 0$

   $x =$ _____ or $x =$ _____

9. $x^2 + 8x + 15 = 0$

   (_____)(_____) $= 0$

   (_____) $= 0$ or (_____) $= 0$

   $x =$ _____ or $x =$ _____

10. $x^2 - 6x + 5 = 0$

11. $x^2 - 4x - 12 = 0$

12. $2x^2 - 5x - 3 = 0$

13. $6x^2 = 5x + 4$

14. A relief package is released from a helicopter at 1600 feet. The height of the package can be modeled by $h = -16t^2 + 1600$, where h is the height of the package in feet and t is the time in seconds. The pilot wants to know how long it will take for the package to hit the ground.

    a. Write the equation. _____

    b. Solve the equation. _____

Name _____ Date _____ Class _____

LESSON 8-6

Practice B

Solving Quadratic Equations by Factoring

Use the Zero Product Property to solve each equation. Check your answers.

1. $(x - 1)(x - 5) = 0$

   $x - 1 = 0$ or $x - 5 = 0$

   $x =$ ____ or $x =$ ____

2. $(x - 2)(x - 9) = 0$

   $x - 2 = 0$ or $x - 9 = 0$

   $x =$ ____ or $x =$ ____

3. $(x - 2)(x + 4) = 0$

   _____

4. $(2x + 1)(x - 6) = 0$

   _____

Solve each quadratic equation by factoring.

5. $x^2 - 3x = 0$

   _____

6. $x^2 + 4x + 3 = 0$

   _____

7. $x^2 + 5x - 6 = 0$

   _____

8. $x^2 + 11x + 24 = 0$

   _____

9. $x^2 - 12x + 11 = 0$

   _____

10. $x^2 + 18x + 65 = 0$

    _____

11. $x^2 - 4x - 12 = 0$

    _____

12. $x^2 + 11x + 10 = 0$

    _____

13. $x^2 + 12x + 35 = 0$

    _____

14. $2x^2 - 3x - 5 = 0$

    _____

15. $3x^2 - 5x - 2 = 0$

    _____

16. $x^2 = 3x + 40$

    _____

17. $x^2 - 14 = 5x$

    _____

18. $2x - 1 = -8x^2$

    _____

19. $x = 10x^2 - 2$

    _____

20. $2x^2 = 13x + 7$

    _____

21. $6x^2 + x = 5$

    _____

22. $x^2 = 5x$

    _____

23. The height of a flare fired from the deck of a ship in distress can be modeled by $h = -16t^2 + 104t + 56$, where h is the height of the flare above water and t is the time in seconds. Find the time it takes the flare to hit the water.

    _____

Name _____ Date _____ Class _____

LESSON 8-7

Review for Mastery

Solving Quadratic Equations by Using Square Roots

If a quadratic equation is in the form $x^2 = a$, you must take the square root of both sides to find the solutions. Remember to find both the positive and negative square roots.

Solve $x^2 = 36$ using square roots.

$x^2 = 36$

$\sqrt{x^2} = \pm\sqrt{36}$ *Take the square root of both sides.*

$x = \pm 6$

The solutions are 6 and –6.

Check:

$x = 6$	$x = -6$
$x^2 = 36$	$x^2 = 36$
$(6)^2 \stackrel{?}{=} 36$	$(-6)^2 \stackrel{?}{=} 36$
$36 \stackrel{?}{=} 36$ •	$36 \stackrel{?}{=} 36$ •

Solve $2x^2 + 7 = 207$ using square roots.

$2x^2 + 7 = 207$

$-7 \quad -7$ *Add –7 to both sides.*

$2x^2 = 200$

$\frac{2x^2}{2} = \frac{200}{2}$ *Divide both sides by 2.*

$\sqrt{x^2} = \pm\sqrt{100}$ *Take the square root of both sides.*

$x = \pm 10$

The solutions are 10 and –10.

Check:

$x = 10$	$x = -10$
$2x^2 + 7 \stackrel{?}{=} 207$	$2x^2 + 7 \stackrel{?}{=} 207$
$2(10)^2 + 7 \stackrel{?}{=} 207$	$2(-10)^2 + 7 \stackrel{?}{=} 207$
$2(100) + 7 \stackrel{?}{=} 207$	$2(100) + 7 \stackrel{?}{=} 207$
$200 + 7 \stackrel{?}{=} 207$	$200 + 7 \stackrel{?}{=} 207$
$207 \stackrel{?}{=} 207$ •	$207 \stackrel{?}{=} 207$ •

Solve using square roots.

1. $x^2 = 81$ _____
2. $x^2 = 9$ _____
3. $x^2 = -64$ _____
4. $x^2 + 44 = 188$ _____
5. $x^2 - 12 = 37$ _____
6. $x^2 + 10 = 131$ _____
7. $3x^2 + 25 = 73$ _____
8. $5x^2 - 9 = 116$ _____
9. $-4x^2 + 42 = -102$ _____
10. $4x^2 - 11 = 25$ _____
11. $x^2 - 13 = 87$ _____
12. $-3x^2 + 200 = 8$ _____

Name _____ Date _____ Class _____

LESSON 8-7

Review for Mastery

Solving Quadratic Equations by Using Square Roots continued

Remember, the square root of a number is not always a perfect square. You can use a calculator to approximate the answer.

Solve $x^2 + 6 = 24$. Round to the nearest hundredth.

$x^2 + 6 = 24$

$-6 \quad -6$ *Add –6 to both sides.*

$x^2 = 18$

$\sqrt{x^2} = \pm\sqrt{18}$ *Take the square root of both sides.*

$x^2 = \pm\sqrt{18}$

$x = \pm 4.24$ *Evaluate $\sqrt{18}$ on a calculator.*

The approximate solutions are 4.24 and –4.24.

When solving application problems by using square roots, one of the solutions may not make sense.

The length of a rectangle is 5 times the width. The area of the rectangle is 210 square feet. Find the width. Round to the nearest tenth of a foot.

$(5w)(w) = 210$ $lw = A$

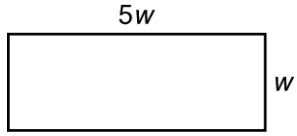
$5w^2 = 210$

$\frac{5w^2}{5} = \frac{210}{5}$

$w^2 = 42$

$w^2 = \pm\sqrt{42}$

$w = \pm 6.5$



It does not make sense for the width to be a negative number. Therefore, the only solution is 6.5 feet.

Solve. Round to the nearest hundredth.

13. $x^2 = 50$ _____

14. $x^2 + 8 = 20$ _____

15. $2x^2 + 21 = 81$ _____

16. A triangle has a base that is 3 times the height. The area of the triangle is 63 cm^2. Find the height of the triangle. Round your answer to the nearest tenth of a centimeter. $\left(A = \frac{1}{2}bh\right)$. _____

17. The length of a rectangle is 4 times the width. The area of the rectangle is 850 square inches. Find the width. Round to the nearest tenth of an inch. _____

Name _____ Date _____ Class _____

LESSON 8-7

Practice A

Solving Quadratic Equations by Using Square Roots

1. Complete: If $x^2 = a$ and a is a positive real number, then $x =$ _____ or $x =$ _____.

Solve using square roots. Check your answers.

2. $x^2 = 4$

   $x = \pm\sqrt{4}$

   $x = \pm$_____

   The solutions are _____ and _____.

3. $x^2 = 169$

   $x = \pm\sqrt{}$

   $x = \pm$_____

   The solutions are _____ and _____.

4. $x^2 = 900$

   $x = \pm\sqrt{}$

   $x = \pm$_____

5. $x^2 = -121$

   _____

6. $144 = x^2$

   $\pm\sqrt{} = x$

   $\pm$_____ $= x$

7. $4x^2 = 400$

   $\frac{4x^2}{4} = \frac{400}{4}$

   $x^2 =$ _____

   $x = \pm\sqrt{}$

   $x = \pm$_____

8. $x^2 = \frac{25}{36}$

   $x = \pm\sqrt{}$

   $x = \pm$_____

9. $5x^2 + 3 = 128$

   $5x^2 =$ _____

   $x^2 =$ _____

   $x = \pm\sqrt{}$

   $x = \pm$_____

10. $x^2 - 10 = 26$

    _____

11. $8x^2 = 32$

    _____

12. $25x^2 - 1 = 0$

    _____

13. $x^2 + 7 = 7$

    _____

14. $x^2 - 8 = -9$

    _____

15. $x^2 - 32 = 17$

    _____

Solve. Round to the nearest hundredth.

16. $5x^2 = 40$

    _____

17. $30 - x^2 = 0$

    _____

18. $12x^2 - 60 = 0$

    _____

19. The area of a square is 225 in^2.

    a. Write a quadratic equation that can be used to find the dimensions of the square. _____

    b. Solve the equation. What are the dimensions? _____

Name _____ Date _____ Class _____

LESSON 8-7

Practice B

Solving Quadratic Equations by Using Square Roots

Solve using square roots. Check your answer.

1. $x^2 = 81$

   $x = \pm\sqrt{81}$

   $x = \pm$_____

   The solutions are _____ and _____.

2. $x^2 = 100$

   $x = \pm\sqrt{}$

   $x = \pm$_____

   The solutions are _____ and _____.

3. $x^2 = 225$

   $x = \pm\sqrt{}$

   $x =$ _____

4. $441 = x^2$

   $\pm\sqrt{} = x$

   _____ $= x$

5. $x^2 = -400$

   _____

6. $3x^2 = 108$

   _____

7. $100 = 4x^2$

   _____

8. $x^2 + 7 = 71$

   _____

9. $49x^2 - 64 = 0$

   _____

10. $-2x^2 = -162$

    _____

11. $9x^2 + 100 = 0$

    _____

12. $0 = 81x^2 - 121$

    _____

13. $100x^2 = 25$

    _____

14. $100x^2 = 121$

    _____

Solve. Round to the nearest hundredth.

15. $8x^2 = 56$

    _____

16. $5 - x^2 = 20$

    _____

17. $x^2 + 35 = 105$

    _____

18. The height of a skydiver jumping out of an airplane is given by $h = -16t^2 + 3200$. How long will it take the skydiver to reach the ground? Round to the nearest tenth of a second.

    _____

19. The height of a triangle is twice the length of its base. The area of the triangle is 50 m^2. Find the height and base to the nearest tenth of a meter.

    _____

20. The height of an acorn falling out of a tree is given by $h = -16t^2 + b$. If an acorn takes 1 second to fall to the ground. What is the value of b?

    _____

Name _____ Date _____ Class _____

LESSON 8-8

Review for Mastery

Completing the Square

You have already learned to solve quadratic equations by using square roots. This only works if the quadratic expression is a perfect square. Remember that perfect square trinomials can be written as perfect squares.

$x^2 + 8x + 16 = (x + 4)^2$ $\quad$ $x^2 - 10x + 25 = (x - 5)^2$

If you have an equation of the form $x^2 + bx$, you can add the term $\left(\frac{b}{2}\right)^2$ to make a perfect square trinomial. This makes it possible to solve by using square roots.

Complete the square of $x^2 + 12x$ to form a perfect square trinomial. Then factor.

$x^2 + 12x$ *Identify b.*

$\left(\frac{12}{2}\right)^2 = 6^2 = 36$ *Find* $\left(\frac{b}{2}\right)^2$.

$x^2 + 12x + 36$ *Add* $\left(\frac{b}{2}\right)^2$.

$(x + 6)^2$ *Factor.*

Complete the square of $x^2 + 7x$ to form a perfect square trinomial. Then factor.

$x^2 + 7x$ *Identify b.*

$\left(\frac{7}{2}\right)^2 = \frac{49}{4}$ *Find* $\left(\frac{b}{2}\right)^2$.

$x^2 + 7x + \frac{49}{4}$ *Add* $\left(\frac{b}{2}\right)^2$.

$\left(x + \frac{7}{2}\right)^2$ *Factor.*

Complete the square to form a perfect square trinomial by filling in the blanks. Then factor.

1. $x^2 - 14x$

$\left(\frac{b}{2}\right)^2 =$ _____

$x^2 - 14x +$ ☐

$(\square)^2$

2. $x^2 + 20x$

$\left(\frac{b}{2}\right)^2 =$ _____

$x^2 + 20x +$ ☐

$(\square)^2$

3. $x^2 + 6x$

$\left(\frac{b}{2}\right)^2 =$ _____

$x^2 + 6x +$ ☐

$(\square)^2$

Complete the square to form a perfect square trinomial. Then factor.

4. $x^2 + 18x$

_____

_____

5. $x^2 - 16x$

_____

_____

6. $x^2 + 5x$

_____

_____

Name _____ Date _____ Class _____

LESSON 8-8

Review for Mastery

Completing the Square continued

To solve a quadratic equation in the form $x^2 + bx = c$, first complete the square of $x^2 + bx$. Then solve using square roots.

Solve $x^2 + 10x = -24$ by completing the square.

Step 1: Write equation in form $x^2 + bx = c$. Identify b.

$x^2 + 10x = -24$

Step 2: Find $\left(\frac{b}{2}\right)^2$.

$\left(\frac{10}{2}\right)^2 = 5^2 = 25$

Step 3: Add $\left(\frac{b}{2}\right)^2$ to both sides.

$x^2 + 10x = -24$

$\underline{+25} \quad \underline{+25}$

$x^2 + 10x + 25 = 1$

Step 4: Factor the perfect square trinomial on the left.

$x^2 + 10x + 25 = 1$

$(x + 5)^2 = 1$

Step 5: Take the square root of both sides.

$\sqrt{(x+5)^2} = \pm\sqrt{1}$

$x + 5 = \pm 1$

Step 6: Write and solve two equations.

$x + 5 = 1$ OR $x + 5 = -1$

$\underline{-5} \quad \underline{-5}$ $\underline{-5} \quad \underline{-5}$

$x = -4$ OR $x = -6$

The solutions are -4 and -6.

Solve by completing the square.

7. $x^2 - 6x = 7$

8. $x^2 + 8x = -12$

9. $x^2 - 2x - 63 = 0$

10. $x^2 + 4x - 32 = 0$

Name _____ Date _____ Class _____

LESSON 8-8

Practice A

Completing the Square

Complete the square to form a perfect square trinomial.

1. $x^2 + 6x + \square$
2. $x^2 - 12x + \square$
3. $x^2 + 8x + \square$

Solve each equation by completing the square.

4. $x^2 + 6x = -8$

   Find $\left(\frac{b}{2}\right)^2$: _____

   Solutions: _____

5. $x^2 - 6x = -5$

   Find $\left(\frac{b}{2}\right)^2$: _____

   Solutions: _____

6. $x^2 - 2x - 24 = 0$

   Find $\left(\frac{b}{2}\right)^2$: _____

   Solutions: _____

7. $x^2 + 10x + 16 = 0$

   Find $\left(\frac{b}{2}\right)^2$: _____

   Solutions: _____

8. $2x^2 - 8x = 10$

   Divide by a: _____

   Find $\left(\frac{b}{2}\right)^2$: _____

   Solutions: _____

9. $3x^2 - 12x - 36 = 0$

   Divide by a: _____

   Find $\left(\frac{b}{2}\right)^2$: _____

   Solutions: _____

10. A rectangular patio has an area of 91 ft^2. The length is 6 feet longer than the width. Find the dimensions of the patio area. Solve by completing the square.

    a. Find the width and the length in terms of w. _____

    b. Write an equation for the total area. _____

    c. Find $\left(\frac{b}{2}\right)^2$. _____

    d. Find the dimensions. _____

11. A sand box has an area of 45 ft^2. The length is 4 feet longer than the width. Find the dimensions of the sand box. Solve by completing the square.

    a. Write an equation for the total area. _____

    b. Find the dimensions. _____

Name _____ Date _____ Class _____

LESSON 8-8

Practice B

Completing the Square

Complete the square to form a perfect square trinomial.

1. $x^2 + 4x + \square$
2. $x^2 - 16x + \square$
3. $x^2 + 7x + \square$

Solve each equation by completing the square.

4. $x^2 + 6x = -8$
5. $x^2 + 4x = 12$
6. $x^2 - 2x = 15$

_____ _____ _____

7. $x^2 - 8x + 13 = 0$
8. $x^2 + 6x + 34 = 0$
9. $x^2 - 2x - 35 = 0$

_____ _____ _____

10. $2x^2 + 16x + 42 = 0$
11. $4x^2 - 7x - 2 = 0$
12. $2x^2 + 9x + 4 = 0$

_____ _____ _____

13. A rectangular pool has an area of 880 ft^2. The length is 10 feet longer than the width. Find the dimensions of the pool. Solve by completing the square. Round answers to the nearest tenth of a foot.

_____

14. A small painting has an area of 400 cm^2. The length is 4 more than 2 times the width. Find the dimensions of the painting. Solve by completing the square. Round answers to the nearest tenth of a centimeter.

_____

Name _____ Date _____ Class _____

LESSON 8-9

Review for Mastery

The Quadratic Formula and the Discriminant

The Quadratic Formula can be used to solve any quadratic equation.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Solve $2x^2 - 5x - 12 = 0$ using the quadratic formula.

$$2x^2 - 5x - 12 = 0$$

Step 1: Identify a, b, and c.

$a = 2$

$b = -5$

$c = -12$

Step 2: Substitute into the quadratic formula.

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$$

Step 3: Simplify.

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-12)}}{2(2)}$$

$$x = \frac{5 \pm \sqrt{25 - (-96)}}{4}$$

$$x = \frac{5 \pm \sqrt{121}}{4}$$

$$x = \frac{5 \pm 11}{4}$$

Step 4: Write two equations and solve.

$$x = \frac{5 + 11}{4} \quad \text{or} \quad x = \frac{5 - 11}{4}$$

$$x = 4 \quad \text{or} \quad x = -\frac{3}{2}$$

Solve using the quadratic equation by filling in the blanks below.

1. $x^2 + 2x - 35 = 0$

   $a =$ ___; $b =$ ___; $c =$ ___

   $$x = \frac{-(\square) \pm \sqrt{(\square)^2 - 4(\square)(\square)}}{2(\square)}$$

   Simplify:

   _____

2. $3x^2 + 7x + 2 = 0$

   $a =$ ___; $b =$ ___; $c =$ ___

   $$x = \frac{-(\square) \pm \sqrt{(\square)^2 - 4(\square)(\square)}}{2(\square)}$$

   Simplify:

   _____

3. $x^2 + x - 20 = 0$

   $a =$ ___; $b =$ ___; $c =$ ___

   $$x = \frac{-(\square) \pm \sqrt{(\square)^2 - 4(\square)(\square)}}{2(\square)}$$

   Simplify:

   _____

4. $2x^2 - 9x - 5 = 0$

   $a =$ ___; $b =$ ___; $c =$ ___

   $$x = \frac{-(\square) \pm \sqrt{(\square)^2 - 4(\square)(\square)}}{2(\square)}$$

   Simplify:

   _____

Name _____ Date _____ Class _____

LESSON 8-9

Review for Mastery

The Quadratic Formula and the Discriminant continued

The discriminant of a quadratic equation is $b^2 - 4ac$. The discriminant will indicate the number of real solutions in a quadratic equation.

If $b^2 - 4ac > 0$	the equation has 2 real solutions.
If $b^2 - 4ac = 0$	the equation has 1 real solution.
If $b^2 - 4ac < 0$	the equation has 0 real solutions.

Find the number of real solutions of $4x^2 - 8x + 5 = 0$ using the discriminant.

$4x^2 - 8x + 5 = 0$

Step 1: Identify a, b, and c.

$a = 4$, $b = -8$, $c = 5$

Step 2: Substitute into $b^2 - 4ac$.

$(-8)^2 - 4(4)(5)$

Step 3: Simplify.

$64 - 80 = -16$

$b^2 - 4ac$ is negative.
There are no real solutions.

Find the number of real solutions of $9x^2 - 49 = 0$ using the discriminant.

$9x^2 - 49 = 0$

Step 1: Identify a, b, and c.

$a = 4$, $b = 0$, $c = -49$

Step 2: Substitute into $b^2 - 4ac$.

$(0)^2 - 4(9)(-49)$

Step 3: Simplify.

$0 + 1764 = 1764$

$b^2 - 4ac$ is positive.
There are two real solutions.

Find the number of real solutions of each equation using the discriminant by filling in the boxes below.

5. $4x^2 + 20x + 25 = 0$

$a = \square$; $b = \square$; $c = \square$

$(\square)^2 - 4(\square)(\square)$

6. $15x^2 + 8x + -1 = 0$

$a = \square$; $b = \square$; $c = \square$

$(\square)^2 - 4(\square)(\square)$

Find the number of real solutions of each equation using the discriminant.

7. $x^2 + 9x - 36 = 0$

8. $25x^2 + 4 = 0$

Name _____ Date _____ Class _____

LESSON 8-9

Practice A

The Quadratic Formula and the Discriminant

Solve using the quadratic formula.

1. $x^2 + 6x + 5 = 0$

a: ☐ b: ☐ c: ☐

$$x = \frac{-\square \pm \sqrt{\square^2 - 4\square\square}}{2\square}$$

2. $x^2 - 9x + 20 = 0$

a: ☐ b: ☐ c: ☐

$$x = \frac{-\square \pm \sqrt{\square^2 - 4\square\square}}{2\square}$$

3. $2x^2 + 9x + 4 = 0$

a: ☐ b: ☐ c: ☐

4. $x^2 - 3x - 18 = 0$

a: ☐ b: ☐ c: ☐

Find the number of real solutions of each equation using the discriminant.

5. $x^2 + 3x + 5 = 0$

$b^2 - 4ac = \square^2 - 4\square\square$

$= $ _____

6. $x^2 + 10x + 25 = 0$

$b^2 - 4ac = \square^2 - 4\square\square$

$= $ _____

7. $x^2 - 6x - 7 = 0$

$b^2 - 4ac = $ _____

Solve using any method.

8. $x^2 - 64 = 0$

9. $x^2 + 12x + 36 = 0$

10. $x^2 + 4x - 32 = 0$

11. $2x^2 + 9x - 5 = 0$

Name _____ Date _____ Class _____

LESSON 8-9

Practice B

The Quadratic Formula and the Discriminant

Solve using the quadratic formula.

1. $x^2 + x = 12$

2. $4x^2 - 17x - 15 = 0$

3. $2x^2 - 5x = 3$

4. $3x^2 + 14x - 5 = 0$

Find the number of real solutions of each equation using the discriminant.

5. $x^2 + 25 = 0$

6. $x^2 - 11x + 28 = 0$

7. $x^2 + 8x + 16 = 0$

Solve using any method.

8. $x^2 + 8x + 15 = 0$

9. $x^2 - 49 = 0$

10. $6x^2 + x - 1 = 0$

11. $x^2 + 8x - 20 = 0$

12. In the past, professional baseball was played at the Astrodome in Houston, Texas. The Astrodome has a maximum height of 63.4 m. The height of a baseball t seconds after it is hit straight up in the air with a velocity of 45 ft/s is given by $h = -9.8t^2 + 45t + 1$. Will a baseball hit straight up with this velocity hit the roof of the Astrodome? Use the discriminant to explain your answer.

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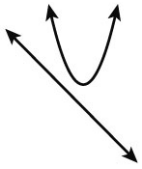
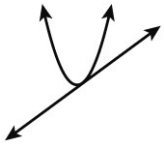
LESSON 8-10

Review for Mastery

Nonlinear Systems

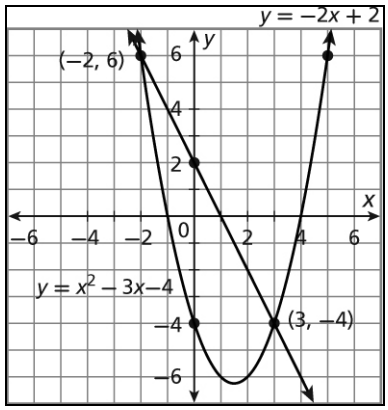
A *nonlinear system of equations* is a system in which at least one of the equations is nonlinear.

Possible Solutions for a Linear-Quadratic System

No Solutions	One Solution	Two Solutions
		

Solve the system by graphing. Check your answer.

$$\begin{cases} y = x^2 - 3x - 4 \\ y = -2x + 2 \end{cases}$$



Step 1: Graph $y = x^2 - 3x - 4$.
Axis of symmetry: $x = 1.5$; vertex: (1.5, –6.25)
y-intercept: (0, –4); another point (–2, 6)
Graph the points and reflect them across the axis of symmetry

Step 2: Graph $y = -2x + 2$.
Slope: –2; *y*-intercept: 2

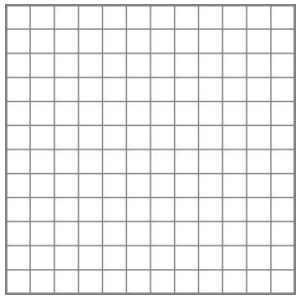
Step 3: Find the points of intersection: (–2, 6) and (3, –4)

Check: Substitute the solutions into each system.

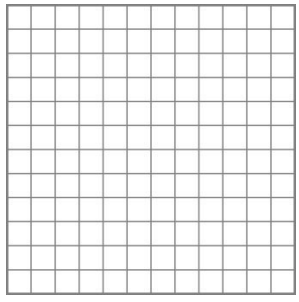
(–2, 6)	**(3, –4)**
$y = x^2 - 3x - 4$	$y = x^2 - 3x - 4$
$6 = (-2)^2 - 3(-2) - 4$	$-4 = 3^2 - 3(3) - 4$
$6 = 6$✓	$-4 = -4$✓
$y = -2x + 2$	$y = -2x + 2$
$6 = -2(-2) + 2$	$-4 = -2(3) + 2$
$6 = 6$✓	$-4 = -4$✓

Solve each system by graphing. Check your answers.

1. $\begin{cases} y = x^2 + 3x - 4 \\ y = 4x - 4 \end{cases}$



2. $\begin{cases} y = 3x^2 + 2x - 1 \\ y = 2x + 2 \end{cases}$



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LESSON 8-10

Review for Mastery

Nonlinear Systems continued

Algebraic methods can also be used to solve a nonlinear system.

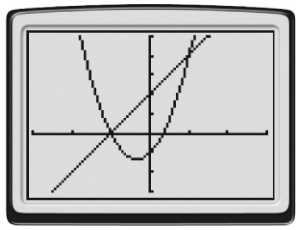
Solve the system by substitution.

$$\begin{cases} y = 3x^2 + 2x - 1 \\ y = 2x + 2 \end{cases}$$

$y = 3x^2 + 2x - 1$	
$y = 2x + 2$	*Both equations are solved for* y.
$2x + 2 = 3x^2 + 2x - 1$	*Substitute* $2x + 2$ *for* y.
$0 = 3x^2 - 3$	*Subtract* $2x + 2$ *from both sides.*
$0 = 3(x^2 - 1)$	*Factor*.
$0 = 3(x + 1)(x - 1)$	
$3 \neq 0$	*Set each factor* $= 0$.
$x + 1 = 0; x = -1$	3 *cannot equal* 0*, so* 3 *is not a solution to the system.*
$x - 1 = 0; x = 1$	
$y = 2x + 2$	*Write the original equation*.
$y = 2(-1) + 2 = 0$ or	*Substitute* -1 *for* x.
$y = 2(1) + 2 = 4$	*Substitute* 1 *for* x.

The solutions are (–1, 0) and (1, 4).

Check.
Use a graphing calculator.



The graph supports the solutions.

3. Solve the system by substitution. Check your answer.

$$\begin{cases} y = -2x^2 + 3x + 4 \\ y = -x + 4 \end{cases}$$

4. Solve the system by elimination. Check your answer.

$$\begin{cases} y = -3x^2 + 3x + 2 \\ -6x + y = 2 \end{cases}$$

Name _____ Date _____ Class _____

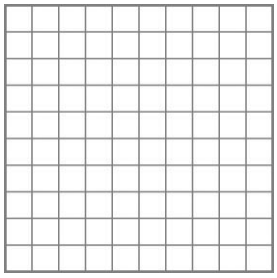
LESSON 8-10

Practice A

Nonlinear Systems

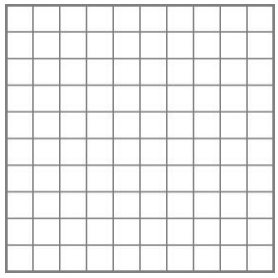
Solve by graphing. Check your answers.

1. $\begin{cases} y = x^2 - 2 \\ y = 5x - 8 \end{cases}$



_____

2. $\begin{cases} y = x^2 - 4x + 6 \\ y = -x + 4 \end{cases}$



_____

Solve by substitution. Check your answers.

3. $\begin{cases} y = x^2 - 3 \\ y = -x + 3 \end{cases}$

_____

4. $\begin{cases} y = x^2 - 2x - 3 \\ y = -2x - 5 \end{cases}$

_____

5. $\begin{cases} y = 2x^2 + x - 3 \\ -3x + y = 1 \end{cases}$

_____

6. $\begin{cases} y = x^2 - 25 \\ y = x + 5 \end{cases}$

_____

Solve by elimination. Check your answers.

7. $\begin{cases} y = x^2 - 1 \\ 2x - y = -2 \end{cases}$

_____

8. $\begin{cases} y = x^2 + 4x + 3 \\ x - y = -1 \end{cases}$

_____

9. $\begin{cases} y = 2x^2 + 4x - 1 \\ 6x + y = -13 \end{cases}$

_____

10. $\begin{cases} y = -x^2 + 3x - 3 \\ 2x - y = 5 \end{cases}$

_____

Name _____ Date _____ Class _____

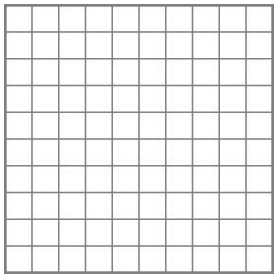
LESSON 8-10

Practice B

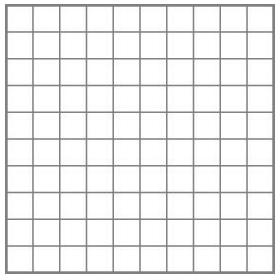
Nonlinear Systems

Solve each system by graphing. Check your answers.

1. $\begin{cases} y = x^2 - x - 2 \\ y = -x + 2 \end{cases}$



2. $\begin{cases} y = x^2 + x - 6 \\ y = -x - 3 \end{cases}$



Solve each system by substitution. Check your answers.

3. $\begin{cases} y = -2x^2 + x + 4 \\ y = -5x + 8 \end{cases}$

4. $\begin{cases} y = -2x^2 - 3x + 2 \\ y = -x + 6 \end{cases}$

5. $\begin{cases} y = 3x^2 + 2x - 1 \\ x + y = 5 \end{cases}$

6. $\begin{cases} y = x^2 - 16 \\ y = x + 4 \end{cases}$

Solve each system by elimination. Check your answers.

7. $\begin{cases} y = x^2 - 1 \\ x + 2y = 8 \end{cases}$

8. $\begin{cases} y = x^2 + 3x + 2 \\ 2x + y = -4 \end{cases}$

9. $\begin{cases} y = 2x^2 + 3x - 1 \\ 2x + y = -4 \end{cases}$

10. $\begin{cases} y = -x^2 + 2x - 4 \\ 3x + y = -4 \end{cases}$

Name _____ Date _____ Class _____

Chapter 8

Quadratic Functions and Equations

Section A Quiz

Select the best answer.

1. Which is a quadratic function?

   A $3x + y^2 = 5$ C $y = 3x + 5$

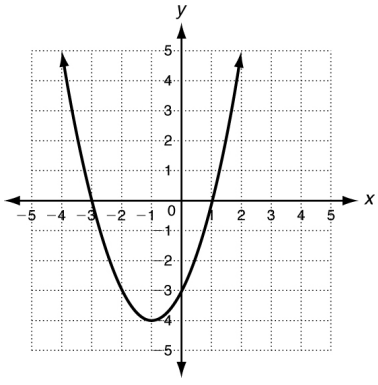
   B $3x^2 + y = 5$ D $x = 3y + 5$

2. Which function has a graph that opens downward?

   F $-x^2 + y = 0$ H $-y = x^2 + 1$

   G $x^2 - y = 0$ J $y = x^2 - 1$

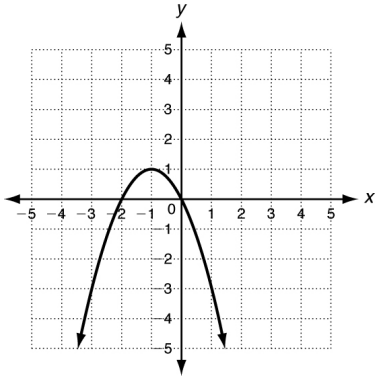
3. What is the vertex of the parabola graphed below?



   A (–3, 0) C (1, 0)

   B (–4, –1) D (–1, –4)

4. What are the zeros of the function graphed below?



   F –1 and 0 H 0 and 1

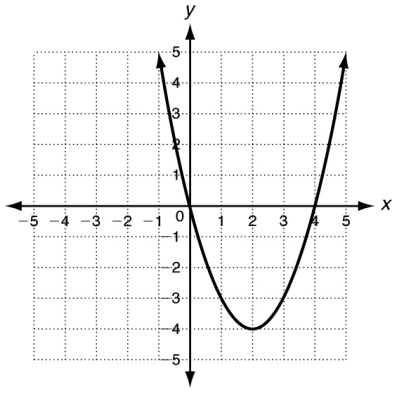
   G –2 and 0 J 0 and 2

5. What is the vertex of the graph of $y = -2x^2 + 8x - 3$?

   A (2, 5) C (–2, 5)

   B (–2, –27) D (4, –11)

6. What function is shown on the graph below?



   F $y = -x^2 - 4x$ H $y = -x^2 + 4x$

   G $y = x^2 - 4x$ J $y = x^2 + 4x$

7. The height in feet of a rocket launched from the ground can be modeled by the function $f(x) = -16x^2 + 96x$, where x is the time in seconds after it is launched. What is the rocket's maximum height?

   A 144 feet C 288 feet

   B 240 feet D 432 feet

8. Which function's graph has an axis of symmetry of $x = 2$?

   F $y = -3x^2 - 12x + 6$

   G $y = 3x^2 - 6x + 12$

   H $y = 3x^2 + 12x + 6$

   J $y = -3x^2 + 12x + 6$

9. $f(x) = x^2$ and $g(x) = 3x^2 + 1$. Which statement is true?

   A $g(x)$ is wider than $f(x)$.

   B $g(x)$ is narrower than $f(x)$.

   C $g(x)$ and $f(x)$ have the same vertex.

   D $g(x)$ and $f(x)$ have different axes of symmetry.

10. Which function has a vertex different from the vertex of the graph of $f(x) = 2x^2 + 1$?

    F $g(x) = x^2 + 4$ H $g(x) = x^2 + 1$

    G $g(x) = 3x^2 + 1$ J $g(x) = -2x^2 + 1$

Name _____ Date _____ Class _____

Chapter 8

Quadratic Functions and Equations

Section B Quiz

Select the best answer.

1. The vertex of a quadratic function is in the second quadrant. The related equation has no real solutions. Which statement is true?

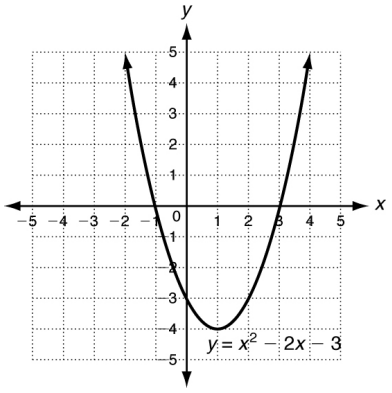
   A The graph opens down.

   B The graph opens up.

   C The *y*-intercept is 0.

   D The axis of symmetry is $x = 0$.

2. Use the graph to find the solutions of $x^2 - 2x - 3 = 0$.



   F –1 and 3 H 1 and –3

   G –1 and –3 J 1 and 3

3. What are the solutions of $(x + 2)(x - 3) = 0$?

   A 2 and –3 C –2 and 3

   B –2 and –3 D 2 and 3

4. What are the solutions of $0 = x^2 + 4x - 5$?

   F 4 and –5 H –4 and 5

   G –5 and 1 J 5 and –1

5. What are the solutions of $0 = 9x^2 - 36$?

   A –6 and 6 C –3 and 3

   B –4 and 4 D –2 and 2

6. A rectangle with an area of 124 cm^2 has a length that is 4 times the width. How long is the width? (Round your answer to the nearest tenth.)

   F 5.6 cm H 22.3 cm

   G 11.1 cm J 44.5 cm

7. What value of *c* will make $x^2 - 20x + c$ a perfect square trinomial?

   A –400 C 100

   B –100 D 400

8. Solve the system by substitution.

$$\begin{cases} y = x^2 + 5x + 4 \\ y = 8x + 8 \end{cases}$$

   F (–4, 0), (1, 16) H (–1, 0), (4, 40)

   G (–1, 0), (–4, 0) J (1, 16), (4, 40)

9. What are the solutions of $(x - 2)^2 = 9$?

   A –1 and 5 C –7 and 11

   B 1 and –5 D 7 and –11

10. How many solutions does $0 = x^2 + 5x - 15$ have?

    F 0 H 2

    G 1 J infinite

11. The discriminant of a quadratic equation is 0. Which statement is true?

    A There are no real solutions.

    B There is one real solution.

    C There are two real solutions.

    D The solution is 0.

12. Carlos is using the quadratic formula to find the solutions of $y = 3x^2 - 5x - 2$. Which of the following will simplify to the correct solutions?

    F $x = \dfrac{5 \pm \sqrt{25 + 24}}{6}$

    G $x = \dfrac{5 \pm \sqrt{25 - 24}}{6}$

    H $x = \dfrac{-5 \pm \sqrt{25 + 24}}{6}$

    J $x = \dfrac{-5 \pm \sqrt{25 - 24}}{6}$

Name _____ Date _____ Class _____

Chapter 8

Quadratic Functions and Equations

Chapter Test *Form B*

Select the best answer.

1. Which function is quadratic?

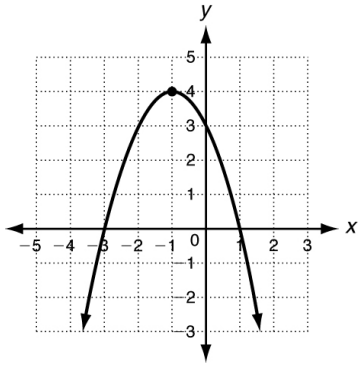
A	***x***	–4	–1	2	5
	y	18	3	6	27

B	***x***	–3	–2	–1	0
	y	–1	1	3	5

C	***x***	–2	0	2	4
	y	–13	–5	3	59

D	***x***	1	5	9	13
	y	2	–2	0	4

2. The vertex of this parabola shows that the _____ value of the function is _____.



F maximum, –1 H minimum, –1

G maximum, 4 J minimum, 4

3. Which table of values would you use to graph $y = x^2 + 3$?

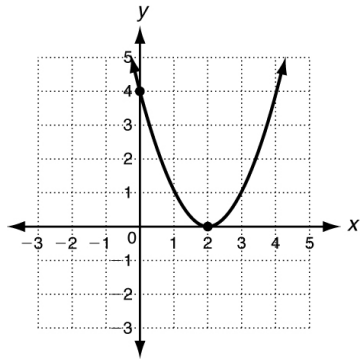
A	***x***	–2	–1	0	1	2
	y	–32	–1	0	1	32

B	***x***	–2	–1	0	1	2
	y	1	4	9	16	25

C	***x***	–2	–1	0	1	2
	y	7	4	3	4	7

D	***x***	–2	–1	0	1	2
	y	12	3	0	3	12

4. Find the zero(s) of $y = x^2 - 4x + 4$ from its graph below.



F 2 H 2 and 4

G 4 J no zeros

5. Find the axis of symmetry of the graph of $y = x^2 + 10x + 16$.

A $x = -10$ C $x = -5$

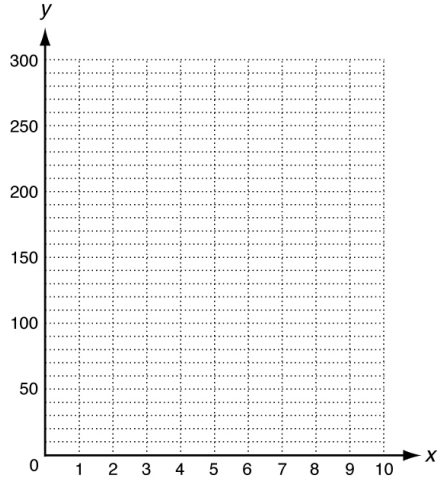
B $x = -8$ D $x = 13$

6. If you graph $y = 2x^2 - 8x - 10$, the y-intercept would be _____.

F –18 H 2

G –10 J 5

7. The height of a ball in feet is modeled by $f(x) = -16x^2 + 128x$, where x is the time in seconds after it is hit. How long is the ball in the air?



A 4 s C 128 s

B 8 s D 256 s

8. Compare the graph of $g(x) = 6x^2$ with the graph of $f(x) = x^2$.

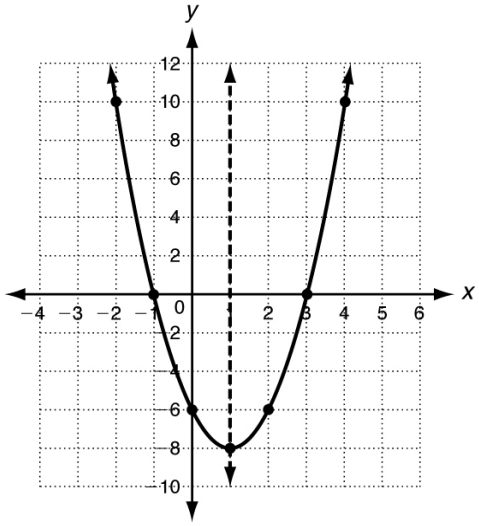
   F $g(x)$ is narrower.

   G $g(x)$ is translated up.

   H $g(x)$ is translated down.

   J $g(x)$ is wider.

9. Use this graph of the quadratic function $y = 2x^2 - 4x - 6$ to solve the equation $2x^2 - 4x - 6 = 0$.



   A $x = -2$ or $x = 4$ C $x = 0$ or $x = 2$

   B $x = -1$ or $x = 3$ D $x = 1$

10. Solve $x^2 - 12 = -4x$ by factoring.

    F $x = -2$ or $x = 6$ H $x = 2$ or $x = -6$

    G $x = -3$ or $x = 4$ J $x = 3$ or $x = -4$

11. Solve the system by elimination.

$$\begin{cases} y = x^2 + 3x + 3 \\ x - y = -11 \end{cases}$$

    A (–2, 1), (4, 31) C (–4, 7), (–2, 9)

    B (–4, 7) (2, 13) D (2, 13), (4, 15)

12. Solve $9x^2 - 4 = 0$ using square roots.

    F $x = \pm\frac{9}{4}$ H $x = \pm\frac{4}{9}$

    G $x = \pm\frac{2}{3}$ J $x = \pm\frac{3}{2}$

13. Which number completes the square to form a perfect square trinomial?

$$x^2 + 7x + \square$$

    A $\frac{7}{2}$ C $\frac{49}{2}$

    B $\frac{49}{4}$ D 49

14. Solve $x^2 + 8x + 18 = 0$ by completing the square.

    F $x = -2$ or $x = -6$

    G $x = -4 + \sqrt{2}$ or $x = -4 - \sqrt{2}$

    H $x = 4 + \sqrt{34}$ or $x = 4 - \sqrt{34}$

    J no real solutions

15. Solve $3x^2 = 5x + 8$ using the Quadratic Formula.

    A $x = -3$ or $x = 8$

    B $x = -1$ or $x = \frac{8}{3}$

    C $x = \frac{5 \pm \sqrt{71}}{6}$

    D no real solutions

16. Find the number of real solutions of the equation $x^2 + 10x + 35 = 0$ using the discriminant.

    F 0 H 2

    G 1 J 3

Name _____ Date _____ Class _____

Chapter 8

Quadratic Functions and Equations

Chapter Test *Form A*

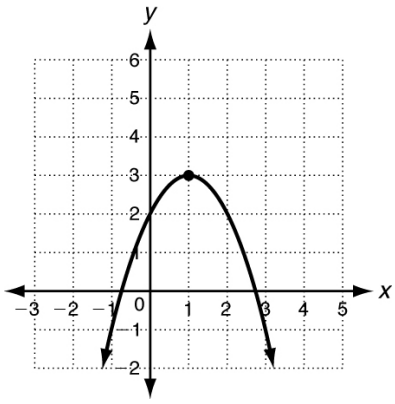
1. Tell whether this function is quadratic. Explain.

$$2x + y = 3x + 9$$

_____

_____

2. Identify the vertex of this parabola. Then give the minimum or maximum value of the function.

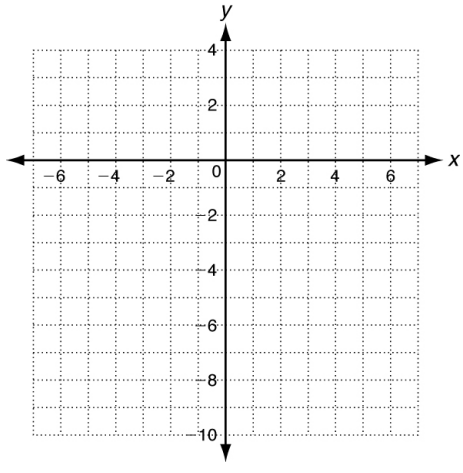


vertex: _____

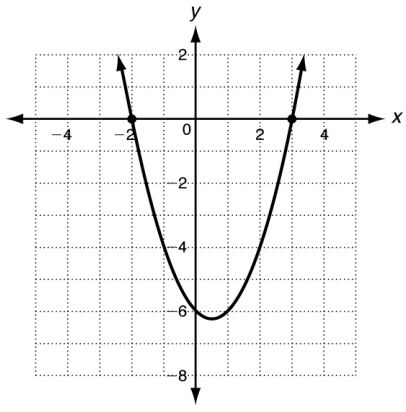
_____

3. Use a table of values to graph $y = -2x^2$.

x	−2	−1	0	1	2
y					



4. Find the zeros of $y = x^2 - x - 6$ from its graph below.



_____

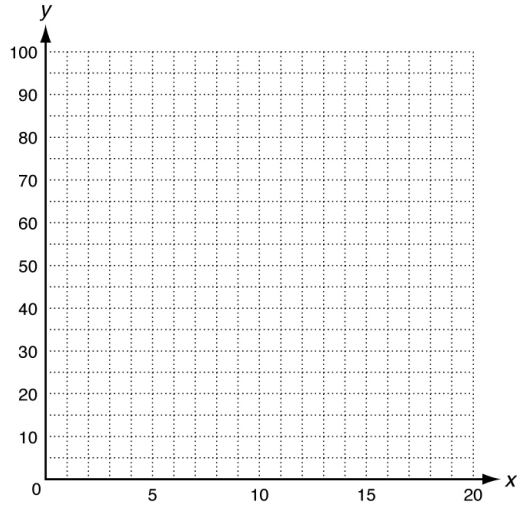
5. The zeros of the graph of a quadratic function are 2 and 6. What is its axis of symmetry?

_____

6. If you graph $y = -x^2 - 8x + 10$, what would be the y-intercept?

_____

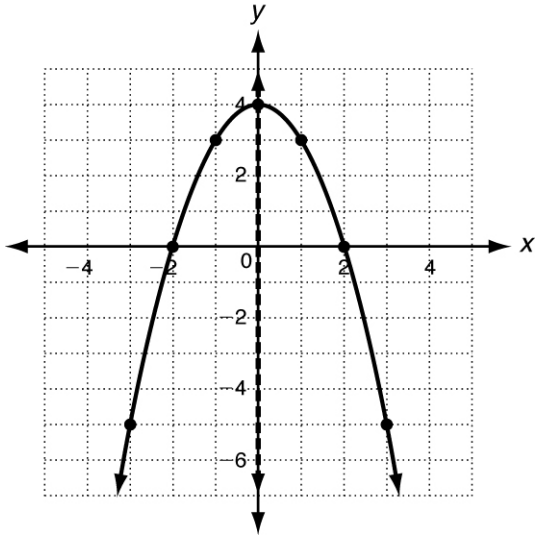
7. The height of a ball in meters is modeled by $f(x) = -5x^2 + 40x$, where x is the time in seconds after it is hit. How long is the ball in the air?



_____

8. Compare the graph of $g(x) = x^2 - 5$ with the graph of $f(x) = x^2$.

9. Use this graph of the quadratic function $y = -x^2 + 4$ to solve the equation $-x^2 + 4 = 0$.



10. Solve $x^2 - 2x - 24 = 0$ by factoring.

11. Solve the system by elimination.

$$\begin{cases} y = x^2 + 2 \\ -4x - y = 10 \end{cases}$$

12. Solve $x^2 = 121$ using square roots.

13. Complete the square to form a perfect square trinomial.

$x^2 + 2x +$ _____

14. Solve $x^2 - 4x = 32$ by completing the square.

15. Solve $3x^2 + 5x + 1 = 0$ using the Quadratic Formula.

16. Find the number of real solutions of the equation $x^2 + 2x + 8 = 0$ using the discriminant.

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

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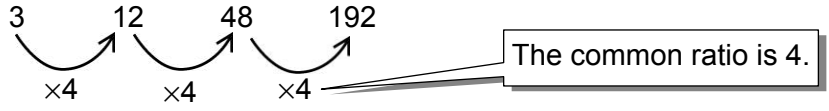
LESSON 9-1

Review for Mastery

Geometric Sequences

In a **geometric sequence**, each term is *multiplied* by the same number to get to the next term. This number is called the **common ratio**.



Determine if the sequence 2, 6, 18, 54, … is a geometric sequence.

Divide each term by the term before it.

$\frac{54}{18} = 3$ $\frac{18}{6} = 3$ $\frac{6}{2} = 3$

This is a geometric sequence; 3 is the common ratio.

Determine if the sequence 5, 10, 15, 20, … is a geometric sequence.

Divide each term by the term before it.

$\frac{20}{15} = \frac{4}{3}$ $\frac{15}{10} = \frac{3}{2}$ $\frac{10}{5} = 2$

This is not a geometric sequence; there is no common ratio.

Find the next three terms in the geometric sequence 1, 4, 16, 64, ….

Step 1: Find the common ratio.

$\frac{64}{16} = 4$ $\frac{16}{4} = 4$ $\frac{4}{1} = 4$

Step 2: Continue to multiply by the common ratio.

$64 \times 4 = 256$ $256 \times 4 = 1024$ $1024 \times 4 = 4096$

The next three terms are 256, 1024, and 4096.

Determine if each sequence is a geometric sequence. Explain.

1. 2, 4, 6, 8, … _____
2. –4, 8, –16, 32, … _____
3. 32, 16, 8, 4, … _____

Find the common ratio in each geometric sequence below. Then find the next three terms.

4. 1, 5, 25, 125, …

_____

5. –6, 12, –24, 48, …

_____

6. 4, 6, 9, 13.5, …

_____

7. $\frac{1}{4}, \frac{1}{2}$, 1, 2, …

_____

Name _____ Date _____ Class _____

LESSON 9-1

Review for Mastery

Geometric Sequences continued

There are two ways to find a given term of a geometric sequence.

Find the 8th term in the geometric sequence 5, 10, 20, 40, ….

Method 1: Extend the sequence to the 8th term.

Step 1: Find the common ratio.

$\frac{40}{20} = 2 \qquad \frac{20}{10} = 2 \qquad \frac{10}{5} = 2$

The common ratio is 2.

Step 2: Continue to multiply each term by 2.

5, 10, 20, 40, 80, 160, 320, **640,** …

Stop at the 8th term.

The 8th term is 640.

Method 2: Use a formula to find the 8th term.

Look at Method 1. The first term, 5, was multiplied by 2 seven times to get to the eighth term.

8th term $= 5\ (2)\ (2)\ (2)\ (2)\ (2)\ (2)\ (2) = 5\ (2)^7$

Written as a formula, this would be:

$$a_n = a_1\, r^{n-1},$$

where n is the number of terms and r is the common ratio.

To find the 8th term of the sequence, use $n = 8$ and $r = 2$.

$$a_n = a_1\, r^{n-1}$$
$$a_8 = 5(2)^{8-1}$$
$$a_8 = 5(2)^7$$
$$a_8 = 5(128)$$
$$a_8 = 640$$

The 8th term is 640.

Find the indicated term.

8. $a_1 = 7$, $r = -2$; 10th term

$a_{10} = \square\left(\square\right)^{\square - 1}$

9. $a_1 = -4$, $r = 3$; 8th term

$a_8 = \square\left(\square\right)^{\square - 1}$

10. The first term of a geometric sequence is 2, and the common ratio is 3. What is the 7th term? _____

11. The first term of a geometric sequence is –3, and the common ratio is –2. What is the 9th term? _____

12. Find the 12th term in the geometric sequence 5, –15, 45, –135, …. _____

13. Find the 8th term in the geometric sequence 243, 81, 27, 9, …. _____

Name _____ Date _____ Class _____

LESSON 9-1

Practice A

Geometric Sequences

Find the common ratio of each geometric sequence. Then find the next three terms in each geometric sequence.

1. 1, 4, 16, 64, …

   common ratio: _____

   _____

2. 10, 100, 1000, 10,000, …

   common ratio: _____

   _____

3. 128, 64, 32, 16, …

   common ratio: _____

   _____

4. 4, –20, 100, –500, …

   common ratio: _____

   _____

5. The first term of a geometric sequence is 2 and the common ratio is 4. Find the 6th term.

   _____

6. The first term of a geometric sequence is –3 and the common ratio is 2. Find the 8th term.

   _____

7. The first term of a geometric sequence is 7 and the common ratio is –2. Find the 9th term.

   _____

8. What is the 5th term of the geometric sequence 9, 27, 81, 243, …?

   common ratio (r): _____

   first term (a_1): _____

   5th term: _____

9. What is the 13th term of the geometric sequence –2, 4, –8, 16, …?

   common ratio (r): _____

   first term (a_1): _____

   13th term: _____

10. Martin got a job at a starting pay of $8.00 per hour. His boss told him that if he works hard he can get a raise each year. The table shows Martin's wage for the first few years. Find Martin's hourly wage after 6 years. Round to the nearest cent.

    common ratio (r): _____

    first term (a_1): _____

    6th term: _____

Year	Hourly Wage ($)
1	$8.00
2	$9.60
3	$11.52

Name _____ Date _____ Class _____

LESSON 9-1

Practice B

Geometric Sequences

Find the next three terms in each geometric sequence.

1. –5, –10, –20, –40, …

2. 7, 56, 448, 3584…

3. –10, 40, –160, 640, …

4. 40, 10, $\frac{5}{2}$, $\frac{5}{8}$, …

5. The first term of a geometric sequence is 6 and the common ratio is –8. Find the 7th term.

6. The first term of a geometric sequence is –3 and the common ratio is $\frac{1}{2}$. Find the 6th term.

7. The first term of a geometric sequence is –0.25 and the common ratio is –3. Find the 10th term.

8. What is the 12th term of the geometric sequence –4, –12, –36, …?

9. What is the 10th term of the geometric sequence 2, –6, 18, …?

10. What is the 6th term of the geometric sequence 50, 10, 2, …?

11. A shoe store is discounting shoes each month. A pair of shoes cost $80. The table shows the discount prices for several months. Find the cost of the shoes after 8 months. Round your answer to the nearest cent.

Month	Price
1	$80.00
2	$72.00
3	$64.80

Name _____ Date _____ Class _____

LESSON 9-2

Review for Mastery

Exponential Functions

An **exponential function** has the independent variable as the exponent.

$y = 3^x$ and $y = -2\,(0.5)^x$ are exponential functions.

A set of ordered pairs satisfies an exponential function if the *y*–values are multiplied by a constant amount as the *x*–values change by a constant amount.

Tell whether the following ordered pairs satisfy an exponential function.

x	*y*	
3	4	*Think* $4 \times ? = 12$.
5	12	*Think* $12 \times ? = 36$.
7	36	*Think* $36 \times ? = 108$.
9	108	

The *x*-values increase by the constant amount 2.

Each *y*-value is multiplied by the constant amount 3.

This is an exponential function.

x	*y*	
1	2	*Think* $2 \times ? = 4$.
2	4	*Think* $4 \times ? = 6$.
3	6	*Think* $6 \times ? = 8$.
4	8	

The *x*-values increase by the constant amount 1.

The *y*-value is multiplied by 2, then 1.5, Then $1.\overline{3}$. There is no constant ratio.

This is not an exponential function.

The population of a school can be described by the function $f(x) = 1500\,(1.02)^x$, where *x* represents the number of years since the school was built. What will be the population of the school in 12 years?

$f(x) = 1500\,(1.02)^x$

$f(12) = 1500\,(1.02)^{12}$ *Substitute 12 for x.*

≈ 1902 *Round number of people to the nearest whole number.*

Tell whether the ordered pairs satisfy an exponential function.

1.

x	*y*
–1	1.5
–2	3
–3	6
–4	12

_____

2.

x	*y*
1	1
2	2
3	6
4	24

_____

3.

x	*y*
–2	–2
–1	–10
0	–50
1	–250

_____

4. If a rubber ball is dropped from a height of 10 feet, the function $f(x) = 20\,(0.6)^x$ gives the height in feet of each bounce, where *x* is the bounce number. What will be the height of the 5th bounce? Round to the nearest tenth of a foot. _____

5. A population of pigs is expected to increase at a rate of 4% each year. If the original population is 1000, the function $f(x) = 1000\,(1.04)^x$ gives the population in *x* years. What will be the population in 12 years? _____

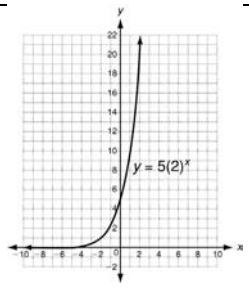
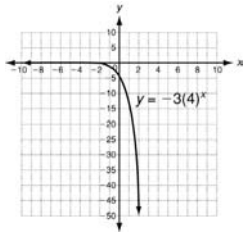
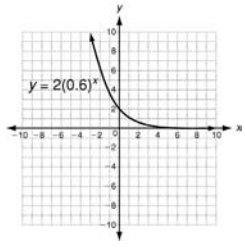
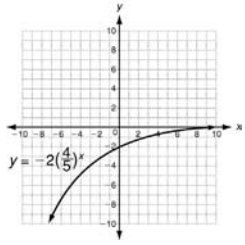
Name _____ Date _____ Class _____

LESSON 9-2

Review for Mastery

Exponential Functions continued

The graph of an exponential function is always a curve in two quadrants. $y = ab^x$

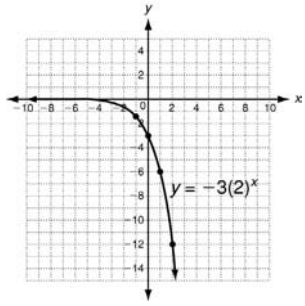
$a > 0$ and $b > 1$	$a < 0$ and $b > 1$	$a > 0$ and $0 < b < 1$	$a < 0$ and $0 < b < 1$
			

Graph $y = -3\,(2)^x$.

Create a table of ordered pairs. Plot the points.

Because $a < 0$ and $b > 1$, this graph should look similar to the second graph above.

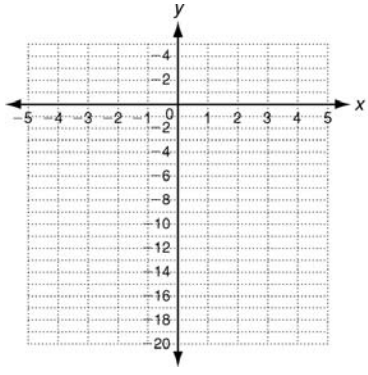
x	$y = -3\,(2)^x$	y
−1	$y = -3\,(2)^{-1}$	−1.5
0	$y = -3\,(2)^0$	−3
1	$y = -3\,(2)^1$	−6
2	$y = -3\,(2)^2$	−12



Graph each exponential function.

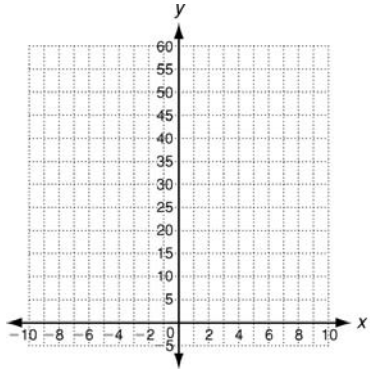
6. $y = -4\,(0.5)^x$

x	$y = -4\,(0.5)^x$	y
−2		
−1		
0		
1		



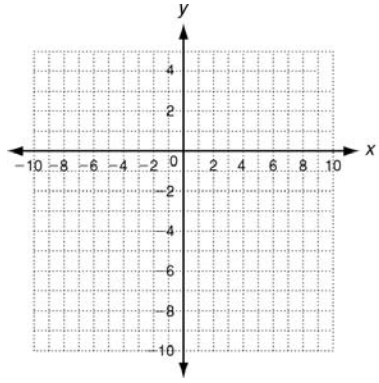
7. $y = 2\,(5)^x$

x	$y = 2\,(5)^x$	y
−1		
0		
1		
2		



8. $y = -1\,(2)^x$

x	$y = -1\,(2)^x$	y
−1		
0		
1		
2		



Name _____ Date _____ Class _____

LESSON 9-2

Practice A

Exponential Functions

1. If a superball is bounced from a height of 20 feet, the function $f(x) = 20\ (0.9)^x$ gives the height of the ball in feet of each bounce, where x is the bounce number. What will be the height of the 6th bounce? Round your answer to the nearest tenth of a foot. _____

Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer.

2. {(1,10), (2, 20), (3, 40), (4, 80)} _____

_____

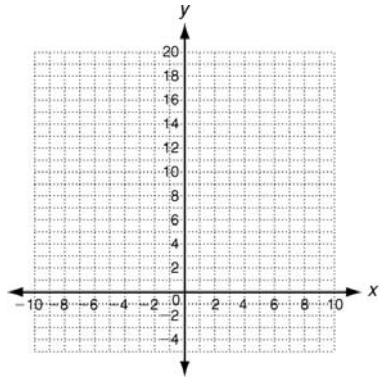
3. {(1,5), (2, 10), (3, 15), (4, 20)} _____

_____

Graph each exponential function.

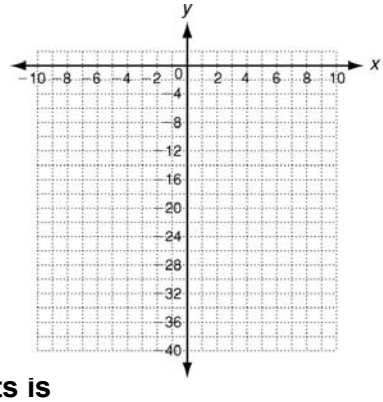
4. $y = 2(3)^x$

x	$y = 2\ (3)^x$	y	(x, y)
–2	$y = 2(3)^{-2}$		
–1	$y = 2(3)^{-1}$		
0	$y = 2(3)^0$		
1	$y = 2(3)^1$		
2	$y = 2(3)^2$		



5. $y = -2(4)^x$

x	$y = -2\ (4)^x$	y	(x, y)
–2			
–1			
0			
1			
2			



In the absence of predators, the natural growth rate of rabbits is 4% per year. A population begins with 100 rabbits. The function $f(x) = 100(1.04)^x$ gives the population of rabbits in x years.

6. How long will it take the population of rabbits to double? _____

7. How long will it take the population of rabbits to reach 1000? _____

Name _____ Date _____ Class _____

LESSON 9-2

Practice B

Exponential Functions

1. If a basketball is bounced from a height of 15 feet, the function $f(x) = 15\ (0.75)^x$ gives the height of the ball in feet of each bounce, where x is the bounce number. What will be the height of the 5th bounce? Round to the nearest tenth of a foot.

_____

Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer.

2. {(2, 4), (4, 8), (6, 16), (8, 32)} _____

_____

3. {(–2, 5), (–1, 10), (0, 15), (1, 20)} _____

_____

4. {(1, 750), (2, 150), (3, 30), (4, 6)} _____

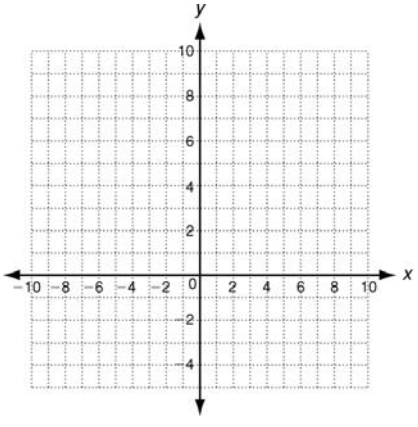
_____

5. $\left\{\left(-5, \frac{1}{3}\right),\ (0, 1), (5, 3), (10, 9)\right\}$ _____

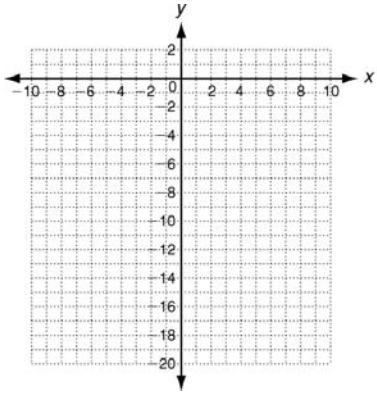
_____

Graph each exponential function.

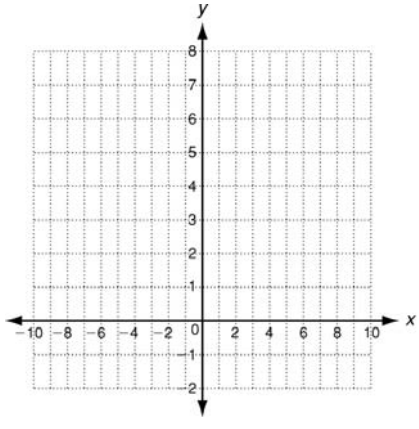
6. $y = 5(2)^x$



7. $y = -2(3)^x$



8. $y = 3\left(\frac{1}{2}\right)^x$



In the year 2000, the population of Virginia was about 7,400,000. Between the years 2000 and 2004, the population in Virginia grew at a rate of 5.4%. At this growth rate, the function $f(x) = 7{,}400{,}000\ (1.054)^x$ gives the population x years after 2000.

9. In what year will the population reach 15,000,000? _____

10. In what year will the population reach 20,000,000? _____

Name _____ Date _____ Class _____

LESSON 9-3

Review for Mastery

Exponential Growth and Decay

In the exponential growth and decay formulas, y = final amount, a = original amount, r = rate of growth or decay, and t = time.

Exponential growth: $y = a(1 + r)^t$

The population of a city is increasing at a rate of 4% each year. In 2000 there were 236,000 people in the city. Write an exponential growth function to model this situation. Then find the population in 2009.

Step 1: Identify the variables.

$a = 236{,}000$ $r = 0.04$

Step 2: Substitute for a and r.

$y = a(1 + r)^t$

$y = 236{,}000(1 + 0.04)^t$

The exponential growth function is $y = 236{,}000(1.04)^t$.

Growth = greater than 1.

Step 3: Substitute for t.

$y = 236{,}000(1.04)^9$

$\approx 335{,}902$

The population will be about 335,902.

Exponential decay: $y = a(1 - r)^t$

The population of a city is decreasing at a rate of 6% each year. In 2000 there were 35,000 people in the city. Write an exponential decay function to model this situation. Then find the population in 2012.

Step 1: Identify the variables.

$a = 35{,}000$ $r = 0.06$

Step 2: Substitute for a and r.

$y = a(1 - r)^t$

$y = 35{,}000(1 - 0.06)^t$

The exponential decay function is $y = 35{,}000(0.94)^t$.

Decay = less than 1.

Step 3: Substitute for t.

$y = 35{,}000(0.94)^{12}$

$\approx 16{,}657$

The population will be about 16,657.

Write an exponential growth function to model each situation. Then find the value of the function after the given amount of time.

1. Annual sales at a company are $372,000 and increasing at a rate of 5% per year; 8 years

   $y = \square(1+\square)^{\square}$

   _____

2. The population of a town is 4200 and increasing at a rate of 3% per year; 7 years

   _____

Write an exponential decay function to model each situation. Then find the value of the function after the given amount of time.

3. Monthly car sales for a certain type of car are $350,000 and are decreasing at a rate of 3% per month; 6 months

   $y = \square(1-\square)^{\square}$;

   _____

4. An internet chat room has 1200 participants and is decreasing at a rate of 2% per year; 5 years

   _____

Name _____ Date _____ Class _____

LESSON 9-3

Review for Mastery

Exponential Growth and Decay continued

A special type of exponential growth involves finding compound interest.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

- where A is the total balance after t years
- P is the original amount
- r is the interest rate
- n is the number of times the interest is compounded in one year
- t is the number of years

Write a compound interest function to model $15,000 invested at a rate of 3% compounded quarterly. Then find the balance after 8 years.

$A = 15{,}000\left(1 + \frac{0.03}{4}\right)^{4t}$

$A = 15{,}000\ (1.0075)^{4t}$ *Compound interest function*

$A = 15{,}000\ (1.0075)^{4(8)}$ *Substitute 8 for t.*

$A = 15{,}000\ (1.0075)^{32}$

$\approx 19{,}051.67$

The balance after 8 years is $19,051.67.

A special type of exponential decay involves the half-life of substances.

$$A = P\ (0.5)^{t}$$

- where A is the final amount
- P is the original amount
- t is the number of half-lives in a given time period

Ismuth-212 has a half-life of approximately 60 seconds. Find the amount of Ismuth-212 left from a 25 gram sample after 300 seconds.

Step 1: Find t. $t = \frac{300}{60} = 5$

Step 2: Substitute for P and t.

$A = 25\ (0.5)^{5}$

$= 0.78125$

The amount after 300 s is 0.78125 g.

Write a compound interest function to model each situation. Then find the balance after the given number of years.

5. $17,000 invested at 3%, compounded annually; 6 years _____

6. $23,000 invested at 2%, compounded quarterly; 8 years _____

Write an exponential decay function to model each situation. Then find the value after the given amount of time.

7. A 30 gram sample of Iodine-131 has a half-life of about 8 days; 24 days _____

8. A 40 gram sample of Sodium-24 has a half-life of 15 hours; 60 hours _____

Name _____ Date _____ Class _____

LESSON 9-3

Practice A

Exponential Growth and Decay

Write an exponential growth function to model each situation. Then find the value of the function after the given amount of time.

1. Annual sales for a clothing store are $270,000 and are increasing at a rate of 7% per year; 3 years

$y = \square\left(1+\square\right)^{\square}$

$y =$ _____

2. The population of a school is 2200 and is increasing at a rate of 2%; 6 years

$y = \square\left(1+\square\right)^{\square}$

$y \approx$ _____

3. The value of an antique vase is $200 and is increasing at a rate of 8%; 12 years

$y =$ _____

$y \approx$ _____

Write a compound interest function to model each situation. Then find the balance after the given number of years.

4. $20,000 invested at a rate of 3% compounded annually; 8 years

$A = \square\left(1+\frac{\square}{\square}\right)^{(\square)(\square)}$

$A \approx$ _____

5. $35,000 invested at a rate of 6% compounded monthly; 10 years

$A = \square\left(1+\frac{\square}{\square}\right)^{(\square)(\square}$

$A \approx$ _____

6. $35,000 invested at a rate of 8% compounded quarterly; 5 years

$A =$ _____

$A \approx$ _____

Write an exponential decay function to model each situation. Then find the value of the function after the given amount of time.

7. The population of a school is 800 and is decreasing at a rate of 2% per year; 4 years

$y = \square\left(1-\square\right)^{\square}$

$y \approx$ _____

8. The bird population in a forest is about 2300 and decreasing at a rate of 4% per year; 10 years

$y = \square\left(1-\square\right)^{\square}$

$y \approx$ _____

9. The half-life of strontium-90 is approximately 28 years. Find the amount of strontium-90 left from a 10 gram sample after 56 years.

$A = \square(0.5)^{\square}$

$A \approx$ _____

Name _____ Date _____ Class _____

LESSON 9-3

Practice B

Exponential Growth and Decay

Write an exponential growth function to model each situation. Then find the value of the function after the given amount of time.

1. Annual sales for a fast food restaurant are $650,000 and are increasing at a rate of 4% per year; 5 years _____

2. The population of a school is 800 students and is increasing at a rate of 2% per year; 6 years _____

3. During a certain period of time, about 70 northern sea otters had an annual growth rate of 18%; 4 years _____

Write a compound interest function to model each situation. Then find the balance after the given number of years.

4. $50,000 invested at a rate of 3% compounded monthly; 6 years _____

5. $43,000 invested at a rate of 5% compounded annually; 3 years _____

6. $65,000 invested at a rate of 6% compounded quarterly; 12 years _____

Write an exponential decay function to model each situation. Then find the value of the function after the given amount of time.

7. The population of a town is 2500 and is decreasing at a rate of 3% per year; 5 years _____

8. The value of a company's equipment is $25,000 and decreases at a rate of 15% per year; 8 years _____

9. The half-life of Iodine-131 is approximately 8 days. Find the amount of Iodine-131 left from a 35 gram sample after 32 days. _____

Name _____ Date _____ Class _____

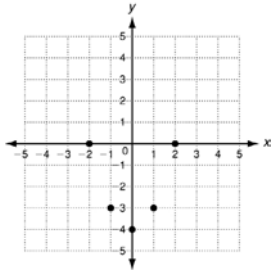
LESSON 9-4

Review for Mastery

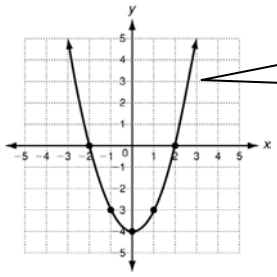
Linear, Quadratic, and Exponential Models

Graph to decide whether data is best modeled by a linear, quadratic or exponential function.

Graph (–2, 0), (–1, –3), (0, –4), (1, –3), (2, 0). What kind of model best describes the data?



Connect the points.



The data appear to be quadratic.

You can also look at patterns in data to determine the correct model.

Linear functions have constant 1st differences.

x	*y*	
2	5	
		–3
4	2	
		–3
6	–1	
		–3
8	–4	

Quadratic functions have constant 2nd differences.

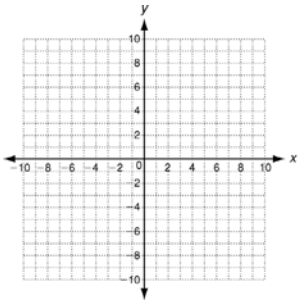
x	*y*		
1	–8		
		+3	
2	–5		+2
		+5	
3	0		+2
		+7	
4	7		

Exponential functions have a constant ratio.

x	*y*	
0	–2	
		×4
1	–8	
		×4
2	–32	
		×4
3	–128	

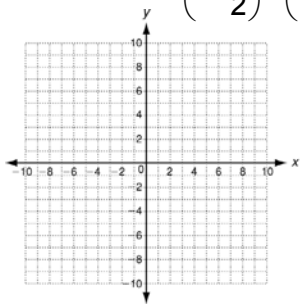
Graph each data set. Which kind of model best describes the data?

1. (–2, –4), (–1, –2), (0, 0), (1, 2), (2, 4)



_____

2. (–1, 4), (0, 2), (1, 1), $\left(2, \frac{1}{2}\right)$, $\left(3, \frac{1}{4}\right)$



_____

Look for a pattern in each data set to determine which kind of model best describes the data.

3.

x	*y*
0	6
1	12
2	24
3	48

_____

4.

x	*y*
0	10
1	18
2	28
3	40

_____

5.

x	*y*
3	4
6	–2
9	–8
12	–14

_____

Name _____ Date _____ Class _____

LESSON 9-4

Review for Mastery

Linear, Quadratic, and Exponential Models *continued*

After deciding which model fits best, you can write a function.

Linear	Quadratic	Exponential
$y = mx + b$	$y = ax^2 + bx + c$	$y = ab^x$

Use the data in the table to describe how the software's cost is changing. Then write a function to model the data.

Computer Software				
Year	0	1	2	3
Cost ($)	80.00	72.00	64.80	58.32

Step 1: Determine whether data is linear, quadratic, or exponential.

Check differences:

x	*y*	
0	80.00	
		–8
1	72.00	
		–7.20
2	64.80	
		–6.48
3	58.32	

–8 → +0.8 → –7.20 → +0.72 → –6.48

First differences are not constant.

Second differences are not constant.

Check ratio:

x	*y*	
0	80.00	
		× 0.9
1	72.00	
		× 0.9
2	64.80	
		× 0.9
3	58.32	

Ratio is constant. Use an exponential model.

Step 2: Write the function.

Use $y = ab^x$

$y = a\,(0.9)^x$	*Substitute the constant ratio 0.9, for b.*
$80 = a\,(0.9)^0$	*Substitute the ordered pair (0, 80) for x and y.*
$80 = a\,(1)$	*Simplify* $(0.9)^0$.
$80 = a$	*The value of a is 80.*
$y = 80(0.9)^x$	*Write the function.*

Describe the model that best fits the data below. Then write a function to model the data.

6.

x	*y*
0	1
1	4
2	16
3	64

model: _____

function: _____

7.

x	*y*
0	7
1	10
2	13
3	16

model: _____

function: _____

Name _____ Date _____ Class _____

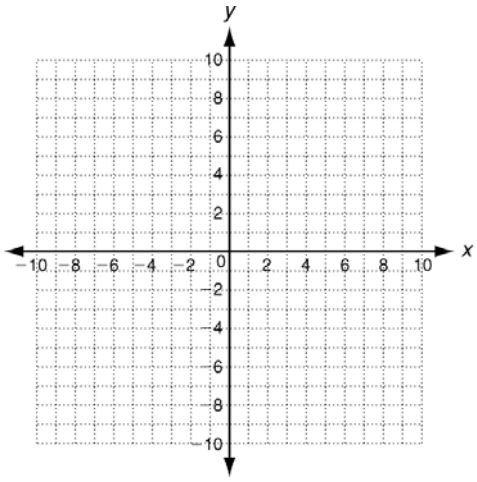
LESSON 9-4

Practice A

Linear, Quadratic, and Exponential Models

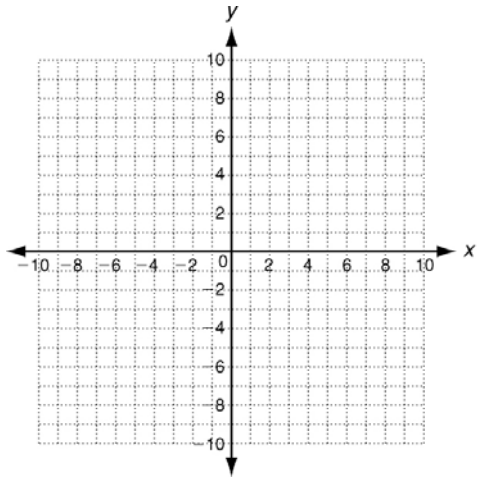
Graph each data set. Write *linear*, *quadratic*, or *exponential*.

1. {(0, –4), (1, –2), (2, 0), (3, 2), (4, 4)}



_____

2. {(–2, –5), (–1, –8), (0, –9), (1, –8), (2, –5)}



_____

Look for a pattern in each data set. Write *linear*, *quadratic*, or *exponential*.

3.

x	*y*
0	3
1	6
2	12
3	24

_____

4.

x	*y*
–2	–10
–1	–8
0	–6
1	–4

_____

5.

x	*y*
0	2
1	6
2	12
3	20

_____

6. The data in the table show the price of apples at a local store over several *y*ears.

Year	1	2	3	4
Cost ($)	0.45	0.90	1.35	1.80

a. Which model best describes the data for apples? _____

b. Write the function that models the data for apples. _____

c. Predict the cost of apples in year 8. _____

7. The data in the table show the price of a game over several *y*ears.

Year	0	1	2	3
Cost ($)	5.00	6.00	7.20	8.64

a. Which model best describes the data for the game? _____

b. Write the function that models the data for the game. _____

c. Predict the cost of the game in year 7. Round the cost to the nearest cent. _____

Name _____ Date _____ Class _____

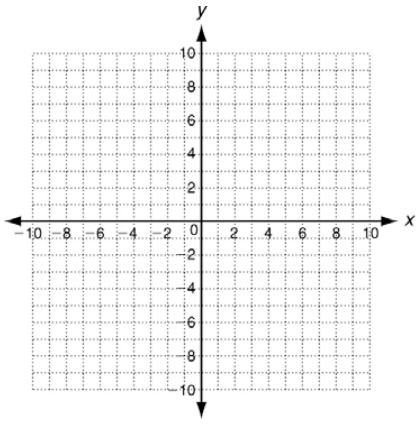
LESSON 9-4

Practice B

Linear, Quadratic, and Exponential Models

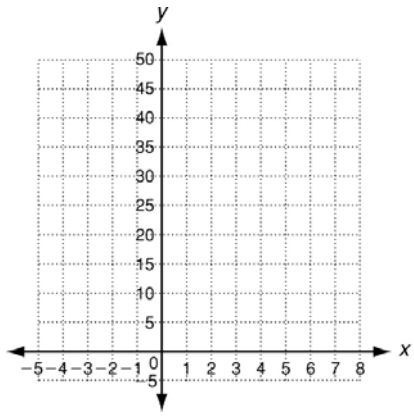
Graph each data set. Which kind of model best describes the data?

1. {(–2, 0), (–1, –3), (0, –4), (1, –3), (2, 0)}



_____

2. {(0, 3), (1, 6), (2, 12), (3, 24), (4, 48)}



_____

Look for a pattern in each data set to determine which kind of model best describes the data.

3. {(–5, 9), (–4, 0), (–3, –7), (–2, –12)} _____
4. {(–2, 9), (–1, 13), (0, 17), (1, 21)} _____
5. {(1, 4), (2, 6), (3, 9), (4, 13.5)} _____
6. {(0, 4), (2, 12), (4, 36), (6, 76)} _____
7. $\left\{(1,17),\ \left(3,8\frac{1}{2}\right),\ \left(5,4\frac{1}{4}\right),\ \left(7,2\frac{1}{8}\right)\right\}$ _____

8. Use the data in the table to describe how the restaurant's sales are changing. Then write a function that models the data. Use your function to predict the amount of sales after 8 years.

Restaurant				
Year	0	1	2	3
Sales ($)	20,000	19,000	18,050	17,147.50

_____

_____

9. Use the data in the table to describe how the clothing store's sales are changing. Then write a function that models the data. Use your function to predict the amount of sales after 10 years.

Clothing Store				
Year	0	1	2	3
Sales ($)	15,000	15,750	16,500	17,250

_____

_____

Name _____ Date _____ Class _____

LESSON 9-5

Review for Mastery

Comparing Functions

Function Types

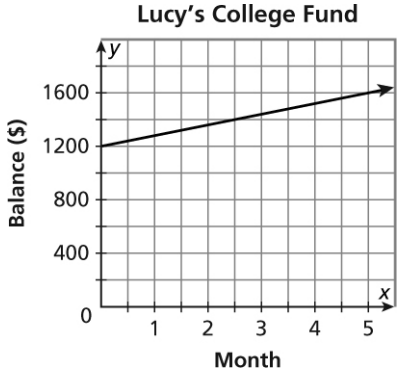
	Linear	Quadratic	Exponential
Equation	$y = mx + b$	$y = ax^2 + bx + c$ $a \neq 0$	$y = ab^x$ $a \neq 0,\ b \neq 1,\ b > 0$
Rate of change	Constant	Variable	Variable

You can compare functions in different representations, including tables, graphs, or equations.

Compare the accounts at right by finding slopes and *y*-intercepts and interpreting those values in the context of the situation.

Evie's College Fund

Month	Balance ($)
0	1000
1	1100
2	1200
3	1300
4	1400
5	1500

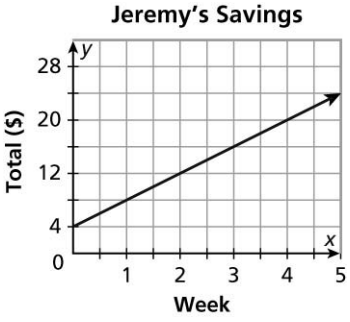


Evie	Lucy	Interpret and Compare
Slope: Use (0, 1000) and (5, 1500): $\frac{1500-1000}{5-0} = 100$	Slope: Use (0, 1200) and (5, 1600): $\frac{1600-1200}{5-0} = 80$	The slope is the rate of change. Evie is saving at a higher rate.
(0, 1000) is in the table *y*-intercept = 1000	(0, 1200) is on the graph. *y*-intercept = 1200	The *y*-intercept is the beginning account balance. Lucy started with more money.

1. Jon and Jeremy each save money weekly from their allowances, as shown. Compare the accounts by finding and interpreting slopes and *y*-intercepts.

Jon's Savings

Week	0	1	2	3	4
Total ($)	11	16	21	26	31



a. Slopes _____

b. Interpret and compare: _____

_____

c. *y*-intercepts: _____

d. Interpret and compare: _____

_____

Name _____ Date _____ Class _____

LESSON 9-5

Review for Mastery

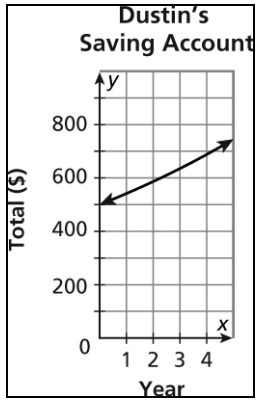
Comparing Functions continued

Nonlinear functions do not have a constant rate of change, but you can calculate their average rates of change over a certain interval. For a function $f(x)$ whose graph contains the points (x_1, y_1) and (x_2, y_2), the *average rate of change* over the interval $[x_1, x_2]$ is the slope of the line through (x_1, y_1) and (x_2, y_2).

Compare the accounts below by finding and interpreting the average rates of change from year 0 to year 5.

Darin's Savings Account

Year	Balance ($)
0	500
1	520
2	540.80
3	562.43
4	608.33
5	632.66

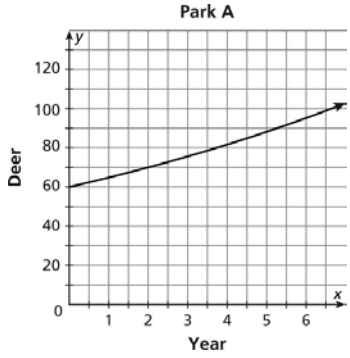


Darin	Dustin	Interpret and Compare
Use (0, 500) and (5, 632.66): $\frac{632.66-500}{5-0}=\frac{132.66}{5}\approx 26.53$	Use the graph to estimate. When $x = 5$, $y \approx 750$. Use (0, 500) and (5, 750): $\frac{750-500}{5-0}=\frac{250}{5}=50$	From years 0 to 5, Darin's account balance increased in value at an average rate of $26.53/year, while Dustin's account balance increased in value by about $50/year.

2. The table and graph represent the number of deer in two different parks. Compare the populations by finding and interpreting the average rates of change from year 1 to year 5.

Park A

Year	1	2	3	4	5
Deer	80	92	99	108	120



a. Rates of change: _____

b. Interpret and compare: _____

_____

Name _____ Date _____ Class _____

LESSON 9-5

Practice A

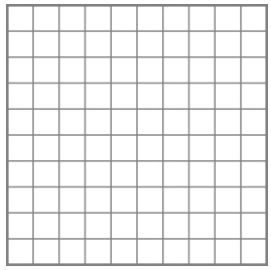
Comparing Functions

1. Complete the tables for each function below. Find the rate of change over [0, 4] for each function. Then graph all three functions on the same coordinate plane.

$y = 5x + 10$	
x	y
0	
1	
2	
3	
4	

$y = 1 + 5^x$	
x	y
0	
1	
2	
3	
4	

$y = 5x^2 + 5x$	
x	y
0	
1	
2	
3	
4	



Rate of change _____ _____ _____

a. Compare the rates of change. _____

_____

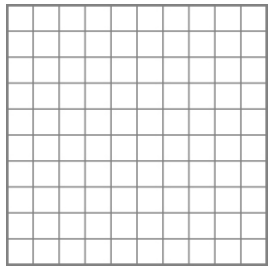
b. How do the y-values at $x = 0$ and $x = 4$ relate to the rates of change over [0, 4]?

_____

2. An engineer designs satellite dishes. Equations for two designs are shown below. Complete the tables for each function. Find and compare the average rates of change, minimums, and maximums over the interval [0, 4].

Design 1: $y = 3x^2 + 3x$	
x	y
0	
1	
2	
3	
4	

Design 2: $y = 3 + 3^x$	
x	y
0	
1	
2	
3	
4	



Rate of change _____ _____

Minimum value on [0, 4] _____ _____

Maximum value on [0, 4] _____ _____

Name _____ Date _____ Class _____

LESSON 9-5

Practice B

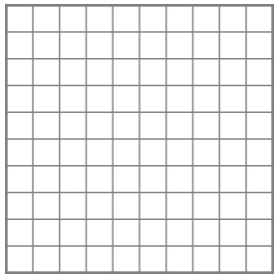
Comparing Functions

1. Three functions are given below. Complete the tables and find the rate of change over [0, 3] for each function. Then graph all three functions on the same coordinate plane.

$y = 4x + 10$	
x	y
0	
1	
2	
3	
4	

$y = 1 + 4^x$	
x	y
0	
1	
2	
3	
4	

$y = 4x^2 + 4x$	
x	y
0	
1	
2	
3	
4	



Rate of change _____ _____ _____

a. Compare the rates of change. _____

_____

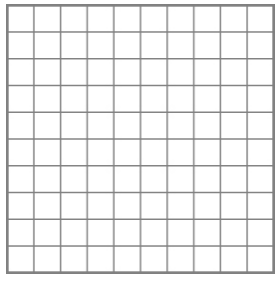
b. How do the y-values at $x = 0$ and $x = 3$ relate to the rates of change over [0, 3]?

_____

2. An engineer designs headlight reflectors. Equations for the shapes of two of his designs are shown below. Complete the tables for each function. Compare the designs by finding and comparing average rates of change, minimums, and maximums over the interval [0, 3].

Design A: $y = 5x^2 + 5x$	
x	y
0	
1	
2	
3	
4	

Design B: $y = 5 + 5^x$	
x	y
0	
1	
2	
3	
4	



Rate of change _____ _____

Minimum value on [0, 3] _____ _____

Maximum value on [0, 3] _____ _____

Name _____ Date _____ Class _____

Chapter 9

Exponential Functions

Section A Quiz

Select the best answer.

1. Which of the following is a geometric sequence?

   A –1, –3, 9, 27, … C 1, 4, 9, 16, …

   B –1, 2, –4, 8, … D 1, 3, 5, 7, …

2. The first term of a geometric sequence is –2. The common ratio is 4. What is the 6th term?

   F –8192 H 2048

   G –2048 J 8192

3. Which are the next three terms in the geometric sequence 16, 8, 4, 2, …?

   A 1, 0, –1

   B 1, $\frac{1}{2}$, $\frac{1}{4}$

   C 0, –2, –4

   D $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$

4. Which is the 10th term of the geometric sequence $\frac{2}{9}$, $\frac{2}{3}$, 2, …?

   F 6

   G 486

   H 4,374

   J 13,122

5. Which is the 8^{th} term of the geometric sequence 1024, 256, 64 ,…?

   A $\frac{1}{16}$

   B $\frac{1}{4}$

   C 1

   D 4

6. If a ball is dropped from a height of 18 feet, the function $f(x) = 18(0.75)^x$ gives the height in feet of each bounce, where x is the bounce number. What will be the height of the 7th bounce to the nearest tenth of a foot?

   F 0.2 H 2.4

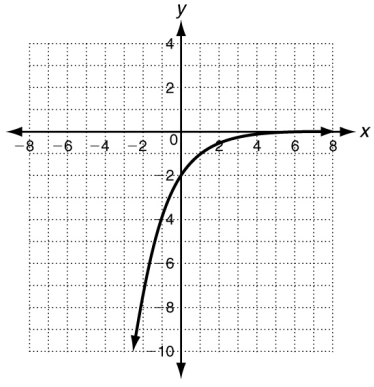
   G 1.8 J 3.2

7. A population of 200 animals has a growth rate of 1.03% each year. At this growth rate, the function $f(x) = 200(1.03)^x$ gives the population in x years. In how many years will the population first reach 300?

   A 12 C 16

   B 14 D 18

8. The graph of which function is shown below?



   F $y = -2(2)^x$

   G $y = -2\left(\frac{1}{2}\right)^x$

   H $y = 2(2)^x$

   J $y = 2\left(\frac{1}{2}\right)^x$

9. Which of these sets of ordered pairs satisfies an exponential equation?

   A {(1, –2), (3, –8), (5, –32), (7, –128)}

   B {(1, –2), (3, 2), (5, 6), (7, 10)}

   C {(1, –1), (2, –8), (3, –27), (4, –64)}

   D {(1, –1), (2, –4), (3, –9), (4, –16)}

10. The function $f(x) = 4(2)^x$ models the length of an image in centimeters after it has been enlarged by 100% x times. Which of these is the length of the image after it has been enlarged 3 times?

    F 8 centimeters H 32 centimeters

    G 16 centimeters J 64 centimeters

Name _____ Date _____ Class _____

Chapter 9

Exponential Functions

Section B Quiz

Select the best answer.

1. A population of 100 frogs has a growth rate of 1.25% each montH At this growth rate, the function $f(x) = 100(1.25)^x$ gives the population in x months. In how many months will the population first reach 500?

   A 12 C 8

   B 10 D 6

2. The population of deer in an area is 2,000 and is decreasing at a rate of 15% per year. In how many years will there be less than half the deer in the area?

   F 4 H 6

   G 5 J 7

3. Which of the following data sets is best described by a linear model?

   A {(5, 1), (4, 2), (3, 4), (2, 8)}

   B {(5, 1), (4, –1), (3, –3), (2, –5)}

   C {(5, 12), (4, 6), (3, 3), (2, 1.5)}

   D {(5, 1), (4, 0), (3, 1), (2, 4)}

4. $1200 is invested at 3% compounded quarterly. What is the total amount, to the nearest dollar, after 5 years?

   F $1236 H $1391

   G $1245 J $1393

5. Chess club earnings are $40 per month and will increase at a rate of 2.5% each montH Which function describes this situation?

   A $y = 40(0.75)^x$ C $y = 40(1.025)^x$

   B $y = 40(0.975)^x$ D $y = 40(1.25)^x$

6. Iodine-131 has a half-life of about 8 days. About how much is left from a 50 gram sample after 24 days?

   F 0.195 grams H 3.125 grams

   G 0.781 grams J 6.250 grams

7. Which of the following data sets is best described by a quadratic model?

   A {(1, –2), (2, –4), (3, –6), (4, –8)}

   B {(1, 2), (2, 4), (3, 6), (4, 8)}

   C {(1, –1), (2, 2), (3, –4), (4, 8)}

   D {(1, –1), (2, 2), (3, 7), (4, 14)}

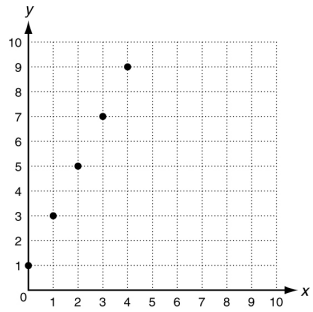
8. The table shows store sales by year. Which function models the data?

Year	0	1	2	3
Sales	5000	4000	3200	2560

   F $y = 5000 + 0.8x$ H $y = 5000(0.8)^x$

   G $y = 5000 + 1.2x$ J $y = 5000(1.2)^x$

9. Which kind of model best describes the data graphed below?



   A linear C exponential

   B quadratic D none of these

10. Argyle has $1000 in his savings account. He wants to save more money. He is looking at two investment plans. Under plan A, he will increase his account balance by $200 a year. Under plan B, he will increase his account balance by 15% each year. How much more will he save with Plan B after 10 years?

    F $1,046 H $131

    G $459 J $11

11. Which is the average rate of change over the interval [0, 4]?

    Equation A

X	0	2	4	6
Y	0	4	16	36

    Equation B

    $f(x) = 2x - 1$

    A A: 4, B: 2 C A: 8, B: 16

    B A: 4, B: 4 D A: 8, B: 4

Name _____ Date _____ Class _____

Chapter 9

Exponential Functions

Chapter Test *Form B*

Select the best answer.

1. Find the next three terms in this sequence: 5120, 1280, 320, 80, …

   A –160, –400, –640

   B 20, 5, 1.25

   C 40, 20, 10

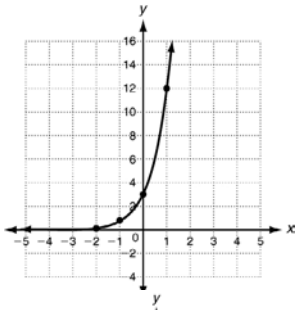
   D 76, 72, 68

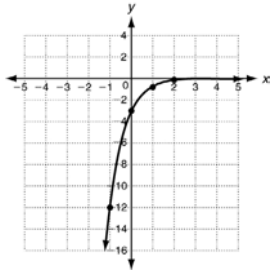
2. The first term of a geometric sequence is –2 and the common ratio is 3. What is the 12th term of the sequence?

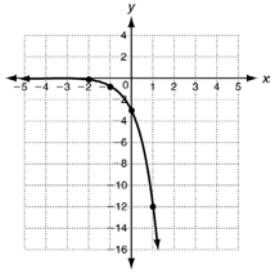
   F –1,062,882 H –6144

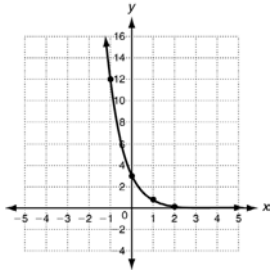
   G –354,294 J 12,288

3. Which graph shows $y = 3\left(\frac{1}{4}\right)^x$?

   A 

   B 

   C 

   D 

4. The function $f(x) = 50(1.2)^x$ gives the number of bacteria in a science experiment, where x is the number of days after the start of the experiment. To the nearest whole number, how many bacteria will there be after 5 days?

   F 124 H 375,000,000

   G 300 J 777,600,000

5. Which are the next three terms in the geometric sequence 216, 36, 6, 1, …?

   A 0, –1, –6 C $\frac{1}{3}, \frac{1}{6}, \frac{1}{9}$

   B $\frac{1}{6}, \frac{1}{36}, \frac{1}{216}$ D 6, 36, 216

6. Which is the 10th term of the geometric sequence $\frac{1}{512}, \frac{1}{256}, \frac{1}{128}, \frac{1}{64}, \ldots$?

   F 1 H $\frac{1}{4}$

   G $\frac{1}{2}$ J $\frac{1}{8}$

7. Which is the 6th term of the geometric sequence 729, 81, 9,…?

   A $\frac{1}{729}$ C $\frac{1}{9}$

   B $\frac{1}{81}$ D 1

8. Which ordered pairs satisfy an exponential function?

   F

X	–4	–3	–2	–1
Y	0	5	0	–25

   G

X	4	3	2	1
Y	81	27	9	1

   H

X	4	3	2	1
Y	64	27	8	1

   J

X	4	3	2	1
Y	4	2	0	–2

9. Which set of ordered pairs satisfies an exponential function?

   A {(–2, 1), (–8, 2), (–32, 3), (–128, 4)}

   B {(–1, 2), (0, 10), (1, 50), (2, 250)}

   C {(1, 2), (1, 6), (1, 18), (1, 54)}

   D {(1, 2), (2, 4), (3, 6), (4, 8)}

10. The number of members in a labor union is 240, and the number increases by 5% each year. Find the number of members after 4 years.

    F 278 H 810

    G 292 J 1215

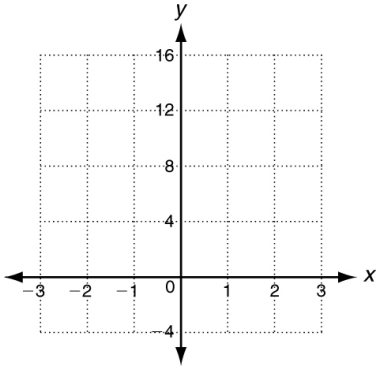
11. Iodine-131 has a half-life of approximately 8 days. Find the amount of iodine-131 left from a 100-gram sample after 16 days.

    A 0.0015 g C 25 g

    B 0.39 g D 32.75 g

12. Determine which kind of model best describes this data set.

    {(–2, 1), (–1, 2), (0, 4), (1, 8), (2, 16)}



    F linear H quadratic

    G exponential J none

13. Which of the following data sets is best described by a linear model?

    A {(–2, 4), (–1, 9), (0, 16), (1, 25)}

    B {(–2, –1), (–1, 0), (0, 1), (1, 0)}

    C {(–2, 12), (–1, 10), (0, 8), (1, 6)}

    D {(–2, 1), (–1, 0), (0, 1), (1, 4)}

14. Which of the following models best describes the data set?
    {(5, 2), (6, 0), (7, 2), (8, 8)}

    F linear H exponential

    G quadratic J none

15. Martin has $200 in his savings account. He wants to save more money. He is looking at two investment plans. Under plan A, he will increase his account balance by $40 a year. Under plan B, he will increase his account balance by 15% each year. How much more will he save with Plan B after 10 years?

    A $209 C $26

    B $92 D $2

16. Which is the average rate of change over the interval [2, 3]?

    Equation A

X	0	1	2	3
Y	1	4	9	16

    Equation B

    $f(x) = -x + 2$

    F A: 7, B: 1 H A: 3, B: –1

    G A: 7, B: –1 J A: –1, B: 7

17. Which is the *y*-intercept of the equations?

    Equation A

X	0	1	2	3
Y	1	4	9	16

    Equation B

    $f(x) = -x + 2$

    A A: –1, B: –1 C A: –1, B: 2

    B A: 2, B: 0 D A: 1, B: 2

Name _____ Date _____ Class _____

Chapter 9

Exponential Functions

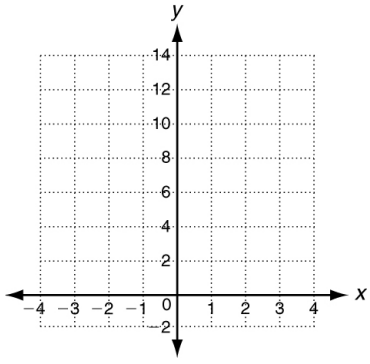
Chapter Test *Form A*

1. Find the next three terms in this sequence: 5, 15, 45, 135, ...

2. The first term of a geometric sequence is 2 and the common ratio is 4. What is the 6th term of the sequence?

3. Graph $y = 4(3)^x$.

x	*y*



4. The function $f(x) = 12(2)^x$ models an insect population after x weeks. To the nearest whole number, what will the population be after 5 weeks?

5. Which are the next three terms in the geometric sequence 54, 18, 6, 2, …?

6. Which is the 10^{th} term of the geometric sequence $\frac{1}{256}, \frac{1}{128}, \frac{1}{64}, \frac{1}{16}, \ldots$?

7. Which is the 6^{th} term of the geometric sequence 0.2, 1, 5,…?

8. Fill in the ordered pairs that satisfy the exponential function.

X	*Y*
1	3
2	9
3	
4	
5	243
6	729

9. Does this set of ordered pairs satisfy an exponential function? Explain.

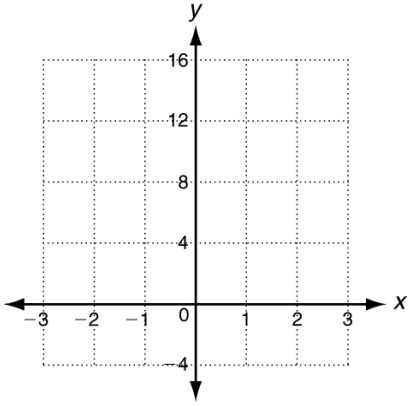
{(–2, 1.25), (–1, 2.5), (0, 5), (1, 10)}

10. The original value of a painting is $1100, and the value increases by 12% each year. Write an exponential growth function to model this situation. Then find the value of the painting in 15 years.

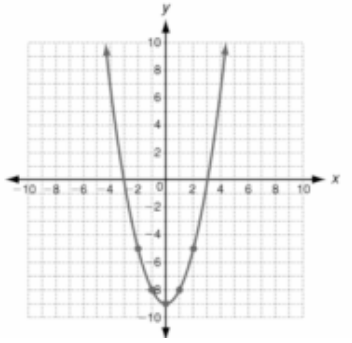
11. A new movie premiers on Friday, September 2, and 1350 people attenD Attendance then decreases by 20% each day. Write an exponential decay function to model this situation. Then find the attendance on Wednesday, September 7.

12. Determine which kind of model—linear, quadratic, exponential, or square-root—best describes this data set.

{(–2, 0.75), (–1, 1.5), (0, 3), (1, 6), (2, 12)}



13. Which kind of model best describes the graph?



14. Which kind of model best describes the data set?

X	1	2	3	4
Y	0.5	0.25	0.125	0.0625

15. Alistair has $1000 in his savings account. He wants to save more money. He is looking at two investment plans. Under plan A, he will increase his account balance by $300 a year. Under plan B, he will increase his account balance by 25% each year. How much more will he save with Plan B after four years?
Round your answer to the nearest whole.

16. What is the average rate of change over the interval [–1, 2]?

Equation A

X	–1	0	1	2
Y	3	2	3	6

Equation B

$f(x) = 3x + 2$

17. Which is the *y*-intercept of the equations?

Equation A

X	–1	0	1	2
Y	3	2	3	6

Equation B

$f(x) = 3x + 2$

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

NOTES FOR CHAPTER _____

Name _____ Date _____ Class _____

LESSON 10-1

Review for Mastery

Organizing and Describing Data

If data:	Then use:
is organized into categories	bar graph/double bar graph
changes over a period of time	line graph/double line graph
compares categories to whole set	circle graph

Use the data at right to make a graph. Explain why you chose that type of graph.

Because the data compares categories (the ingredients) to a whole set (the recipe), a circle graph is best.

Recipe for Bubbles	
Ingredient	**Cups**
bubble soap	8
dishwashing liquid	1
glycerin	1
water	10

Step 1: Total the number of cups.

$8 + 1 + 1 + 10 = 20$

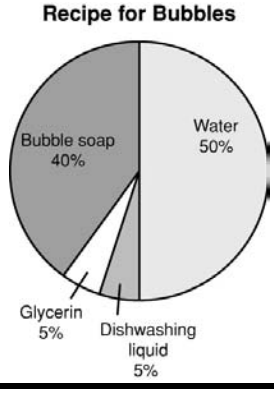
Step 2: Calculate the percent of each ingredient.

- bubble soap: $\frac{8}{20} = 40\%$
- glycerin: $\frac{1}{20} = 5\%$
- dishwashing liquid: $\frac{1}{20} = 5\%$
- water: $\frac{10}{20} = 50\%$

Step 3: Find the angle measure for each sector of the graph.

- bubble soap: 40% (360°) = 144°
- glycerin: 5% (360°) = 18°
- dishwashing liquid: 5% (360°) = 18°
- water: 50% (360°) = 180°

Use a compass and protractor to draw the graph.



Write *bar, double-bar, line, double-line*, or *circle* to indicate the type of graph that would best display the data described.

1. math scores of one student over the school year _____
2. attendance at an exercise class by age group, as it relates to total attendance _____
3. number of animals seen at a farm _____
4. A store owner uses an entire wall to display toys as shown in the table. Use the data to make a graph. Then explain why you chose that type of graph.

Toys for Sale	
Toy	**Shelves**
games	10
puzzles	5
dolls	3
trains	2

Name _____ Date _____ Class _____

LESSON 10-1

Review for Mastery

Organizing and Describing Data continued

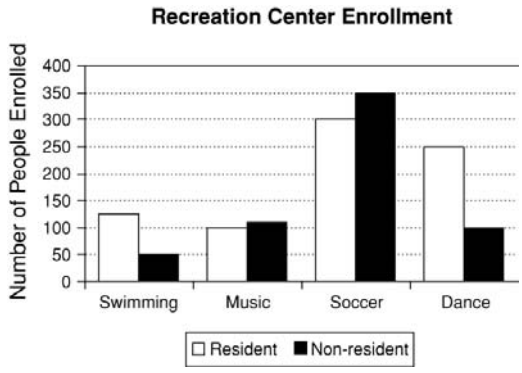
Comparisons between two groups can be made easily on a double-bar graph.

Which class shows the greatest difference between residents and non-residents?

Dance — *Compare bars for each class. Choose the bars with the greatest difference.*

How many more people were enrolled in soccer than dance?

300 — *Find total for soccer: 350 + 300 = 650. Find total for dance: 100 + 250 = 350. Subtract: 650 − 350 = 300.*



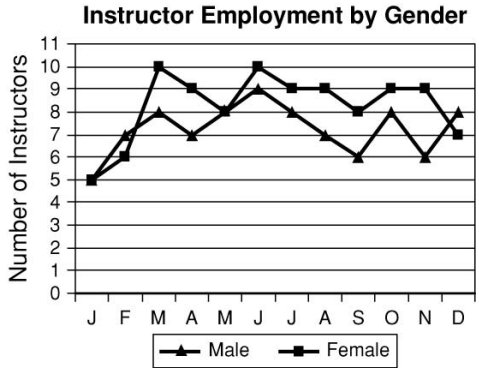
With a double-line graph, you can easily see how groups change over time.

During which month(s) were the number of male instructors equal to the number of female instructors?

May — *Look for where the data points overlap.*

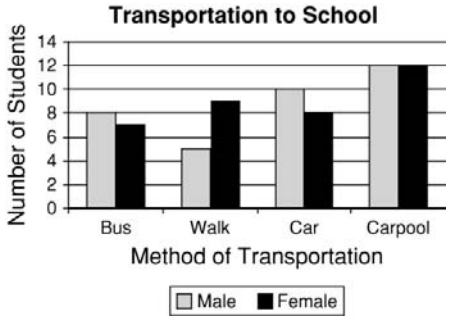
Between what two consecutive months did the number of female instructors increase the most?

February to March — *Look at female data points only. Find the steepest positive slope.*



Use the bar graph for 5–7.

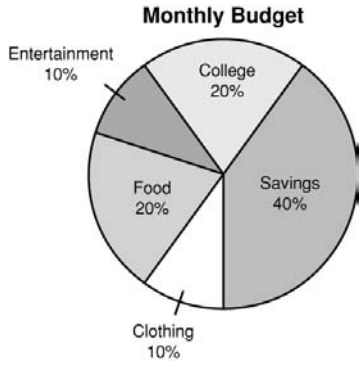
5. Which method of transportation is used by most students? _____
6. How many more girls than boys walk to school? _____
7. How many boys go by car or ride in a carpool? _____



Use the circle graph for 8–10.

8. Which category accounts for the highest percentage of the monthly budget? _____
9. Which categories account for the smallest percentages of the monthly budget? _____
10. If the budget is $500, how much is spent on food?

_____



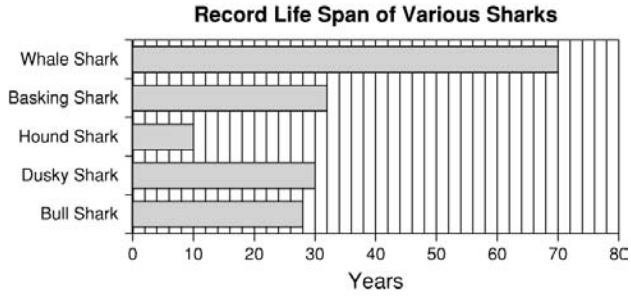
Name _____ Date _____ Class _____

LESSON 10-1

Practice A

Organizing and Describing Data

Use the bar graph for Exercises 1–3.



1. Which shark lived longer than any other shark?

_____

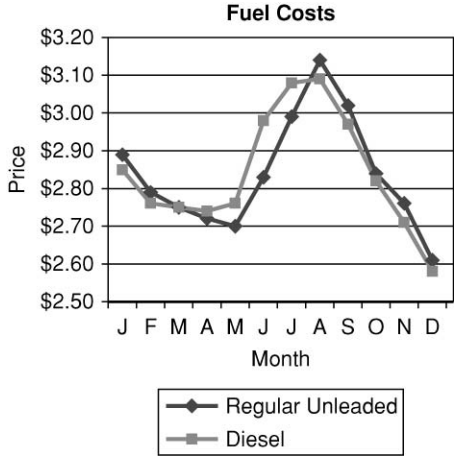
2. About how long did the Basking Shark live?

_____

3. Which shark lived about one-third as along as the Dusky Shark?

_____

Use the line graph for Exercises 4–6.



4. In what month was the cost of diesel fuel and regular unleaded the same?

_____

5. For how many months was the cost of diesel fuel more than regular unleaded?

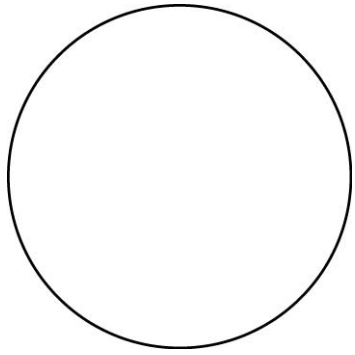
_____

6. About how much more was the cost of diesel fuel in July than in December?

_____

7. The table shows what types of pizzas were ordered at Vinnie's Restaurant one weekend. Use the data to make a circle graph. Then tell why a circle graph is appropriate for this data set.

Type	Number of Orders
extra cheese	15
pepperoni	55
veggie	30
meat	30
plain	70



_____

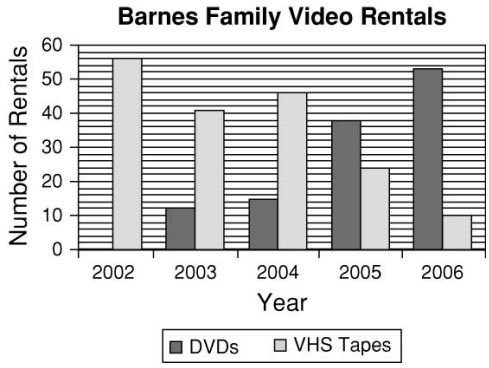
Name _____ Date _____ Class _____

LESSON 10-1

Practice B

Organizing and Describing Data

Look at the double bar graph.



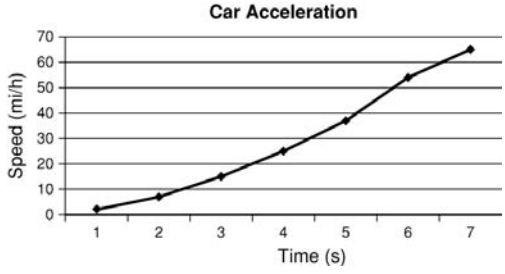
1. Which was the first year that the Barnes rented more DVDs than VHS tapes?

   _____

2. About how many videos did the Barnes family rent in all in 2003?

   _____

Look at the line graph.



3. During which time interval did the car's speed increase the least?

   _____

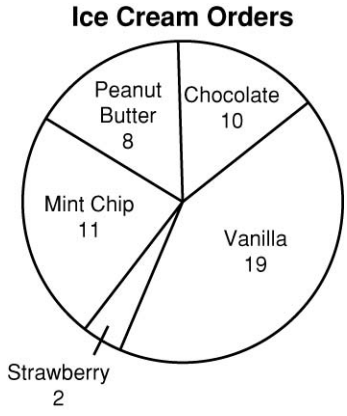
4. Describe how the speed changed over time.

   _____

   _____

   _____

Look at the circle graph.



5. There were 5 times the number of orders for _____ as there were for strawberry.
6. What percent of the orders for ice cream were for mint chip or vanilla? _____
7. The table shows the number of customers who pumped 4 types of fuel at a gas station in a given time period. Use the given data to make a graph. Explain why you chose that type of graph.

87 Octane	89 Octane	93 Octane	Diesel
12	1	5	2

_____

Name _____ Date _____ Class _____

LESSON 10-2

Review for Mastery

Frequency and Histograms

A **stem-and-leaf plot** arranges data by dividing each data value into two parts: a leaf (the last digit), and a stem (the digit or digits other than the last digit).

The amount of money collected by each student for the drama club is shown below. Use the data to make a stem-and-leaf plot.

55, 82, 90, 113, 100, 90, 93, 68, 66, 108, 116, 56, 85, 89, 102, 103

Step 1: List the stems.

The least value is 55, the greatest value is 116. List stems from 5 to 11. Do not omit any stems.

Step 2: List the leaves.

For each stem, write the ones digit from least to greatest.

Step 3: Write a key explaining one value.

Stems	Leaves
5	5 6
6	6 8
7	
8	2 5 9
9	0 0 3
10	0 2 3 8
11	3 6

Key: 8|2 means 82

The test scores from two different math classes are shown below. Use the data to make a back-to-back stem-and-leaf plot.

Class A: 50, 68, 95, 80, 92, 100, 98, 85, 82, 81
Class B: 75, 81, 100, 63, 52, 94, 100, 100, 87, 99

Step 1: List the stems.

The lowest value is 50, the highest value is 100. List stems from 5 to 10. Do not omit any stems.

Step 2: List the leaves.

For each stem, write the ones digit from least to greatest.

Step 3: Write a key explaining one value from each side.

Leaves (Class A)	Stems	Leaves (Class B)
	5	2
8	6	3
	7	5
5 2 1 0	8	1 7
8 5 2	9	4 9
0	10	0 0 0

Key: 8|1 means 81
5|9 means 95

1. The daily low temperatures in degrees Fahrenheit in a town in the Northeast are given below. Use the data to make a back-to-back stem-and-leaf plot.

Daily Low Temperatures (°F)					
40	56	50	60	62	63
49	48	49	40	36	59
57	52	53	42	44	39

Daily High Temperatures (°F)					
70	84	71	73	71	70
73	78	76	65	65	67
66	76	69	70	70	58

Low Temp		High Temp

Name _____ Date _____ Class _____

LESSON 10-2

Review for Mastery

Frequency and Histograms continued

The ages of people visiting a water park during a certain time period are given below. Use the data to make a frequency table with intervals. Then make a histogram.

5, 12, 22, 15, 17, 13, 25, 34, 7, 9, 12, 32, 12, 15, 18

Step 1: Find the difference between the greatest and least values.

Least: 5 Greatest: 34

$34 - 5 = 29$

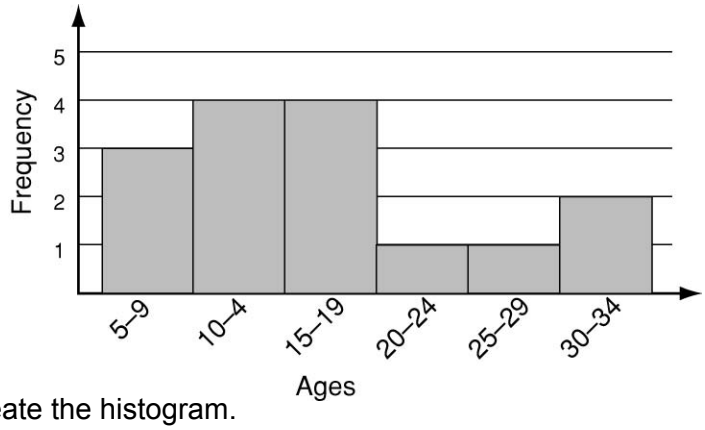
Step 2: Use the difference to decide on intervals. ⇨

Try different widths for your intervals to determine the number of bars in the histogram.

Finding the Interval		
If width of interval is:	Then divide:	The number of intervals is:
10	$\frac{29}{10} = 2.9$	3 (too few)
3	$\frac{29}{3} \approx 9.7$	10 (too many)
5	$\frac{29}{5} = 5.8$	6 (good)

Step 3: Create the frequency table.

Ages of Visitors	
Age	Frequency
5 - 9	3
10 - 14	4
15 - 19	4
20 - 24	1
25 - 29	1
30 - 34	2

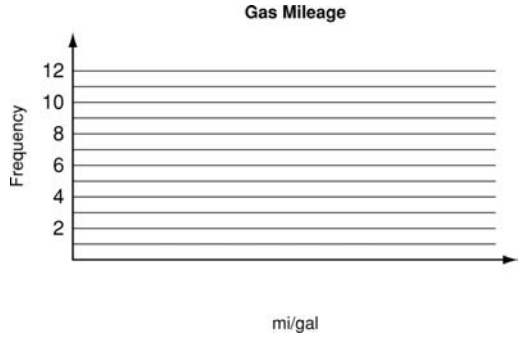


Step 4: Use the frequency table to create the histogram. Draw each bar to the corresponding frequency.

2. The estimated miles per gallon for selected cars are shown in the table. Use the data to make a frequency table with intervals. Then make a histogram.

26	28	32	33	26	15	21
35	17	18	25	29	30	26
27	30	24	25	24	32	25
19	22	32	25	31	28	23
27	23	24	20	38	44	18

Car Gas Mileage	
mi/gal	Frequency



Name _____ Date _____ Class _____

LESSON 10-2

Practice A

Frequency and Histograms

1. The number of rushing yards completed by a running back on a professional football team in each of the 16 regular season games is given. Use the data to make a stem-and-leaf plot with a title and a key.

Rushing Yards							
43	52	98	96	74	32	73	54
57	48	65	78	72	83	54	68

stem	leaves

2. The test scores for two Algebra classes are shown in the stem-and-leaf plot.

Period 5					Period 3			
4	2	0	0	5	3			
	6	5	2	6	8	9		
7	7	4	2	7	2	9	9	
		8	3	8	4	4	4	
	9	3	1	9	1	3	3	6
				10	0	0		

Key:|6|8 means 68
3|8| means 83

   a. How many students scored 100? _____

   b. How many students in Period 5 scored greater than 80? _____

   c. What was the lowest score in Period 3? _____

   d. Which Period had more scores?

      How many more? _____

3. The number of calls per day to a fire and rescue service for three weeks is given below. Use the data to complete the frequency table.

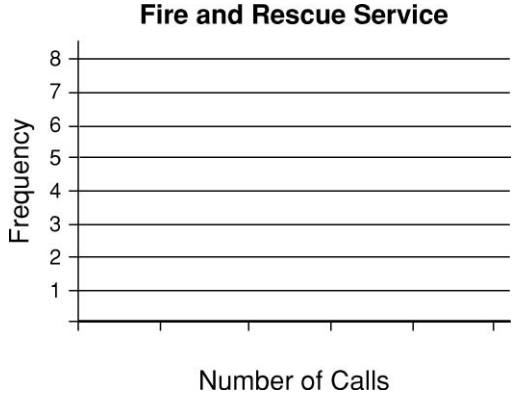
Calls for Service										
5	17	2	12	0	6	3	8	15	1	4
19	16	8	2	11	13	18	3	10	6	

Fire and Rescue Service	
Number of Calls	**Frequency**
0 - 3	
4 - 7	
8 - 11	
12 - 15	
16 - 19	

4. Use the frequency table in Exercise 3 to make a histogram with a title and axis labels.

5. Which intervals have the same frequency?

_____



Name _____ Date _____ Class _____

LESSON 10-2

Practice B

Frequency and Histograms

1. Heights of two groups of plants after two weeks are given at right.

Group A		Group B
	1	2
	2	3 4
9 7 3 3	3	5 5 8
8 1	4	1
0	5	

Key: |2|3 means 2.3
1|4| means 1.4

   a. Which group had the tallest plant? What was its height?

_____

   b. One group had twice as much sunlight as the other. Which group do you think it was? Explain.

_____

2. The receiving yards completed by two wide receivers on different professional football teams in each of the 16 regular season games is given. Use the data to make a back-to-back stem-and-leaf plot.

Player A: 32, 17, 94, 79, 68, 73, 63, 84, 72, 73, 45, 69, 94, 89, 84, 34

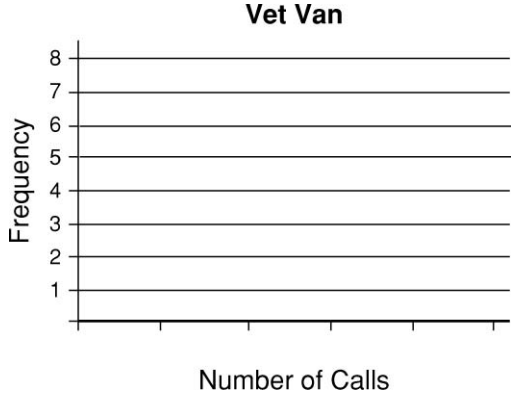
Player B: 79, 12, 97, 73, 54, 82, 21, 32, 28, 67, 74, 88, 41, 38, 78, 67

3. The number of calls per day received by a traveling Vet Van service for three weeks is given below. Use the data to make a frequency table with intervals.

Number of Calls						
18	22	13	15	16	21	22
26	17	14	12	13	18	14
16	22	23	20	21	18	22

Vet Van	
Number of Calls	**Frequency**

4. Use the frequency table in Exercise 3 to make a histogram.



5. Complete the "third column" for the table in Exercise 3 to make it a cumulative frequency table.

Cumulative Frequency

Name _____ Date _____ Class _____

LESSON 10-3

Review for Mastery

Data Distributions

Consider the data set {2, 6, 4, 2, 1}.

The **mean** of the data set is the average of the data set. Add all the numbers and divide by the number of numbers.

$$\frac{2+6+4+2+1}{5} = \frac{15}{5} = 3$$

The mean is 3.

The **median** of the data set is the middle number when the numbers are listed in order.

1, 2, **2**, 4, 6

The median is 2.

If there are two middle numbers, the median is the average of those numbers.

The **mode** is the number that occurs most often.

1, **2**, **2**, 4, 6

The mode is 2.

There can be more than one mode, or there can be no mode.

The **range** is the difference between the greatest and least numbers.

1, 2, 2, 4, **6**

6 – 1 = 5

The range is 5.

Find the mean, median, mode, and range of each data set.

1. 8, 2, 3, 4, 3

   mean: $\frac{\square + \square + \square + \square + \square}{5} = \frac{\square}{5} = \square$ mode: _____

   median: _____ range: _____

2. 4, 5, 7, 4, 5, 8

   mean: _____ mode: _____

   median: _____ range: _____

3. 12, 8, 16, 4

   mean: _____ mode: _____

   median: _____ range: _____

Name _____ Date _____ Class _____

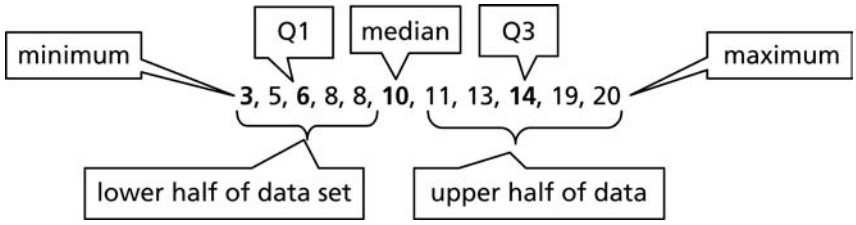
LESSON 10-3

Review for Mastery

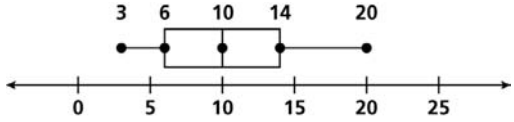
Data Distributions (continued)

Consider the data set {3, 5, 6, 8, 8, 10, 11, 13, 14, 19, 20}.

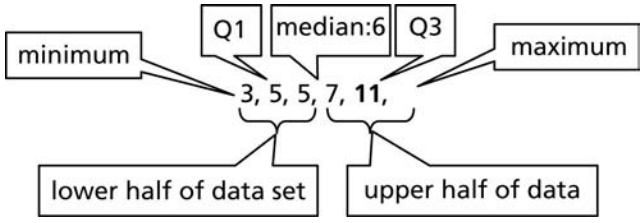
To make a **box-and-whisker plot**, first identify the median, which divides the data into two halves. Then identify the **first quartile**, Q1, the median of the lower half, and the **third quartile**, Q3, the median of the upper half. Last, identify the minimum (lowest) and maximum (greatest) numbers.



Plot the five numbers above a number line. Draw a box so the sides go through Q1 and Q3. Draw a line through the median. Connect the box to the minimum and maximum.



When there is an even number of numbers, the two middles numbers are included in the upper and lower halves of the data set.



Consider the data set {9, 11, 18, 21, 18, 14, 5}.

4. Write the data in order: _____
5. Minimum: _____, Q1: ____, Median: ____, Q3: ____, Maximum: ____
6. Draw the box-and-whisker plot.

Consider the data set {7, 5, 2, 14, 9, 15}.

7. Write the data in order: _____
8. Minimum: _____, Q1: ____, Median: ____, Q3: ____, Maximum: ____
9. Draw the box-and-whisker plot.

Name _____ Date _____ Class _____

LESSON 10-3

Practice A

Data Distributions

Find the mean, median, mode, and range of each data set.

1. 7, 19, 25, 9, 10

   Order the numbers: _____, _____, _____, _____, _____

   mean: $\frac{\square + \square + \square + \square + \square}{\square} =$ _____ median: _____

   mode: _____ range: _____ – _____ = _____

2. 5, 3, 3, 5, 2, 5, 5

   Order the numbers: _____, _____, _____, _____, _____, _____, _____

   mean: _____ median: _____

   mode: _____ range: _____

3. 8, 12, 17, 12, 9, 8

   mean: _____ median: _____

   mode: _____ range: _____

Identify the outlier in each data set, and determine how the outlier affects the mean, median, mode, and range of the data.

4. 7, 11, 29, 3, 10

   _____

   _____

5. 52, 39, 11, 44

   _____

   _____

6. Mr. Bernard drove 46, 4, 64, 50, and 56 miles on his last five trips. For each question, choose the mean, median, or mode, and give its value.

   a. Which value describes Mr. Bernard's average driving distance? _____

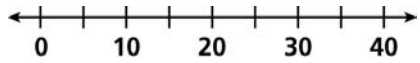
   b. Which value would Mr. Bernard tell his boss to convince him that he spends too much time on the road? Explain.

   _____

7. Use the data to make a box-and-whisker plot. 18, 22, 10, 22, 30, 8, 33, 15, 14

   a. Order the data: _____

   b. Min: _____, Q1_____, Med: _____,
      Q3: _____, Max: _____

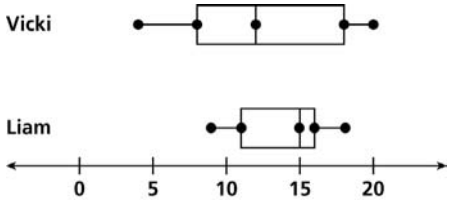


The quiz scores of two students are shown in the box-and-whisker plots.

8. Who has the higher median score? _____

9. Who has the highest score? _____

10. Who has the most consistent scores? _____



Name _____ Date _____ Class _____

LESSON 10-3

Practice B

Data Distributions

Find the mean, median, mode, and range of each data set.

1. 22, 45, 30, 18, 22

_____

2. 8, 10, 8, 14, 8, 15

_____

3. 1.25, 0.5, 3.25, 0.75, 1.75

_____

4. 95, 92, 96, 93, 94, 95, 93

_____

Identify the outlier in each data set, and determine how the outlier affects the mean, median, mode, and range of the data.

5. 31, 35, 41, 40, 40, 98

_____

_____

6. 82, 24, 100, 96, 79, 93, 86

_____

_____

7. The amounts of Cathy's last six clothing purchases were $109, $72, $99, $15, $99, and $89. For each question, choose the mean, median, or mode, and give its value.
   a. Which value describes the average of Cathy's purchases? _____
   b. Which value would Cathy tell her parents to convince them that she is not spending too much money on clothes? Explain.

      _____

   c. Which value would Cathy tell her parents to convince them that she needs an increase in her allowance? Explain.

      _____

Use the data to make a box-and-whisker plot.

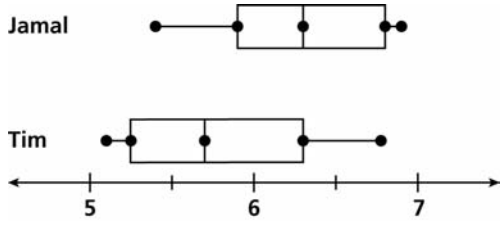
8. 71, 79, 56, 24, 35, 37, 81, 63, 75

9. 210, 195, 350, 250, 260, 300

The finishing times of two runners for several one-mile races, in minutes, are shown in the box-and-whisker plots.

10. Who has the faster median time? _____
11. Who has the slowest time? _____
12. Overall, who is the faster runner? Explain.

    _____



Name _____ Date _____ Class _____

LESSON 10-4

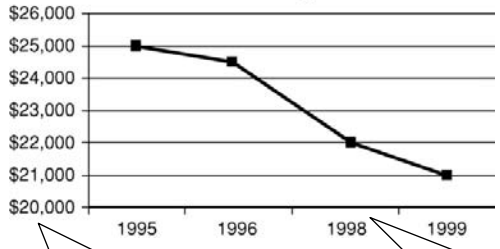
Review for Mastery

Misleading Graphs and Statistics

Graphs can be used to mislead people.

Bar Graphs and Line Graphs: If the vertical scale does not start at 0, the difference between categories or time intervals can look larger than it is. If the horizontal scale is not at equal intervals, the rate of change can look steeper than it is.

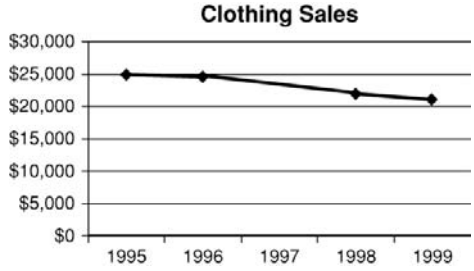
Misleading Graph



Does not start at 0.

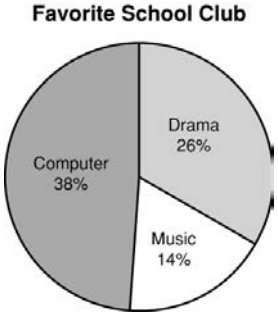
Intervals not equal.

Corrected Graph



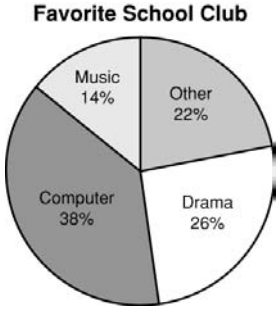
Circle Graphs: If the sections in a circle graph do not sum to 100%, sections will appear larger than they actually are.

Misleading Graph

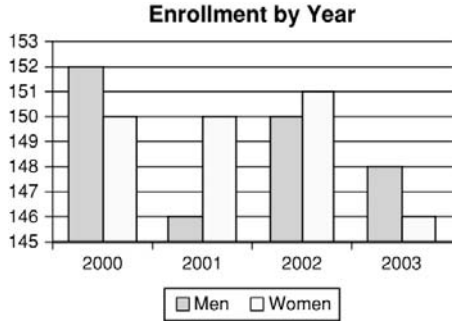


Sectors do not sum to 100%

Corrected Graph



1. The graph shows the number of men and women who have enrolled in a school.



   a. Explain why the graph is misleading.

   _____

   _____

   b. What might someone believe because of the graph?

   _____

   _____

   c. Who might want to use this graph? _____

   _____

Name _____ Date _____ Class _____

LESSON 10-4

Review for Mastery

Misleading Graphs and Statistics continued

Statistics can be misleading because of the way the data is collected or because of the way the results are reported.

- A sample is biased if it only surveys a certain group of people.
- A sample is biased if it is too small.
- Statistics can mislead if the measures used are not a good representation of the data.

A researcher surveys kindergarteners and asks if they have too much homework. Explain why the following statement is misleading: "Only 5% of students in West Branch School District think they have too much homework."

The sample is biased because students in kindergarten tend to have little or no homework. Students from other grades, who get more homework, were not surveyed.

A researcher asks 2 people whether they approve of the way their town is being run. Explain why the following statement is misleading: "50% of townspeople are unhappy with local government."

This sample is biased because only 2 people were surveyed. The sample size is too small.

A car dealership is selling 5 cars at the following prices: $12,000, $13,000, $15,000, $55,000, and $13,000. Explain why the following statement made by a competitor is misleading: "The car dealership sells cars at an average price of $21,600."

This statistic is misleading because most of the cars are less than $21,600.

The mean is not a good descriptor of this data set because it has an outlier.

2. Houses on Main Street sold for the following amounts: $175,000, $182,000, $178,000, and $389,000. Explain why the following statement is misleading: "Houses on Main Street are selling for an average of $231,000."

_____

_____

3. A researcher is contacting people by e-mail to see what proportion of them use a computer every day. Explain why the following statement is misleading: "85% of people use a computer every day."

_____

_____

4. A researcher asks 5 students if they think the cost of school lunches is too high. Explain why the following statement is misleading: "Four-fifths of all students think school lunches are too expensive."

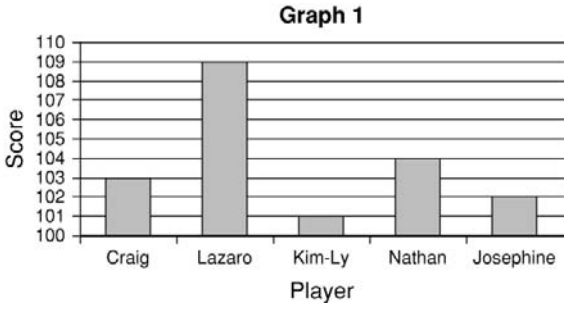
_____

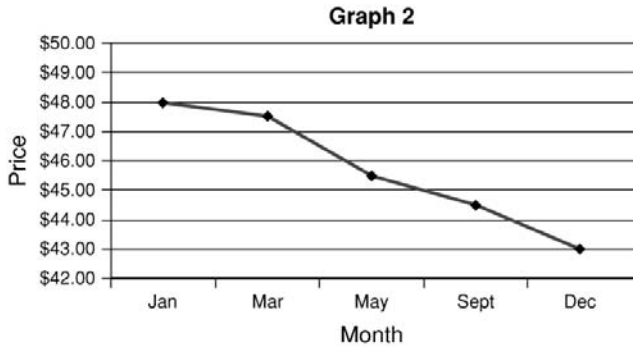
Name _____ Date _____ Class _____

LESSON 10-4

Practice A

Misleading Graphs and Statistics





Graph 1 shows the number of points scored by five players in a game.

1. Explain why the graph is misleading. _____

_____

2. What might someone believe because of the graph? _____

_____

3. Which player do you think made the graph? _____

Graph 2 shows the price change of Product X over one year.

4. Explain why the graph is misleading. _____

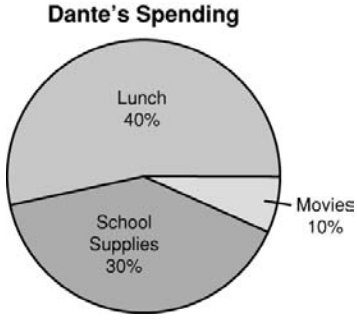
_____

5. What might someone believe because of the graph? _____

_____

6. Who might want to use this graph? _____

The circle graph shows how Dante spent his allowance.



7. Explain why the graph is misleading.

_____

8. Who might Dante show this graph to and why?

_____

_____

9. Joe surveyed people at an Italian restaurant about their favorite foods. Explain why his statement is misleading: "75% of our community prefers Italian foods."

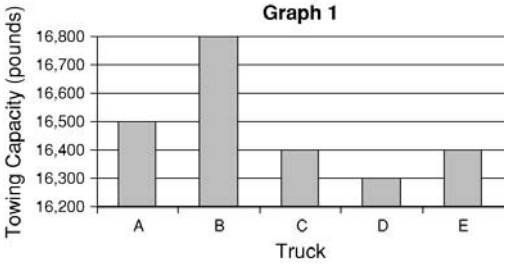
_____

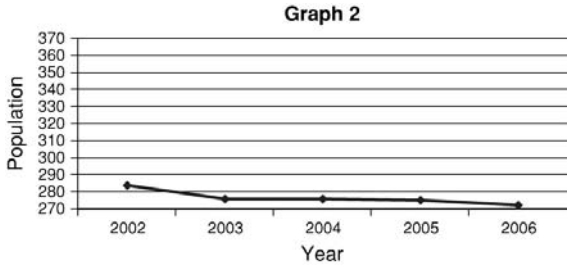
Name _____ Date _____ Class _____

LESSON 10-4

Practice B

Misleading Graphs and Statistics





Graph 1 shows the maximum towing capacity of five full-size pickup trucks.

1. Explain why the graph is misleading. _____

_____

2. What might someone believe because of the graph? _____

_____

3. The manufacturer of which truck would be most upset with this graph? _____

Graph 2 shows the change in population of a certain animal species in a wooded area.

4. Explain why the graph is misleading. _____

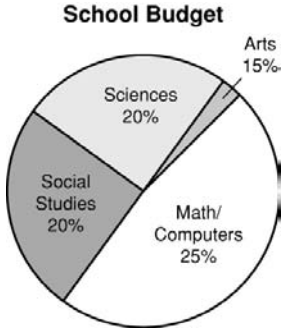
_____

5. What might someone believe because of the graph? _____

_____

6. Who might want to use this graph? _____

The circle graph shows how a school distributed money.



7. Explain why the graph is misleading.

_____

8. What might someone believe because of the graph?

_____

_____

9. Who might want to use this graph? _____

10. Sue surveyed people at a baseball stadium about their leisure activities. Explain why her statement is misleading: “85% of this town prefers sports over music.”

_____

Name _____ Date _____ Class _____

LESSON 10-5

Review for Mastery

Experimental Probability

An **experiment** is an activity involving chance. The **sample space** of an experiment is the set of all possible outcomes.

Identify the sample space for tossing one coin and rolling one number cube.
List each possible number with heads and then each possible number with tails.

(1, H) (2, H) (3, H) (4, H) (5, H) (6, H)

(1, T) (2, T) (3, T) (4, T) (5, T) (6, T)

Probability is the measure of how likely an event is to occur. You can estimate the probability of an event by performing an experiment. The more trials you perform, the more accurate the estimate will be.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}}$$

An experiment consists of randomly selecting marbles from a bag. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
Red	12
Green	8
White	15
Blue	5

The sum of frequencies equals the number of trials.

A. **selecting a green marble**

$$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{8}{12+8+15+5} = \frac{8}{40} = \frac{1}{5}$$

B. **not selecting a white marble**

$$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{12+8+5}{12+8+15+5} = \frac{25}{40} = \frac{5}{8}$$

Identify the sample space for each experiment.

1. rolling a 6-sided number cube

_____

2. spinning a spinner labeled A – E

_____

3. An experiment consists of selecting letters from a bag. Use the results in the table to find the experimental probability of each event.

Outcome	M	A	R	B	L	E
Frequency	8	4	7	10	14	2

a. selecting the letter M _____

b. not selecting the letter B _____

c. selecting a vowel _____

d. not selecting L or E _____

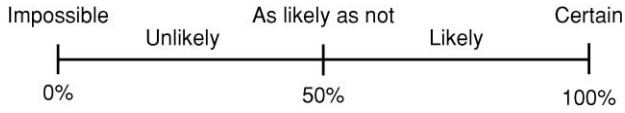
Name _____ Date _____ Class _____

LESSON 10-5

Review for Mastery

Experimental Probability continued

Many people give probabilities as a word or phrase. These phrases correspond to the probabilities shown in the spectrum below.



You can use experimental probability to make predictions. A **prediction** is an estimate or guess about something that has not yet happened.

Inspectors tested 500 cars for smog emissions. Thirteen of them failed the test.

A. **What is the experimental probability that a car chosen at random will fail the test?**

$$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{13}{500} = 2.6\%$$

B. **Is this event *impossible, unlikely, as likely as not, likely* or certain to occur?**

Because the probability is 2.6%, this event is unlikely to occur.

C. **125 cars are scheduled to take the smog emissions test. Predict the number of cars that are likely to fail the test.**

Find 2.6% of 125.

$0.026\ (125) = 3.25$

About 3 cars will fail the test.

4. A machine assembled 600 boxes. An inspector notices that 594 of the boxes have no defects.
   a. What is the experimental probability that a box chosen at random will have no defects? _____
   b. Is this event impossible, unlikely, as likely as not, likely or certain to occur? _____
   c. The machine assembles 800 boxes. Predict the number of boxes that will have no defects. _____

5. The owner of a vending machine kept track of the number of times the machine dispensed change incorrectly. He found that the change was incorrect in 13 out of 325 purchases.
   a. What is the experimental probability that the machine will dispense incorrect change? _____
   b. Is this event impossible, unlikely, as likely as not, likely or certain to occur? _____
   c. 25 purchases are made at the vending machine. Predict the number of times the change will be incorrect. _____

Name _____ Date _____ Class _____

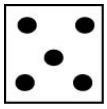
LESSON 10-5

Practice A

Experimental Probability

Identify the sample space and the outcome shown for each experiment.

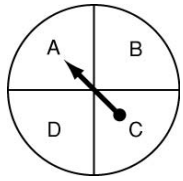
1. rolling a number cube



_____

_____

2. spinning a spinner



_____

_____

Write *impossible, unlikely, as likely as not, likely*, or *certain* to describe each event.

3. Selecting a green marble from a bag of white marbles _____
4. Choosing a vowel from the letters A, M, O, F, P, I _____
5. Correctly guessing a number from 1 to 3 when you have 2 tries _____

An experiment consists of randomly choosing a colored card from a box. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
red	7
yellow	12
orange	8
white	13

6. choosing a yellow card _____
7. choosing an orange card _____
8. not choosing a white card _____
9. not choosing a red card _____
10. A cook inspects 20 hamburgers and finds 3 of them are missing a pickle.
    a. What is the experimental probability that a hamburger will be missing a pickle? _____
    b. The restaurant makes 300 hamburgers. Predict the number of hamburgers that are likely to be missing a pickle. _____
11. An inspector checks 150 children with bike helmets and found that 21 children are not wearing them properly.
    a. What is the experimental probability that a child will not be wearing a bike helmet properly? _____
    b. The inspector checks 500 more children with bike helmets. Predict the number of those children that will not be wearing their bike helmet properly. _____

Name _____ Date _____ Class _____

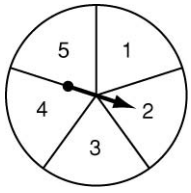
LESSON 10-5

Practice B

Experimental Probability

Identify the sample space and the outcome shown for each experiment.

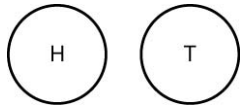
1. spinning a spinner



_____

_____

2. tossing two coins



_____

_____

Write *impossible, unlikely, as likely as not, likely*, or *certain* to describe each event.

3. The mail was delivered before noon on 4 of the last 5 days. The mail will be delivered before noon today. _____

4. Sean rolls a number cube and gets an even number. _____

5. The pages of a book are numbered 1 – 350. Amelia begins reading on page 400. _____

An experiment consists of rolling a standard number cube. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
1	6
2	7
3	4
4	10
5	8
6	5

6. rolling a 1 _____

7. rolling a 5 _____

8. not rolling a 3 _____

9. not rolling a number less than 5 _____

10. A tire manufacturer checks 80 tires and finds 6 of them to be defective.
    a. What is the experimental probability that a tire chosen at random will be defective? _____
    b. The factory makes 200 tires. Predict the number of tires that are likely to be defective. _____

11. A safety commission tested 1500 electric scooters and found that 15 of them had defective handles.
    a. What is the experimental probability that a scooter will have a defective handle? _____
    b. The factory makes 40,000 scooters. Predict the number of scooters that are likely to have defective handles. _____

Name _____ Date _____ Class _____

LESSON 10-6

Review for Mastery

Theoretical Probability

When the outcomes in the sample space of an experiment have the same chance of occurring, the outcomes are **equally likely**.

$$\text{theoretical probability} = \frac{\text{number of ways the event can occur}}{\text{total number of equally likely outcomes}}$$

A bag of marbles contains 8 yellow, 2 red, and 10 green marbles. An experiment consists of selecting one marble at random from the bag. Find the theoretical probability of each outcome.

A. **selecting a yellow marble**

Step 1: Determine total number of outcomes.

$$8 + 2 + 10 = 20$$

Step 2: Determine the number of ways the event can occur.

The event occurs if a yellow marble is selected. Thus, the number of ways the event can occur is 8.

Step 3: Find theoretical probability.

$$P(\text{yellow}) = \frac{8}{20} = 0.4 = 40\%$$

B. **selecting a red or yellow marble**

Step 1: Determine total number of outcomes.

$$8 + 2 + 10 = 20$$

Step 2: Determine the number of ways the event can occur.

The event occurs if a red or yellow marble is chosen. Thus the number of ways the event can occur is $2 + 8 = 10$.

Step 3: Find theoretical probability.

$$P(\text{red or yellow}) = \frac{10}{20} = 0.5 = 50\%$$

The sum of the probabilities of an event and its complement is 100%, because the event will either happen or not happen.

Use the information above to find the probability of NOT selecting a yellow marble.

$$\begin{aligned} P(\text{yellow}) + P(\text{not yellow}) &= 100\% \\ 40\% + P(\text{not yellow}) &= 100\% \\ -40\% \qquad\qquad & \quad -40\% \\ P(\text{not yellow}) &= 60\% \end{aligned}$$

Find the theoretical probability of each outcome.

1. rolling an odd number on a number cube _____
2. randomly choosing a red marble from a bag of 6 red, 6 blue and 8 green marbles _____
3. rolling a number less than or equal to 2 on a number cube _____
4. not rolling a 6 on a number cube _____
5. There is a 12% probability of winning a game. Find the probability of not winning the game. _____

Name _____ Date _____ Class _____

LESSON 10-6

Review for Mastery

Theoretical Probability continued

Odds are another way to discuss the likelihood of an event.

Odds in favor of an event describe the likelihood the event will occur.

$$\text{odds in favor} = \frac{\text{number of ways event can happen } (a)}{\text{number of ways event can fail to happen } (b)} \text{ or } a{:}b$$

Odds against an event describe the likelihood that the event will not occur.

$$\text{odds against} = \frac{\text{number of ways event can fail to happen } (b)}{\text{number of ways event can happen } (a)} \text{ or } b{:}a$$

Convert from odds to probability:

The odds of winning a game are 3:7. What is the probability of winning the game?

Step 1: Determine the number of ways to win and not win.

If the odds of winning a game are 3:7, there are 3 ways to win and 7 ways to not win.

Step 2: Find total number of outcomes. Add the ways to win and the ways to not win to get the total number of outcomes.

$$3 + 7 = 10$$

Step 3: Find the probability.

Because the ways to win equals 3, and total outcomes is 10, the probability is $\frac{3}{10}$ or 30%.

Convert from probability to odds.

The probability of winning a game is 10%. What are the odds in favor of winning the game?

Step 1: Write the probability as a fraction.

$$10\% = \frac{1}{10}$$

Step 2: Find the number of ways to win and not win.

The numerator is the number of ways to win: 1. The number of ways to not win is the total number of outcomes minus the number of ways to win: $10 - 1 = 9$.

Step 3: Find the odds.

The odds in favor are $\frac{1}{9}$ or 1:9.

6. The probability of a spinner landing on green is 20%. What are the odds in favor of the spinner landing on green? _____
7. The odds in favor of getting tickets to a concert are 4:5. What is the probability of getting the tickets? _____
8. The odds against winning a contest are 98:1. What is the probability of not winning the contest? _____
9. The probability of choosing a blue marble is 60%. What are the odds in favor of choosing a blue marble? _____
10. The odds in favor of winning a game are 1:20. What is the probability of winning the game? _____

Name _____ Date _____ Class _____

LESSON 10-6

Practice A

Theoretical Probability

Find the theoretical probability of each outcome.

1. flipping one coin and having it land tails up _____
2. randomly choosing a yellow marble from a bag of 3 yellow marbles and 7 blue marbles _____
3. rolling a 1 on a number cube _____
4. randomly choosing the letter A from the letters in MATH _____
5. The probability it will rain is 10%. What is the probability it will not rain? _____
6. The probability of choosing a red marble from a bag is $\frac{3}{4}$.
   What is the probability of not choosing a red marble? _____
7. A spinner has red, green, and blue. The probability of spinning red is 0.2 and the probability of spinning blue is 0.3. What is the probability of spinning a green? _____
8. The probability of winning first place in a contest is 5%. What is the probability of not winning first place? _____
9. The odds in favor of winning a contest are 1:4.
   a. What is the total number of possible outcomes? _____
   b. How many ways can a person win? _____
   c. What is the probability that a person wins? probability = $\frac{\square}{\square}$
10. The odds against a spinner landing on green are 7:2.
    a. What is the total number of possible outcomes? _____
    b. How many ways can the spinner not land on green? _____
    c. What is the probability of the spinner not landing on green? probability = $\frac{\square}{\square}$
11. A bag contains 5 marbles. The probability of choosing a green marble from the bag is $\frac{3}{5}$.
    a. How many ways can green be chosen? _____
    b. How many ways can green not be chosen? _____
    c. What are the odds in favor of choosing a green marble? odds = $\frac{\square}{\square}$ or $\square : \square$
12. The table shows how many of each letter are in a bag. Find the following.
    a. P(A) _____ b. P(not B) _____
    c. odds in favor of C _____

Letter	How Many in Bag
A	6
B	4
C	5

Name _____ Date _____ Class _____

LESSON 10-6

Practice B

Theoretical Probability

Find the theoretical probability of each outcome.

1. rolling a number less than 4 on a standard number cube _____
2. randomly choosing a day of the week and it is a weekend _____
3. spinning red on a spinner with equal sections of red, blue, and green _____
4. randomly choosing the letter N from the letters in NUMBER _____
5. The probability it will snow is 60%. What is the probability it will not snow? _____
6. The probability of tossing two coins and having them land heads up is $\frac{1}{4}$. What is the probability the coins will not land heads up? _____
7. A spinner has red, green, blue, and yellow. The probability of spinning a red is 0.4, the probability of spinning a blue is 0.05 and the probability of spinning a yellow is 0.25. What is the probability of spinning a green? _____
8. Miguel entered a contest offering prizes to the top 3 finishers. The probability of winning 1st is 12%, the probability of winning 2nd is 18% and probability of winning 3rd is 20%. What is the probability that Miguel will not win any prize? _____
9. The odds of winning a contest are 1:50. What is the probability of winning the contest? _____
10. The odds against a spinner landing on yellow are 3:1. What is the probability the spinner will not land on yellow? _____
11. The probability of a thunderstorm is 80%. What are the odds that there will be a thunderstorm? _____
12. The odds of selecting a red card from a box of cards are 2:5. What is the probability of not selecting a red card from a box? _____

The table shows how many of each letter are in a bag. Use the table for 13–16. Find the following.

13. *P*(A) _____
14. *P*(B) _____
15. odds in favor of C _____
16. odds against E _____

Letter	How Many in Bag
A	5
B	4
C	6
D	2
E	8

Name _____ Date _____ Class _____

LESSON 10-7

Review for Mastery

Independent and Dependent Events

Events are **independent** if the occurrence of one event does not affect the probability of the other.

If A and B are independent events, then $P(A \text{ and } B) = P(A) \cdot P(B)$.

In other words, if two or more events are independent, multiply their individual probabilities.

An experiment consists of rolling a number cube twice. What is the probability of rolling a 3 the first time and a 2 the second time?

Step 1: Determine if the two events are independent.

The first roll of a number cube will not affect the second roll. Therefore, the two rolls are independent events.

Step 2: Find the probability.

$P(A \text{ and } B) = P(A) \cdot P(B)$

$P(3, 2) = P(3) \cdot P(2)$

$= \frac{1}{6} \cdot \frac{1}{6}$

$= \frac{1}{36}$

An experiment consists of randomly selecting a marble from a bag, replacing it, and then selecting another marble. The bag contains 2 red marbles, 1 white marble, and 7 yellow marbles. What is the probability of selecting a white marble and then a yellow marble?

Step 1: Determine if the two events are independent.

Because the first marble is replaced, the probability of getting a certain color on the second selection is not affected by which color was selected first. The events are independent.

Step 2: Find the probability.

$P(A \text{ and } B) = P(A) \cdot P(B)$

$P(\text{white, yellow}) = P(\text{white}) \cdot P(\text{yellow})$

$= \frac{1}{10} \cdot \frac{7}{10} = \frac{7}{100}$

1. Six cards are numbered 1 to 6 and placed in a box. One card is selected at random and replaced. Another card is selected at random. What is the probability of selecting a 1 and then a 6?

   $P(1)$ _____ $P(6)$ _____ $P(1 \text{ and } 6)$ _____

2. A coin is tossed three times. What is the probability of the coin landing heads all three times? _____

3. A bag contains 5 red marbles, 8 white marbles, and 7 green marbles. What is the probability of randomly selecting a white marble, replacing it, then randomly selecting another white marble? _____

4. Ten cards are numbered from 1 to 10 and placed in a box. One card is selected at random and replaced. Another card is selected at random. What is the probability of selecting a multiple of 3, then a multiple of 2? _____

Name _____ Date _____ Class _____

LESSON 10-7

Review for Mastery

Independent and Dependent Events *continued*

Events are **dependent** if the occurrence of one event does affect the probability of the other.

If A and B are dependent events, then $P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$

In other words, the second probability depends on the first outcome.

A class has 18 boys and 12 girls. Two students are chosen at random. What is the probability that the students chosen will be a boy and a girl?

Step 1: Determine if the two events are dependent.

Selecting the first person reduces the total number of outcomes by 1. Therefore, the events are dependent.

Step 2: Find the probability.

$P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$

$P(\text{boy and girl}) = P(\text{boy}) \cdot P(\text{girl after boy has been selected})$

$$= \frac{18}{30} \cdot \frac{12}{29} = \frac{216}{870} \approx 24.8\%$$

Total outcome is reduced by 1.

What is the probability of selecting two boys?

$P(\text{boy and girl}) = P(\text{boy}) \cdot P(\text{boy after boy has been selected})$

There is 1 less boy to select from.

$$= \frac{18}{30} \cdot \frac{17}{29} = \frac{306}{870} \approx 35.2\%$$

Total outcomes is reduced by 1.

5. A bag contains 3 red marbles, 5 green marbles, and 2 blue marbles. What is the probability of selecting a blue marble, setting it aside, then selecting a red marble?

   $P(\text{blue})$ _____ $P(\text{red after blue has been selected})$ _____

   $P(\text{blue and red})$ _____

6. Twenty-six cards with all the letters of the alphabet are placed in a box. What is the probability of selecting a vowel (A, E, I, O, U), setting it aside, then selecting another vowel? _____

7. A bag contains 8 orange marbles, 5 blue marbles, and 7 yellow marbles. What is the probability of randomly selecting an orange marble, setting it aside, then randomly selecting another orange marble? _____

8. Ten cards are numbered from 1 to 10 and placed in a box. What is the probability of selecting one even card, setting it aside, and then selecting one odd card? _____

Name _____ Date _____ Class _____

LESSON 10-7

Practice A

Independent and Dependent Events

Tell whether each set of events is independent or dependent. Explain your answer.

1. You roll a number cube three times. _____

2. Select a marble from a bag, do not replace it, then select another marble. _____

3. **A number cube is rolled two times.**
   a. Are the events independent or dependent? _____
   b. What is the probability of rolling a 5 both times? _____

4. **The numbers 1 – 20 are written on pieces of paper and put in a box. Two pieces of paper are randomly selected and not replaced.**
   a. Are the events independent or dependent? _____
   b. What is the probability of selecting a number less than 6 both times? _____

5. **A bag contains 1 red, 7 black, and 2 yellow marbles. State whether the following events are independent or dependent. Then find the probabilities.**
   a. probability of selecting a black marble, replacing it, then selecting a red marble _____
   b. probability of selecting a yellow marble, not replacing it, then selecting another yellow marble? _____
   c. probability of selecting 1 yellow marble, not replacing it, then selecting a black marble _____

The number of drama club members per grade is given. Two students will be chosen.

	Drama Club
9th	8
10th	2

6. What is the probability both students are 9th graders? _____
7. What is the probability both students are 10th graders? _____
8. What is the probability one student is a 9th grader and one student is a 10th grader? _____

Name _____ Date _____ Class _____

LESSON 10-7

Practice B

Independent and Dependent Events

Tell whether each set of events is independent or dependent. Explain your answer.

1. You roll a die and flip a coin. _____

2. You select one marble, do not replace it, then select another marble. _____

3. A number cube is rolled three times. What is the probability of rolling a 2 each time? _____

4. The numbers 1 – 40 are written on pieces of paper and put in a box. Two pieces of paper are randomly selected. What is the probability both numbers will be multiples of 4? _____

5. A coin is tossed 4 times. What is the probability of getting 4 tails? _____

6. **A bag contains 2 yellow, 12 red, and 6 green marbles.**
   a. What is the probability of selecting a red marble, replacing it, then selecting another red marble? _____
   b. What is the probability of selecting a red marble, not replacing it, then selecting another red marble? _____
   c. What is the probability of selecting 1 yellow marble, not replacing it, then selecting a green marble? _____

7. **There are 7 girls and 3 boys in a class. Two students are to be randomly chosen for a special project.**
   a. What is the probability both students will be girls? _____
   b. What is the probability both students will be boys? _____
   c. What is the probability of selecting a boy and a girl? _____

A music class consists of 9th and 10th graders as shown in the table. Two students will be selected at the same time.

Music Class		
	9th	**10th**
male	9	8
female	12	11

8. What is the probability both students are male? _____

9. What is the probability both students are 9th graders? _____

10. What is the probability one student is female and the second student is male? _____

Name _____ Date _____ Class _____

Chapter 10

Data Analysis and Probability

Section A Quiz

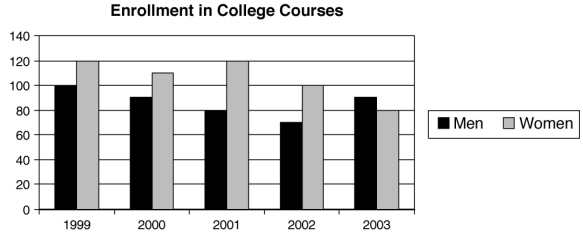
Select the best answer.

1. Which type of graph would best display the change in the number of student absences over the school year?

   A circle C bar

   B line D double-bar

Use the double-bar graph for 2–3.



2. How many people were enrolled in college courses in 1999?

   F 100 H 200

   G 120 J 220

3. In what year was the difference between men's and women's enrollment the greatest?

   A 2000 C 2002

   B 2001 D 2003

Use the stem-and-leaf plot for 4–6.

7	**2**	**2**	**2**	**3**
8	**0**	**5**	**8**	
9	**3**	**7**		
10	**0**			

Key: 8|0 = 80

4. If you organized the data in a frequency table, which *could* be intervals?

   F 70–80 and 80–90

   G 70–79 and 80–84

   H 70–79 and 80–89

   J 70–80 and 81–90

5. What is the median?

   A 72 C 82.5

   B 80 D 83.2

6. What is the mean?

   F 72 H 82.5

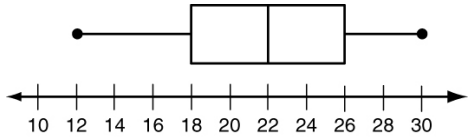
   G 80 J 83.2

7. For the set {1, 1, 2, 4, 5, 6, 7, 8, 10,} which would NOT be affected if another value of 10 was included?

   A range C median

   B mean D mode

8. Look at the box-and-whisker plot below. Between what values does the middle half of the data fall?



   F 12 and 18 H 18 and 26

   G 12 and 30 J 22 and 30

9. One type of car gets 70 mi/gal and 4 other cars get 30 mi/gal. Why is this statement misleading: "The average mi/gal for these 5 cars is 38"?

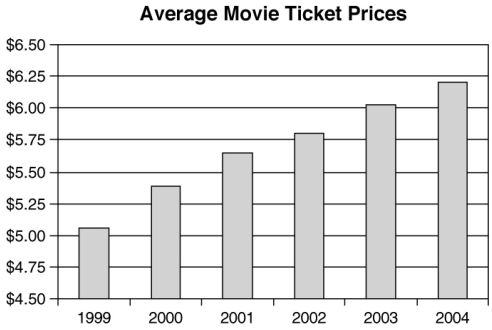
   A The sample size is too small.

   B The sample is biased.

   C The median is equal to the mode.

   D The mean is not a good descriptor for this data set.

10. What might someone be incorrectly influenced to believe based on the graph below?



   F Prices have been increasing.

   G Prices have been decreasing.

   H Prices tripled between 1999 and 2004.

   J Prices decreased between the years 2003 and 2004.

Name _____ Date _____ Class _____

Chapter 10

Data Analysis and Probability

Section B Quiz

Select the best answer.

1. An inspector checks 98 cell phones and finds 2 of them not working. If a company has 850 of the phones, how many are likely to not be working?

   A 2 C 17

   B 9 D 49

A spinner is spun. Use the results to find the experimental probability.

Outcome	Frequency
Red	7
Green	3
Blue	10

2. spinning green

   F $\frac{3}{20}$ H $\frac{7}{20}$

   G $\frac{3}{10}$ J $\frac{7}{10}$

3. NOT spinning red

   A $\frac{7}{10}$ C $\frac{13}{20}$

   B $\frac{7}{20}$ D $\frac{13}{10}$

4. An experiment consists of randomly selecting a card from a box containing cards numbered 1 – 12. Which has the smallest probability?

   F *P*(greater than 8)

   G *P*(multiple of 4)

   H *P*(even number)

   J *P*(less than 5)

5. The odds of winning a contest are 3:7. What is the probability of winning the contest?

   A $\frac{3}{10}$ C $\frac{7}{10}$

   B $\frac{3}{7}$ D $\frac{7}{3}$

A bag contains 4 red, 2 blue, 6 green and 8 white marbles. Use this to answer 6–7. Round answers to nearest tenth.

6. What is the probability of selecting a green marble, replacing it, and then selecting a red marble?

   F 4.5% H 6.0%

   G 4.7% J 6.3%

7. What is the probability of selecting a white marble, keeping it out, and then selecting another white marble?

   A 14% C 16%

   B 14.7% D 16.8%

8. Which are independent events?

   F Two volunteers are chosen from a group.

   G Two marbles are selected without replacing the first.

   H Two coins are tossed.

   J One card is drawn, set aside, and then another card is drawn.

You are rolling a six-sided cube. Use this to answer 9-10. Round answers to the nearest tenth.

9. Which of these is the probability of rolling a 1 or a 6?

   A $\frac{1}{6}$ C $\frac{1}{3}$

   B $\frac{1}{5}$ D 3

10. Which of these is the probability of rolling two even numbers in a row?

    F 1 H $\frac{1}{3}$

    G $\frac{1}{2}$ J $\frac{1}{4}$

Name _____ Date _____ Class _____

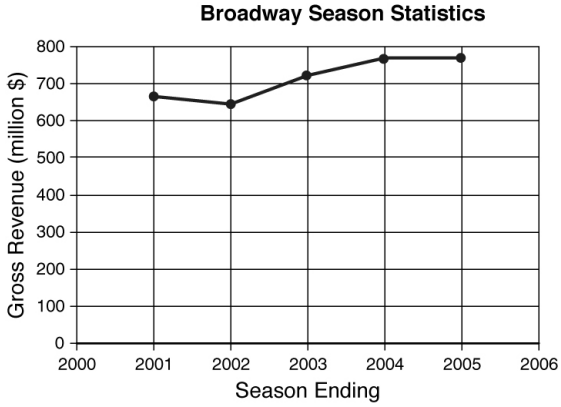
Chapter 10

Data Analysis and Probability

Chapter Test *Form B*

Select the best answer.

1. Use this line graph to identify the period that saw the greatest change in gross revenue.



A 2001–2002 C 2003–2004

B 2002–2003 D 2004–2005

2. Which type of graph would be best for displaying this data?

Actors/Actresses with The Most Oscar Nominations

Actor/Actress	Nominations
Meryl Streep	13
Katherine Hepburn	12
Jack Nicholson	12
Bette Davis	10
Laurence Olivier	10

F bar graph H histogram

G circle graph J line graph

3. This stem-and-leaf plot gives the number of gold medals won by ten countries during the 2004 Olympics. Which data set is plotted?

Stem	Leaves
0	9 9
1	0 1 4 6 7
2	7
3	2 5

Key: 3 | 2 means 32

A {0, 1, 2, 4, 5, 6, 7, 7, 9, 9}

B {1, 11, 23, 41, 53, 61, 71, 72, 90, 90}

C {9, 9, 10, 11, 14, 16, 17, 27, 32, 35}

D {27, 99, 325, 101, 467}

The ages of the U.S. Presidents that were inaugurated during the 1900's are given below. Use this data for questions 4–7.

Ages at Inauguration
42 51 56 55 51 54 51 60 62
43 55 56 61 52 69 64 46

4. Which frequency table reflects the data?

F

Ages	Freq.
41–50	3
51–60	4
61–70	5

H

Ages	Freq.
41–50	3
51–60	10
61–70	4

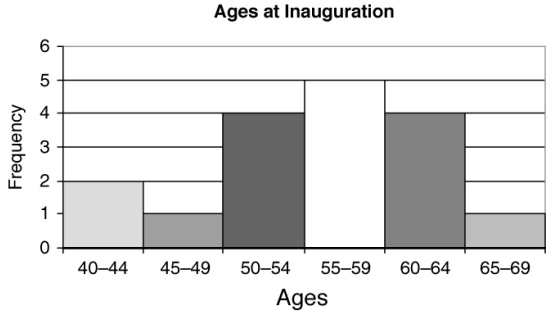
G

Ages	Freq.
41–50	3
51–60	9
61–70	5

J

Ages	Freq.
41–50	6
51–60	8
61–70	3

5. What is wrong with this histogram?



A The bar for 40–44 is too short and the bar for 45–49 is too tall.

B The bar for 50–54 is too tall.

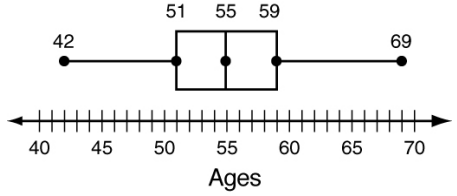
C The bar for 50–54 is too short and the bar for 55–59 is too tall.

D The bar for 55–59 is too short.

6. Find the mean, median, and mode. (Round answers to the nearest tenth.)

	mean	median	mode
F	54.6	55	51
G	54.6	62	51
H	55	54.6	no mode
J	55	55	no mode

7. What, if anything, is wrong with this box-and-whisker plot?



A The value of Q1 is incorrect.

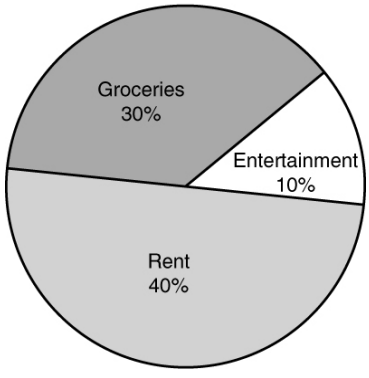
B The value of the median is incorrect.

C The value of Q3 is incorrect.

D The boxplot is correct.

8. This graph shows how Russell spends his income each month. Explain why the graph is misleading.

Russell's Monthly Spending



F The entertainment sector is too small relative to the groceries sector.

G The rent sector is too large relative to the entertainment sector.

H The sample size is too small.

J The sectors do not add to 100%.

An experiment consists of spinning a spinner. Use these results for questions 9 and 10.

Outcome	Freq.
Red	4
Green	10
Blue	6

9. What is the experimental probability that the spinner lands on red?

A 4% C 25%

B 20% D 40%

10. If Angie spins the spinner 250 times, predict the number of times it will land on green.

F 10 H 50

G 25 J 125

11. Find the theoretical probability of randomly choosing a vowel from the letters in EXPERIMENT.

A $\frac{1}{5}$ C $\frac{2}{5}$

B $\frac{3}{10}$ D $\frac{3}{5}$

12. The probability of picking a red marble from a bag is $\frac{2}{7}$. What are the odds against picking a red marble?

F 2:5 H 5:7

G 5:2 J 7:5

13. A number cube is rolled 2 times in a row. What is the probability of rolling a multiple of 3 both times?

A $\frac{1}{36}$ C $\frac{1}{15}$

B $\frac{1}{18}$ D $\frac{1}{9}$

14. A game board has 8 cards, and 2 say WIN. Mayela picks 2 cards without replacing the first. What is the probability that neither say WIN?

F $\frac{15}{32}$ H $\frac{9}{16}$

G $\frac{15}{28}$ J $\frac{9}{14}$

15. Which are independent events?

A Two number cubes are rolled.

B A coin is drawn from a jar, set aside, and then another coin is drawn.

C Two freshmen are chosen for a class project.

D 20 students are selected for the baseball team.

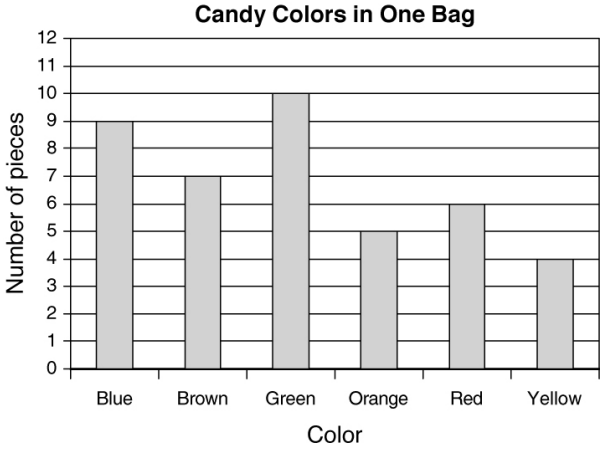
Name _____ Date _____ Class _____

Chapter 10

Data Analysis and Probability

Chapter Test *Form A*

1. Use this bar graph to identify how many more candies are green than yellow.



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2. Use this data to make a graph. Explain why you chose that type of graph.

Average Price for a Gallon of Regular Gasoline, October 2005	
Date	**Price ($)**
Oct. 3	2.92
Oct. 10	2.82
Oct. 17	2.69
Oct. 24	2.56
Oct. 31	2.44

_____

_____

_____

3. The number of items correct on a test for ten students are given below. Use the data to make a stem-and-leaf plot.
{32, 48, 50, 46, 35, 49, 35, 45, 33, 50}

The low temperatures for Nashville, TN, for October 1–15, 2005, are given below. Use this data for questions 4–7.

Low Temperatures (ºF)
56 66 67 63 64 60 52 52 54 56 58 54 55 55 49

4. Complete this frequency table.

Temperature (ºF)	Frequency
45–49	
50–54	
55–59	
60–64	
65–69	

5. Use your frequency table in question 4 to make a histogram.

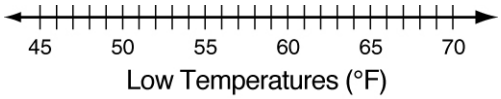
6. Find the mean, median, and mode.

mean: _____

median: _____

mode: _____

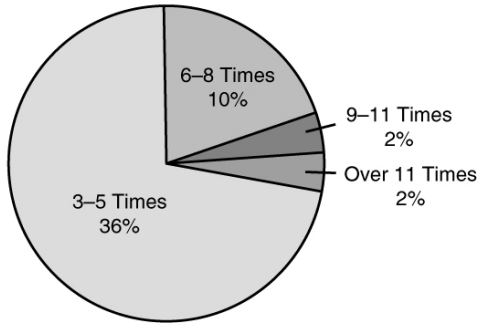
7. Use the data to make a box-and-whisker plot.



Low Temperatures (°F)

8. This graph shows the number of absences for students at Central High School. Explain why the graph is misleading.

Number of Times Students Are Absent from School



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A manufacturer inspects 40 computer monitors and finds that 32 have no defects. Use this information for questions 9 and 10.

9. What is the experimental probability that a monitor chosen at random has no defects?

_____

10. If the manufacturer sells 20,000 computer monitors, predict the number that have no defects.

_____

11. Find the theoretical probability of rolling a number less than 4 on a standard number cube.

_____

12. The probability of picking a red marble from a bag is $\frac{1}{9}$. What are the odds in favor of picking a red marble?

_____

13. A number cube is rolled 2 times in a row. What is the probability of rolling a 5 both times?

_____

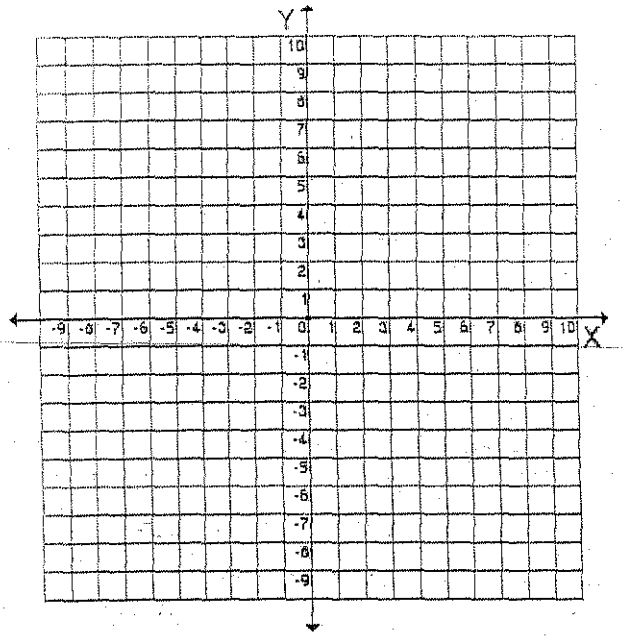
14. A bag has 10 marbles, and 7 are black. Petra picks 2 marbles without replacing the first. What is the probability that both are black?

_____

15. Is the event dependent or independent?

A card is drawn from a standard deck, replaced, and then another card is drawn.

_____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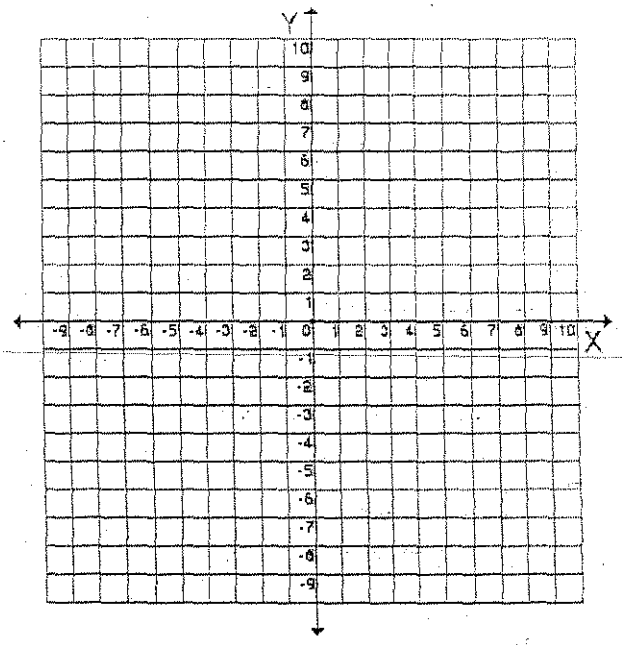
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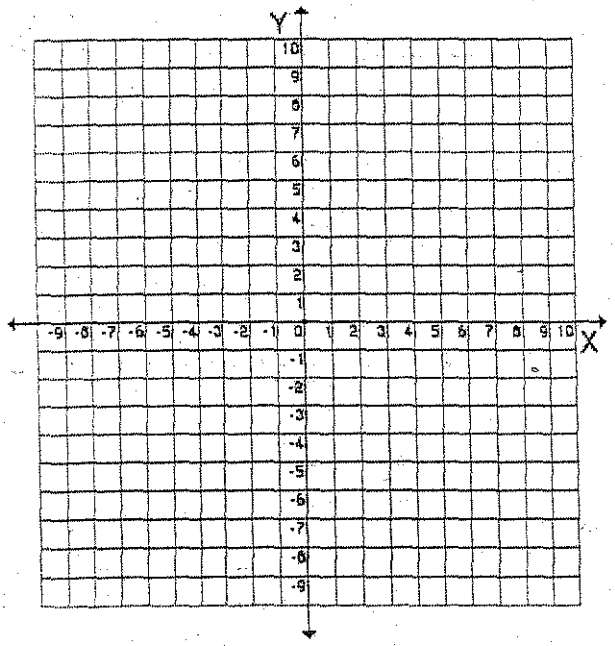
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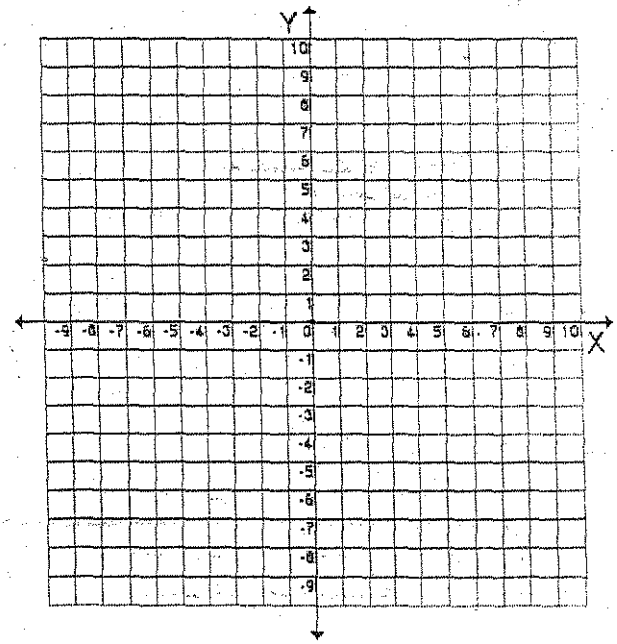
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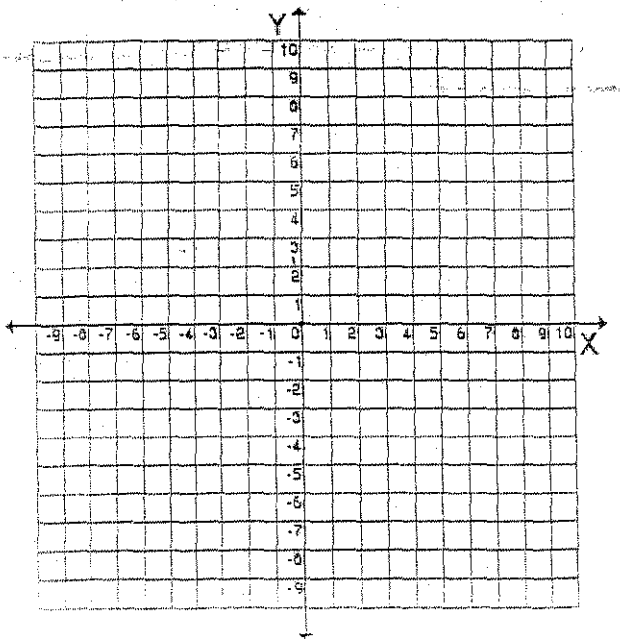
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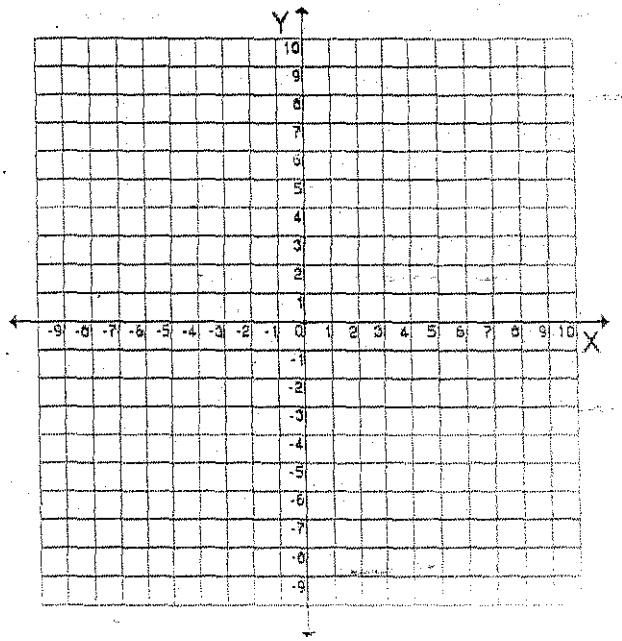
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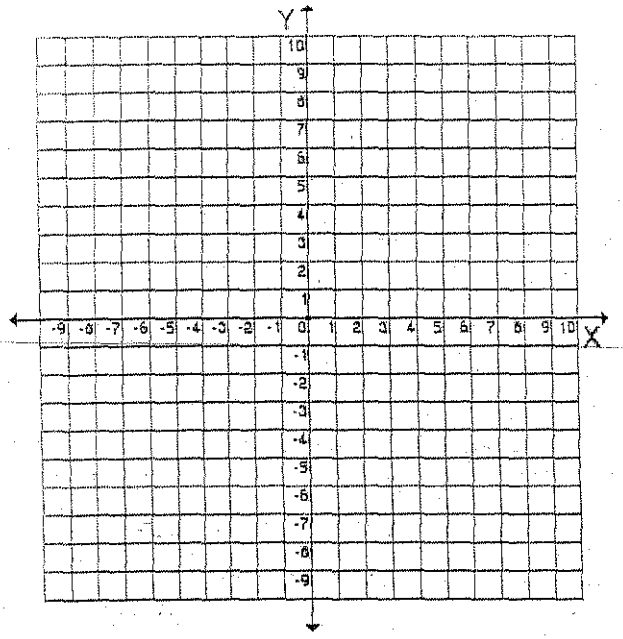
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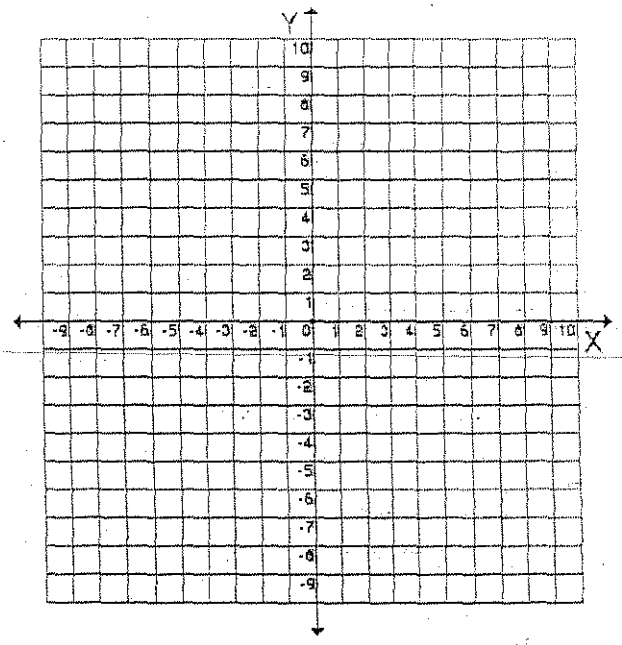
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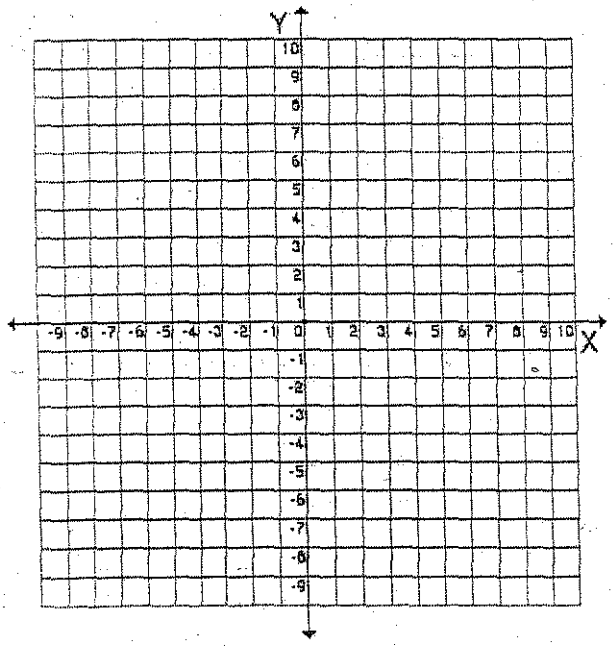
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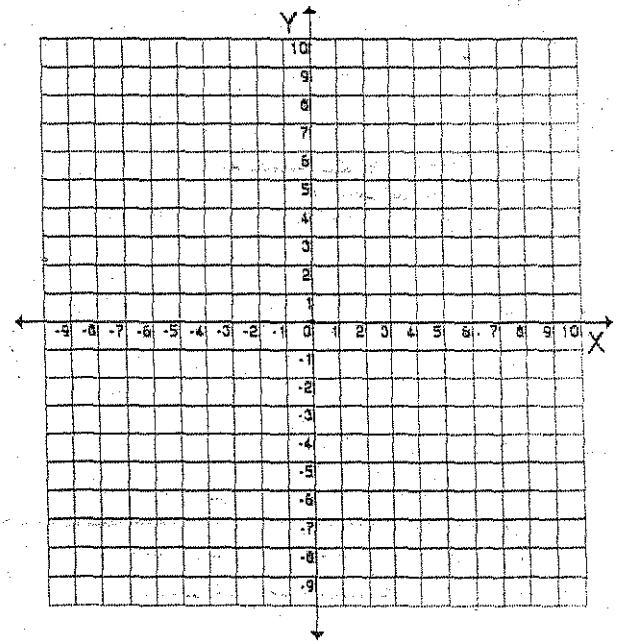
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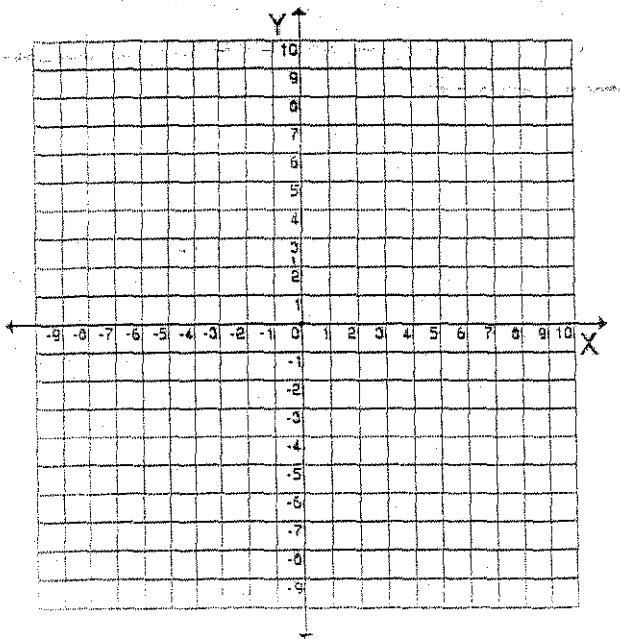
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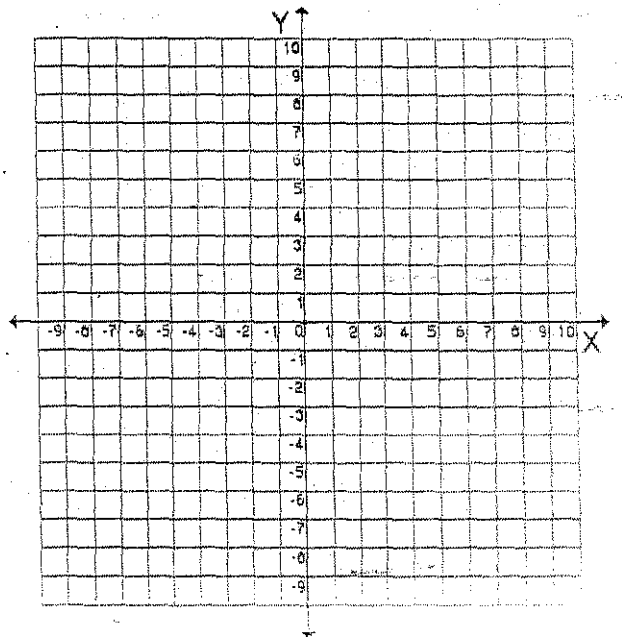
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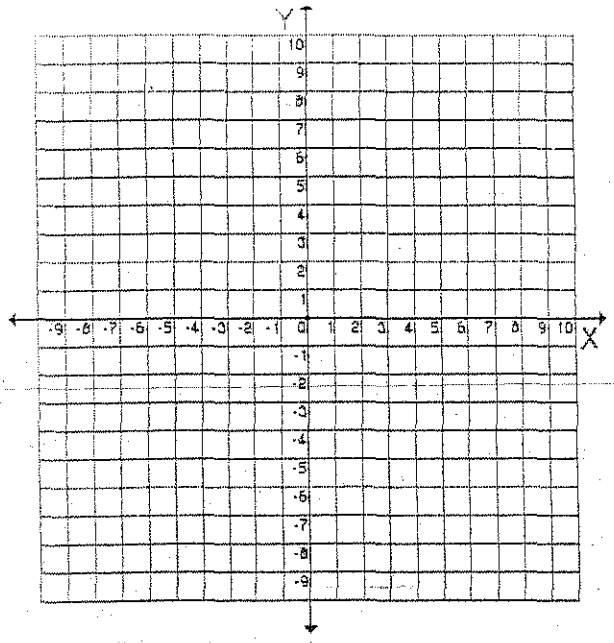
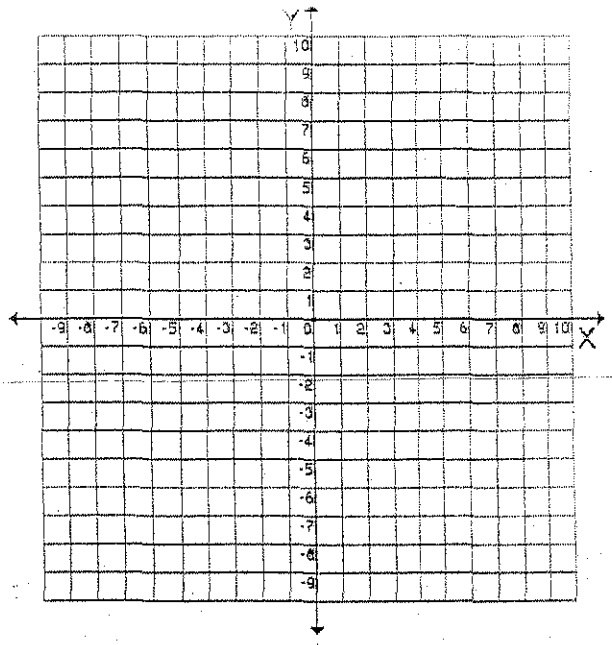
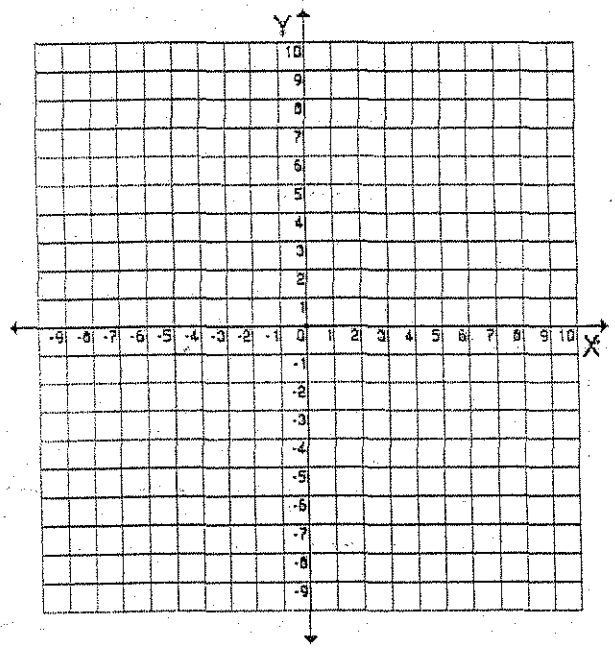
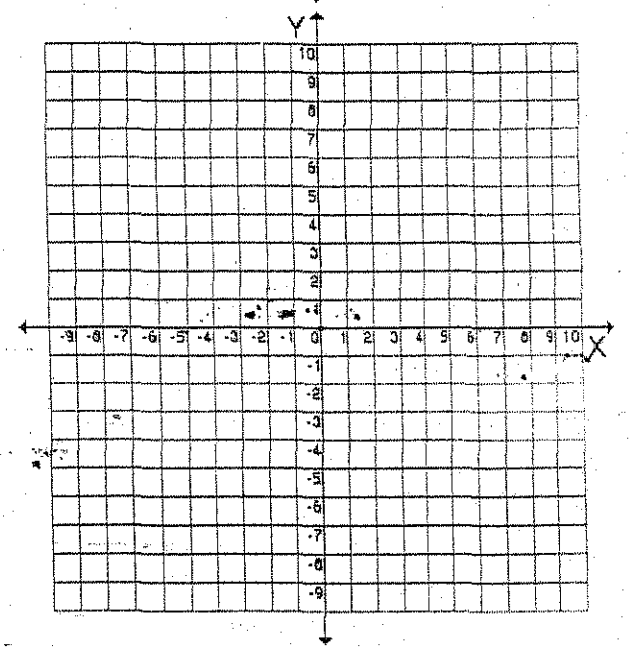
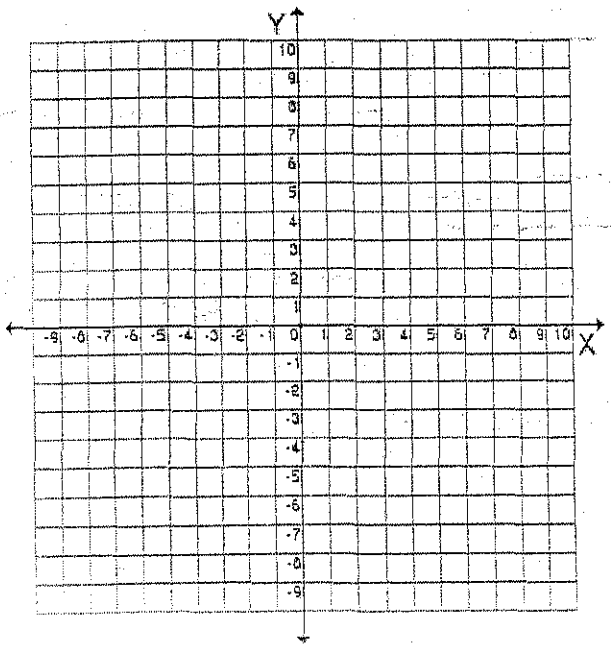
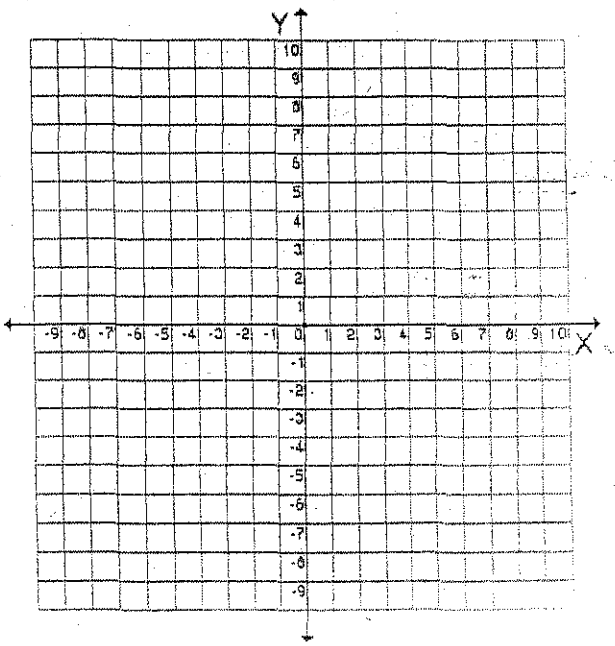

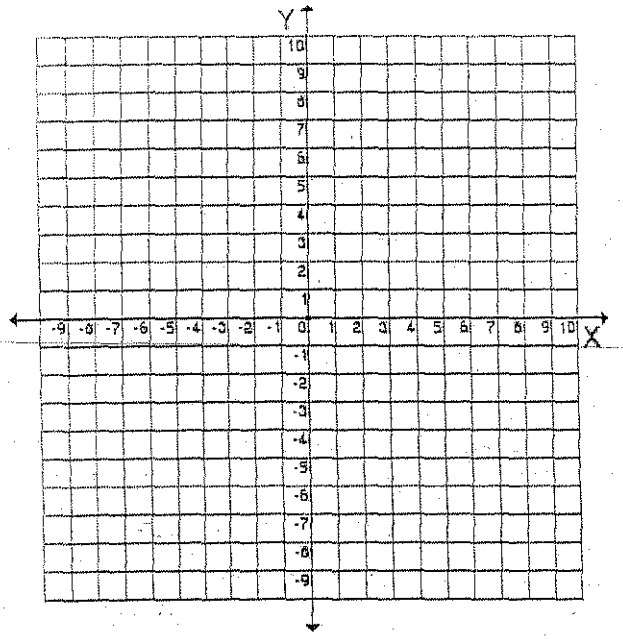
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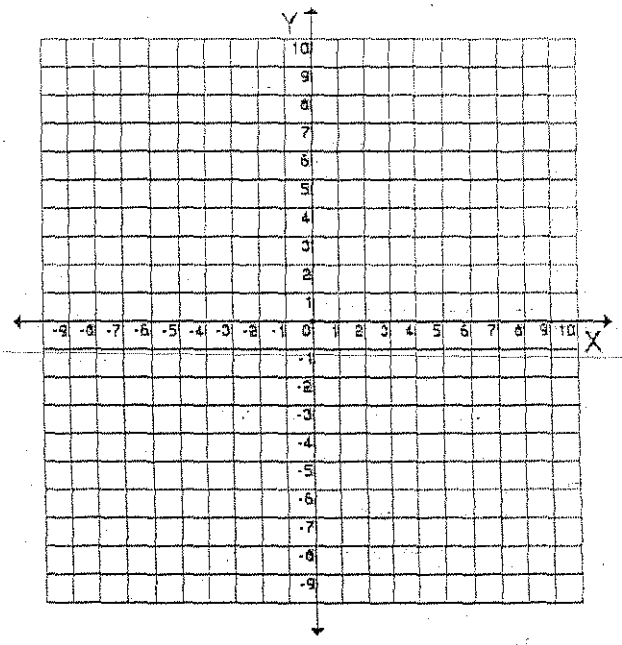
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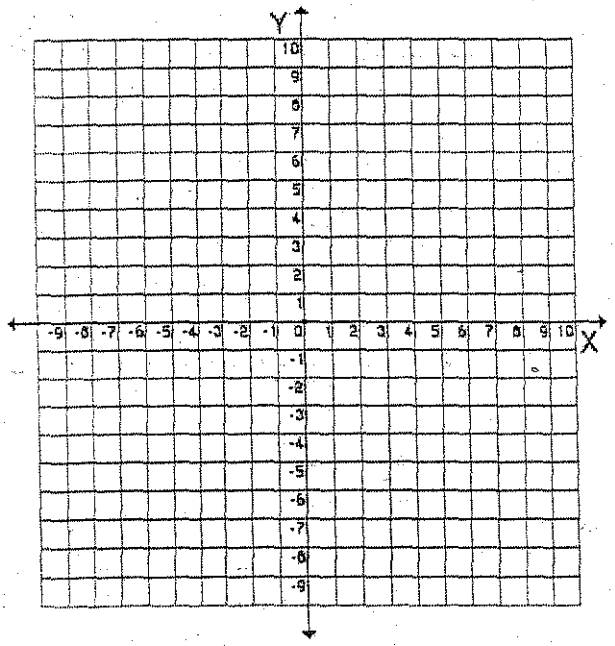
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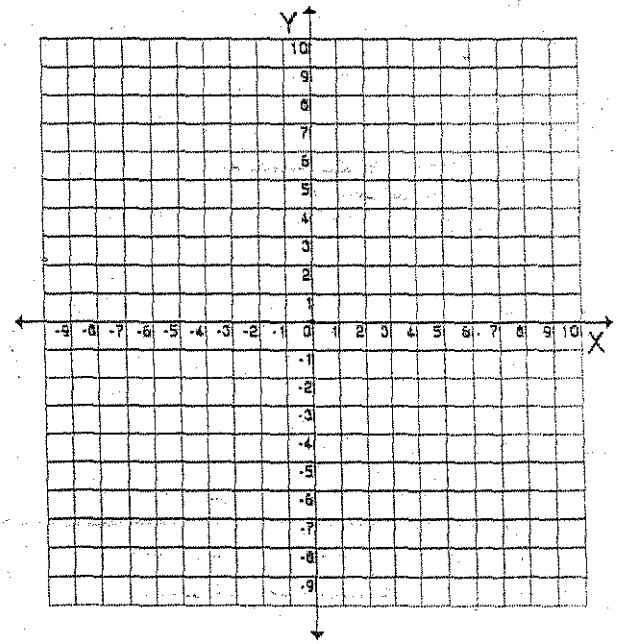
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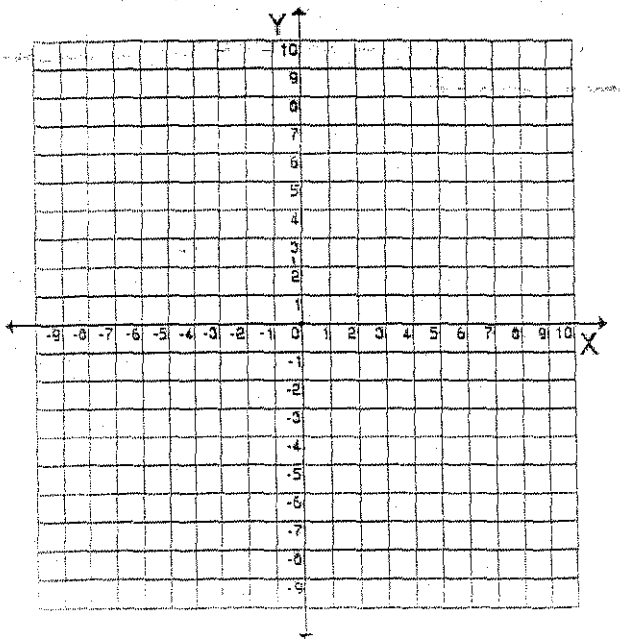
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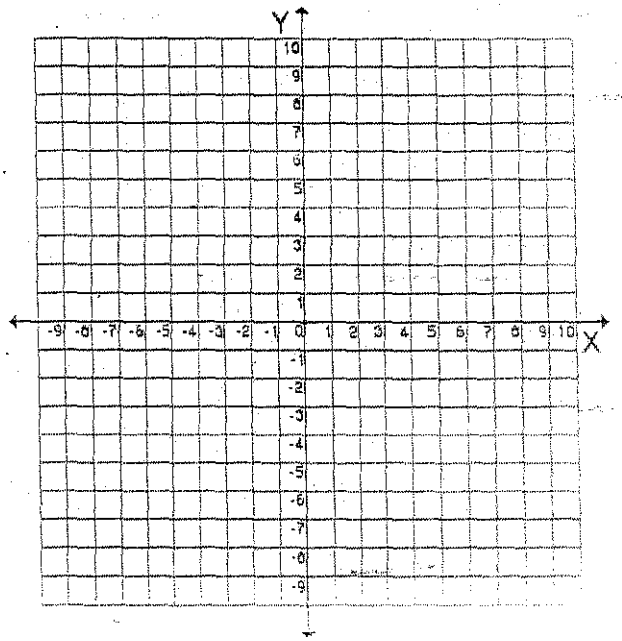
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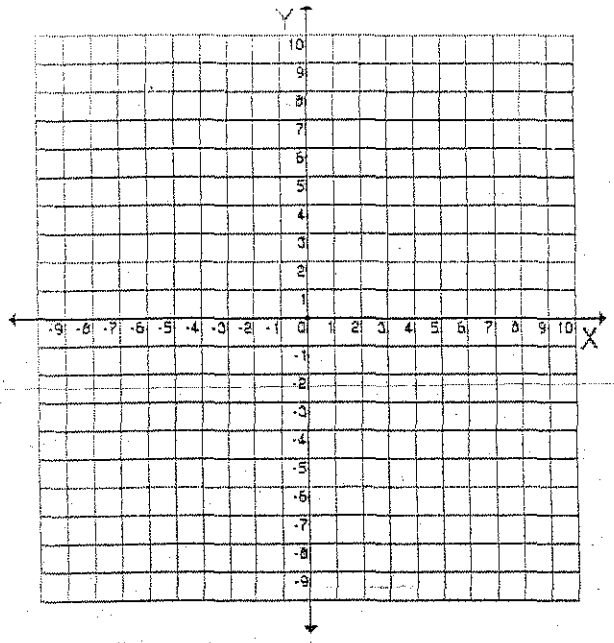
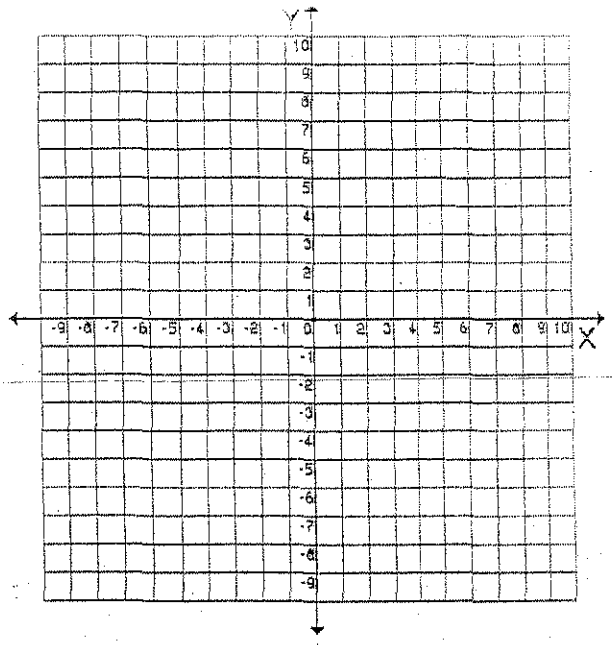
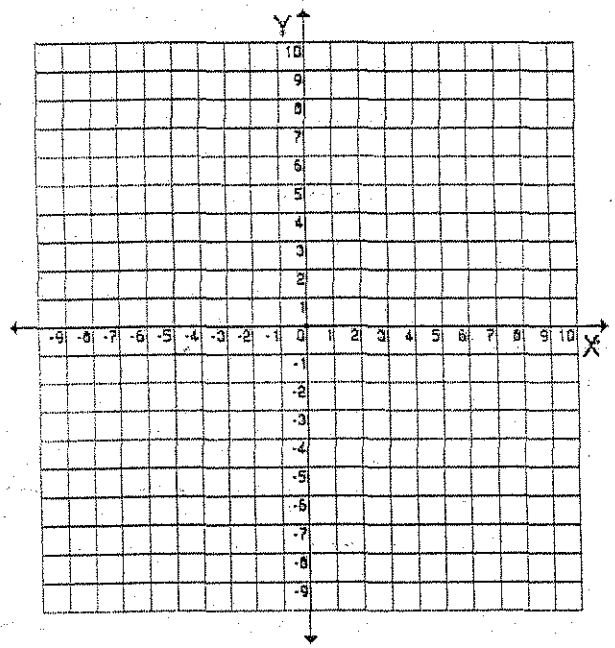
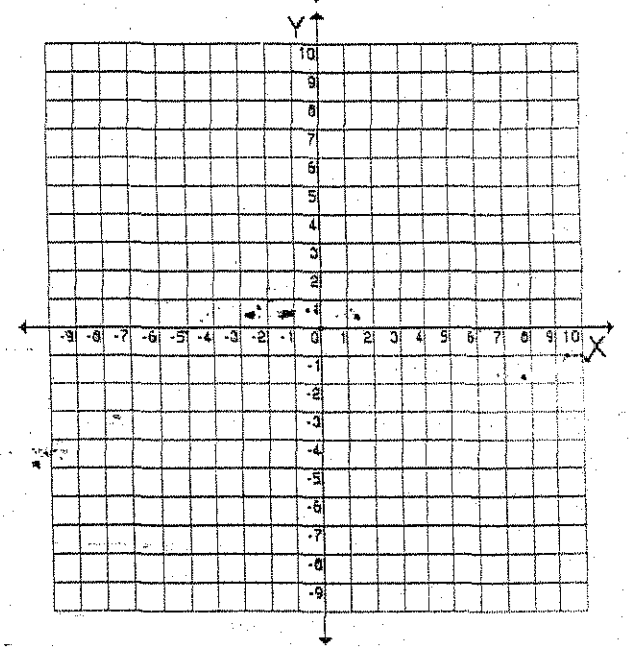
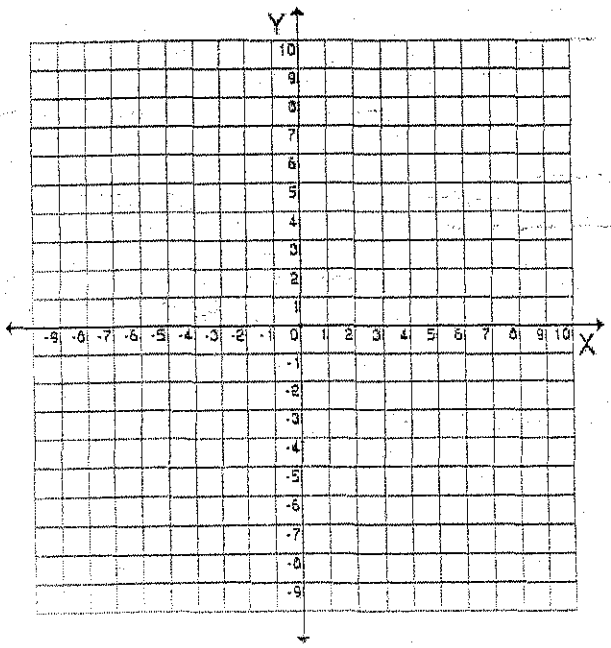
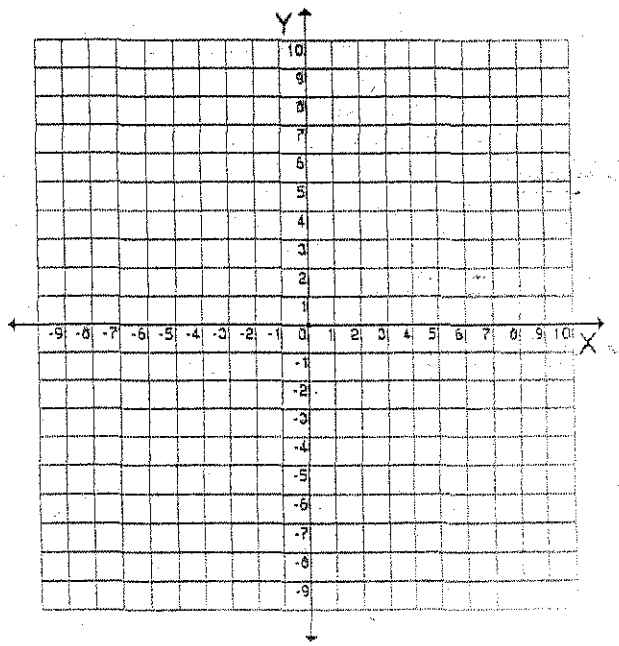

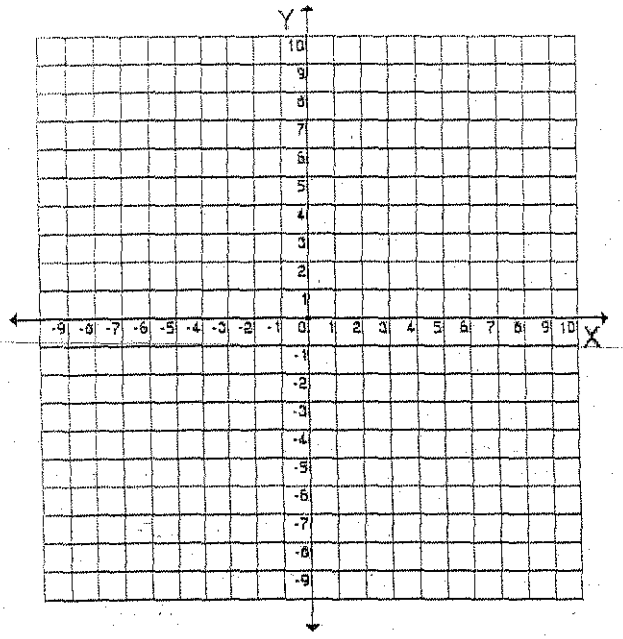
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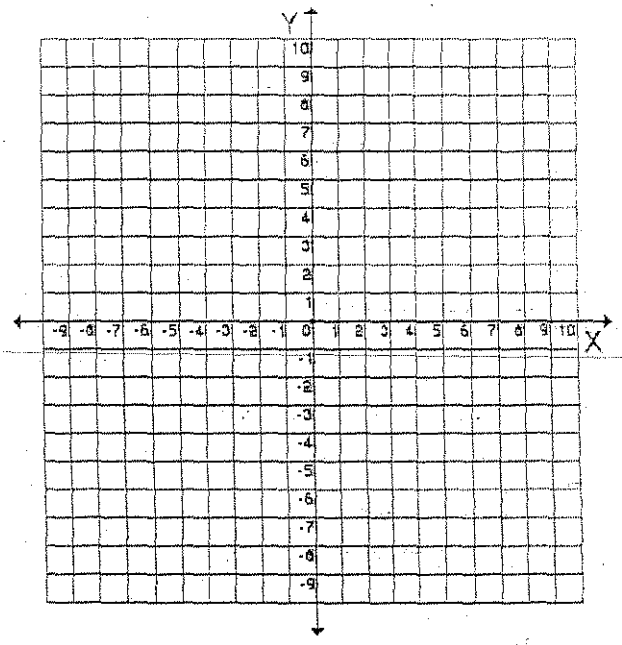
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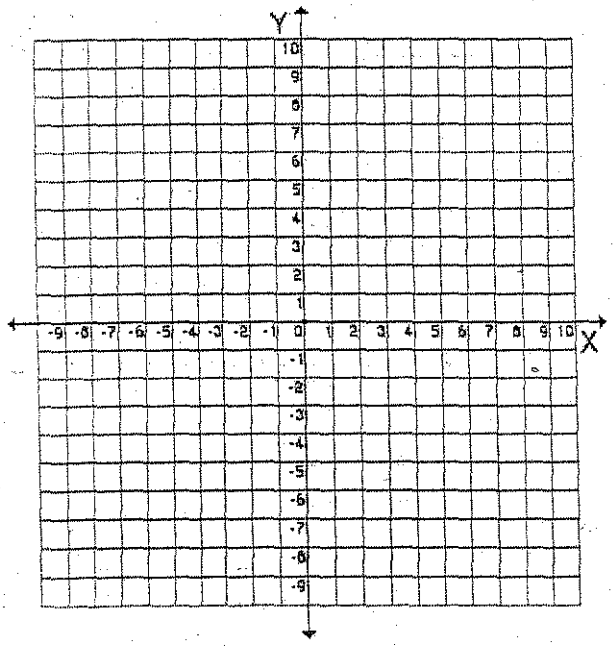
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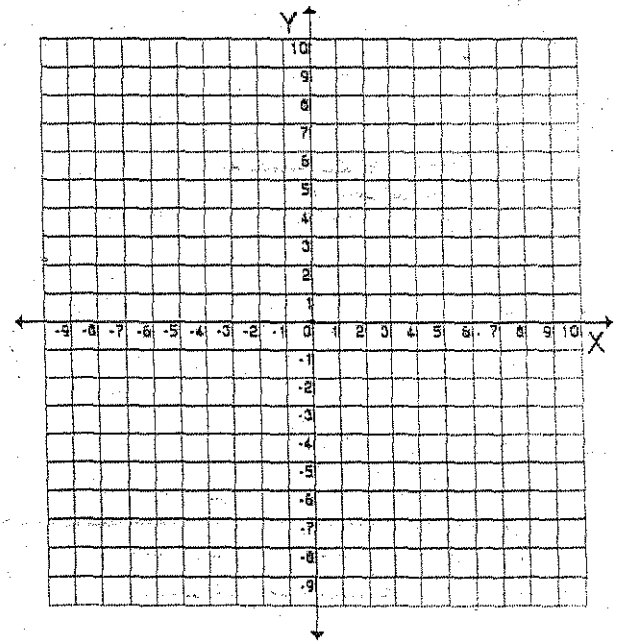
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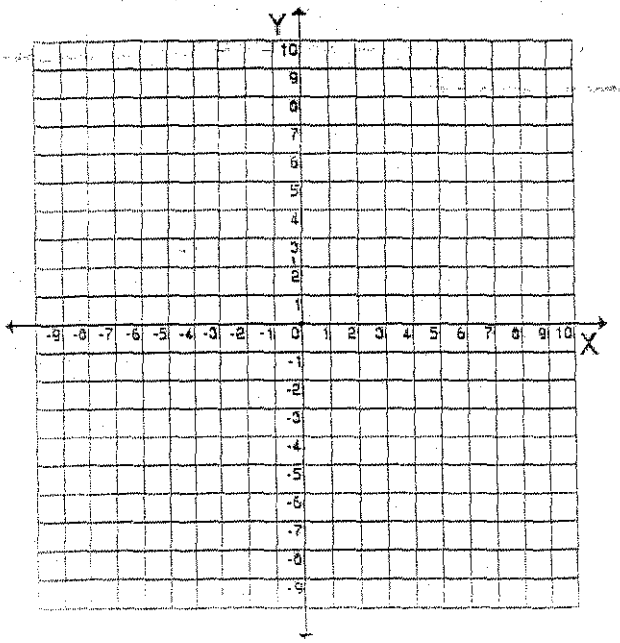
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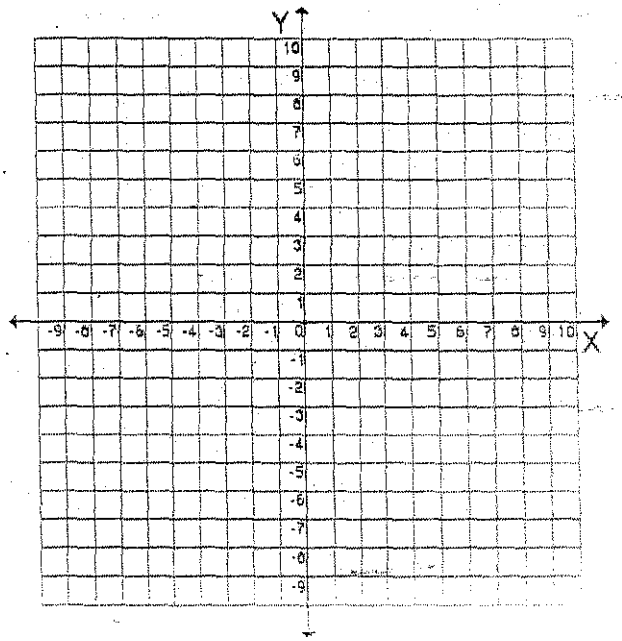
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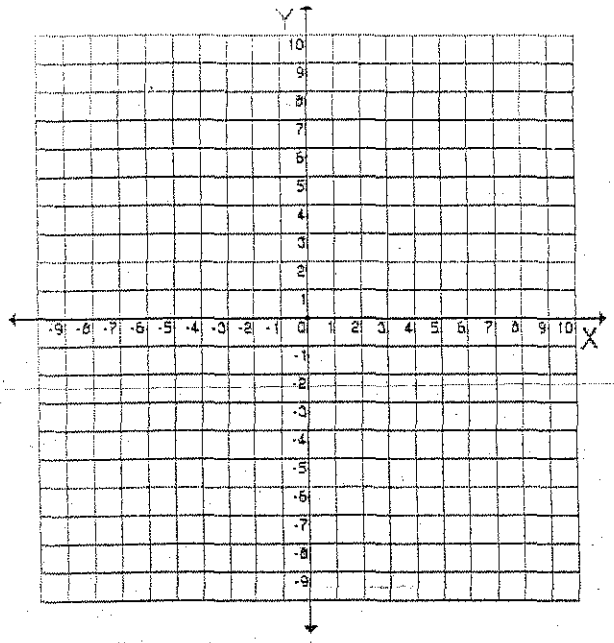
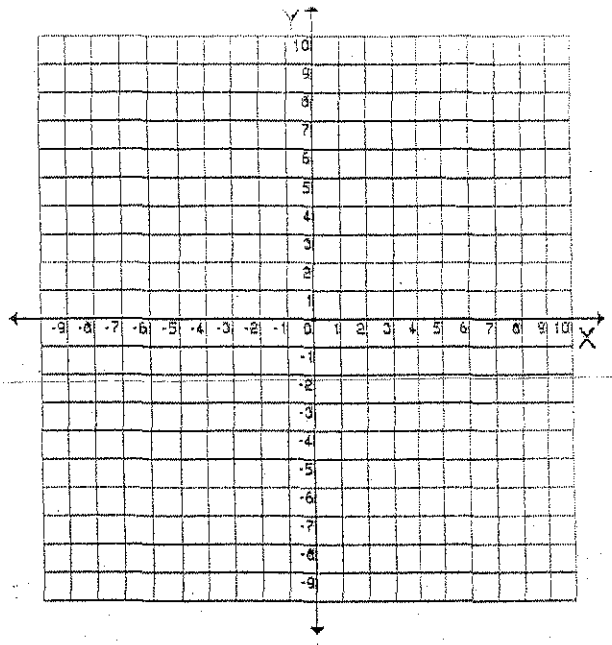
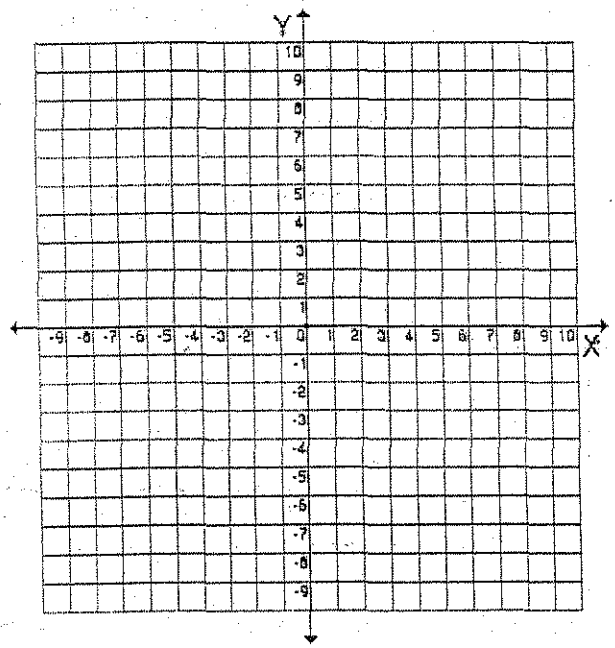
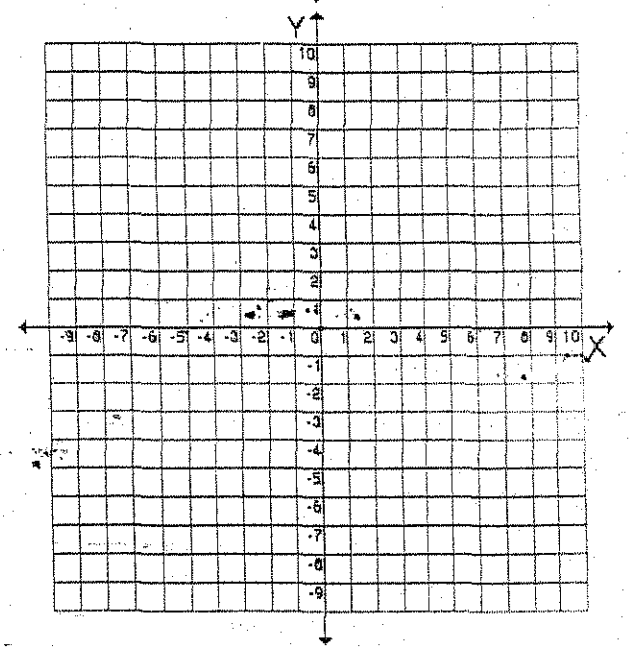
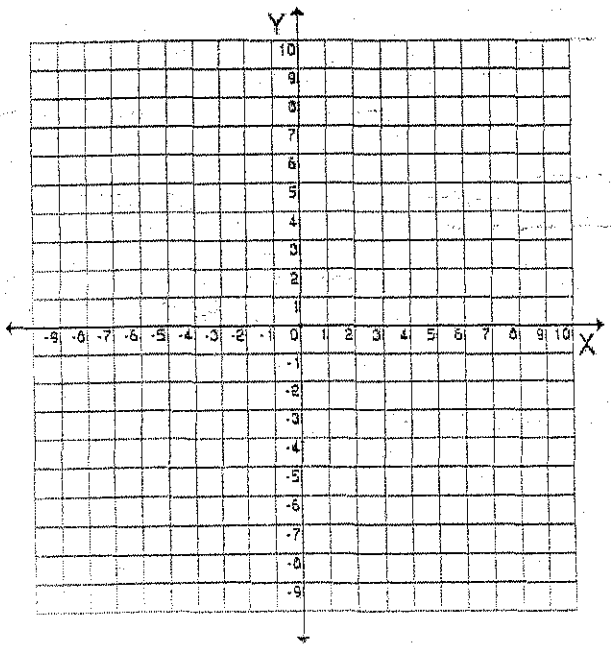
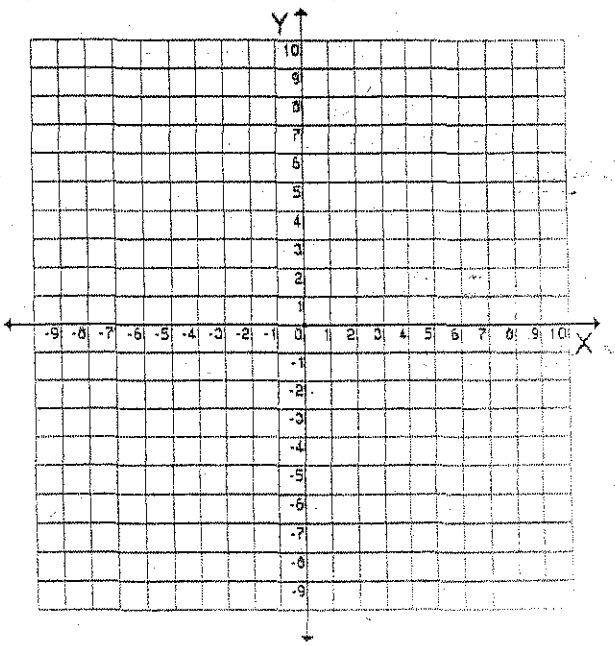

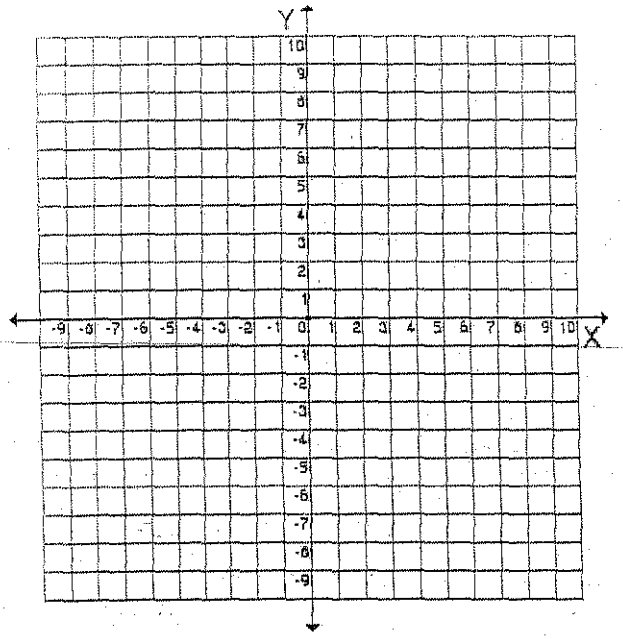
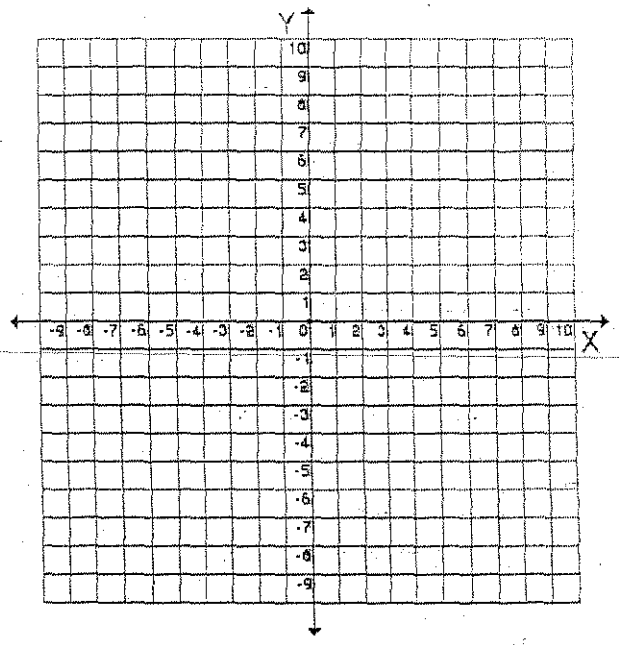
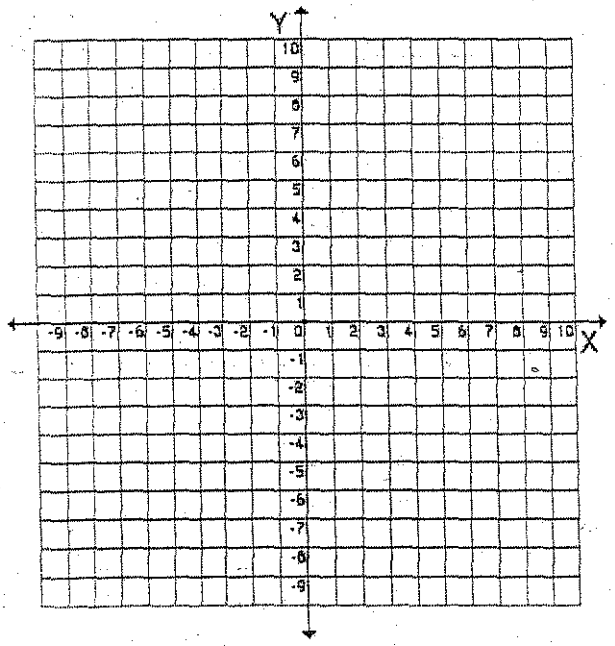
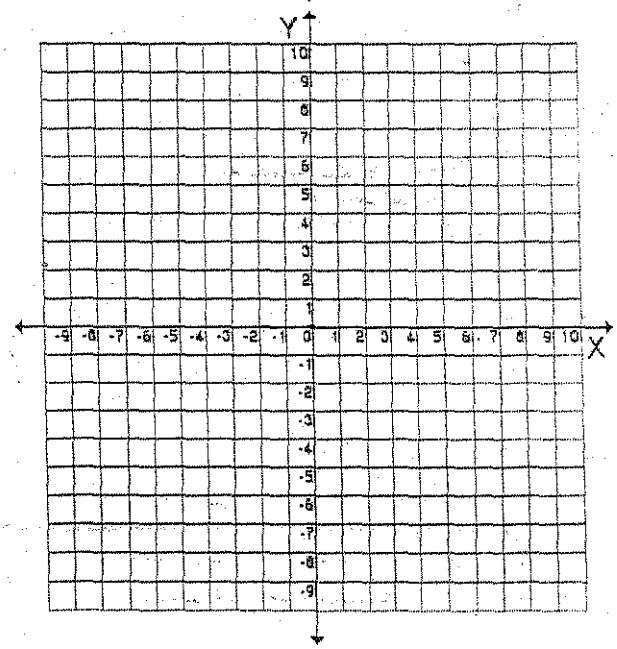
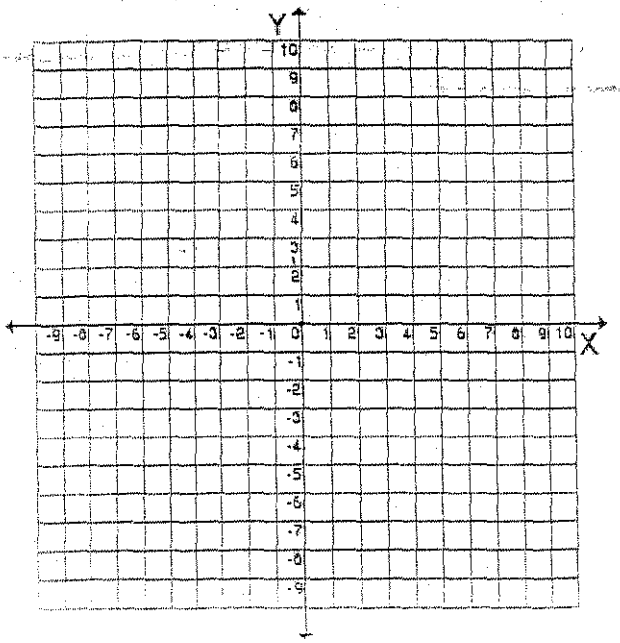
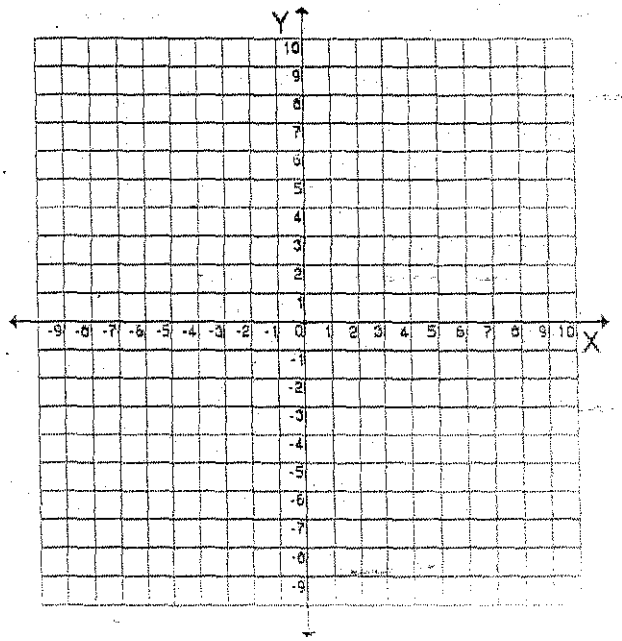

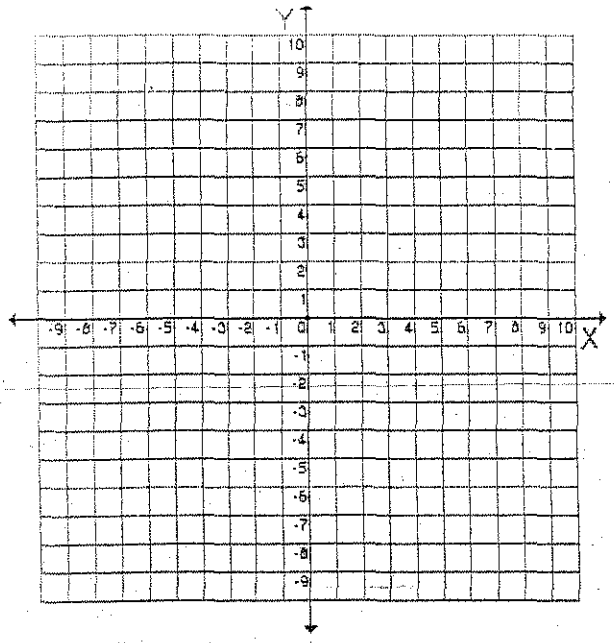
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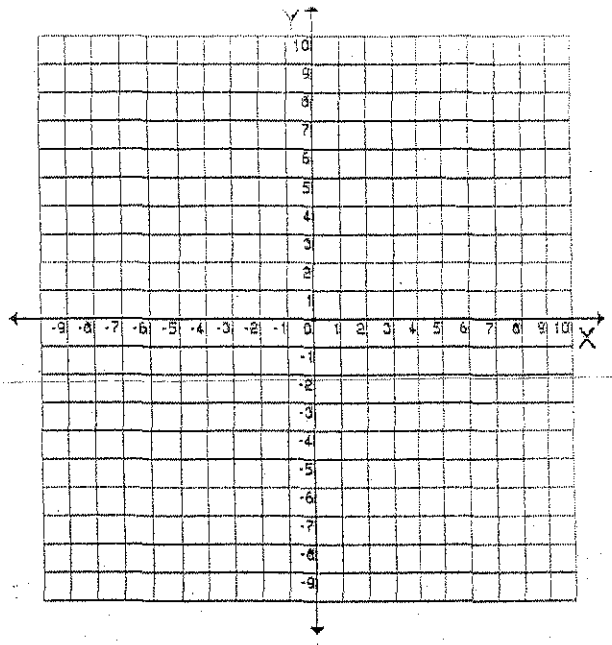
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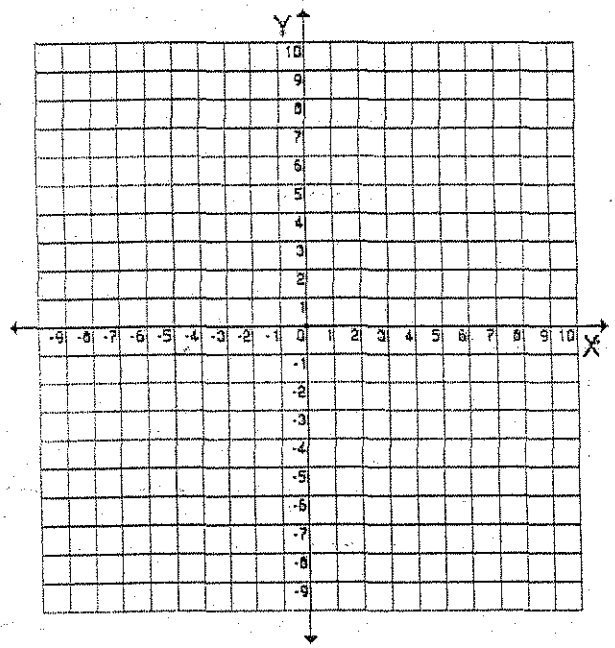
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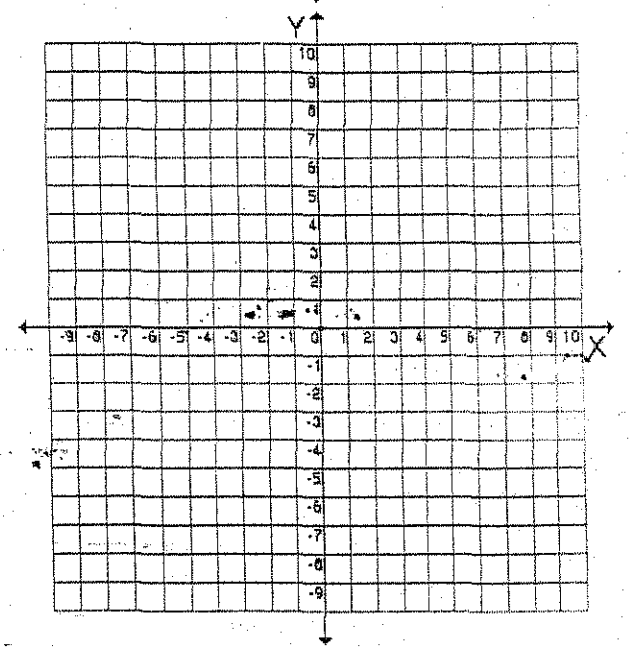
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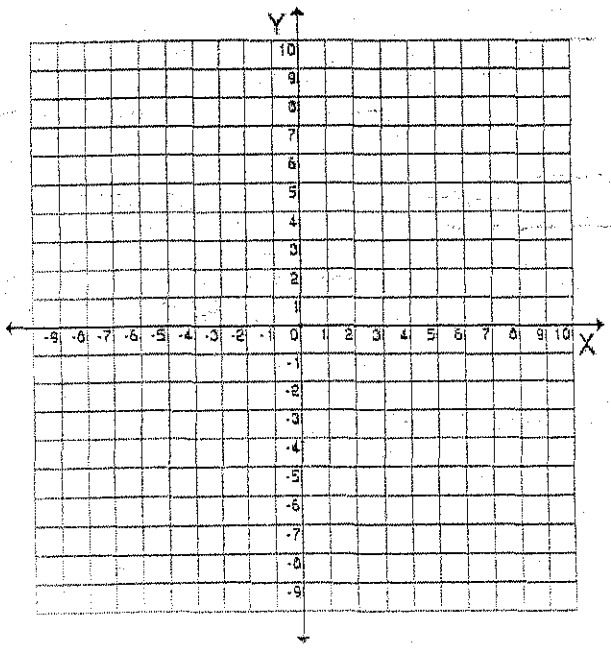
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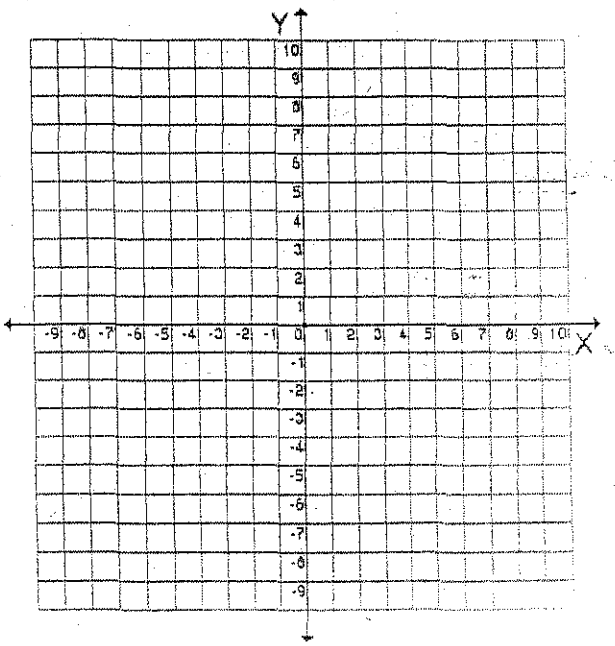
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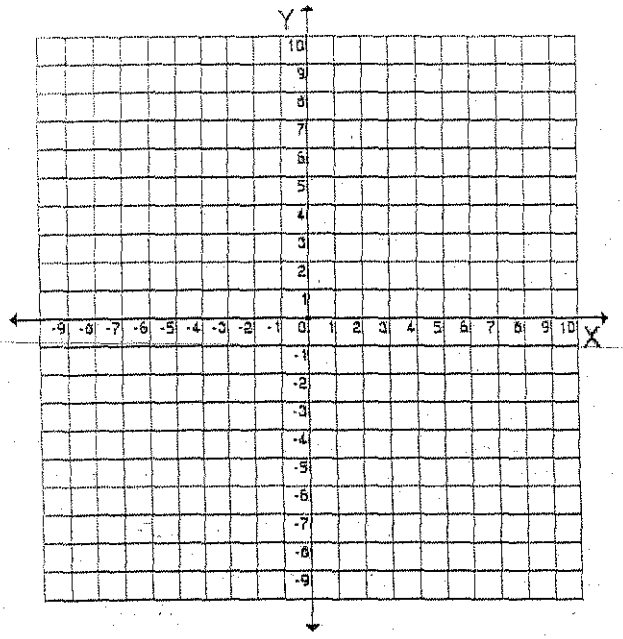
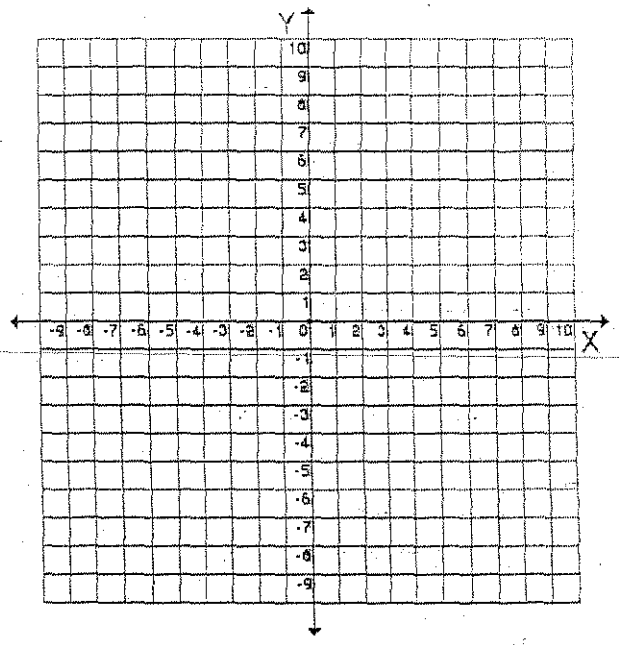
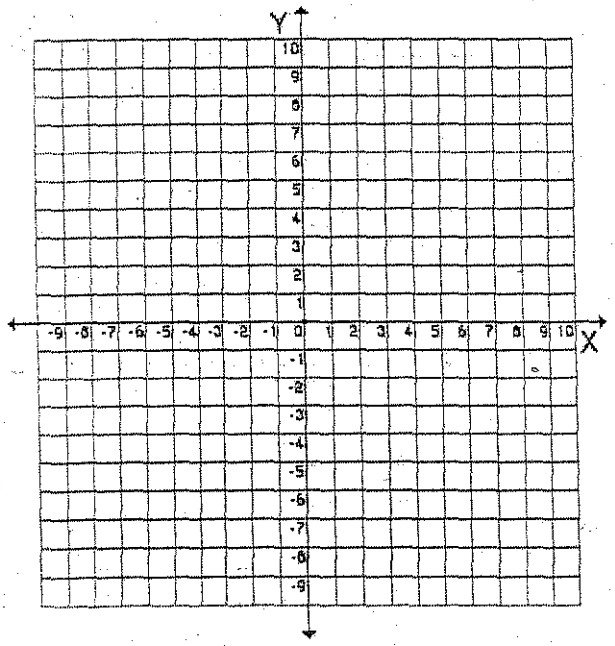
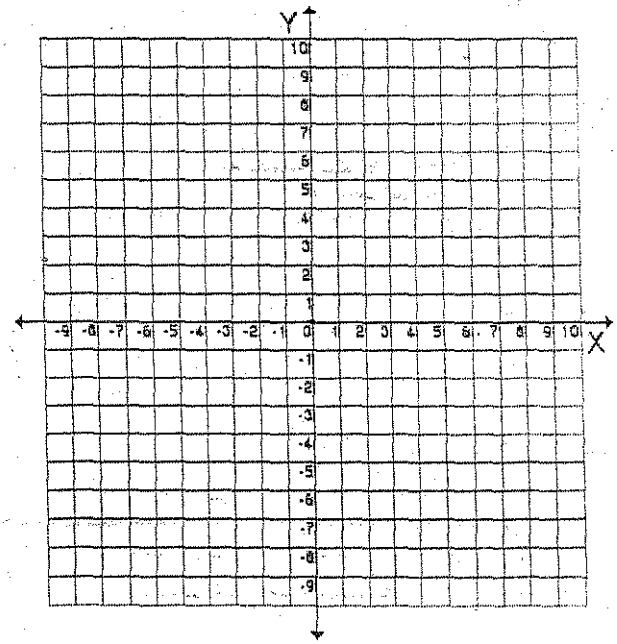
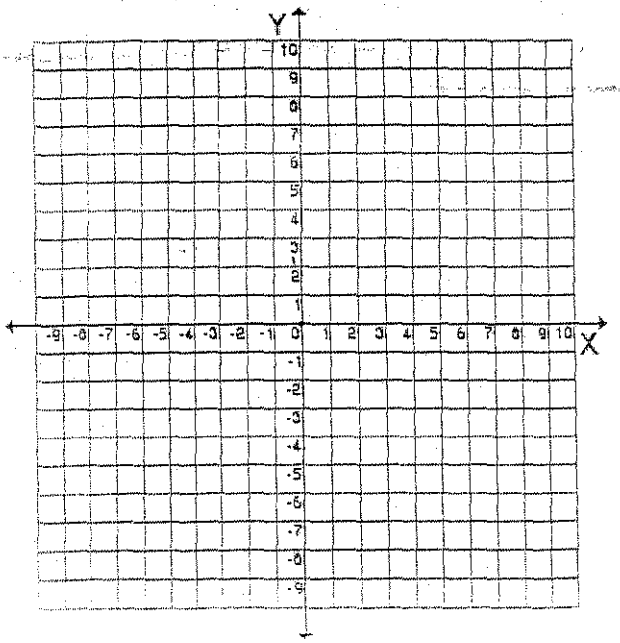
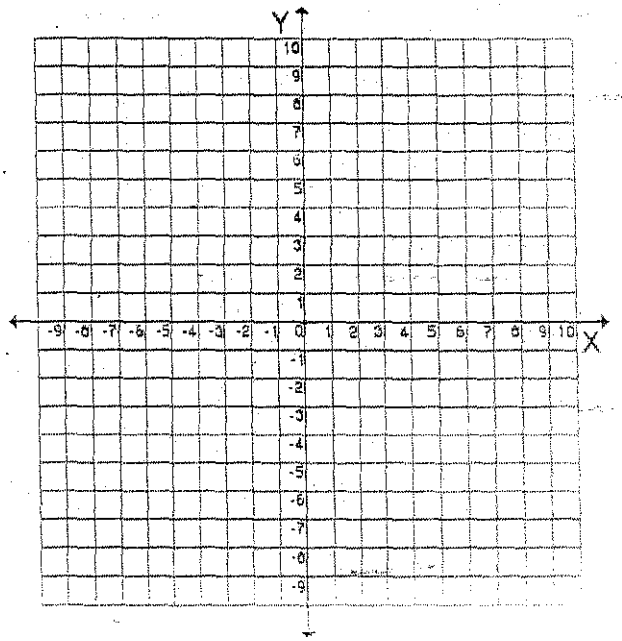

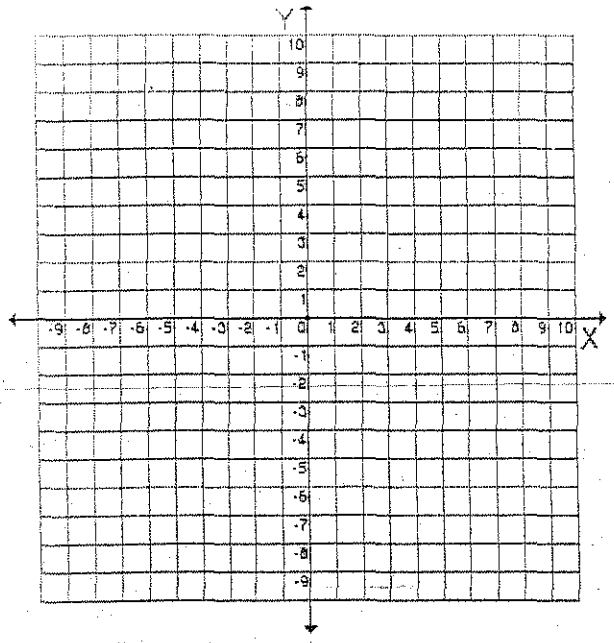
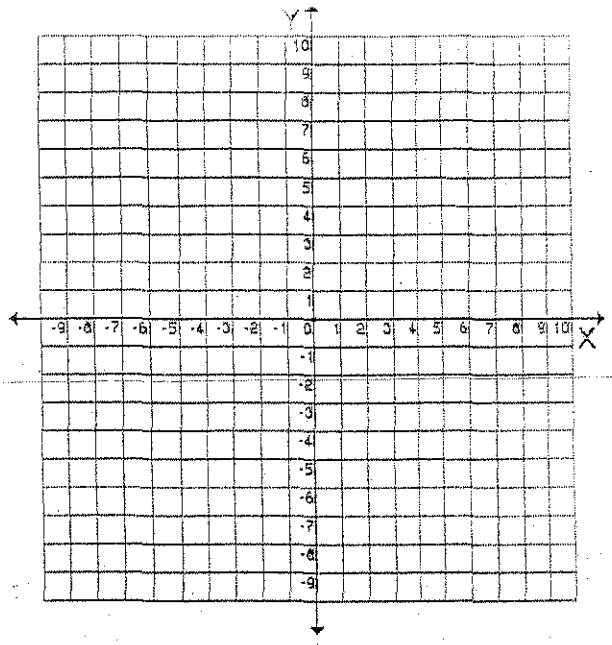
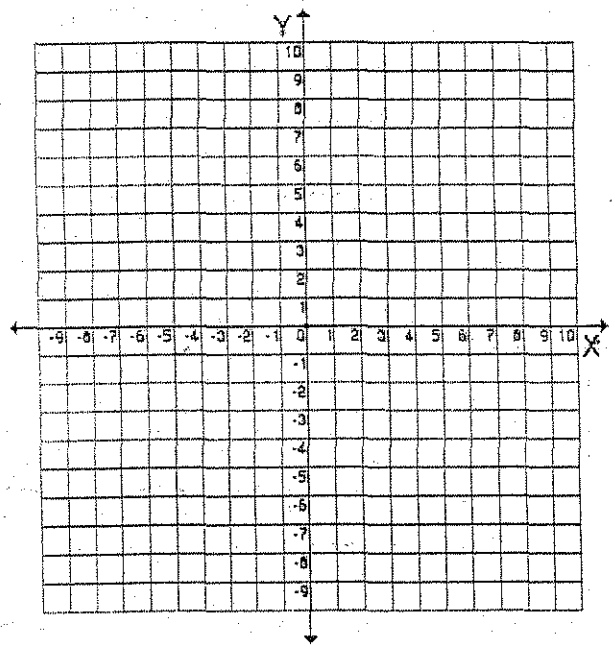
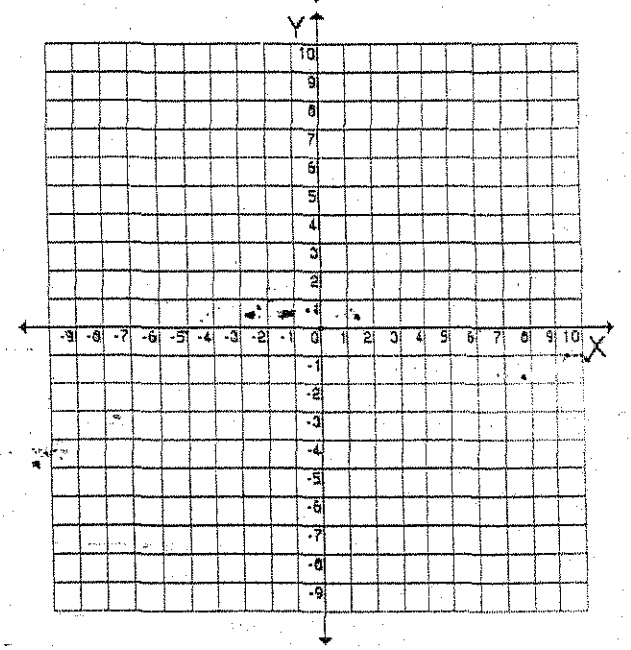
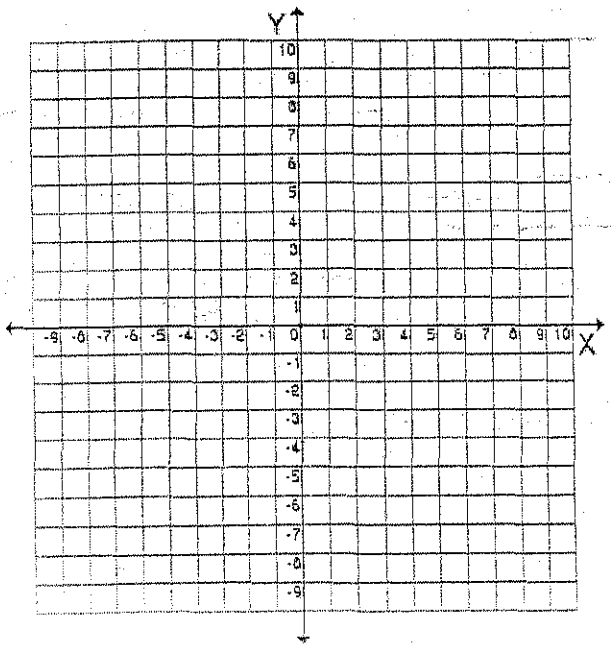
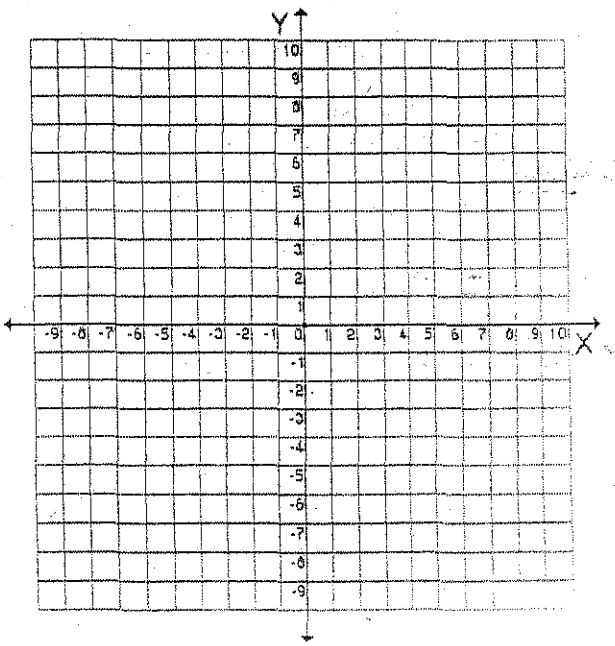

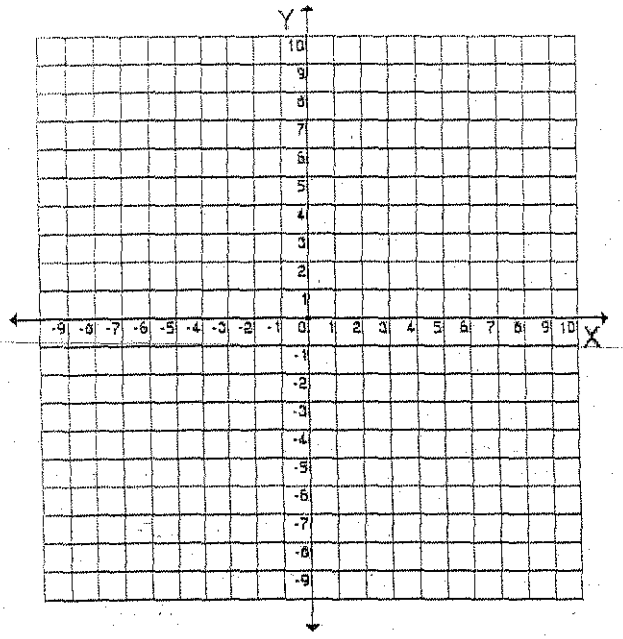
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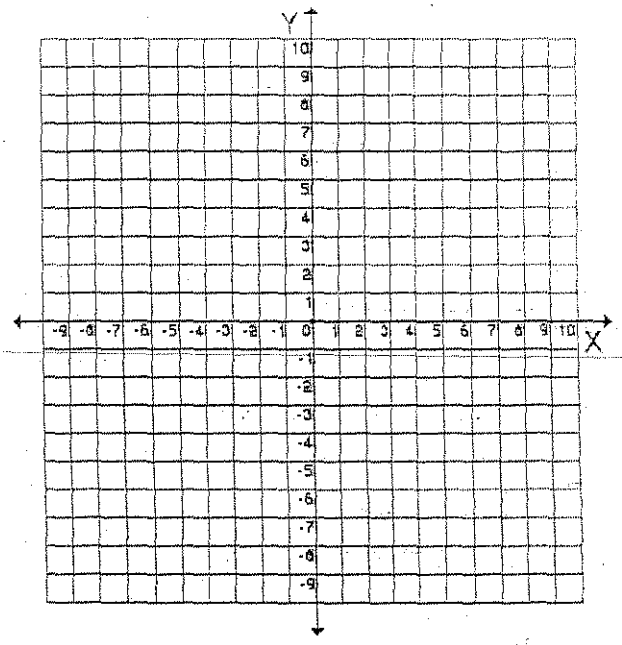
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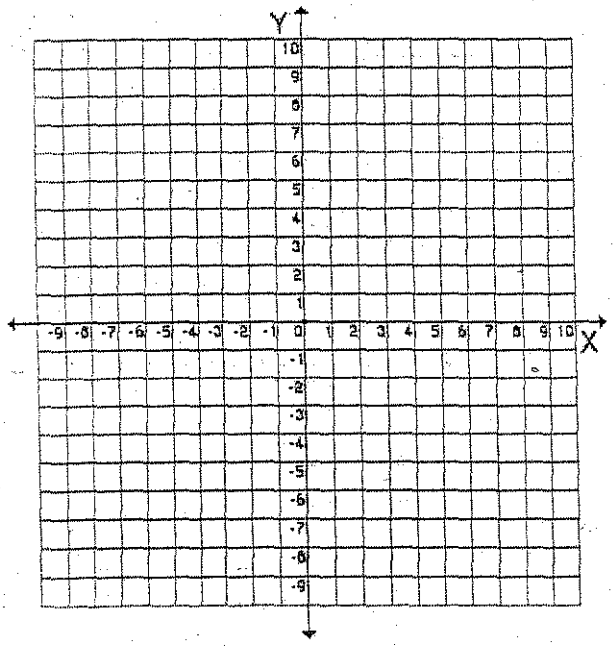
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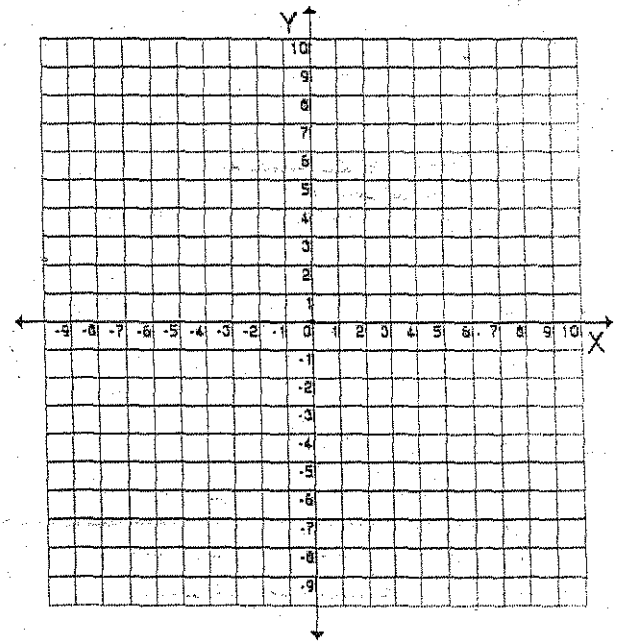
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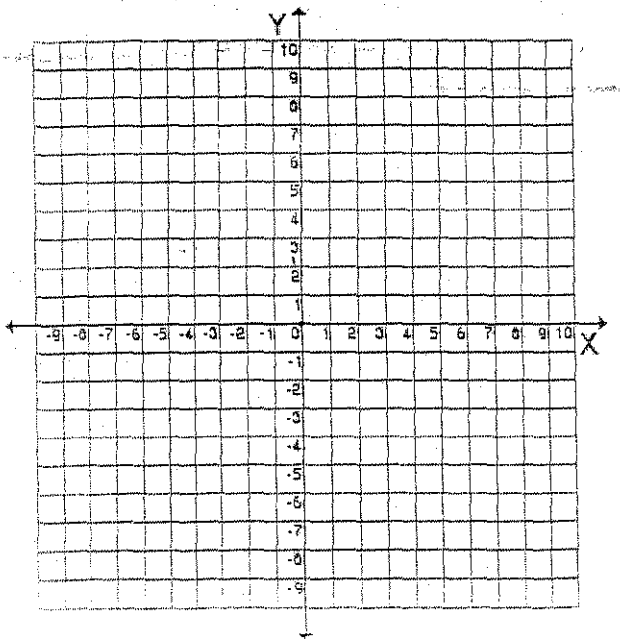
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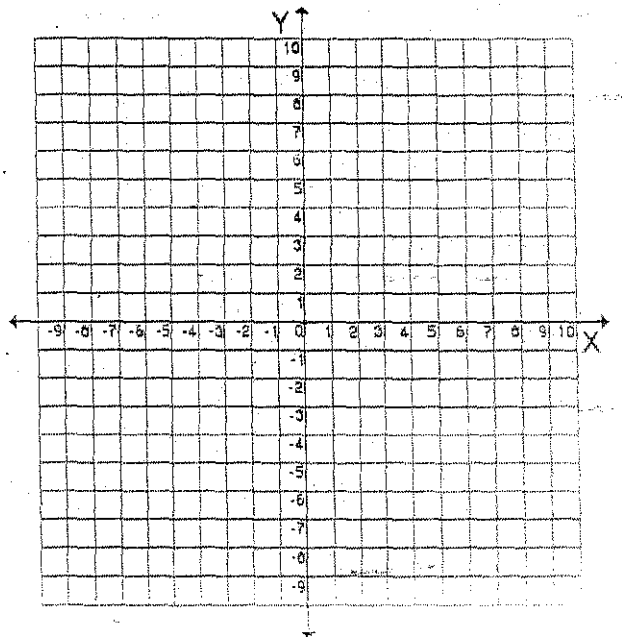
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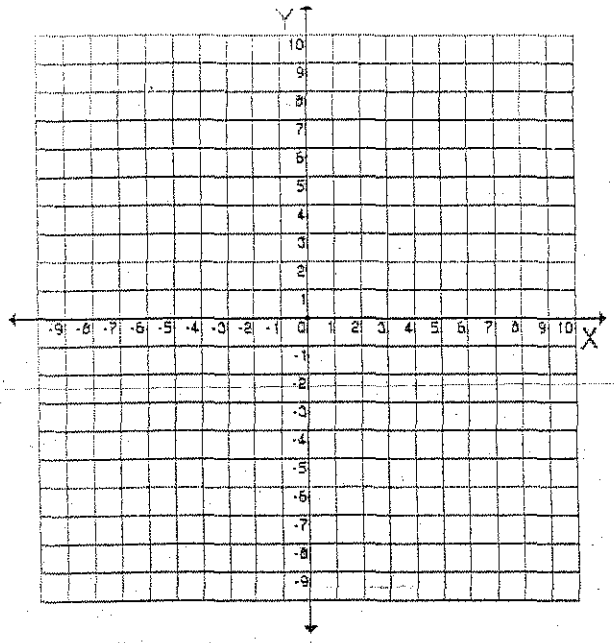
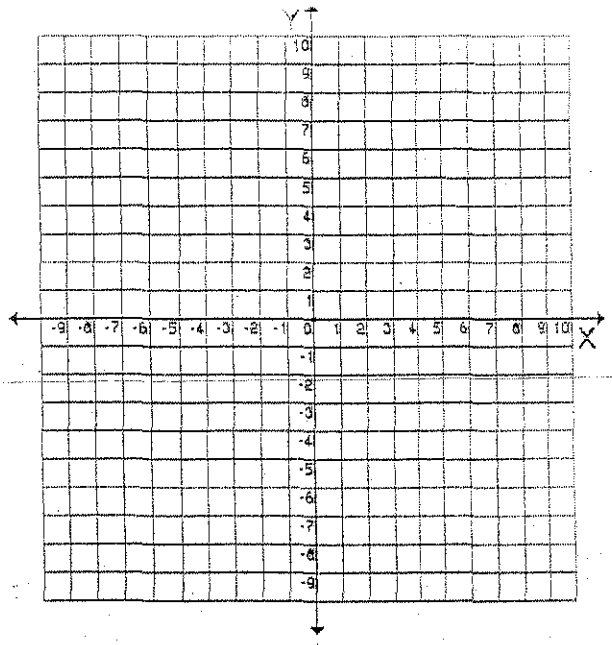
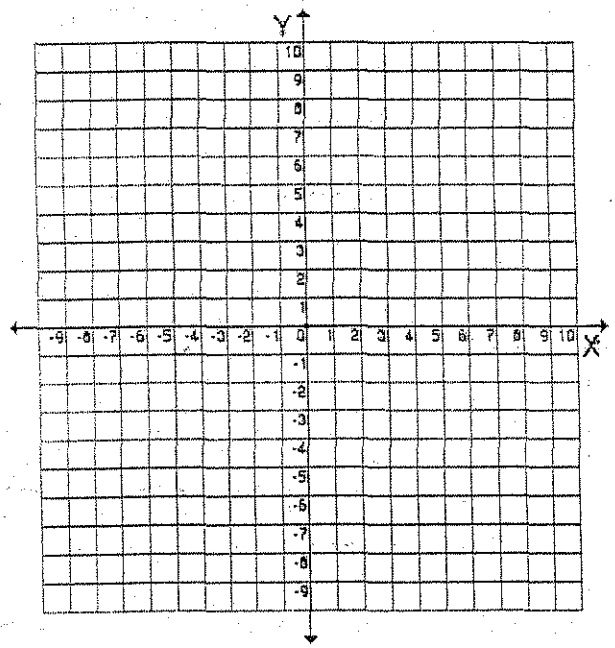
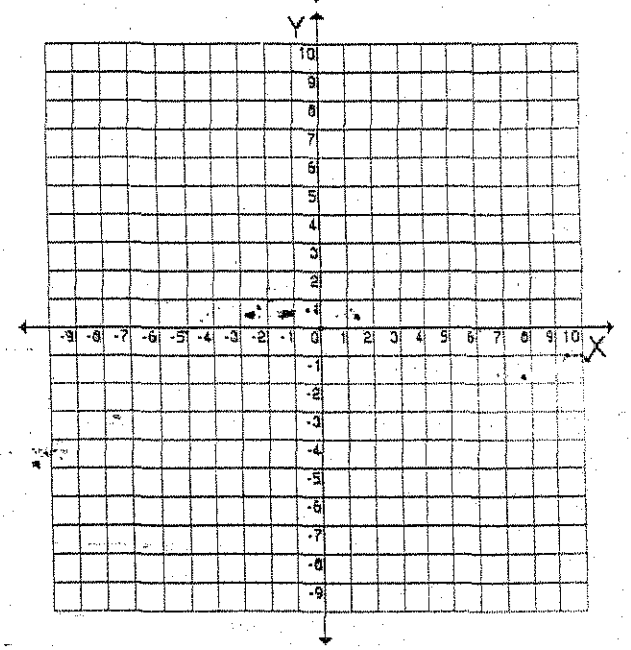
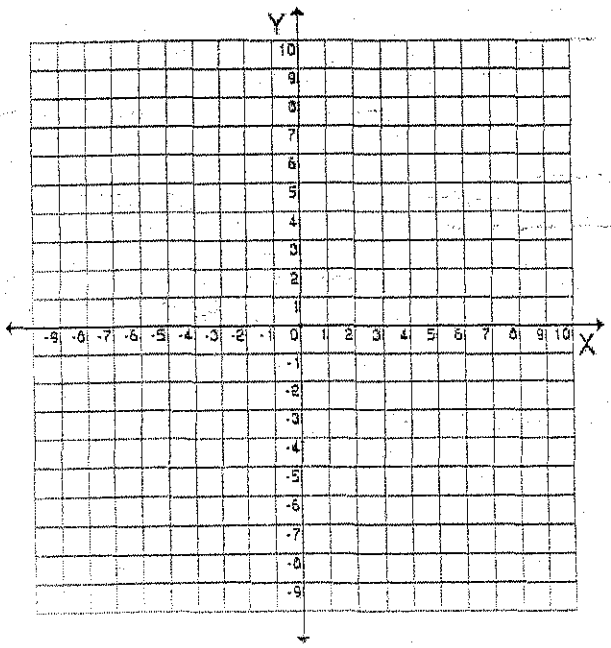
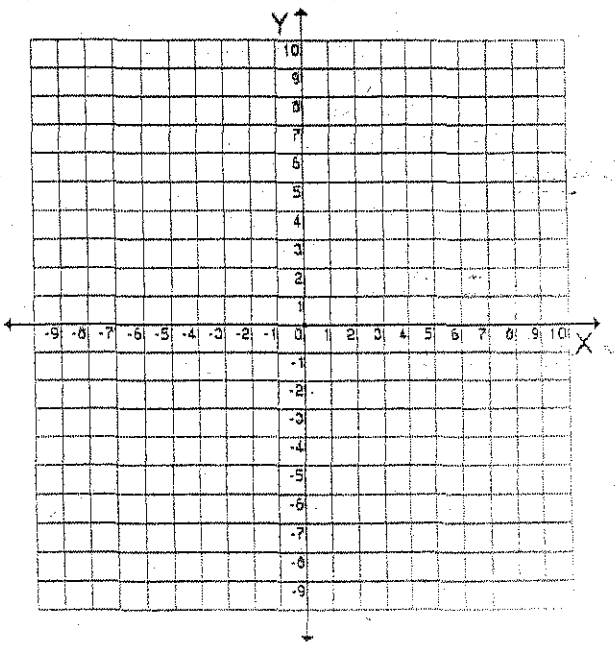

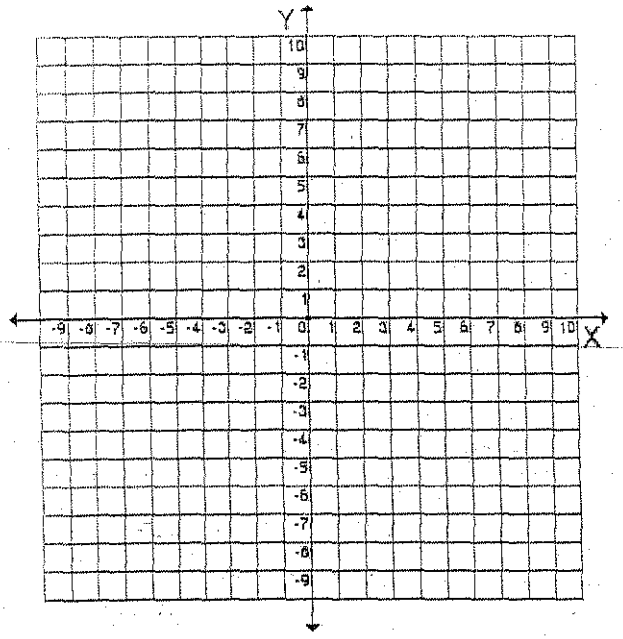
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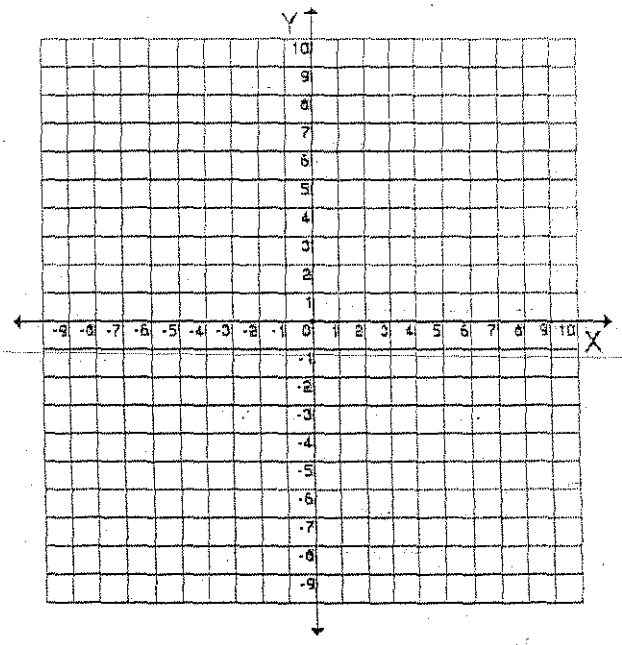
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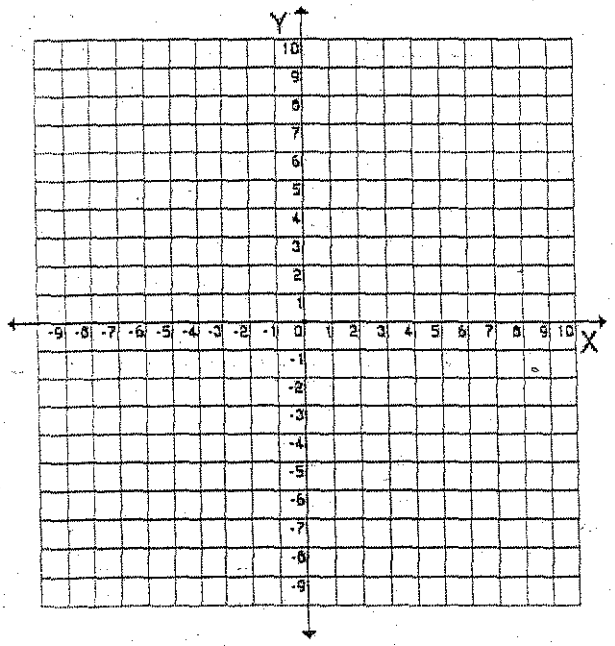
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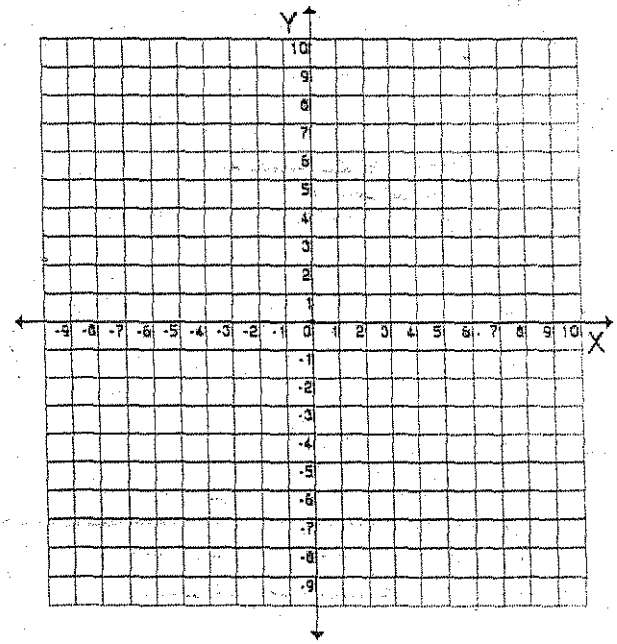
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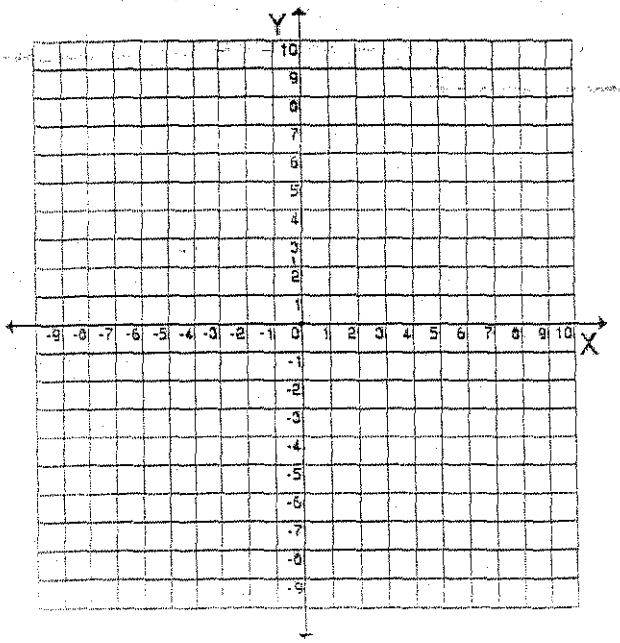
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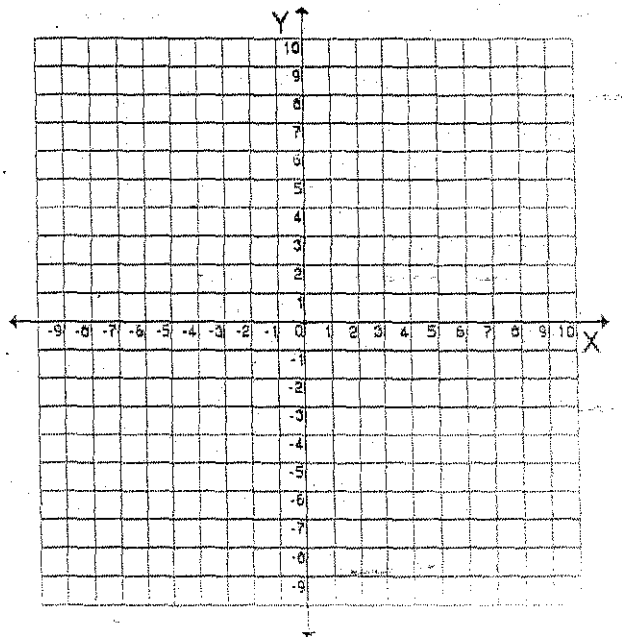
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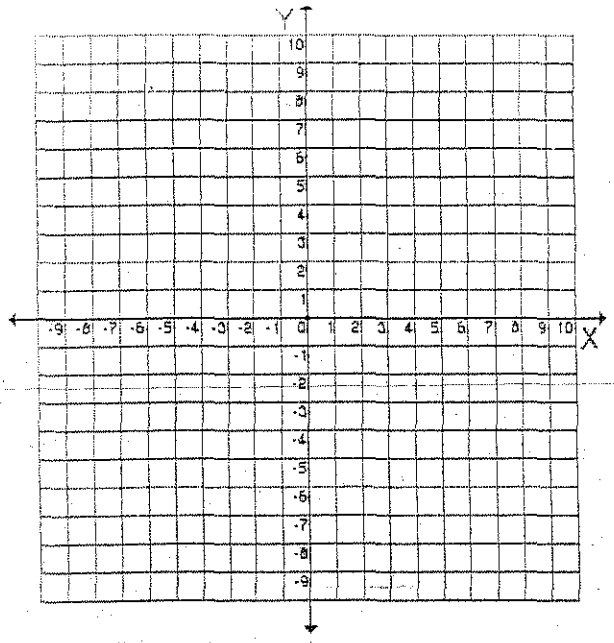
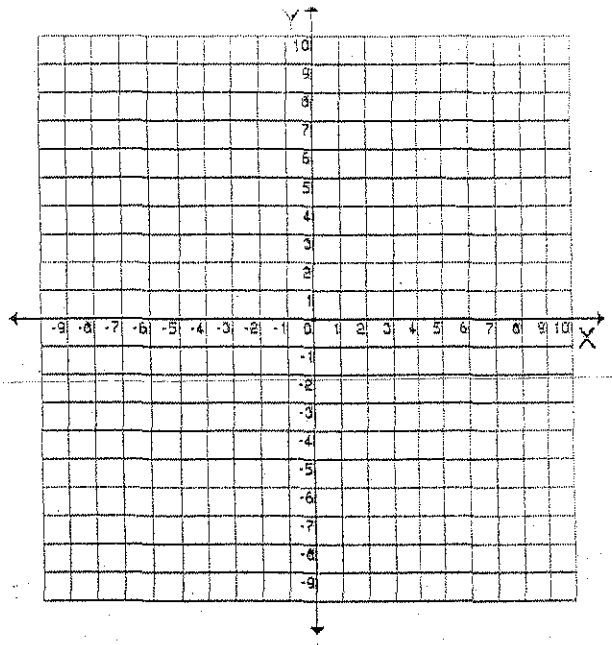
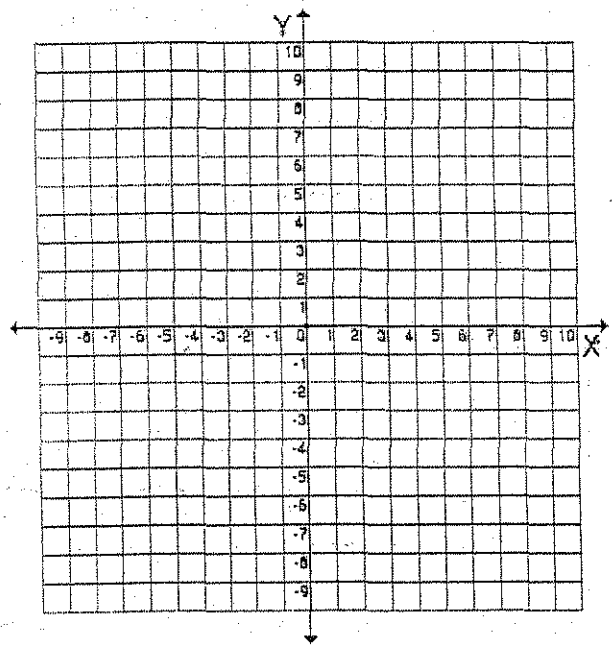
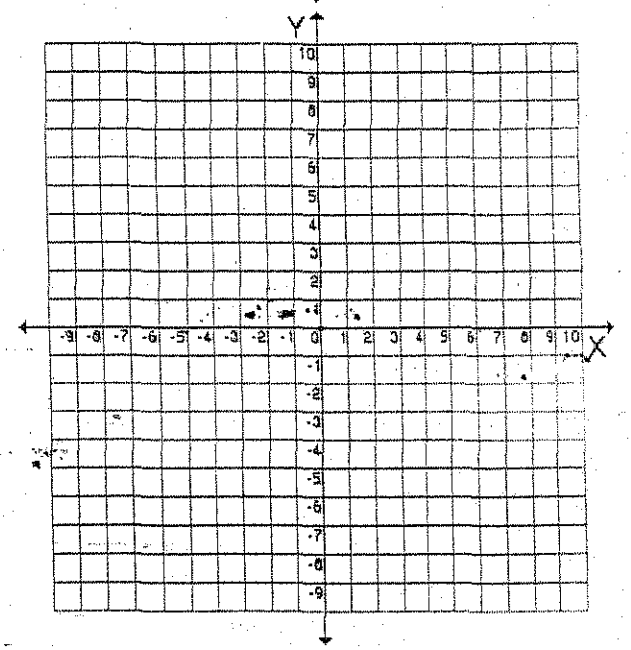
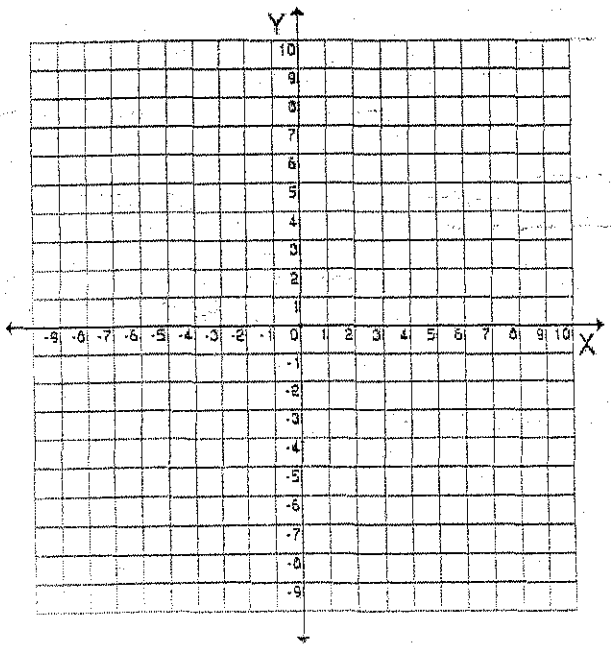
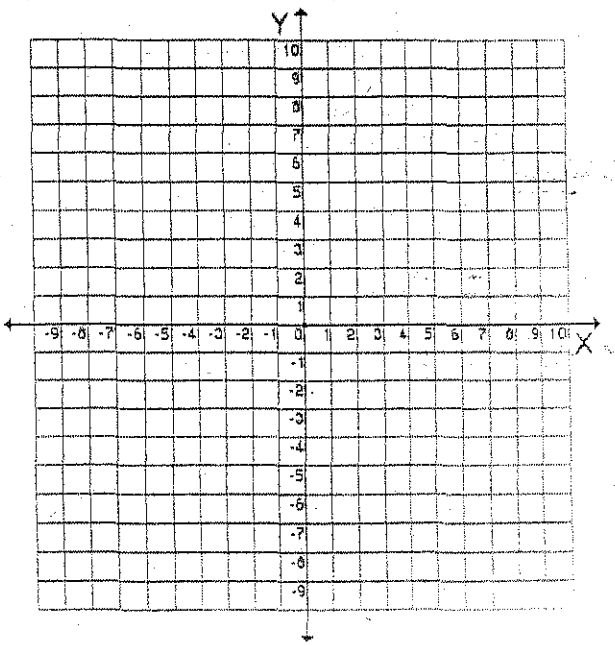

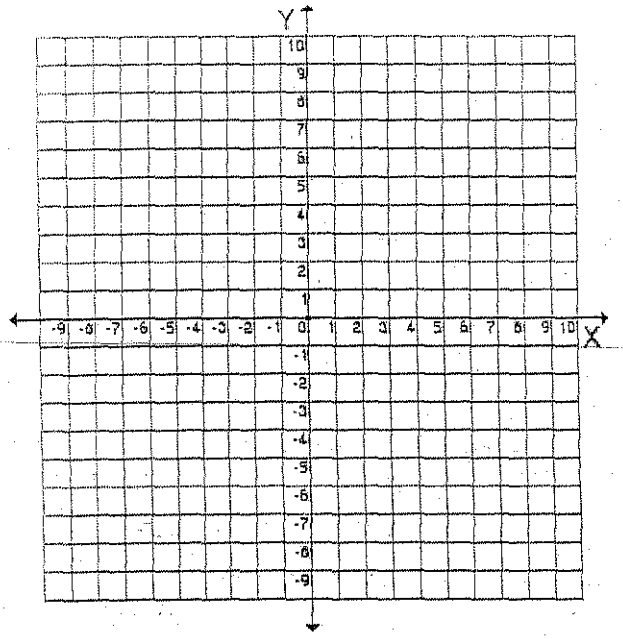
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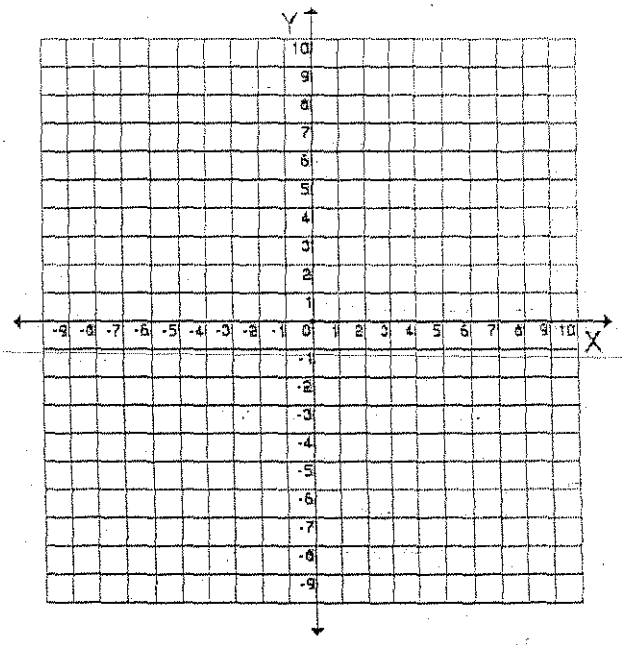
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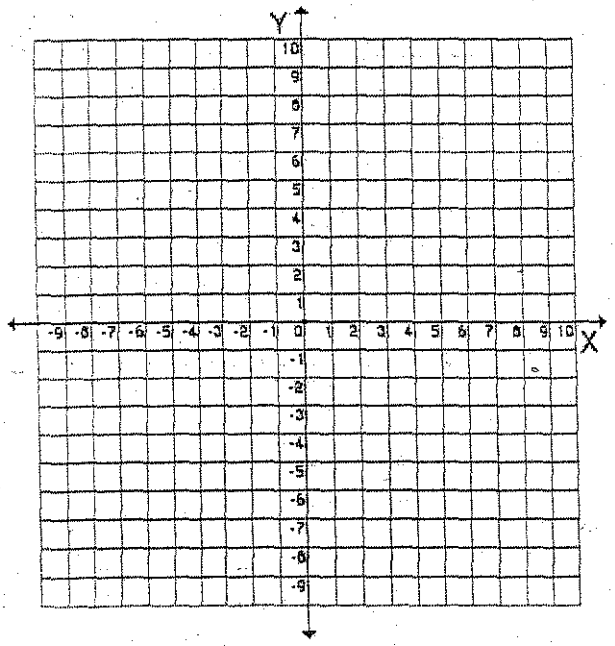
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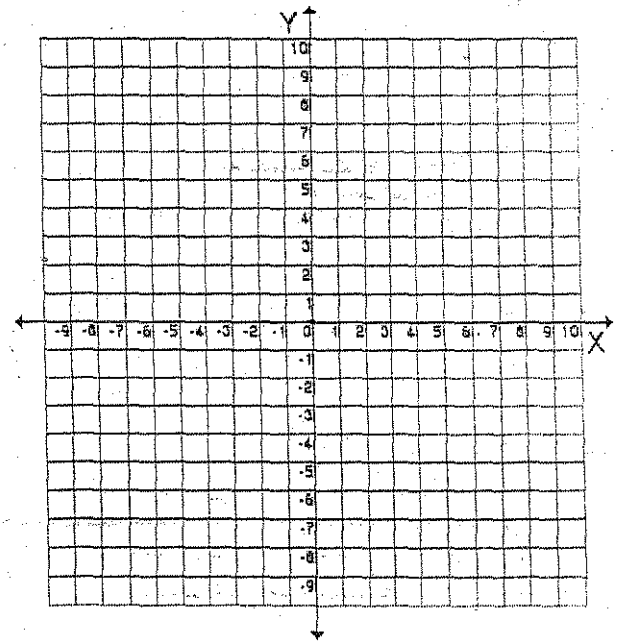
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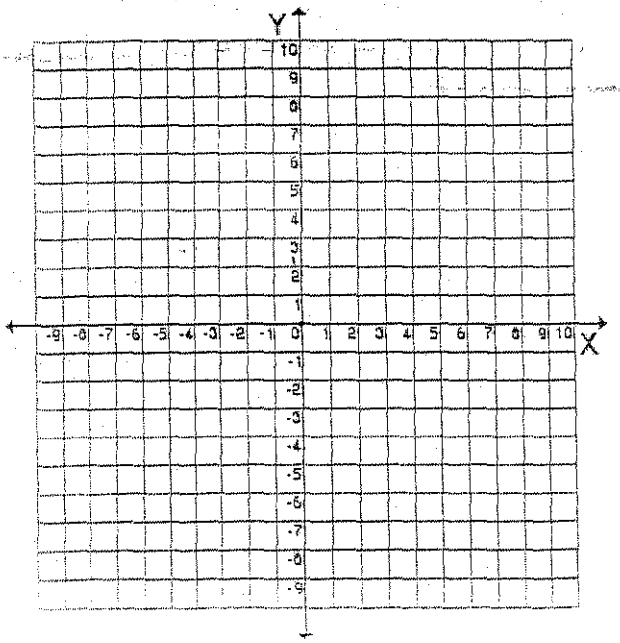
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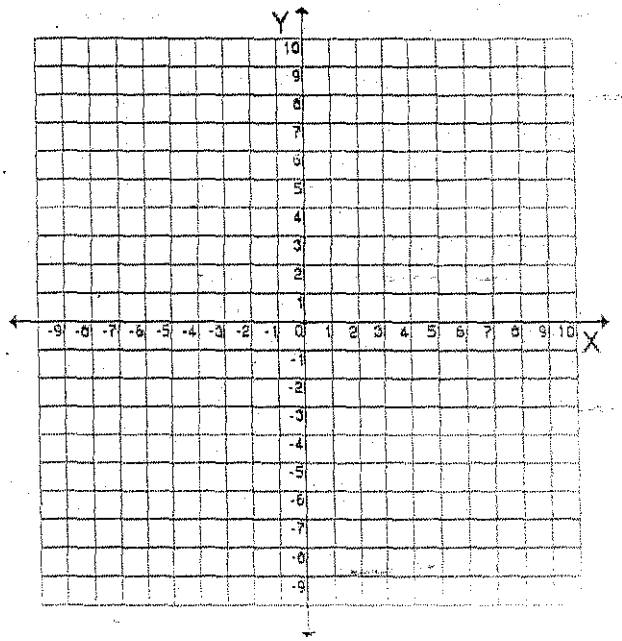
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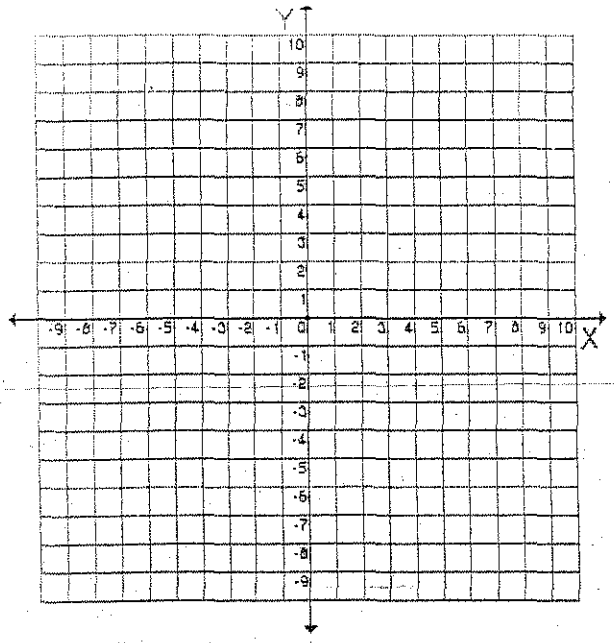
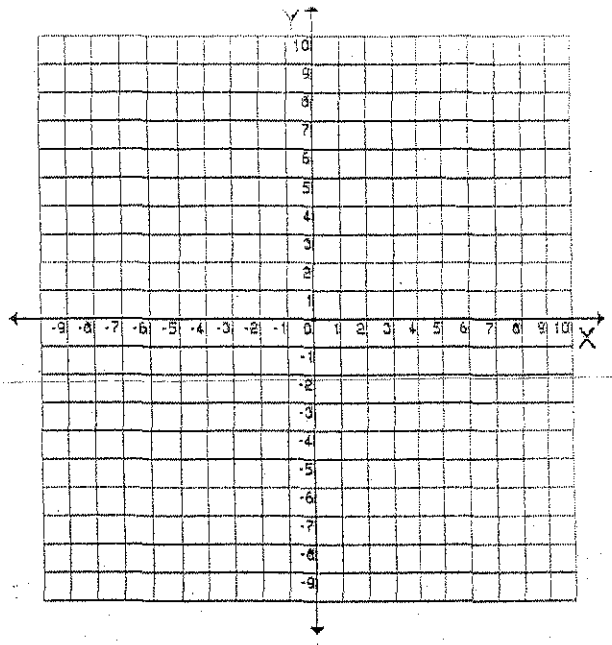
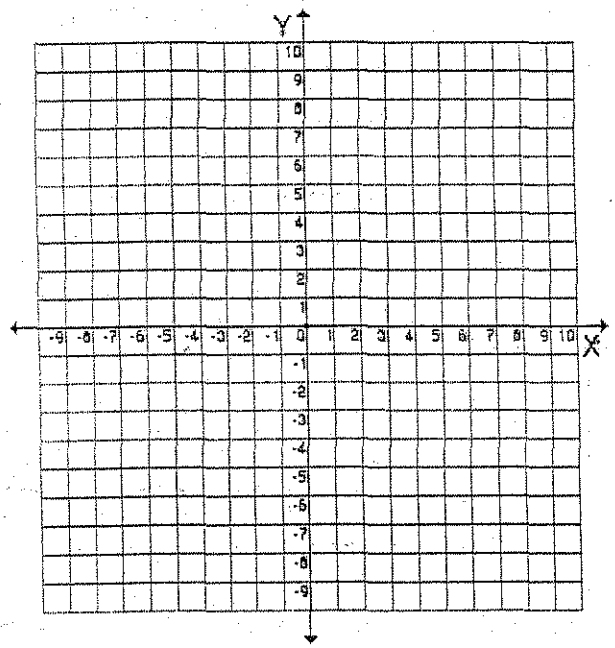
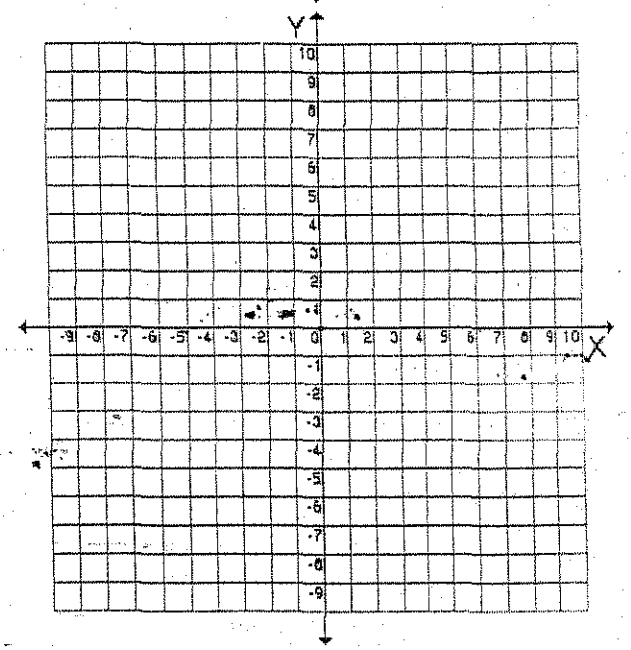
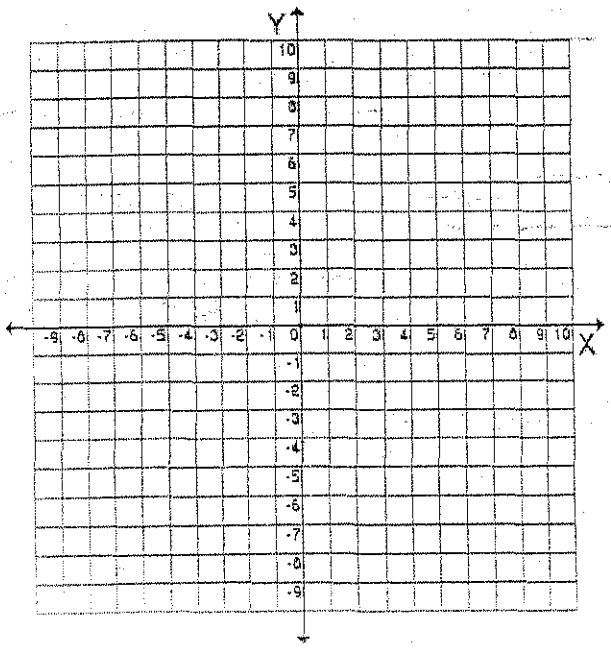
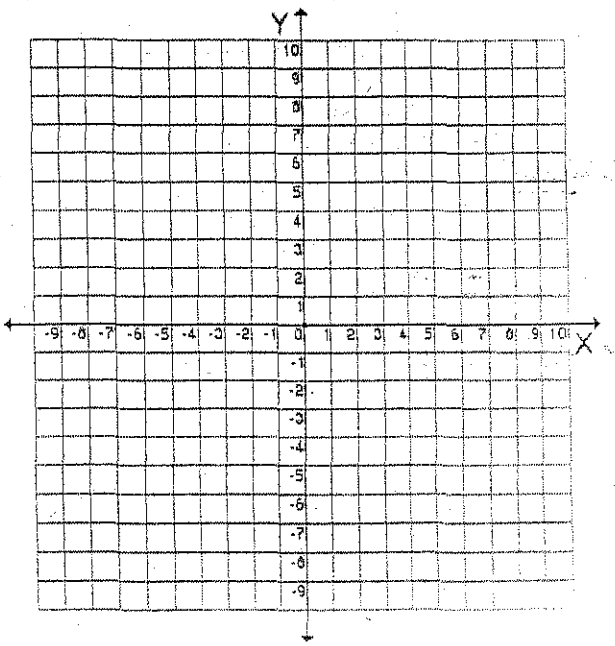

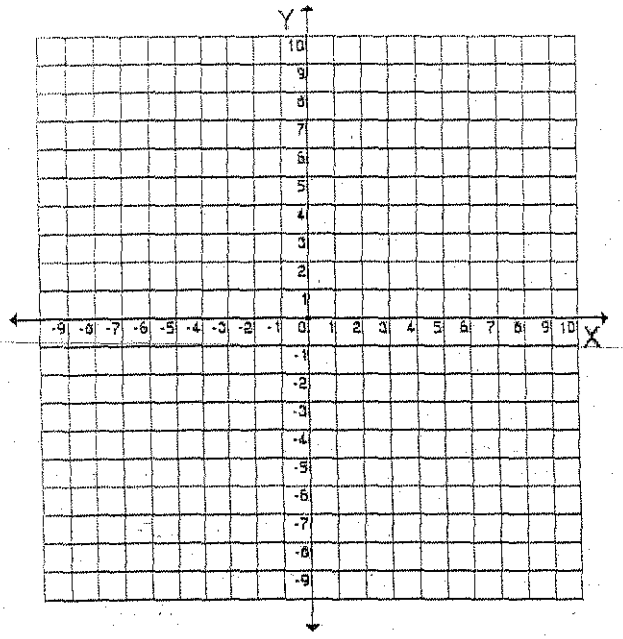
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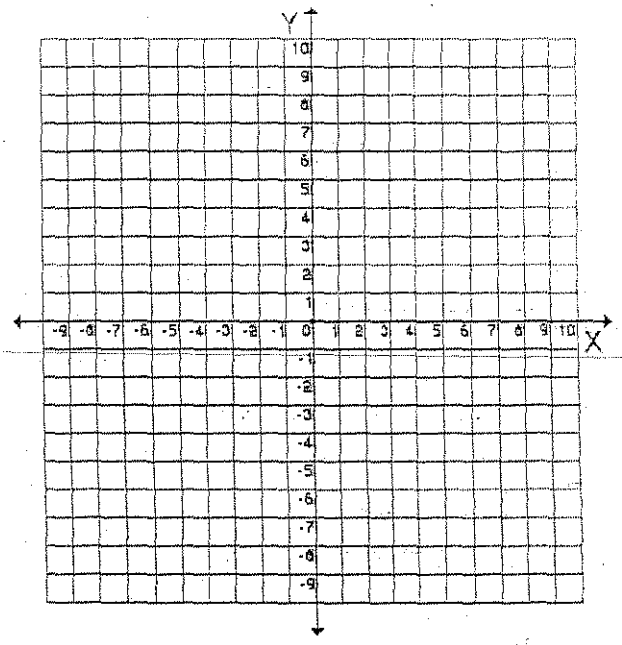
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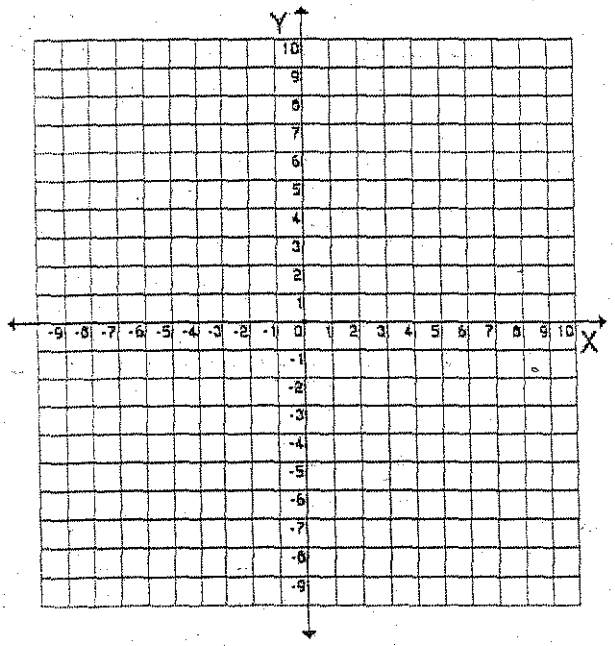
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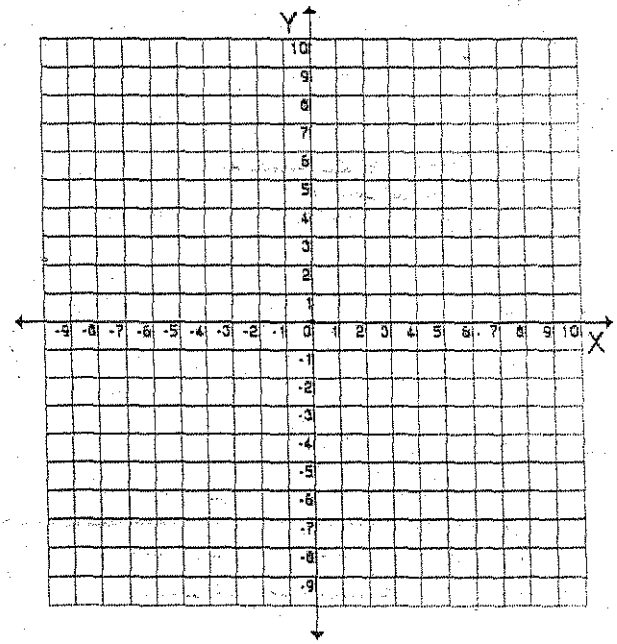
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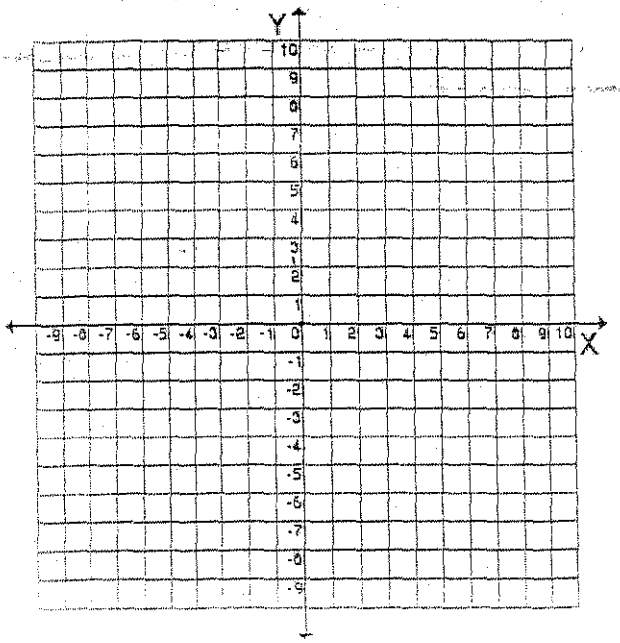
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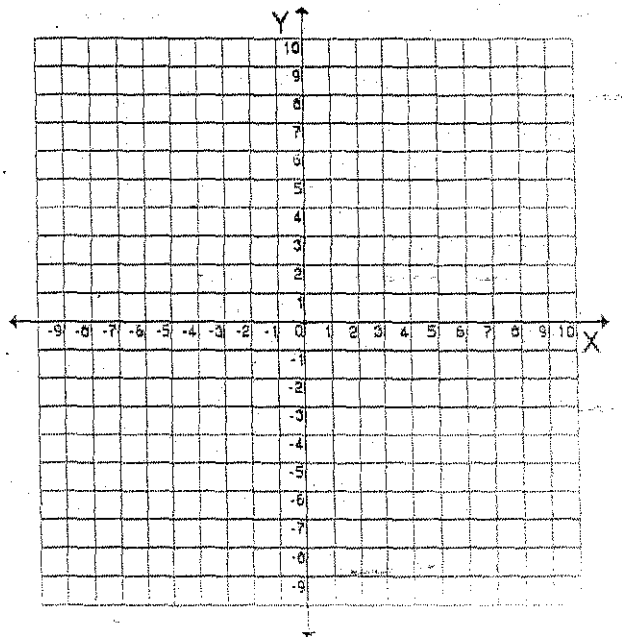
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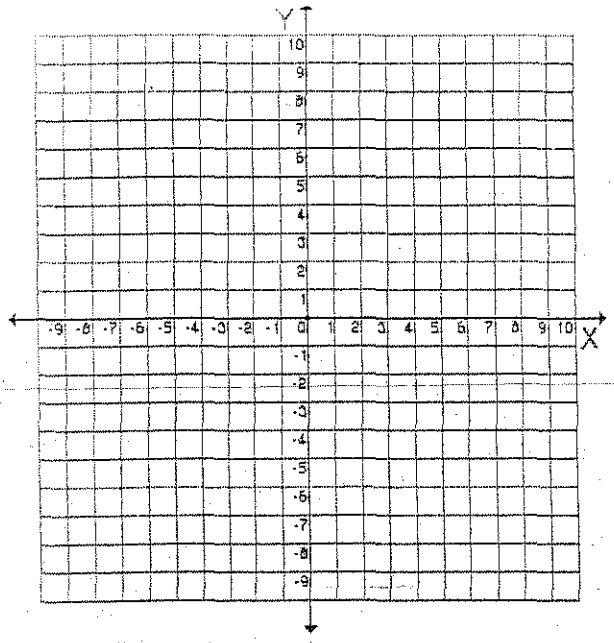
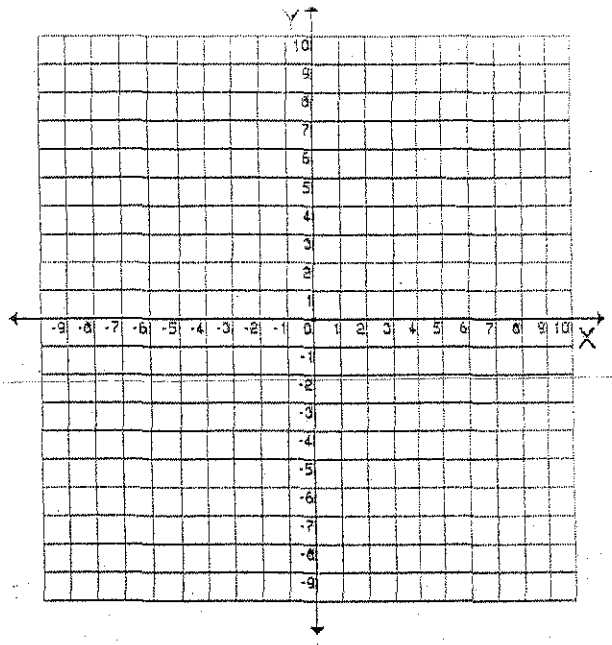
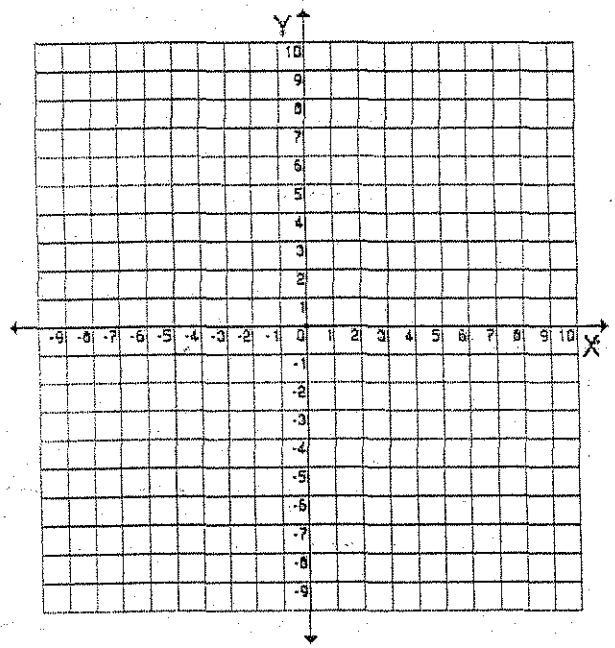
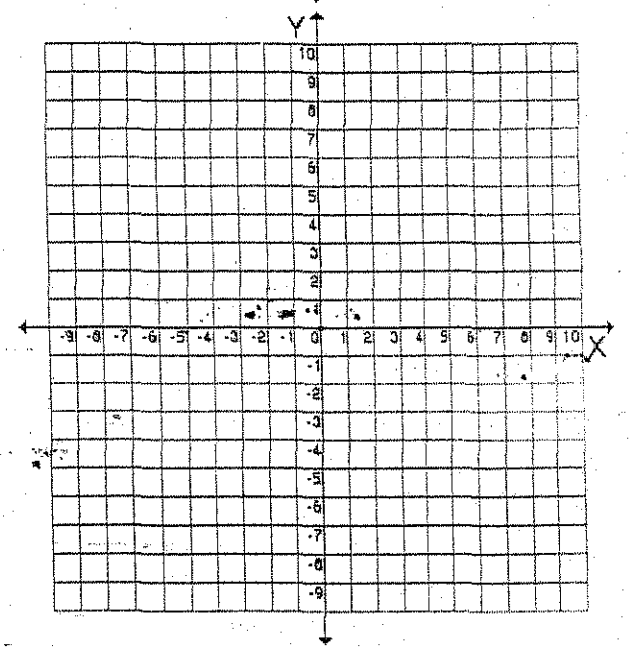
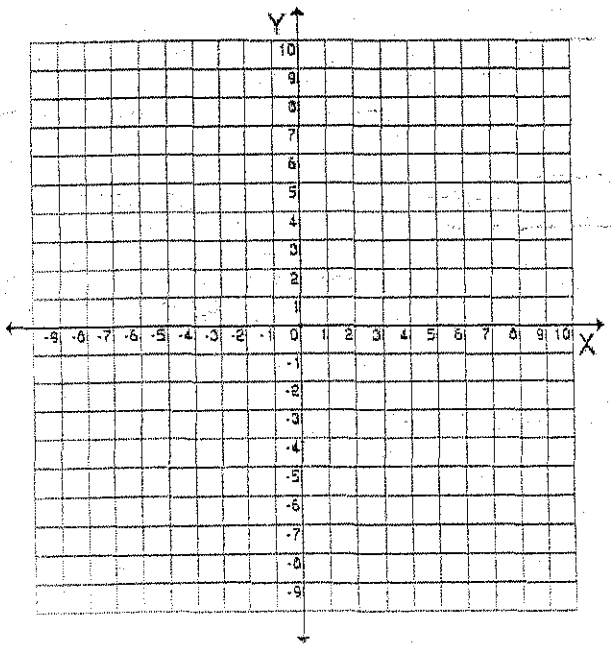
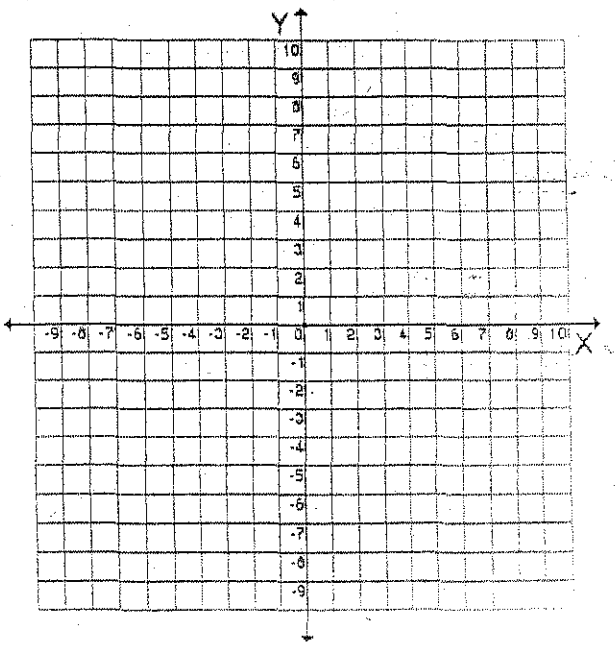
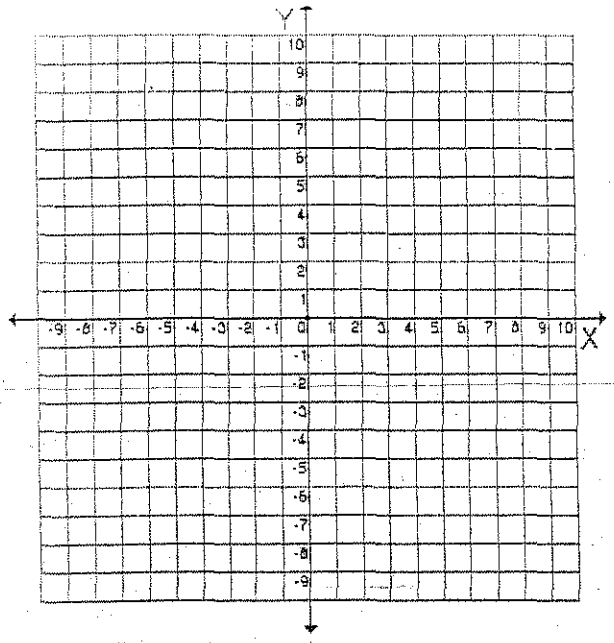
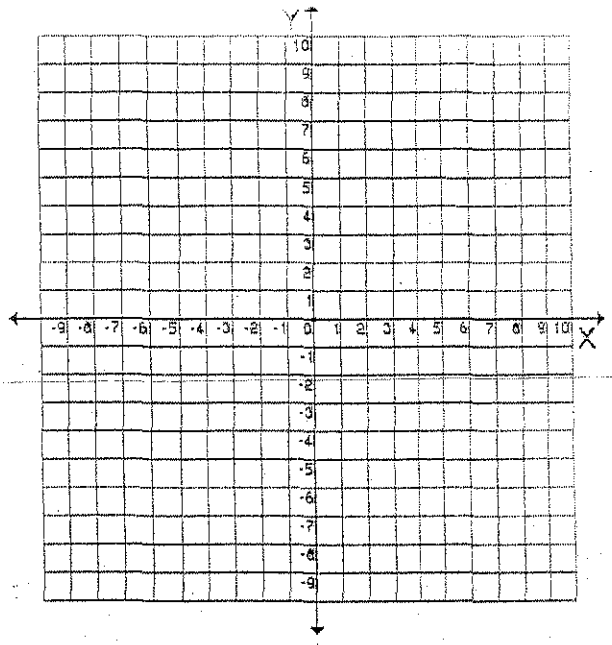
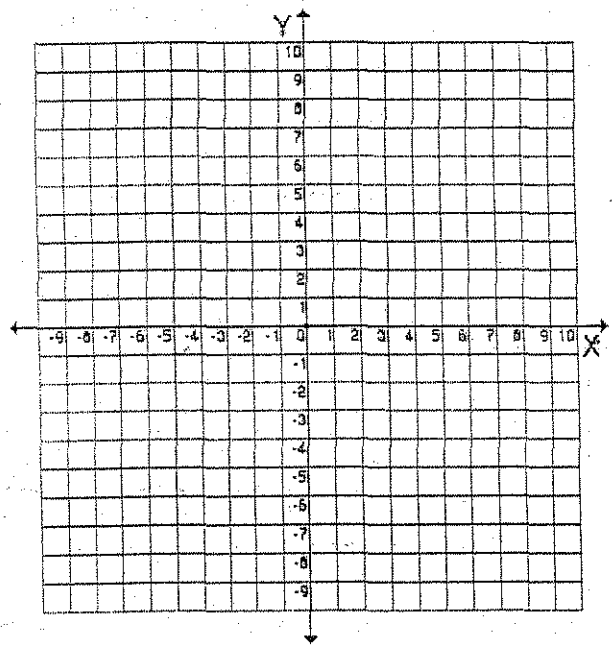
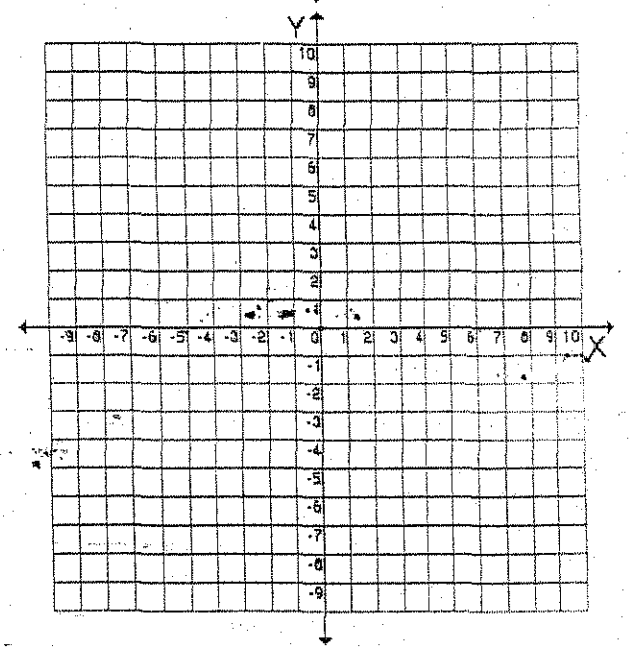
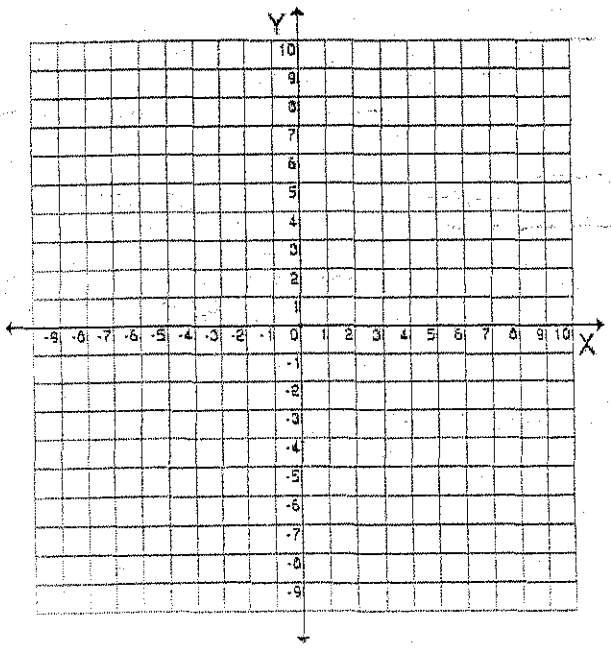
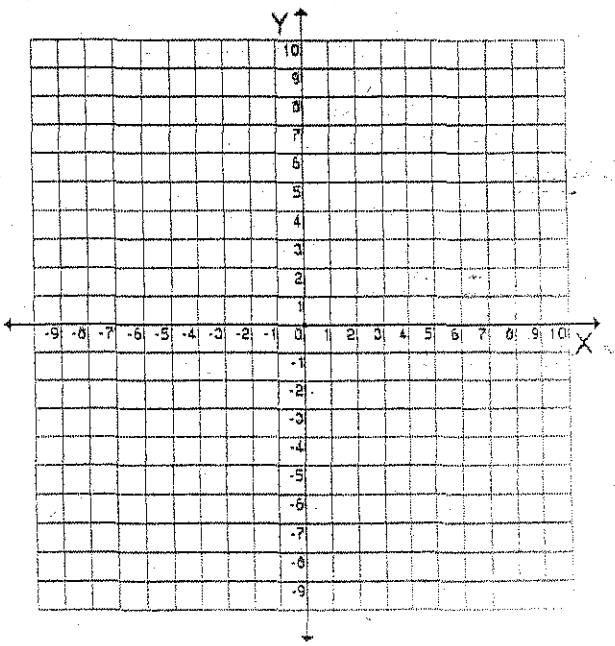







Name: _____ **Class:** _____ **Date:** _____ **ID: A**

FINAL EXAM ALGEBRA 1 SEMESTER 2 CHAPTERS 6-10 REVIEW

Multiple Choice
Identify the choice that best completes the statement or answers the question.

_____ **1** Simplify $(-4)^0$.

A. 1
B. $-\frac{1}{4}$
C. –4
D. 0

_____ **2** Evaluate $a^0 b^{-2}$ for $a = 2$ and $b = -2$.

A. 0
B. $\frac{1}{4}$
C. $\frac{1}{2}$
D. –4

_____ **3** Simplify.
$\frac{a^{-7} b^0}{c^4}$

A. $\frac{1}{a^7 c^4}$
B. $\frac{a^{-7}}{c^4}$
C. $\frac{a^7 b}{c^4}$
D. $\frac{b}{a^7 c^4}$

_____ **4** Simplify $\frac{9x^0 y^{-8}}{z^{-8}}$.

A. $\frac{9y^8}{z^8}$
B. $\frac{9z^8}{y^8}$
C. $9xy^8 z^8$
D. $\frac{9}{y^8 z^8}$

_____ **5** Find the value of the power 10^7.

A. 1000000
B. 0.0000001
C. 70
D. 10000000

_____ **6** Simplify $(-6) \cdot (-6)^2$.

A. –18
B. Cannot simplify
C. –216
D. $-\frac{1}{216}$

_____ **7** Simplify $m^3 \cdot y^6 \cdot m^2$.

A. $m^5 \cdot y^6$
B. $(m \cdot y)^{11}$
C. $m \cdot y^6$
D. $m^6 \cdot y^6$

_____ **8** Simplify $(8^7)^3$.

A. 8^{10}
B. 8^{21}
C. 8^4
D. 56^3

_____ **9** Simplify $(x^3)^{-8}x^4$.

A. x^{-20}
B. $\frac{1}{x^{96}}$
C. $\frac{1}{x^{20}}$
D. $\frac{1}{x^{20}}$

_____ **10** Simplify $(4x)^3$.

A. $64x$
B. $4x^3$
C. $64x^3$
D. $-64x^3$

_____ **11** Simplify $(m^2n^{-3})^2(-m^{-3}n^3)^3$.

A. $-\frac{n^3}{m^5}$
B. $-\frac{1}{m^{36}n^{54}}$
C. $-m^4n^5$
D. $-\frac{n^{243}}{m^{108}}$

_____ **12** Simplify $\frac{6^3}{6}$.

A. 3
B. 36
C. 1,296
D. Cannot simplify

_____ **13** Simplify $\frac{y^6z^{12}}{(yz)^3}$.

A. y^6z^{12}
B. y^3z^9
C. Cannot simplify
D. y^6z^4

_____ **14** Simplify $(8.82 \times 10^5) \div (9 \times 10^2)$ and write the answer in scientific notation.

A. 9.8×10^7
B. 98
C. 9.8×10^2
D. 9.8×10^4

_____ **15** Simplify $\left(\frac{4}{3}\right)^3$.

A. $\frac{27}{64}$
B. $\frac{64}{27}$
C. $-\frac{16}{3}$
D. $-\frac{1}{3}$

_____ **16** Simplify $\left(\frac{2}{4}\right)^{-3}$.

A. $-\frac{3}{4}$
B. 8
C. $-\frac{16}{3}$
D. $\frac{1}{8}$

_____ **17** Simplify.
$\left(\frac{5a}{b^2}\right)^{-2}$

A. $\frac{b^4}{25a^2}$
B. $\frac{b^4}{5^2a^2}$
C. $\frac{a^2}{25b^4}$
D. $\frac{5a^{-2}}{b^2}$

_____ **18** Simplify the expression $64^{\frac{2}{3}}$.

A. 16
B. 4
C. 12
D. 20

_____ **19** Simplify. All variables represent nonnegative numbers.
$\left(a^2 b^{\frac{1}{2}}\right)^8 \sqrt[6]{b^6}$

A. $a^{16}b^5$
B. $a^{16}b^4$
C. $a^{10}b^{\frac{19}{2}}$
D. a^2b^5

_____ **20** Find the degree of the monomial $-5a^7b^4$.

A. 7
B. 11
C. –5
D. 4

_____ **21** Find the degree of the polynomial $3x^3y^6 + 5xy + x^3$.

A. 6
B. 12
C. 9
D. 14

_____ **22** A toy rocket is launched from a platform 34 feet above the ground at a speed of 90 feet per second. The height of the rocket in feet is given by the polynomial $-16t^2 + 90t + 34$, where t is the time in seconds. How high will the rocket be after 3 seconds?

A. 160 feet
B. 126 feet
C. 2608 feet
D. 256 feet

_____ **23** Add or subtract.
$-10m + 2m^4 - 13m - 20m^4$

A. $-23m - 18m^4$
B. $-23m^2 - 18m^8$
C. $3m + 22m^4$
D. $-41m^5$

_____ **24** Subtract.
$(8b^4 - b^3) - (b^4 + 4b^3 - 4)$

A. $7b^4 - 5b^3 + 4$
B. $7b^4 - 5b^3$
C. $8b^4 - 5b^3 - 4$
D. $8b^4 + 4b^3 - 4$

_____ **25** Multiply.
$(\frac{2}{3}p^4y^3)(y^4s^5)(6p^2s^3)$

A. $4p^6y^7s^8$
B. $6\frac{2}{3}p^6y^7s^8$
C. $6\frac{2}{3}p^8y^{12}s^{15}$
D. $4p^8y^{12}s^{15}$

_____ **26** Multiply.
$9x^4y^5\left(-5x^3y^3 - 3y^3\right)$

A. $9x^8y^9 + 9x^5y^9$
B. $-45x^{12}y^{15} - 27y^{15}$
C. $4x^7y^8 + 6x^4y^8$
D. $-45x^7y^8 - 27x^4y^8$

_____ **27** Multiply.
$(n-5)(n-1)$

A. $n(n-1)-5(n-1)$
B. n^2-5n+5
C. n^2-6n+5
D. n^2+5

_____ **28** Multiply.
$(6w+6z)^2$

A. $36w^2+36wz+36z^2$
B. $36w^2+36z^2$
C. $36w^2+72wz+36z^2$
D. $12w^2+12z^2$

_____ **29** Multiply.
$(p-8)^2$

A. $p^2-16p-64$
B. $p^2+16p+64$
C. $p^2-16p-8$
D. $p^2-16p+64$

_____ **30** Multiply.
$(r+7)(r-7)$

A. r^2-49
B. r^2+14
C. $r^2-7r+49$
D. $2r-14$

_____ **31** Find the prime factorization of 70.

A. $2\cdot5$
B. $2\cdot5\cdot7$
C. $2^2\cdot3$
D. $2^3\cdot5^2\cdot7^2$

_____ **32** Find the GCF of 48 and 72.

A. 72
B. 24
C. 48
D. 144

_____ **33** Find the GCF of $2m^5$ and $32m^4$.

A. $32m^4$
B. m^4
C. $2m$
D. $2m^4$

_____ **34** Factor the polynomial $12y^3 + 33y^2 - 6y$.

A. $3y(4y^2 + 11y - 2)$
B. Cannot be factored
C. $3(4y^3 + 11y^2 - 2y)$
D. $y(12y^2 + 33y - 6)$

_____ **35** Factor $5(x - 2) - 9x(x - 2)$.

A. $-45x(x - 2)$
B. $(x - 2)(9x - 5)$
C. $(5 - 9x)(x - 2)(x - 2)$
D. $(x - 2)(5 - 9x)$

_____ **36** Factor $15x^3 - 6x^2 - 25x + 10$ by grouping.

A. $(5x - 2)(3x^2 - 5)$
B. $(5x - 5)(3x^2 - 2)$
C. $(15x - 2)(x^2 - 5)$
D. $(x - 2)(15x^2 - 5)$

_____ **37** Factor $x^2 + 101x + 100$.

A. $(x + 101)(x + 100)$
B. $(x + 2)(x + 50)$
C. $(x + 5)(x + 20)$
D. $(x + 1)(x + 100)$

_____ **38** Factor the trinomial $a^2 + 14a + 48$.

A. $(a + 14)(a + 1)$
B. $(a + 1)(a + 48)$
C. $(a + 6)(a + 8)$
D. $(a - 8)(a - 6)$

_____ **39** Factor the trinomial $r^2 + r - 20$.

A. $(r - 4)(r + 5)$
B. $(r - 5)(r - 4)$
C. $(r + 1)(r - 20)$
D. $(r - 1)(r - 20)$

_____ **40** Factor $x^2 + 20x + 36$. Check that the original polynomial and the factored form have the same values for x = 0, 1, 2, 3, and 4.

A. $(x + 20)(x + 36)$
B. $(x + 10)(x + 10)$
C. $(x + 4)(x + 9)$
D. $(x + 2)(x + 18)$

_____ **41** Factor the trinomial $x^4 + 50x^2 + 625$.

A. $2(x^2 + 25)^2$
B. $(x^2 + 50)^2$
C. $(x + 25)^4$
D. $(x^2 + 25)^2$

_____ **42** Factor $3x^2 + 2x - 8$.

A. $(x - 2)(3x + 4)$
B. $(x + 2)(3x + 4)$
C. $(x - 2)(3x - 4)$
D. $(x + 2)(3x - 4)$

_____ **43** Factor $2x^2 + 7x + 6$.

A. $(x + 3)(2x + 2)$
B. $(x + 2)(2x - 3)$
C. $(x + 2)(x + 3)$
D. $(x + 2)(2x + 3)$

_____ **44** Factor the trinomial $42n^2 - n - 30$.

A. Cannot be factored
B. $(6n - 5)(7n + 6)$
C. $(6n + 6)(7n - 5)$
D. $(6n + 5)(7n - 6)$

_____ **45** Find all possible values of b such that $4x^2 + bx + 3$ can be factored.

A. 7, 8
B. 7, 8, 13
C. 7
D. 8, 13

_____ **46** Tell whether the polynomial $6y^2(y^2 + 6y + 9)$ is completely factored. If not, factor it.

A. Yes.
B. No; $6y^2(y + 3)(y - 3)$.
C. No; $6y^4 + 36y^3 + 54y^2$.
D. No; $6y^2(y + 3)^2$.

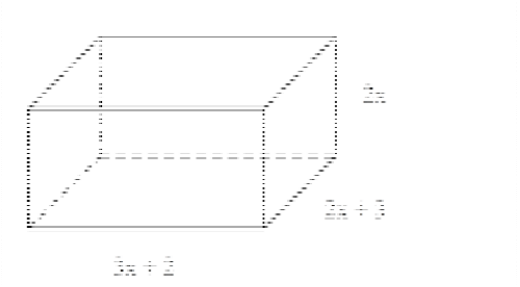
_____ **47** Factor $27x^2z + 36xz + 12z$ completely.

A. $z(3x + 12)^2$
B. $3z(3x + 2)^2$
C. $12z(2x^2 + 3x + 1)$
D. $3z(3x + 2)(3x - 2)$

_____ **48** Factor the polynomial $30x^3 + 22x^2 + 4x$ completely.

A. $2x(5x + 1)(3x + 2)$
B. $2x(5x + 2)(3x + 1)$
C. $(10x^2 + 4x)(3x + 1)$
D. $2(5x + 2)(3x + 1)$

_____ **49** Write a polynomial that represents the volume of the prism using x.

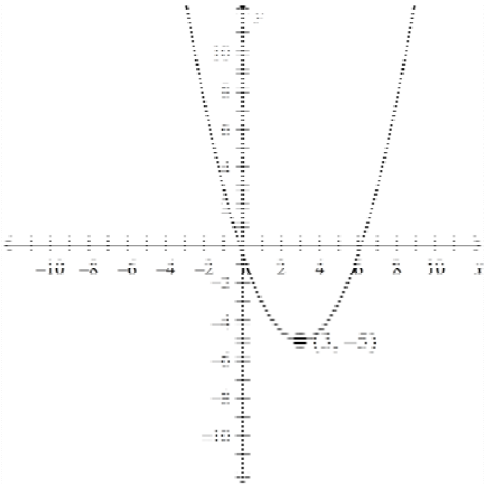


A. $7x + 5$
B. $12x^3 + 26x^2 + 12x$
C. $12x^2 + 26x + 12$
D. $12x^3 + 10x$

_____ **50** Tell whether the function $y + 2x^2 = -2$ is quadratic. Explain.

A. This is not a quadratic function because the x-term is missing.
B. This is a quadratic function because it can be written in standard form as $y = -2x^2 - 2$.
C. This is not a quadratic function because it is not written in standard form.
D. This is a quadratic function because it has an x^2 term.

_____ **51** Find the domain and range.



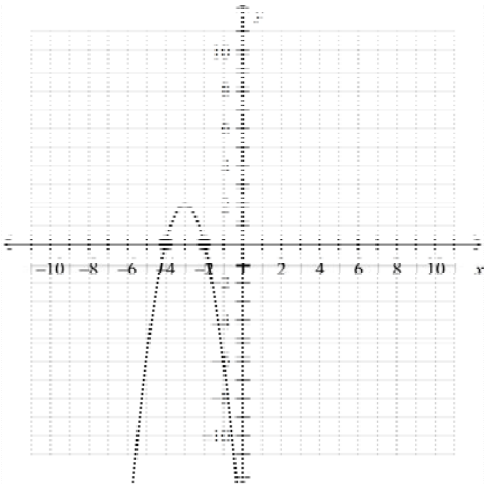
A. D: all real numbers
R: $y \geq 3$

B. D: $-10 \leq x \leq 10$
R: $y \geq -5$

C. D: all real numbers
R: $y \geq -5$

D. D: $x \geq -5$
R: all real numbers

_____ **52** Find the vertex of the parabola $y = -2x^2 - 12x - 16$.



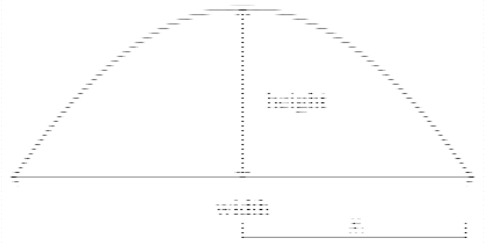
A. (–3, 2)

B. (2, –3)

C. (–2, 0) and (–4, 0)

D. (3, –70)

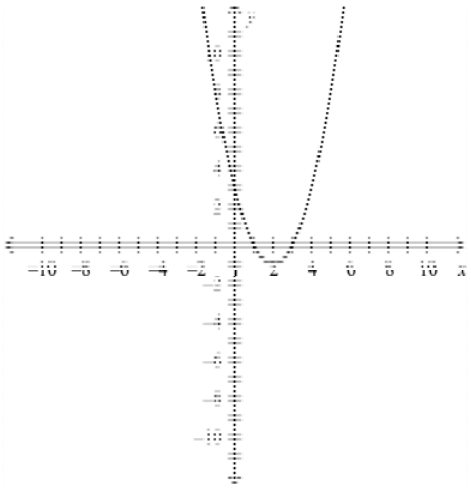
_____ **53** The height of a curved support beam can be modeled by $f(x) = -\frac{x^2}{300} + 12$. Find the height and width of the beam.



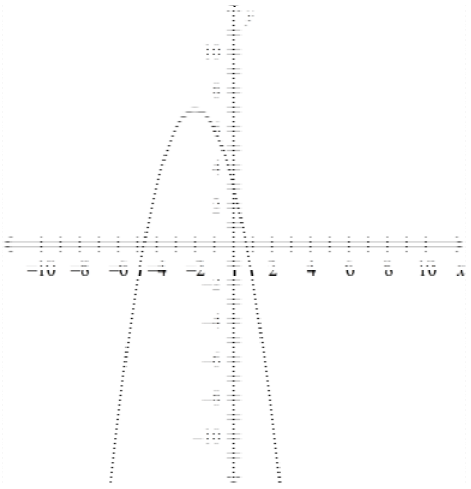
A. height = 25 units; width = 60 units
B. height = 12 units; width = 60 units
C. height = 25 units; width = 120 units
D. height = 12 units; width = 120 units

_____ **54** Graph $y = -x^2 - 4x - 3$.

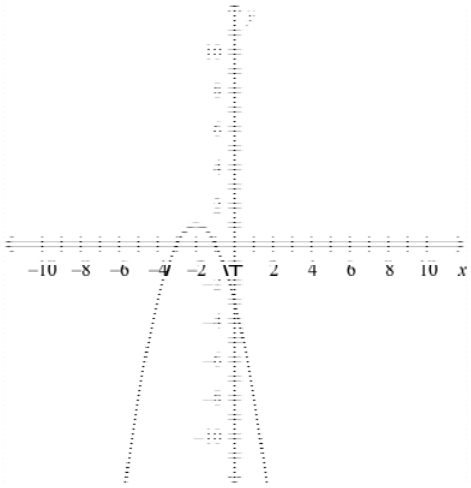
A.



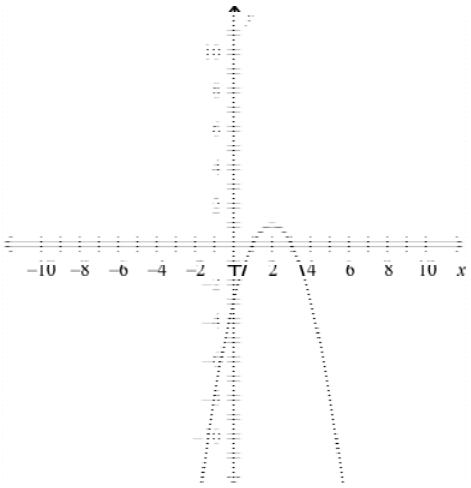
C.



B.



D.



_____ **55** Solve the equation $x^2 + 2x - 3 = 0$ by graphing the related function.

A. The solutions are 1 and –3.
B. The solutions are –1 and –4.
C. The solutions are 2 and –3.
D. The solutions are –1 and 3.

_____ **56** Solve the equation $-x^2 + 10x - 25 = 0$ by graphing the related function.

A. $y = 5$
B. $x = 5$
C. $x = 0$
D. $x = -5$

_____ **57** A kicker starts a football game by "kicking off". The quadratic function $y = -16x^2 + 60x$ models the football's height after x seconds. How long is the football in the air?

A. 1.94 sec
B. 6.63 sec
C. 15 sec
D. 3.75 sec

_____ **58** Use a graphing calculator to find approximate solutions of the equation $0 = -1.04x^2 + 5.2208x - 5.15268$.

A. (1.4, 2.5)
B. (4, 0)
C. (4, 0) and (1, 0)
D. (2.5, 1.4) and (1, 0)

_____ **59** Use the Zero Product Property to solve the equation $(x + 4)(x - 3) = -10$.

A. The solutions are –2 and 1.
B. The solutions are 4 and –3.
C. The solutions are –4 and 3.
D. The solutions are 2 and –1.

_____ **60** Solve the quadratic equation $x^2 + 2x - 8 = 0$ by factoring.

A. –4 and 2
B. 4 and 2
C. –4 and –2
D. 4 and –2

_____ **61** Solve the quadratic equation $12z^2 + 24z + 12 = 0$ by factoring.

A. $-\frac{1}{3}$
B. 1
C. –1
D. $\frac{1}{2}$

_____ **62** The height of an arrow that is shot upward at an initial velocity of 40 meters per second can be modeled by $h = 40t - 5t^2$, where h is the height in meters and t is the time in seconds. Find the time it takes for the arrow to reach the ground.

A. 6 sec
B. 4 sec
C. 8 sec
D. 2 sec

_____ **63** Solve $x^2 = -4$ by using square roots.

A. The solutions are 2 and –2.
B. The solution is 2.
C. There is no solution.
D. The solution is –2.

_____ **64** Solve $x^2 - 10 = 0$. If necessary, round to the nearest hundredth.

A. ±3.16
B. 100
C. ±20
D. There is no solution as you cannot take the square root of a negative number.

_____ **65** Solve $3x^2 - 6x + 1 = 0$. If necessary, round to the nearest hundredth.

A. $x \approx 1.82$ or $x \approx 0.18$
B. $x \approx 6.82$ or $x \approx 5.18$
C. There are no solutions.
D. $x \approx 10.90$ or $x \approx 1.10$

_____ **66** Complete the square for $x^2 - 14x +$? to form a perfect square trinomial.

A. $x^2 - 14x - 196$
B. $x^2 - 14x + 49$
C. $x^2 - 14x + 196$
D. $x^2 - 14x - 49$

_____ **67** Solve $r^2 - 4r = 12$ by completing the square.

A. 3 and –2
B. 6 and –2
C. 3 and 0
D. 6 and 3

_____ **68** Solve $2x^2 + 12x = -10$ by completing the square.

A. The solution is –5.
B. There is no solution.
C. The solutions are –1 and 5.
D. The solutions are –1 and –5.

_____ **69** Solve $3x^2 - 6x + 1 = 0$ by using the Quadratic Formula. If necessary, round to the nearest hundredth.

A. $x \approx 1.82$ or $x \approx 0.18$
B. $x \approx 6.82$ or $x \approx 5.18$
C. There are no solutions.
D. $x \approx 10.90$ or $x \approx 1.10$

_____ **70** Find the number of solutions of the equation $6x^2 + 4x + 4 = 0$ by using the discriminant.

A. There is one solution.
B. Cannot determine the number of solutions. The discriminant can only be used for a quadratic equation, and $6x^2 + 4x + 4 = 0$ is not a quadratic equation.
C. There are no real solutions.
D. There are two solutions.

_____ **71** Solve $c^2 + 10c + 16 = 0$.

A. $c = -8$ or $c = -2$
B. $c = 2$ or $c = 8$
C. $c = 1$ or $c = 16$
D. $c = 10$ or $c = 1$

____ **72** Simplify $\sqrt{\frac{z^{11}}{81z}}$. The variable represents a nonnegative number.

A. $\frac{\sqrt{z^{10}}}{9}$

B. $\frac{z^5}{9}$

C. $\frac{z^{10}}{81}$

D. $\sqrt{\frac{z^5}{9}}$

____ **73** Simplify $\sqrt{\frac{300}{49}}$.

A. $\frac{3\sqrt{10}}{7}$

B. $\frac{3}{7}$

C. $\frac{10\sqrt{3}}{7}$

D. $\frac{30}{7}$

____ **74** Subtract.
$3\sqrt{3} - 15\sqrt{3}$

A. $-12\sqrt{3}$

B. $18\sqrt{6}$

C. $18\sqrt{3}$

D. -12

____ **75** Find the perimeter of a triangle whose side lengths are 7 cm, $5\sqrt{3}$ cm, and $\sqrt{12}$ cm. Give the answer as a radical expression in simplest form.

A. $(7 + 5\sqrt{3} + \sqrt{12})$ cm

B. $(7 + 7\sqrt{3})$ cm

C. $(7 + 9\sqrt{3})$ cm

D. $14\sqrt{3}$ cm

____ **76** Multiply $\left(\sqrt{10} - 9\right)^2$. Write the product in simplest form.

A. $91 - 18\sqrt{10}$

B. -71

C. $73\sqrt{10}$

D. $-71 - 18\sqrt{10}$

____ **77** Simplify $\frac{9}{\sqrt{6} - \sqrt{5}}$.

A. $9\sqrt{6} + 9\sqrt{5}$

B. 9

C. $\frac{9\sqrt{6} + 9\sqrt{5}}{\sqrt{6} - \sqrt{5}}$

D. $9\sqrt{6} - 9\sqrt{5}$

_____ **78** Find the excluded values of the rational expression $\frac{3}{n^2 - 5n + 4}$.

A. The excluded values are –4 and –1.
B. The excluded values are 3 and –5.
C. The excluded values are –5 and 4.
D. The excluded values are 4 and 1.

_____ **79** Simplify the rational expression $\frac{3r^2 - 9r}{r - 3}$. Identify any excluded values.

A. $3r$; $r \neq 3$
B. $3r$; $r \neq 3$ or 0
C. $3r$; no excluded values
D. $3r\left(r - 3\right)$; $r \neq 3$

_____ **80** Multiply. Simplify your answer.

$(x^2 + 9x + 14) \cdot \frac{9}{3x + 21}$

A. $\frac{(x + 2)(x + 7)}{1} \cdot \frac{9}{3(x + 7)}$
B. $3x + 6$
C. $\frac{3}{x + 7}$
D. $\frac{(x + 2)}{1} \cdot \frac{9}{3}$

_____ **81** Simplify the complex fraction.

$$\frac{\frac{x^2 - x - 6}{2x^2 - 6x}}{\frac{x^2 + 4x + 4}{x^2 + x}}$$

A. $\frac{x + 1}{2x + 4}$
B. $\frac{x}{x^2 + 4}$
C. $\frac{2x^2 - 6}{3x^2 - 2x + 4}$
D. $\frac{1}{16}$

_____ **82** Add. Simplify your answer.

$\frac{3y}{9y^2} + \frac{3y}{18y}$

A. $\frac{1}{3}$
B. $\frac{2}{9y^2}$
C. $\frac{2 + y}{6y}$
D. $\frac{1}{y}$

_____ **83** Divide by using long division.
$(x^2 - x - 6) \div (x - 3)$

A. $x - 4$
B. $x + 2$
C. $x + 6$
D. $x - 2$

_____ **84** Solve $\frac{3}{q-4} = \frac{2}{5q}$. Check your answer.

A. $q = -\frac{8}{13}$
B. $q = -\frac{8}{17}$
C. $q = \frac{8}{13}$
D. $q = \frac{8}{17}$

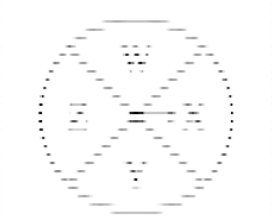
_____ **85** Solve $\frac{x}{x-1} = \frac{x+3}{-2x+2}$. Check for extraneous solutions.

A. $x = -1$ or $x = -2$
B. $x = -1$
C. $x = 1$
D. $x = 1$ or $x = -1$

_____ **86** A chemist has 600 milliliters of a solution that is half acid. She needs a solution that is 70% acid. How many milliliters of acid she should add?

A. 300 mL
B. 400 mL
C. 500 mL
D. 600 mL

_____ **87** Identify the sample space and the outcome shown for spinning the game spinner.



A. Sample space: {W, X, Y, Z}
Outcome shown: Z
B. Sample space: {V, W, X, Y, Z}
Outcome shown: X
C. Sample space: {W, Y, Z}
Outcome shown: X
D. Sample space: {W, X, Y, Z}
Outcome shown: X

_____ **88** An experiment consists of spinning a spinner. Use the results in the table to find the experimental probability that the spinner does not land on purple. Express your answer as a fraction in simplest form.

Outcome	Frequency
red	8
purple	12
yellow	10

A. $\frac{11}{15}$
C. $\frac{3}{5}$
B. $\frac{2}{5}$
D. $\frac{4}{15}$

_____ **89** An experiment consists of rolling a number cube. Find the theoretical probability of rolling a number greater than 4. Express your answer as a fraction in simplest form.

A. $\frac{2}{3}$
C. $\frac{1}{2}$
B. $\frac{1}{6}$
D. $\frac{1}{3}$

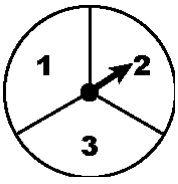
_____ **90** An experiment consists of rolling a number cube. Find the theoretical probability of rolling a number less than or equal to 5. Express your answer as a fraction in simplest form.

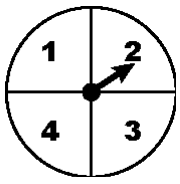
A. $\frac{1}{3}$
C. $\frac{2}{3}$
B. $\frac{1}{6}$
D. $\frac{5}{6}$

_____ **91** The probability of drawing a green marble from a marble bag is 40%. What are the odds in favor of drawing a green marble?

A. 5:2
C. 2:3
B. 3:2
D. 2:5

_____ **92** Jean spins two spinners. The results of both spins are shown. Tell whether the events are dependent or independent. Explain your answer.





A. The spin on the first spinner does not affect the spin on the second, so the events are independent.
B. The spin on the first spinner does not affect the spin on the second, so the events are dependent.
C. The spin on the first spinner affects the spin on the second, so the events are independent.
D. The spin on the first spinner affects the spin on the second, so the events are dependent.

____ **93** The daily low temperatures in degrees Fahrenheit in a city for February 1–14 are given. Use the stem-and-leaf plot to answer the question.
On how many days were the temperatures lower than 20° F?

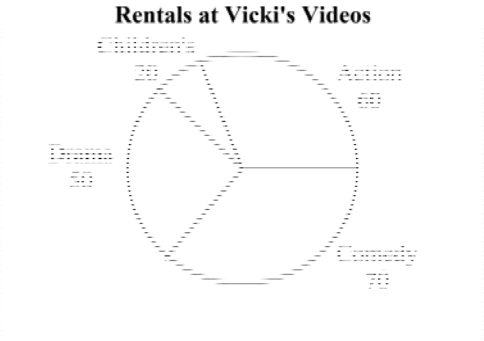
February Temperatures

Stem	Leaves
1	7 7 8 8
2	0 1 3 3 5 6 6 7
3	3 9

Key: 2|3 *means* 23

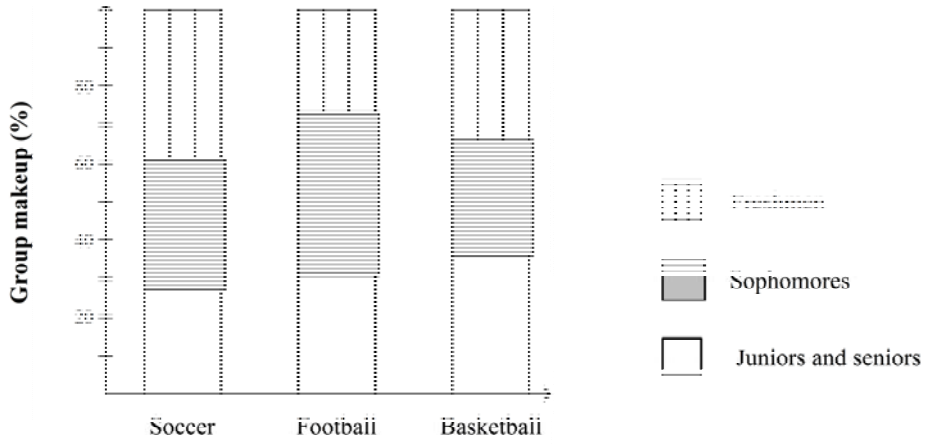
A. 5
B. 7
C. 4
D. 6

____ **94** Which type of video was rented most often? Use the graph to find the answer.



A. Comedy
B. Children's
C. Action
D. Drama

_____ **95** In each of the sports teams at the local high school, there are students from all grades. On which sports team is the percentage of juniors and seniors higher than the percentage of sophomores?



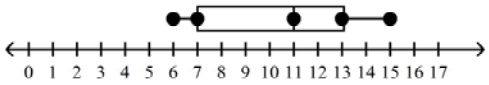
A. Soccer team
B. Basketball team
C. None
D. Football team

_____ **96** The monthly rents for five apartments advertised in a newspaper were $650, $650, $740, $1650, and $820. Use the mean, median, and mode of the rents to answer the question. Which value best describes the monthly rents? Explain.
mean = $902, median = $740, mode = $650

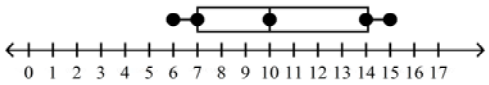
A. The median best describes the rents because most of the rents were near $740.
B. The mode best describes the rents because $650 was the rent seen most often.
C. The mean best describes the rents because $902 is the average rent.

_____ **97** The number of calls answered by a paramedic team over an 8-day period are given. Use the data to make a box-and-whisker plot.
12, 6, 8, 15, 14, 6, 14, 10

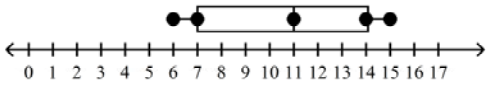
A.



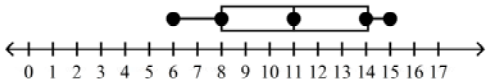
B.



C.



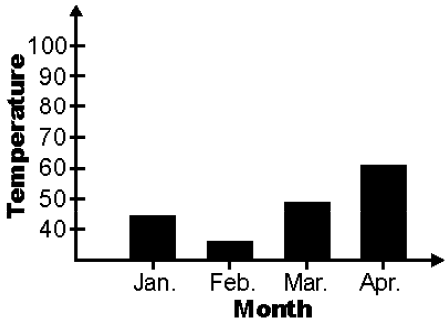
D.



_____ **98** The data {1, 5, 8, 5, 1} represent a random sample of the number of days absent from school for five students at Monta Vista High. Find the mean and the standard deviation of the data.

A. The mean is 4, and the standard deviation is about 2.68.
B. The mean is 4.4, and the standard deviation is about 2.76.
C. The mean is 20, and the standard deviation is about 7.6.
D. The mean is 4, and the standard deviation is about 7.2.

____ **99** The bar graph represents the average temperatures in a city over the first four months of the year. Explain why the graph is misleading. What might someone believe because of the graph?



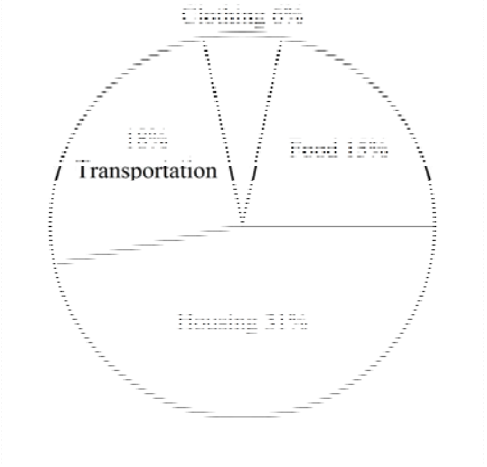
A. The graph is misleading because a bar graph is not a good way to compare temperatures.
Someone might believe that temperatures in March were only a little warmer than in January. In fact, they were much warmer.

B. The graph is misleading because the scale on the vertical axis begins at 30.
Someone might believe that the average temperature in February was less than half the January temperature. In fact, they were only 10 degrees less than those in January.

C. The graph is misleading because the intervals are too large to show a gradual change in temperature.
Someone might believe temperatures increased 10 degrees from February 28 to March 1. In fact, the change in temperature was probably only a degree or two each day.

D. The graph is misleading because the scale on the vertical axis is inconsistent.
Someone might believe that the temperatures in April were only a little warmer than in March. In fact, they were more than 10 degrees warmer.

____ **100** The circle graph shows how the average American family spends its money. Explain why the graph is misleading.



A. A family with an annual income of $32,000 spends about $2000 on clothing.
B. The sections of the graph do not add to 100%, so the percent for at least one type of expense is not represented.
C. Some people might believe that transportation is a major expense.
D. The amount of money spent on transportation and food exceeds the amount of money spent on housing.