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IMPACT Mathematics

Investigation Notebook and Reflection Journal

An all-in-one notebook, organizer, and journal covering every lesson and investigation in the Student Edition

This Notebook Helps You:

- Preview the chapter
- Build your mathematics vocabulary knowledge
- Organize and take notes using graphic organizers
- Improve your writing skills
- Reflect on mathematical concepts
- Prepare for chapter tests

Name: ______________________________

Period: ______________________________

COURSE 3

How to Use This Book:

Your *Investigation Notebook and Reflection Journal* will help you succeed in *IMPACT Mathematics* by providing:

- organizational tools to record your notes.
- opportunities to reflect on key mathematical concepts.

For each **Chapter Opener**, you will find questions relating to the chapter's Real-Life Math connection, key chapter vocabulary, and Family Letter home activities.

To help you master **Investigation** concepts, this study guide provides opportunities to:

- review key vocabulary terms.
- summarize main ideas.
- reflect on Explore and Think & Discuss topics.
- use a variety of graphic organizers, including Venn diagrams and tables.

Each lesson ends with a **What Did You Learn?** section to help you summarize key lesson ideas.

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COURSE 3

Table of Contents

CHAPTER 1

Linear Relationships

Real-Life Math

Leonardo da Vinci used ratios to describe what he called a perfect human body. These ratios can be described by linear equations.

Contents in Brief

Think About It

Suppose a student found the length of his hand to be eight inches and the length of his arm to be two feet. Does Leonardo da Vinci's relationship $a = 3h$ hold true for this student? Tell why or why not.

Leonardo da Vinci also believed that a person's height should be six times the length of his or her foot. What variables could you use to write an equation that expresses the relationship between a person's height and foot length?

Write an equation to express this relationship. ______

What is the ratio of your left arm to your right arm? Why?

Write an equation to express this relationship. Be sure to tell what your variables represent.

Connections to the Past (Course 1, Chapter 8 and Course 2, Chapter 8)

In this chapter, you will plot points and graph lines. Describe one way you know how to graph a line given its equation.

Vocabulary

Complete each statement with one of the following words. You can use a word more than once.

coefficient	direct	slope
constant	direct variation	slope-intercept form

- The equation for any ____________ variation can be written in the form $y = mx$, where x and y are variables and m is a ____________. ____________ is the steepness of a line.
- In the equation $y = mx + b$, m is the ____________ of x, and b is the ____________ term.
- In a ____________, there is a direct relationship between the variables. The ratio is ____________, it never changes.
- The ____________ of a line, $y = mx + b$ is so named because the slope m and y-intercept b are easily identified.

Family Letter

What linear real-world situations did you find that involve time?

____

____

____

What linear real-world situations did you find that involve money?

____

____

____

What other types of linear real-world situations did you find?

____

____

____

LESSON 1.1

Direct Variation

In Lesson 1.1, I expect to learn:

____

____

Explore

Why did the human graphs form straight lines?

First team:

____

____

____

Second team:

____

____

____

____

I found this on page ____.

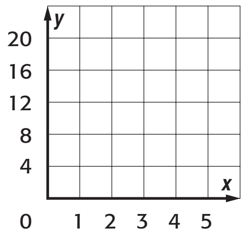
Vocabulary Relationships with straight-line graphs are called

____________________.

Investigation 1

1. Complete the table and graph for the equation $y = 4x$.

x	1		3	
y		8		16



I found this on page _____.

2. Vocabulary Two variables are __________ if when you multiply the value of one variable by a quantity, the other variable is multiplied by the same quantity. A linear relationship in which two variables are directly proportional is a

__________.

I found this on page _____.

Develop & Understand: B

Fill in the blank with *always, sometimes,* or *never*.

3. A direct variation is __________ a linear relationship.

4. A linear relationship is __________ a direct relationship.

5. The graph of a direct variation __________ passes through the origin.

6. The graph of a linear relationship __________ passes through the origin.

Investigation 2

Develop & Understand: A

7. How are decreasing linear relationships the same as increasing linear relationships? How are they different?

____

____

____

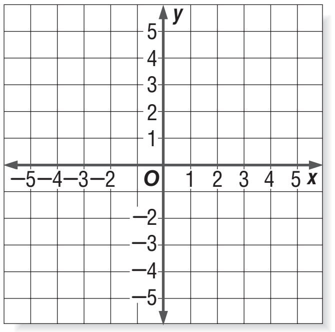
____

Develop & Understand: B

I found this on page _____.

8. Use a solid line to sketch a graph of a decreasing relationship that is a direct variation.

9. Use a dashed line to sketch a graph of a decreasing linear relationship that is not a direct variation.



Investigation 3

I found this on page ______.

Think & Discuss

10. Describe how you can identify each type of relationship from the following representations.

	From an Equation	From a Graph	From a Table
Linear			
Direct Variation			

What Did You Learn?

I need to remember the following about:

linear relationships: ____

____

direct variation: ____

____

Draw a sample linear graph and a direct variation graph.

Linear graph:

Direct variation graph:

LESSON 1.2

Slope

In Lesson 1.2, I expect to learn:

I found this on page ______.

Think & Discuss

Describe one way to measure the steepness of a roof.

Investigation 1

Develop & Understand: A

1. What is meant by rise?

I found this on page ______.

2. What is meant by run?

3. How can the real world meanings of rise and run help you remember their mathematical meanings?

I found this on page ______.

4. Vocabulary The $\frac{\text{rise}}{\text{run}}$ ratio represents the ____________________ of the line.

Develop & Understand: C

5. Use the grids to draw lines with slopes of $\frac{2}{3}$, $\frac{4}{3}$, and $\frac{1}{2}$.

6. Order the slopes from Exercise 5 from least to greatest (flattest to steepest).

___

7. Draw examples of lines with the following slopes in the boxes below.

Positive slope	Slope of 0	Negative slope	No slope

8. What is the slope of the line that passes through (6, 2) and (4, 5)?

___

Investigation 2

Example

9. Suppose you graph two lines on different coordinate planes. What is the benefit of using the same scale on each axis?

___

___

10. Consider graphs A and B drawn on congruent grids. The x-axis for graphs A and B is numbered from 0 to 10. The y-axis for graph A is numbered from 0 to 50, but the y-axis for graph B is numbered from 0 to 100.

The line $y = 2x$ is graphed on both. On which graph will the slope appear steeper? Why?

___

___

What Did You Learn?

I need to remember the following about:

slope: ___

___

___

___

scales on axes: ___

___

___

LESSON 1.3

Write Equations

In Lesson 1.3, I expect to learn:

I found this on page ______ .

Think & Discuss

Of a description, equation, graph, or table, which would you least prefer to use to determine if the relationship is linear? Why?

Investigation 1

Develop & Understand: A

I found this on page ______ .

1. Find the missing values for each linear relationship. Find the slope for each set of values.

x	0	1	2	3	
y	4	6			12

slope = ______

x	−3	−2	−1	0	1
y	15				

slope = ______

I found this on page ______ .

Example

2. Write the equation for each x-coefficient and constant term.

	Coefficient of x	Constant Term	Equation
a.	3	−10	
b.	−1	0	
c.	0	7	

Investigation 2

Develop & Understand: A

3. Identify the quadrants through which each line will pass.

Quadrants

$y = -5$	$y = -5x$	$x = -5$

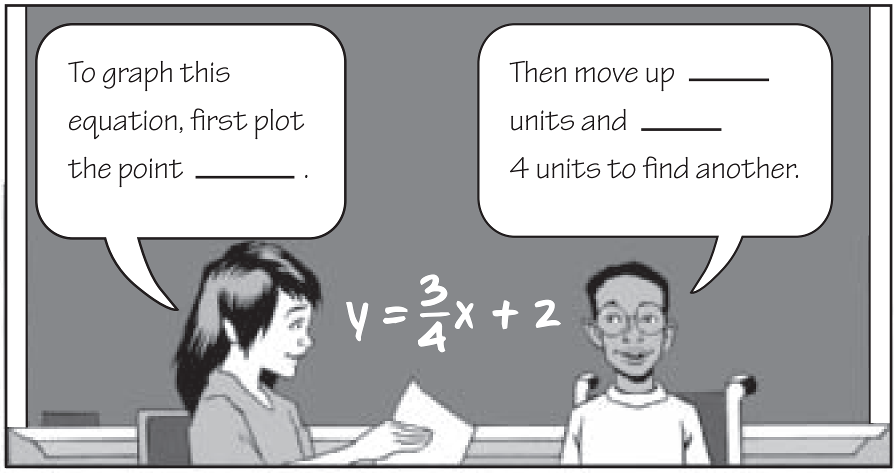
Investigation 3

4. Vocabulary The formula $y = mx + b$, or $y = ax + b$, is called the ________________ of a linear equation.

Develop & Understand: A

This cartoon is found on page 42.

5. Complete Maya and Darnell's sentences.



Investigation 4

Develop & Understand: A

I found this on page ______ .

6. Tell how to find the equation of a line when you know the slope of the line and one point on the line.

____

____

____

____

Develop & Understand: B

7. What additional step is needed to find the equation of a line when you know two points on the line?

____

Develop & Understand: C

8. Suppose you need to find the equation of the line that contains points at (3, 6) and (0, 9). After finding that the slope is -1, you write the equation $y = -x + b$. Which point would you choose for finding the y-intercept? Why? What is the equation of the line in slope-intercept form?

____

____

Investigation 5

9. Vocabulary The linear equation $4x + 2y = 46$ is written in ____________________.

Develop & Understand: C

I found this on page ______.

10. Complete the graphic organizer.

$10x - 15 = 15y$

standard form:

slope-intercept form:

x-intercept:

y-intercept:

slope:

Inquiry

Investigation 6

I found this on page ______.

11. Complete the table to provide information about the equations that produce each type of graph.

The Lines . . .	The equations . . .	Possible Equations
pass through the origin.		
are parallel.		
are perpendicular.		

What Did You Learn?

I need to remember the following about:

slope-intercept form: ____

____

____

writing a linear equation: ____________________________________

____

____

CHAPTER

2

Lines and Angles

Contents in Brief

Real-Life Math

You can estimate the outside temperature by counting the number of times a cricket chirps in 15 seconds. The approximate temperature is represented by $y = x + 37$, where x is the number of chirps and y is the temperature in degrees Fahrenheit.

Think About It

What is the approximate temperature when a cricket chirps 41 times in 15 seconds? ____________________

Suppose a cricket chirps 132 times in one minute. What would be the value of x? Why?

____

____

On a different night, Tony used cricket chirps to estimate the temperature to be 82°F. How many cricket chirps did he count in 15 seconds? Tell how you know.

____

____

Connections to the Past (Chapter 1)

The equation $y = x + 37$ describes a linear relationship. Complete the table.

Equation	Dependent Variable	Independent Variable	Slope	y-intercept

Write $y = x + 37$ in standard form.

____

Vocabulary

Circle true or false for each statement.

▶ Points that are **collinear** lie on the same line.	true	false
▶ **Outliers** are points that are close to each other on a graph.	true	false
▶ **Complementary angles** add up to 180°.	true	false
▶ When two parallel lines are crossed by a transversal, the angles formed inside the parallel lines are called **interior angles**.	true	false
▶ To **bisect** a line segment is to cut the line exactly into thirds.	true	false
▶ A **transversal** is a line that crosses two others.	true	false

Family Letter

For the first home activity on page 65, tell how the graph changes when the amount with which you start changes.

List some of the places where you found intersections of lines. Tell the type of angles that were formed.

What are some angles formed by walls in buildings or at home?

LESSON 2.1

Lines

In Lesson 2.1, I expect to learn:

____

____

I found this on page ______ .

Explore

Identify the common characteristics in each group, or family, of lines.

____

____

____

Investigation 1

Develop & Understand: A

1. Just by looking at their equations, how can you determine if lines are parallel?

____

____

2. Give examples of three lines that would be parallel if you graphed them.

____

I found this on page ______ .

3. Vocabulary ________________ points all lie on the same line.

Develop & Understand: B

4. Explain how you can tell that the points (3, 11), (1, 3), and (0, –1) are collinear without graphing them.

____

____

____

Investigation 2

I found this on page ______.

Think & Discuss

5. How can writing linear equations in slope-intercept form help you determine if they are in the same family?

____

____

____

Develop & Understand: B

6. Explain how to write $2y - 2 = 2x$ in slope-intercept form.

____

____

7. Give three examples each of equations in slope-intercept form and in standard form.

Slope-Intercept Form	Standard Form

Inquiry Investigation 3

8. Explain how a graph can be used to make a prediction.

____

____

____

____

____

9. Fill in the blanks for a standard viewing window on a calculator.

[______, ______] scl: ______ by [______, ______] scl: ______

______-axis ______-axis

Investigation 4

I found this on page ______ .

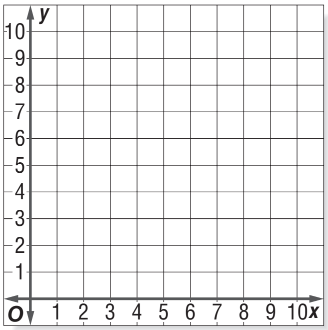
10. Vocabulary A ____________________ is a line that fits all of the data points as closely as possible.

Develop & Understand: B

I found this on page ______ .

11. When a data point seems very different from the others, it is called an ____________________ .

12. On the grid below, graph 10 data points of your choosing that are close to forming a line but have two outliers. Circle the outliers. Sketch a line of best fit for your points.



What Did You Learn?

I need to remember the following about:

equations of parallel lines: ____

____

Examples of Parallel Lines	Examples of Non-Parallel Lines

lines of best fit: ____

____

a technique I can use to improve the fit of a line when I know the data points in the graph: ____

____

LESSON 2.2

Angle Relationships

In Lesson 2.2, I expect to learn:

____

____

Investigation 1

Think & Discuss

I found this on page ____.

1. Vocabulary When two lines intersect, two angles that are opposite one another are ________________ .

2. Write *always, sometimes,* or *never.*

Vertical angles are ________________ equal.

Vertical angles are ________________ right angles.

Vertical angles ________________ have a side in common.

Example

I found this on page ____.

3. Complete the table with words and figures. Draw pairs of angles that do and do not share sides.

	Words	Figures
Complementary angles		
Supplementary angles		

I found this on page ____ .

Develop & Understand: B

4. An angle measures 95°. Explain why the angle has a supplement but not a complement.

____

____

____

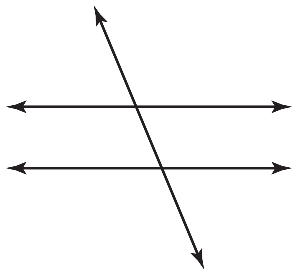
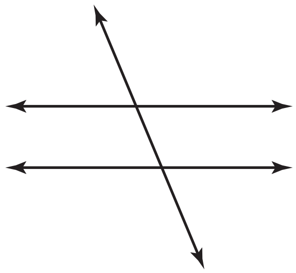
Investigation 2

I found this on page ____ .

5. Vocabulary When parallel lines are intersected by a third line, the third line is called a ________________ .

Develop & Understand: A

6. Complete the table below by writing the definition, marking a pair of angles in the diagram, and telling how the angle measures are related.

	Definition	Example	How Measures Relate
Alternate interior angles			
Alternate exterior angles			

What Did You Learn?

I need to remember the following about:

vertical angles: ____

____

complementary and supplementary angles: ______________________________

____

LESSON 2.3

Constructions

In Lesson 2.3, I expect to learn:

____

____

Explore

Name some items, other than a ruler, that you can use to make a line.

____

I found this on page ______ .

Vocabulary An ________________ is a curve that is part of a circle. A ________________ is an object that has a hard edge and can be used to draw a straight line.

Investigation 1

I found this on page ______ .

Develop & Understand: A

1. In your own words, tell how to draw a congruent line segment without using a ruler.

____

____

____

____

2. Vocabulary A ________________ is any line that cuts a line segment exactly in half. ________________ lines form right angles.

Develop & Understand: B and C

I found this on page ______ .

3. How many bisectors does a segment have? How many perpendicular bisectors? Explain how you know.

____

____

____

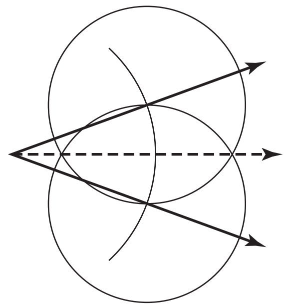
____

Investigation 2

Develop & Understand: A

I found this on page ____ .

4. Place the numbers 1, 2, 3, and 4 next to each dashed arc or ray to tell in which order the marks were made to bisect the angle.



Develop & Understand: B

I found this on page ____ .

5. The first step in copying an angle is to draw a straight line segment. Does it matter how the long line segment is that you draw? Why or why not?

____

6. If you bisect a $60°$ angle, what should be the measure of each new angle formed? Why?

____

____

What Did You Learn?

I need to remember the following about:

straightedge: ____

____

perpendicular bisector: ____

____

how bisecting an angle is like bisecting a line segment and how bisecting an angle is different than bisecting a line segment: ____

____

____

CHAPTER 3

Percents and Proportions

Contents in Brief

Real-Life Math

Percents are used to describe many situations, including athletic performances by both individuals and teams.

Think About It

What is a team's winning percentage when the team's wins equal the team's losses? ____________

What would it mean if a team's winning percentage was 0%?

____

What would it mean if a team's winning percentage was 100%?

____

Suppose that the football team played ten games instead of eight. If they had won five of the games in Year 1, would the percent shown in the table need to be changed? Explain.

____

In 2007, the New York Giants won 62.5% of their football games during the regular season. If they play 16 games in 2008 and win the same percentage of games, how many games would you expect them to win?

____

Connections to the Past (Chapter 1)

Percents can be used to describe the steepness of roads, just as slope can. Recall that slope is $\frac{\text{rise}}{\text{run}}$. Describe the slope of a road whose steepness (or grade) is described as 4%.

____

____

Vocabulary

For each statement, tell if you would calculate a *percent increase* or a *percent decrease*. Write I or D.

Statement	I or D
Zoe made 20 phone calls during her first week of vacation and 5 phone calls during her second week.	
A baseball card was worth $4 in 1990 and $26 in 2008.	
In 2005, a new company had 14 employees. Now it has 21 employees.	

Family Letter

List at least two items that you found on sale while shopping. Give the original price, percent of discount, and sale price.

____

____

List at least three examples of percents that you calculated from the statistics in the sports section of a newspaper.

____

____

____

____

____

____

LESSON 3.1

Understand Percents

In Lesson 3.1, I expect to learn:

____

____

Investigation 1

I found this on page ____ .

Develop & Understand: A

1. How do you estimate a percent when given the part and the whole?

____

____

2. Write an amount at the top of the chart. Then, tell how you would estimate the amount that is each percent of the number.

Amount: ______________	
12%	
42%	
155%	

I found this on page ____ .

Develop & Understand: B

3. Tell how you know when a percent will be greater than 100%. Give an example.

____

____

____

____

Investigation 2

4. One way to work with percents is to set up and solve a

______________________.

5. When using the percent proportion, you will know two of the

______________________ values.

I found this on page ______.

6. Fill in each blank with *part*, *whole*, or *percent*.

________ ________

$$\frac{b}{a} = \frac{n}{100}$$

____

7. Use the percent proportion in Exercise 6 to compare the values of *a*, *b*, and *n*.

If . . .	Then, the value of *n* is . . .
b is less than *a*	
a is less then *b*	
a equals *b*	

Develop & Understand: B

8. Show the steps that you would use to find what percent 42 is of 120.

____

What Did You Learn?

I need to remember the following about:

estimating percents: ____

____

writing a proportion: ____

____

EXAMPLE: ____

how do you determine which value to substitute for *a* and which value to substitute for *b* when using a proportion to solve a percent problem: ______________________

____

LESSON 3.2

Work with Percents

In Lesson 3.2, I expect to learn:

____

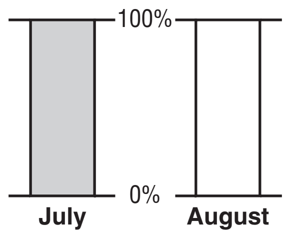
____

Investigation 1

I found this on pages ________ .

Develop & Understand: A

1. Shade the second bar of each group to any height that you wish. It can be greater or less than 100%. Then estimate the percent of increase or decrease you have shown.



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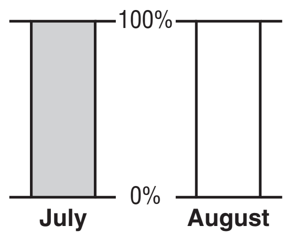


____

Develop & Understand: C

I found this on page ______ .

2. Describe how you find a percent increase or percent decrease. Give an example.

____

____

____

____

Investigation 2

Develop & Understand: A

3. Give an example of a percent of a percent situation where there are two 10% decreases, each worth a different amount.

____

____

____

____

Investigation 3

I found this on page ____.

Develop & Understand: A

4. Give an example of a part-to-whole and of a part-to-part ratio. Find the equivalent percent.

____

____

____

Inquiry

Investigation 4

I found this on page ____.

5. List different ways that sale information can be given. Then create your own example of each.

Way to give sale information	Example

What Did You Learn?

I need to remember the following about:

percent increase: ______________________________

____

EXAMPLE: the percent increase for selling a \$100 necklace for \$350 is ________

percent decrease: ______________________________

____

EXAMPLE: the percent decrease for a car worth \$20,000 losing \$8,000 of its value the first year is: ______________________________

percent of a percent: ______________________________

____

____

CHAPTER

4

Exponents and Exponential Variation

Real-Life Math

This chapter begins by discussing the scenario of passing on a computer virus warning. One person forwards an e-mail to each of ten friends, and then each of them forwards the e-mail to each of their friends, and so on.

Think About It

There were ten e-mails sent in the first hour. Then, each person forwarded the e-mail to ten people in the second hour. How many e-mails were sent in the second hour? The third hour? Tell how you know.

Look at the number of e-mails sent during the first, second, and third hours. What pattern do you see? How does this pattern show why 10,000,000 households will receive the message after seven hours?

Connections to the Past (Chapter 3)

There are approximately 115 million households in the United States. If 10 million households received the e-mail, about what percent of U.S. households received the e-mail?

Contents in Brief

Vocabulary

State if you Agree (A) or Disagree (D) with each statement.

A or D	Statement
	The **cube root**, or third root, of 27 is 9.
	The number 4.32×10^7 is written in **scientific notation**.
	-4 is a **square root** of 16.
	If the number 15 is repeatedly multiplied by 0.9, the situation can be described as **exponential growth**.
	The **radical sign** is a symbol indicating that a root is being taken of the number under the sign. A small number, called the index, may appear outside and above the symbol. The **index** tells which root is to be taken. If no index is shown, it is assumed to be 2 and the square root should be taken.

Family Letter

Real-world numbers, such at the national debt, may be very large. However, they are often reported in standard, rather than scientific notation. Why do you think this is?

____

____

____

What type of real-world references would you expect to see expressed in scientific notation? Why?

____

____

____

____

State one of the real-world examples that you found and describe where you found the information.

____

____

____

LESSON
4.1

Exponents

In Lesson 4.1, I expect to learn:

___

___

Explore

Find the differences between consecutive numbers in the list. What do you notice? Why does this happen?

___

___

Investigation 1

1. What is the exponent for a base when no exponent is shown?

___

Develop & Understand: B

I found this on page ____ .

2. Complete the table. Assume *a* is a positive integer.

Power	Example	Positive or Negative?
$(-a)^n$, where n is an odd integer		
$(-a)^n$, where n is an even integer		
$-a^n$, where n is a positive integer		

I found this on page ____ .

3. Vocabulary A number is written in ______________ notation when it is expressed as the product of a ______________ and a number greater than or equal to 1 but less than 10.

Develop & Understand: A

Investigation 2

I found this on page ____ .

4. Give an example of each for each situation.

Negative Exponent, Integer Base	Negative Exponent, Fractional Base	Zero Exponent

I found this on page ______.

5. Explain why $a \cdot b^{-8}$ is the same as $a \div b^{8}$.

____

____

Investigation 3

Example

I found this on page ______.

6. Describe each law in your own words. Give an example.

Law	Example	Description
$a^b \cdot a^c = a^{b+c}$		
$a^c \cdot b^c = (ab)^c$		
$\frac{a^b}{a^c} = a^{b-c}$		
$\frac{a^c}{b^c} = \left(\frac{a}{b}\right)^c$		
$(a^b)^c = a^{bc}$		

Investigation 4

Develop & Understand: A

7. How are the Product and Quotient Laws of Exponents used when multiplying and dividing numbers written in scientific notation?

____

____

____

____

____

Develop & Understand: B

I found this on page ______.

8. Look at the cartoon on page 156. Replace parts of Lucita's and Tala's conversation to one about multiplying $(3 \times 10^5) \times (5 \times 10^2)$.

Lucita	Tala

Inquiry

Investigation 5

9. How did you determine the spacing between the planets in your prediction?

____

____

____

What Did You Learn?

I need to remember the following about:

negative integer exponents: ____

____

Product Laws and Quotient Laws of Exponents		
when bases are the same	________ the exponents ________ the exponents	examples: ________ ________
when exponents are the same	________ the bases ________ the bases	examples: ________ ________

LESSON 4.2

Exponential Relationships

In Lesson 4.2, I expect to learn:

____

____

I found this on page ____ .

Explore

How much quicker would it take for 1,000 new people to hear the joke if you told it to *three* classmates and everyone continued to tell *three* new people?

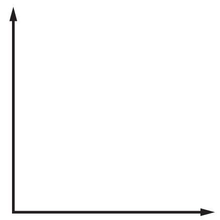
____

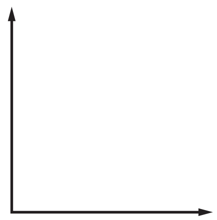
Investigation 1

I found this on page ____ .

Develop & Understand: A

1. Sketch sets of ordered pairs for each expression. Assume a is an integer greater than 1.





Develop & Understand: B

2. If a is an integer greater than 0, for what value(s) of x does $ax = a^x$? ______

3. If a is an integer greater than 0, for what value(s) of x does $ax = x^a$? ______

4. For 2^x and x^2 as x increases from 0 to 5, how would you find which expression's values increase more quickly?

____

Investigation 2

I found this on page ____ .

5. Vocabulary Quantities that are repeatedly multiplied by a number greater than ____________ are said to show ____________ or ____________ .

Think & Discuss

6. In the definition of exponential growth, it is said that x must be greater than 1. What happens if x equals 1?

____

What happens if x is between 0 and 1?

____

7. Give an equation that represents a growth equation and then show a table of values.

Equation: ______________________________________

x					
y					

8. Give an equation that represents a decay equation and then show a table of values.

Equation: ______________________________________

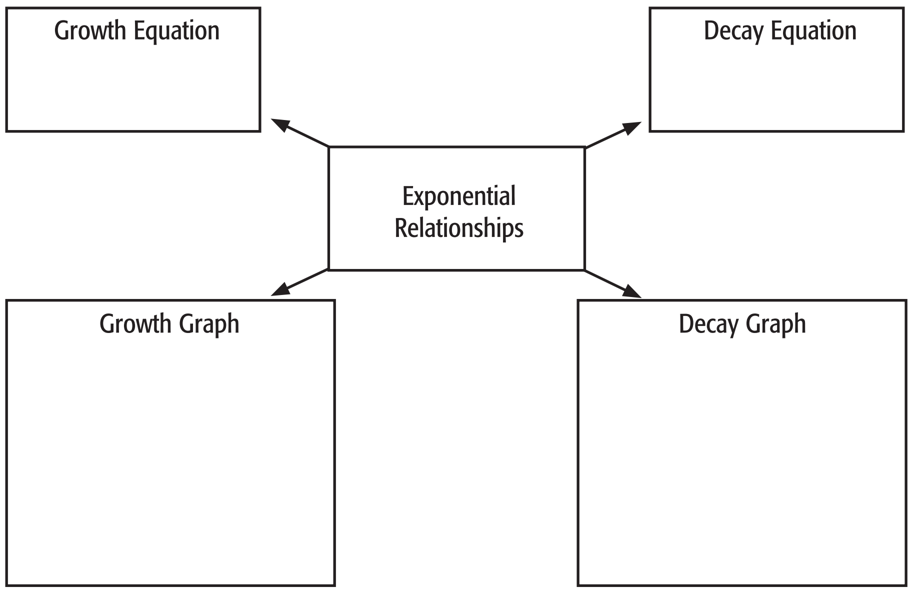
x					
y					

Investigation 3

I found this on page ______ .

Develop & Understand: A

9. Complete the diagram with examples of the form $y = a \cdot b^x$.



I found this on page ______ .

Develop & Understand: B

10. Suppose the scientist studying bacteria on page 177 extended the experiment for Cultures 1 and 4 three more days. Make a table showing the additional results.

Days	Culture 1	Culture 2

What Did You Learn?

I need to remember the following about:

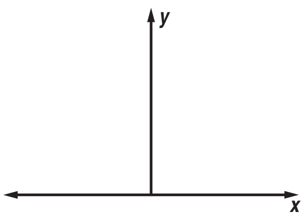
exponential growth: ______________________________

____

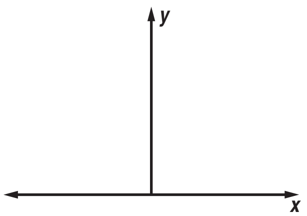
exponential decay: ______________________________

____

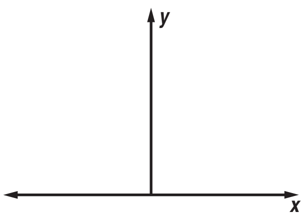
graphs that express an exponential relationship: ______________________________



or



graphs that do not express an exponential relationship: ______________________________



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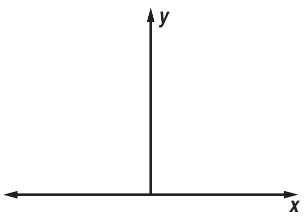


LESSON 4.3

Radicals

In Lesson 4.3, I expect to learn:

Explore

Without using a calculator, how do you know that the side length of a square with an area of 12.5316 square units is between 3 and 4 units?

Investigation 1

I found this on page ______.

I found this on page ______.

1. Vocabulary When you undo the process of a squaring a number, you find the ______________ of the number.

2. What does the radical sign indicate?

3. How do you indicate the negative square root of a number?

Develop & Understand: B

4. Give examples of squares of square roots that you can find without a calculator.

5. Why are absolute value symbols needed to write $\sqrt{n^2}$ as a single expression that has no radical signs?

Develop & Understand: C

I found this on page ______.

6. The solution to a radical equation is shown below. Fill in the reasons for each step.

$$\sqrt{x+3} = 8$$

$$\left(\sqrt{x+3}\right)^2 = 8^2 \qquad \_\_\_\_\_\_\_\_\_\_\_\_$$

$$x + 3 = 64 \qquad \_\_\_\_\_\_\_\_\_\_\_\_$$

$$x = 61 \qquad \_\_\_\_\_\_\_\_\_\_\_\_$$

Investigation 2

I found this on page ______.

Example

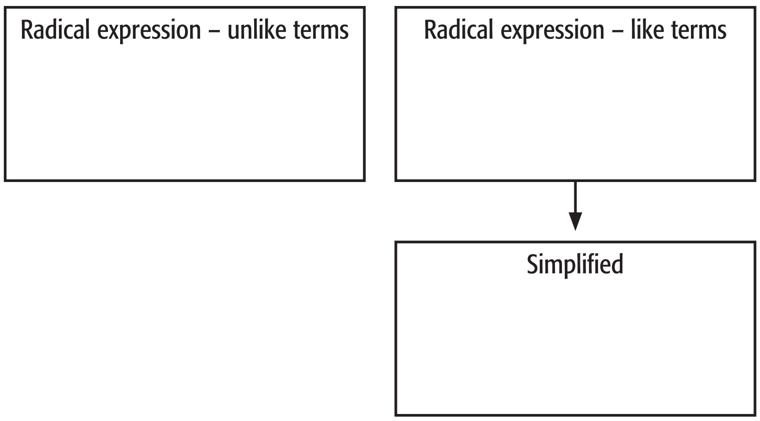
7. When is a radical expression considered simplified?

Develop & Understand: B

8. What are the square root factors of 48? Which would you use to simplify $\sqrt{48}$? Why?

Develop & Understand: C

9. Complete the diagram with examples.



10. Give another expression equivalent to your simplified expression above.

Inquiry Investigation 3

Think & Discuss

11. Give an example of a cubic number, or perfect cube. Explain how you know it is cubic.

___

Develop & Understand: A and B

I found this on page ____.

12. Complete the table about the nth roots of x.

When n is	and x is	for example,	then…
even	positive,		
odd	positive,		
	negative,		

What Did You Learn?

I need to remember the following about:

the radical sign: ___

simplifying radical expressions and like terms: ___

solving radical equations: ___

how the laws of exponents are related to radical expressions: ___

CHAPTER 5

Algebraic Expressions

Contents in Brief

Real-Life Math

Levers allow us to lift heavy objects. The longer the lever, the more we can lift. You can think of the situation as a see-saw. You cannot lift the other person if you sit very close to the middle, or the fulcrum. As you move further back, it becomes easier to lift the person on the other side.

Think About It

What would happen to the amount of force needed to lift the elephant if the longest lever you could find was less than 368 feet long? Why?

A lever consists of two parts: the effort arm and the load arm. In the diagram shown, which side is which?

Connections to the Past (Course 3, Chapter 1)

You identified linear relationships in Chapter 1. Does the equation $F = \frac{40{,}000}{d}$ represent a linear relationship? Tell how you determined your answer.

(Course 2, Chapter 1)

Find the product.

a. $6(3x - 4)$ ______ **b.** $4x(3x + 2)$ ______

Vocabulary

▶ Draw one line under the expressions that are **monomials,** two lines under **binomials,** and three lines under **trinomials.**

$5x$ $2p^2 + 7p - 4$ $1 - 14y$ $3x^3$ $4gh$

$x + y$ $-2 + w^5 + v^4$ -18 $6d - 3$

▶ Underline all of the *like terms* in each expression below.

a. $6x - 4y + 2x$

b. $5k^3 - 2k^2 + k^2 - 1$

c. $12 - 4z + 10 - 8 - 5z^2$

d. $5xy - 4x + y + 2xy$

Family Letter

Describe two geometric models that you could use to multiply x and $x + 3$.

Model 1:	Model 2:

Which type of geometric model did you find most helpful in understanding how to expand products? Why?

Name a strategy that you learned in this chapter.

LESSON **5.1**

Rearrange Algebraic Expressions

In Lesson 5.1, I expect to learn:

____

____

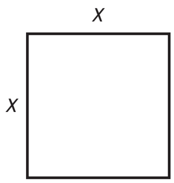
I found this on page ____.

Vocabulary When you use the *distributive property* to write $2(x + 1)$ as $2x + 2$, you are ________________ the expression.

Investigation 1

Develop & Understand: A

1. Add a strip of any length to the square. Explain how the new figure shows the distributive property used over addition.



____

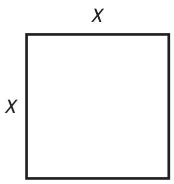
____

____

____

____

2. Remove a strip of any length from the square. Explain how the new figure shows the distributive property used over subtraction.



____

____

____

____

____

Develop & Understand: B

3. Use the distributive property to match each product.

$4(6x - 2)$ ________	**a.** $24x - 8$
$x(8 - 2x)$ ________	**b.** $2x^2 + 8x$
$2x(x + 4)$ ________	**c.** $8x - 2x^2$

Investigation 2

I found this on page ____ .

Think & Discuss

4. Describe how to find the amount of carpet needed for the living room.

____

____

____

5. Vocabulary ________________ have the same variable raised to the same power.

6. Which of the following expressions is equivalent to the expression for the area of the floor: $m^2 + 4m + 5m + m^2 + 4m + 3.5m + 0.5m^2$? Which equivalent expression is in simplest form?

You can choose more than one answer. __________

A $3.5m^2 + 9.5m$

B $2.5m^2 + 16.5m$

C $1.5m^2 + 12.5m$

D $4m + 2.5m^2 + 9m + 3.5m$

I found this on page ____ .

7. Tell how to simplify an expression with like terms. Give an example.

____

____

Inquiry Investigation 3

8. How did you determine the algebraic expression for the area of the H-shape?

____

____

____

____

____

____

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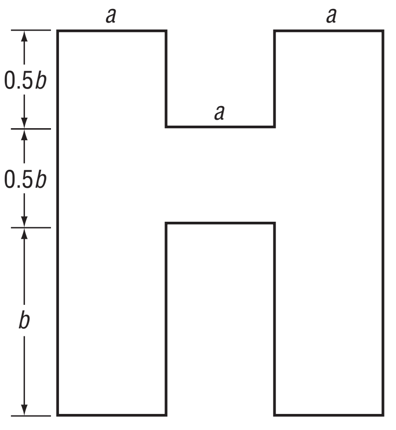
____

____

____



I found this on page ______.

Develop & Understand: A

9. Using the number 8, give two different expressions that result in 16.

____

10. Rewrite the expressions in Exercise 9 using *n* to represent 8.

____

Investigation 4

Develop & Understand: B

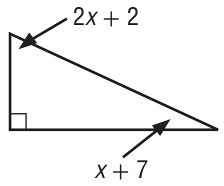
11. Explain how to find the value of *x*.

____

____

____

____



12. What are the measures of the angles in the triangle above? Write two other expressions, using *x,* where *x* has the same value, that could be used for the measures of the angles.

____

What Did You Learn?

I need to remember the following about:

the distributive property: ______________________________

____

EXAMPLE: ______________________________

like terms: ______________________________

____

EXAMPLE: ______________________________

LESSON 5.2

Monomials, Binomials, and Trinomials

In Lesson 5.2, I expect to learn:

____

____

Vocabulary Complete the table.

I found this on page ______ .

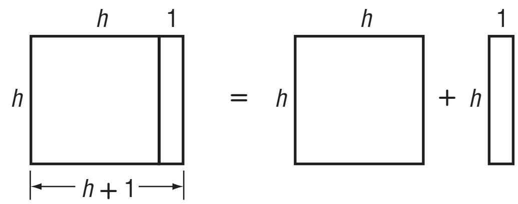
Term	Words	Example
monomial		
binomial		
trinomial		

Investigation 1

I found this on page ______ .

Develop & Understand: A

1. The area of a rectangle with sides h and $h + 1$ can be shown by the model below.



Express the area as a product and as a sum.

____

2. Sketch a model of the area represented by the product $(x + 2)(x + 4)$.

Develop & Understand: C

I found this on page ______.

3. Give an example to show how you divide a binomial by a monomial. Then explain how to divide a binomial by a monomial.

____

____

____

____

Investigation 2

Develop & Understand: A

I found this on page ______.

4. The rectangle diagram that models $(x + 3)(x + 4)$ has four parts. Why does the final expression for the area of the rectangle have three, instead of four, terms?

____

____

5. What is the same about all of the area expressions that represent rectangles with dimensions $x + a$ and $x + b$ where a and b are constants?

____

____

____

Investigation 3

6. Find each of the following products.

a. $7x(2x + 4)$ ____________________

b. $(7x + 3)(2x + 4)$ ____________________

7. How is multiplying a monomial by a binomial like multiplying a binomial by a binomial? How is it different?

I found this on pages ____________.

____

____

____

____

Investigation 4

Develop & Understand: A and B

8. Find each of the following products.

a. $4x(3x - 2)$ ____________

b. $(3x - 1)(5x + 4)$ ____________

9. How is the expanded form of $(x + a)(x - b)$ like the expanded form of $(x + a)(x + b)$? How is it different?

____

____

____

____

Investigation 5

Develop & Understand: A

10. Would you rewrite $(3x + 5)(3 + 2x)$ before multiplying? Why?

____

____

____

What Did You Learn?

I need to remember the following about:

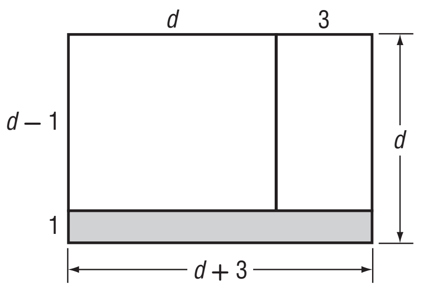
binomials: ____________________

distributive property: ____________________

____

____

showing a product of two binomials: ____________________



____

____

LESSON 5.3

Special Products

I found this on page ____ .

In Lesson 5.3, I expect to learn:

____

Explore

What is true about the constant term in each of the simplifed expressions?

____

Investigation 1

Develop & Understand: A

1. Why do you think $m^2 + 18m + 81$ is called a perfect square trinomial?

____

____

____

I found this on page ____ .

2. Complete the table to show how to find each product.

	Simplified Expanded Form
$(x + 2)^2$	$x^2 +$ ____ $+$ ____
$(x + 3)^2$	
$(a + b)^2$	

	Simplified Expanded Form
$(x - 2)^2$	$x^2 -$ ____ $+$ ____
$(x - 3)^2$	
$(a - b)^2$	

3. Describe the patterns shown in the tables above.

____

____

____

____

____

____

4. How will you remember that $(a + b)^2$ is not equal to $a^2 + b^2$?

Investigation 2

Develop & Understand: A

5. Why do you think $x^2 - 100$ is called a difference of squares?

6. How can you tell if the product of two binomials will be a difference of squares?

7. Complete the tables.

	Simplified Expanded Form
$(a + b)^2$	
$(a - b)^2$	
$(5y + 2)^2$	
$(3k - 4)^2$	

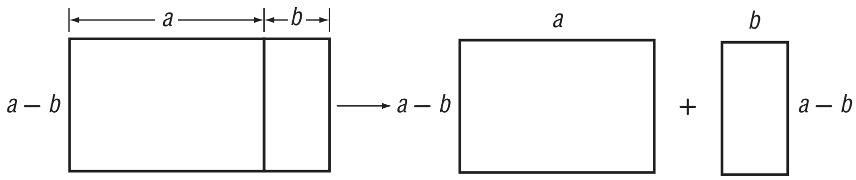
	Simplified Expanded Form
$(a + b)(a - b)$	
$(a - b)(a + b)$	
$(v + 4)(v - 4)$	
$(3r - 8)(3r + 8)$	

Develop & Understand: B

I found this on page ______.

8. Tell how to use the pattern for $(a + b)(a - b)$ to find 32 times 28.

9. Explain why the diagrams below show that $(a + b)(a - b) = a^2 - b^2$.



____

____

____

____

____

What Did You Learn?

	$(a + b)^2$	$(a - b)^2$	$(a + b)(a - b)$	$(a + b)^2$ and $a^2 + b^2$	$(a - b)^2$ and $a^2 - b^2$
What I need to remember					
Example					

CHAPTER 6

Transformational Geometry

Contents in Brief

Real-Life Math

Symmetry is used in art and in architecture. Repeating patterns and symmetric designs may exist in your own home, such as in the tile work on a shower wall.

Think About It

Imagine drawing a vertical line down the center of the picture of the Taj Mahal. What would be true about the left and right sides of the picture?

Although barely shown in this photo, there is a long pool of water in front of the Taj Mahal. Suppose a picture is taken from the far end of the pool. Can you draw a horizontal line across the picture that has the same effect as a vertical line down the center of the picture?

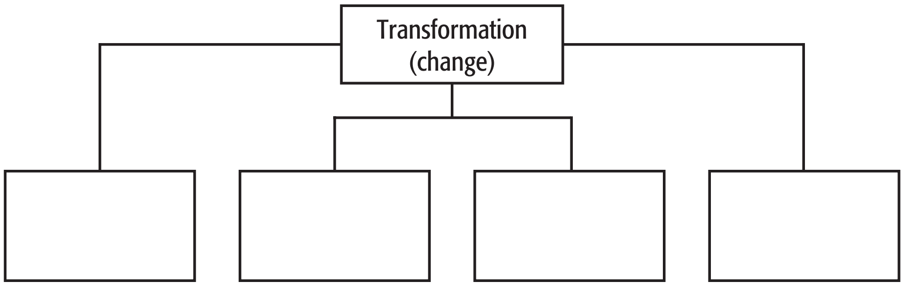
Connections to the Past (Chapter 3)

You estimated percents in Chapter 3. Choose two parts of the Taj Mahal that are the same shape but different size. Estimate the percent increase or decrease between the size of the first part and the size of the second part.

Vocabulary

▶ Complete the graphic organizer so that each box contains two of the words or phrases below.

dilation	enlargement or reduction	flip	reflection
rotation	slide	translation	turn



Family Letter

What types of transformations did you use in your designs? Which type do you think made the most interesting design? Why?

____

____

____

____

If you found places or objects that showed symmetry, list them below. Tell how you know they have symmetry.

Place or Object	How I know it has symmetry.

LESSON 6.1

Symmetry and Reflection

In Lesson 6.1, I expect to learn:

____

____

I found this on page ______ .

Vocabulary A ____________________ is a way to take a figure and create a new figure that is similar or ____________________ to the original.

Vocabulary ____________________ is a form of balance in figures and objects.

Explore

What would have happened if you did not fold your paper exactly in half?

____

____

____

Investigation 1

I found this on page ______ .

1. Vocabulary Reflection symmetry is also called ____________________ .

2. How can you tell if a line is a line of symmetry?

____

____

3. Look at the "Z." Why is the line not a line of symmetry?

____

4. Look at the cartoon on page 261. Can you think of a way to create a figure that has a line of symmetry?

____

____

Develop & Understand: A

5. Complete the chart.

Type of Triangle	Number of Lines of Symmetry	Example
Scalene (no sides have the same length)		
Isosceles (2 sides have the same length)		
Equilateral (3 sides have the same length)		

6. Vocabulary The result of any transformation is called an

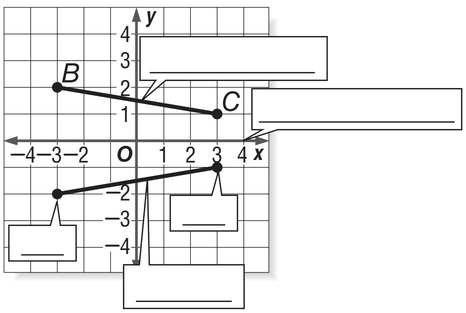
______________________.

Investigation 2

I found this on page ______.

Develop & Understand: B

7. Label each part of the reflection, and give the coordinates of each point.



____

8. What do you know about the lengths of $\overline{BC}$ and the length of its image $\overline{B'C'}$? ______________ What do you know about the distance of each point and its reflection point from the line of reflection? ______________

Investigation 3

I found this on page ______.

9. What is a *perpendicular bisector* of a segment?

____

____

10. Describe how to reflect a point over a line using the perpendicular bisector method.

Step 1. ____________________

____

Step 2. ____________________

____

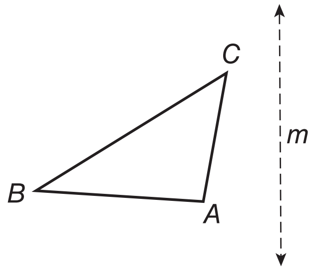
____

____

11. Suppose you want to reflect ΔABC over line m.

a. Which points would you reflect? __________

b. Show the reflection below.



What Did You Learn?

I need to remember the following about:

line of symmetry: ____________________

____

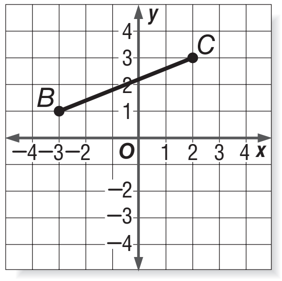
perpendicular bisector: ____________________

____

____

reflecting a line in a plane: ____________________

____



LESSON 6.2

Rotation

In Lesson 6.2, I expect to learn:

____

____

Investigation 1

I found this on page ____ .

Develop & Understand: B

1. How can you determine if a figure has rotation symmetry?

____

____

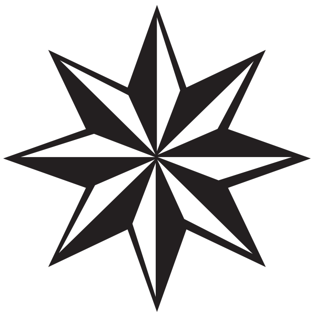
2. Suppose a figure has an angle of rotation of 72°. What do you know about the figure?

____

____

____

3. The figure below has rotation symmetry. Find the angle of rotation. ____________



Investigation 2

I found this on page ____ .

4. How can you tell if a figure is to be rotated clockwise or counterclockwise?

____

____

I found this on page ______ .

Develop & Understand: A

5. In a ____________________, a figure is turned about a point. Sketch the following rotations.

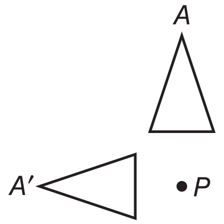
90°	180°	270°	−90°
A •	A •	A •	A •

Investigation 3

I found this on page ______ .

Develop & Understand: B

6. Complete the chart. In each case, rotate the triangle about point *P*.

Measure of angle *APA′*		180°	−90°
Angle of rotation			
Example			

7. How does a rotation of 180° differ from a rotation of any other angle?

____

____

____

Develop & Understand: C

8. You want to rotate a triangle with vertices (−1, 3), (1, 1), and (−2, −1) about the origin. Suppose you use 90° as the angle of rotation. What would be the new coordinates?

____

9. How can you use the 90° rotation rule $(x, y) \rightarrow (-y, x)$ to make a rule for a rotation of 180°?

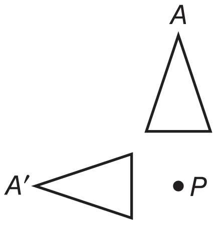
10. Using the rule that you described in Exercise 9, find the coordinates of the image vertices for the triangle with coordinates (0,0), (3,4), and (3,0) if it is rotated 180°.

What Did You Learn?

I need to remember the following about:

rotation symmetry: ______

angle of rotation: ______

EXAMPLE: 

is a ______ rotation of ______.

rotations: ______

the rule for a rotation of 90° in the coordinate plane: ______

EXAMPLE: ______

LESSON 6.3

Translations, Dilations, and Combined Transformations

In Lesson 6.3, I expect to learn:

____

____

Investigation 1

I found this on page ______.

1. Vocabulary In a ____________________, a figure is moved a specific distance in a specific direction.

2. Vocabulary A ____________________ is a line segment with an arrowhead that indicates distance and direction. Here is an example:

Develop & Understand: A

3. How are translations like reflections and rotations? How are they different?

____

____

____

Develop & Understand: C

4. Describe how each rule translates the point (−2, 4) on the coordinate plane.

Rule	How the point moves	Example
Add to *x*-coordinate		Rule: add 3 to *x*-coordinate (−2, 4) → ____________
Subtract from the *x*-coordinate		Rule: subtract 3 from the *x*-coordinate (−2, 4) → ____________
Add to *y*-coordinate		Rule: add 3 to *y*-coordinate (−2, 4) → ____________
Subtract from the *y*-coordinate		Rule: subtract 3 from the *y*-coordinate (−2, 4) → ____________

Investigation 2

I found this on page ______.

Develop & Understand: B

5. Vocabulary A ____________________ is a combination of a reflection over a line and a translation by a vector parallel to that line.

6. Give an example of a combination of transformations in which the image has the same orientation as the original figure. Draw the figure.

____

____

____

____

Inquiry

Investigation 3

I found this on page ______.

7. What is a tessellation?

____

____

I found this on page ______.

8. The first step in making a tessellation from a square is to cut out a shape from one side of it. What are your options for placing the cutout shape back on the paper?

Option 1: ____

Option 2: ____

____

____

Option 3: ____

____

Investigation 4

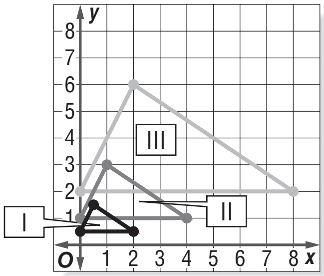
I found this on page ______.

9. Vocabulary The ratio between corresponding side lengths of similar figures is called the ____________________.

10. Complete the table.

Scale Factor	The image is . . .
Between 0 and 1	
1	
Greater than 1	

11. Triangle I, II, and III below show dilations. Fill in the table below.



Triangle ____	is a dilation of Triangle ____	with scale factor ____
III	II	________
I	II	________
II	III	________

What Did You Learn?

I need to remember the following about:

translations: ____________________

____

tessellations: ____________________

____

dilations: ____________________

____

____

applying the projection method and coordinate methods when dilating a figure:

____

____

Example of projection method:

CHAPTER 7

Inequalities and Linear Systems

Contents in Brief

Real-Life Math

This chapter begins by discussing how mathematical programming was developed after World War II and how it is used extensively in business situations to optimize variables such as profit, cost, and time.

Think About It

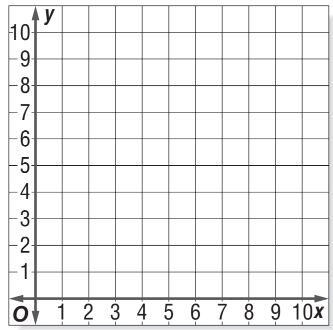
What are some of the variables that a company might consider when maximizing profits?

Which of the variables would the manager of a company have little to no control over?

Suppose the cost of shipping increased. What are some of things the company manager might do so that the profits are not affected by this increase?

Connections to the Past (Chapter 1)

Graph $y = 3x$ and $y = 6$. At what point do the graphs intersect?



Vocabulary

Complete each statement with a term from the list below.

elimination **inequality**
substitution **system of equations**

- When using the process of ______________, you *replace* an expression in one equation with an equivalent expression from another.
- When using the process of ______________, you *remove* a variable by adding opposites.
- A(n) ______________ is a group of two or more equations.
- A(n) ______________ contains one of the following symbols: $<, >, \leq, \geq, \neq$.

Family Letter

Which method of solving equations did you share? Why do you choose this method to share?

____

____

____

____

What were some of the skills that you found that can be used outside of school?

____

____

____

____

LESSON 7.1

Equations

In Lesson 7.1, I expect to learn:

____

____

Think & Discuss

I found this on page ______.

How is backtracking used to solve an equation?

____

____

Investigation 1

Example

I found this on page ______.

1. When creating a flowchart for backtracking, how do you know what to use as the input and what to use as the output?

____

____

Develop & Understand: A

2. What kind of equation would be difficult to solve by backtracking? Give an example.

____

Develop & Understand: B

3. When solving an equation by doing the same thing to both sides, how do you determine which operation to perform on each side? Give an example.

____

____

____

____

____

I found this on page ______ .

Develop & Understand: C

4. What are some of the limitations of the backtracking method? How does simplifying the equation help?

Develop & Understand: D

5. What is a common error when you set up and solve an equation given in words?

Investigation 2

I found this on pages __________ .

Develop & Understand: A and B

6. How do you know when a relationship between variables is linear? How can this be used to demonstrate that the relationship between Fahrenheit and Celsius degrees is linear?

7. Describe how to rearrange the equation $a = \frac{1}{3}b + 5$ into an equation that will give the value of b when a is known. What is this new equation?

8. How can you check that your new equation in Exercise 7 is correct? Show an example.

____

____

____

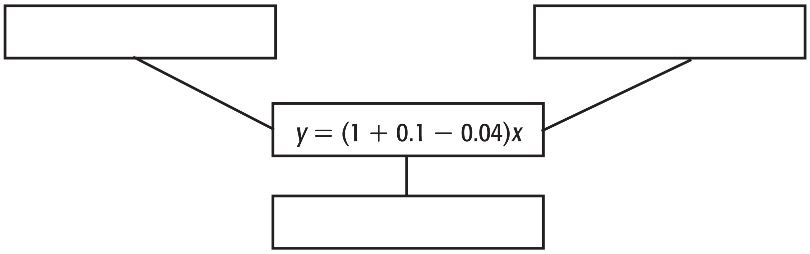
____

____

I found this on page ______ .

Develop & Understand: E and F

9. Complete the chart by writing the equation in different ways.



What Did You Learn?

I need to remember the following about:

backtracking: _______________

____

____

EXAMPLE: An equation that can be solved by backtracking is _______________

____

doing the same thing to both sides: _______________

____

____

EXAMPLE: An equation that can be solved by doing the same thing to both sides is _______________

how doing the same thing to both sides is similar to backtracking: _______________

____

____

LESSON 7.2

Inequalities

In Lesson 7.2, I expect to learn:

____

____

I found this on page ______.

Vocabulary An ______________________ is a mathematical statement that uses <, >, ≤, or ≥ to compare quantities. Give two possible values for each inequality.

Inequality Symbol	Example	Possible Values
$<$	$3x < 9$	
$>$	$4y > 24$	
$\le$	$2t - 9 \le 21$	
$\ge$	$\lvert p \rvert \ge 6$	

Investigation 1

Develop & Understand: A

I found this on page ______.

1. Consider only whole number values for x. Write three other compound inequalities that represent the same set of values. In the center, list the whole numbers for which they are true.

$4 \le x \le 7$

Develop & Understand: B

I found this on page ______.

2. To describe Randall's time in Exercise 14 on page 327, why is $\le$ used and not $<$?

____

____

Investigation 2

I found this on pages ______.

Develop & Understand: A and B

3. How is solving an inequality like solving an equation? How is it different? Give an example to show how they are alike.

I found this on page ______.

4. Give an example to explain why you must reverse the direction of the inequality sign when multiplying or dividing both sides of an inequality by a negative number.

Investigation 3

Develop & Understand: A

5. Complete the table about compound inequalities.

	What I know about solutions	Signs used in absolute-value inequalities	Example of graph
Uses the word "and"			
Uses the word "or"			

Develop & Understand: B and C

I found this on pages ______.

6. Describe the graph of $|m| \leq 5$.

7. Describe the graph of $|n| \geq 2$.

____

____

Investigation 4

I found this on page ______.

Example

8. Complete the table about graphing inequalities on the coordinate plane.

Use a dashed line when . . .	Use a solid line when . . .
Shade above the line when . . .	**Shade below the line when . . .**

Develop & Understand: B

9. Why is it important to convert to slope-intercept form before graphing an equation or inequality?

____

What Did You Learn?

I need to remember the following about:

solving inequalities: ____

____

combined inequalities with *and*: ____

____

combined inequalities with *or*: ____

____

identifying solutions to inequalities that are graphed on a number line:

____

____

graphing inequalities in the coordinate plane: ____

____

LESSON 7.3

Solve Systems of Equations

In Lesson 7.3, I expect to learn:

____

____

Explore

In both graphs, there was one point that satisfied both solutions. Could there be a situation where there is no such point? Explain.

____

____

Investigation 1

I found this on page ______.

1. Vocabulary A ____________________ is a group of two or more equations.

Develop & Understand: A and B

2. Complete the table about solving a system of equations by graphing.

Number of Solutions	Description of Graph of LInes
0	
1	
infinite	

3. For a system of equations, what must be true about the coordinates of the point(s) where the two lines intersect?

____

____

Investigation 2

I found this on page ______.

4. In business, what is meant by a break-even point?

____

____

5. How can you identify a break-even point from a graph?

____

____

Investigation 3

I found this on page ______.

6. "Substitute" means to *replace*. How does this meaning relate to the process of solving a system of equations by substitution?

____

____

7. How does substituting an expression for one of the variables make it possible to solve the system?

____

____

8. Give an example of a system of equations that can be solved by substitution. Then give the solution.

____

Investigation 4

I found this on page ______.

Example

9. Tell how to eliminate each variable in the system.

Eliminate x	$2x - y = 3$ $4x + 3y = 31$	Eliminate y

10. When do you think it is easier to use elimination rather than substitution when solving a system of equations?

____

____

____

11. Show the steps to solving the system by elimination. Start by eliminating x.

$2x - 3y = 13$ $x + y = 4$	→	________ ________	→	________ $y =$ ____	→	$x + y = 4$ ________ $x =$ ____	→	Solution is ________

Think & Discuss

I found this on page ____ .

12. In Exercise 11, y could have been chosen as the variable to eliminate. What would you have done to eliminate y?

____

____

Inquiry Investigation 5

13. What does the command B2 mean when written in a spreadsheet?

I found this on page ____ .

____

____

14. Why do the cells in row 3 of the spreadsheet start with "="?

____

____

What Did You Learn?

I need to remember the following about:

solving a system of equations by graphing: ______________________________

____

solving a system of equations by substitution: ______________________________

____

solving a system of equations by elimination: ______________________________

____

the number of solutions of pairs of equations from the ones shown below and how I check:

i. $y = 2x + 4$ **ii.** $y + 2x = -4$ **iii.** $x = 4 - \frac{y}{2}$ **iv.** $2y - 4x = 10$

____

____

____

CHAPTER

8

Quadratic and Inverse Relationships

Contents in Brief

Real-Life Math

This chapter begins by discussing how Galileo Galilei performed the classic experiment of dropping two different objects from the same height to see if they would hit the ground at the same time.

Think About It

How far will a cannonball have fallen 1 second after it is dropped? How did you determine that distance?

____

Find the distances it will have fallen after 2 seconds and 3 seconds.

____

What do you notice about the rate at which an object falls?

____

____

Connections to the Past (Chapter 1)

You studied linear relationships in Chapter 1. Explain why the equation $d = 16t^2$ does not describe a linear relationship.

____

____

____

(Chapter 7)

You solved equations by backtracking in Chapter 7. To find how long it took an object to fall 400 feet, you would solve $400 = 16t^2$. If you were to solve this equation for t by backtracking, what would be the steps from the input to the output?

____

Vocabulary

Circle true or false for each statement.

▶ A **conjecture** is a proven fact.	true	false
▶ A **parabola** is a symmetric U-shaped curved.	true	false
▶ The equation $y = 3x$ is a **cubic equation**.	true	false
▶ The equation $y = x^3$ is a **quadratic equation**.	true	false
▶ A **vertex** is the highest or lowest point on a parabola.	true	false
▶ If two variables are **inversely proportional**, then as the values of one variable increase, the values of the other variable decrease.	true	false

Family Letter

List sports-related activities that produce projectile motion paths.

____

____

____

List the real-world situations that produce inverse relationships.

____

____

____

LESSON 8.1

Use Graphs and Tables to Solve Equations

In Lesson 8.1, I expect to learn:

____

____

I found this on page ______.

Vocabulary A ______________________ is one in which one of the variables is squared.

Investigation 1

I found this on page ______.

Develop & Understand: B

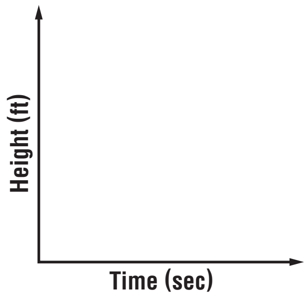
1. Why does it make sense to only look at the part of the graph that is in Quadrant I?

____

____

____

2. A ball is bounced off the ground. It goes straight up and comes back down. Sketch the general shape of the graph that describes the height of the ball x seconds after the bounce.



3. What does the point (0, 0) represent?

____

____

____

4. How can you use the graph to find how long it takes for the ball to come down after it reaches its maximum height?

____

____

____

____

5. Complete the table for an equation in the form $h = vt - 16t^2$.

For a given value of *h*…	
t has ______ values…	when…
2	
1	
0	

Investigation 2

I found this on page ______.

Think & Discuss

6. Explain how the equation $x(x + 1) = 4$ can be used to find the length and width of the tapestry.

____

____

I found this on page ______.

Example

7. What does the Table Setup feature on your calculator allow you to do?

____

____

What Did You Learn?

I need to remember the following about:

the formula $h = vt - 16t^2$: ____

____

a sample graph of $h = vt - 16t^2$:

____

____

____

using a table to solve an equation: ____________________________________

____

____

LESSON 8.2

Quadratic Relationships

In Lesson 8.2, I expect to learn:

____

Explore

Desribe the general shape of the human graph.

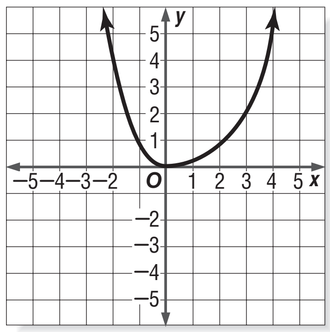
____

Investigation 1

I found this on page ______ .

1. Vocabulary The graph of a quadratic equation is called

a ______________________.



2. Tell why the graph to the right is not a parabola.

____

3. Complete the graphic organizer.

Quadratic Equations

↓

Simplest Equation

↓

Examples

↓

Equation		Constant
$y = 3x^2$	⟷	
	⟷	-1
	⟷	

Develop & Understand: A

4. Given that the equation $y = ax^2$ describes a quadratic equation, do you think a can be 0? Tell why or why not.

I found this on page ______.

5. In the graph of $t = s^2 + 1$, how can you generate both positive and negative ordered pairs without substituting negative numbers for s?

6. Compare and contrast the equations $y = x + 1$ and $y = x^2 + 1$.

Develop & Understand: B

7. What is the number of diagonals in a polygon with 6 sides? Draw the polygon and diagonals to check your work.

8. What is the number of diagonals in a 12-gon? Explain how you found your answer.

9. The equation for the number of diagonals in a polygon is $d = \frac{n(n-3)}{2}$, where d represents the number of diagonals and $n =$ the number of sides of the polygon. Explain why you think the equation shows a quadratic relationship.

____

____

10. What kind of graph will the relationship between the number of diagonals and the number of sides of a polygon have?

____

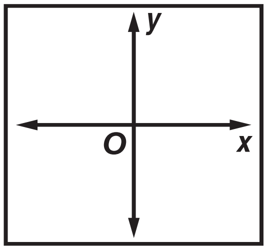
What Did You Learn?

I need to remember the following about:

parabolas: ____

____

the graph of $y = ax^2$ if a is positive: ____________________



quadratic equations: ____

____

____

LESSON 8.3

Families of Quadratics

In Lesson 8.3, I expect to learn:

____

____

I found this on page ______.

Vocabulary Give the general form of each.

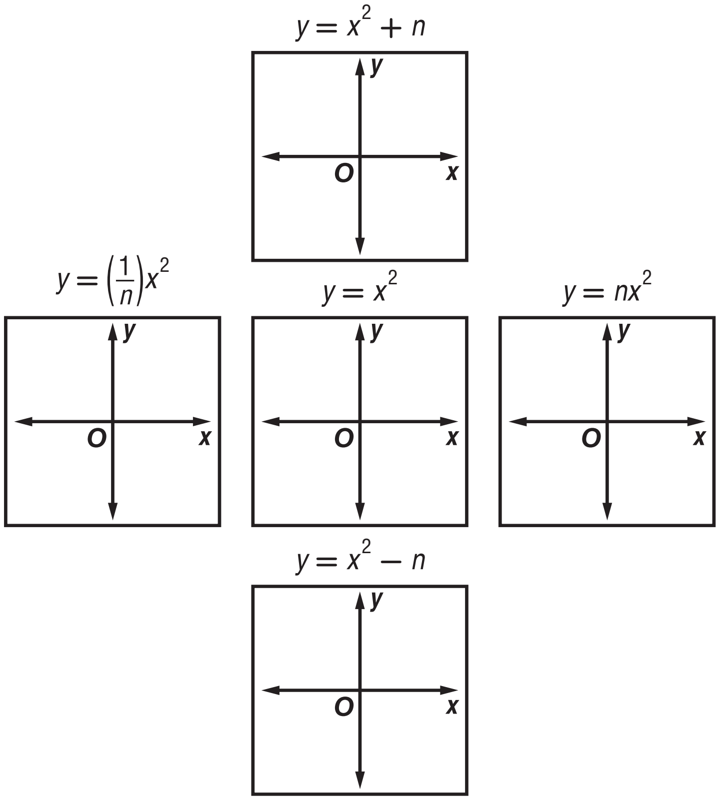
quadratic expression	quadratic equation

For each, *a*, *b*, and *c* are ____________________ and ____________________ is not 0.

Investigation 1

I found this on page ______.

1. Sketch a general graph to fit each equation. Assume $n > 1$. Use the same scale when sketching all five graphs.



Investigation 2

Develop & Understand: A

2. How can you tell from looking at a quadratic equation if its graph will open upward or downward?

____

____

I found this on page ______.

3. Vocabulary The highest or lowest point of a parabola is called its ____________________.

4. How can you tell from looking at a quadratic equation if the vertex of the graph will be on the y-axis?

____

____

Investigation 3

5. A graph shows the trajectory of a ball thrown across a field with time on the x-axis and height on the y-axis. What information can you obtain from the vertex of the parabola?

____

____

____

Investigation 4

Develop & Understand: A

6. Why is the equation $y = b(b + 1)$ a quadratic equation even though neither occurrence of b has an exponent of 2?

____

____

I found this on page ______.

7. Vocabulary A ____________________ can be written in the form $y = ax^3 + bx^2 + cx + d$, where a is not ______________.

Develop & Understand: B

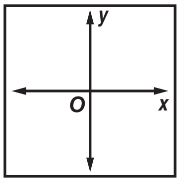
8. How is the graph of a cubic equation similar to the graph of a quadratic equation? How is it different?

____

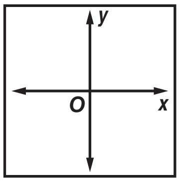
____

9. Sketch a general graph to fit each equation. Assume $n > 1$. Use the same scale when sketching all five graphs.

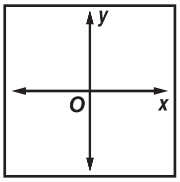
$y = x^3$



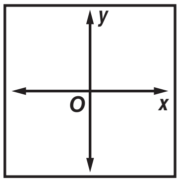
$y = \left(\frac{1}{n}\right)x^3$



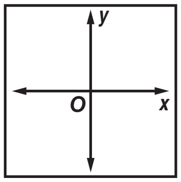
$y = -x^3$



$y = x^3 + n$



$y = x^3 - n$



Inquiry

Investigation 5

10. When using graphs of quadratic equations to make designs, how do you reflect over the *x*-axis? Give an example.

____

____

____

____

What Did You Learn?

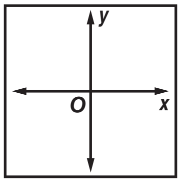
I need to remember the following about:

graphs of quadratic equations: ____

____

____

EXAMPLE:

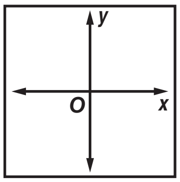


graphs of cubic equations: ____

____

____

EXAMPLE:



LESSON 8.4

Inverse Variation

In Lesson 8.4, I expect to learn:

Explore

I found this on page ____.

Why does the graph appear only in Quadrant I?

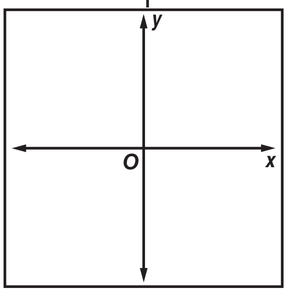
Investigation 1

Develop & Understand: A

I found this on page ____.

1. Write two other forms of the equation $xy = a$. Then sketch the graph of the general equation. Assume $a \geq 1$.

	$xy = a$	



2. What happens to the y-values as the x-values increase?

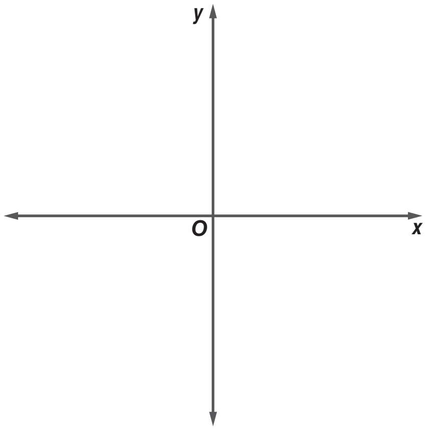
Develop & Understand: C

I found this on page ____.

3. What steps would you use to graph the equation $xy = 8$?

4. Vocabulary The graph of the equation $xy = a$ where a is a nonzero constant is a curve called a ________________ .

5. Sketch the graph of $xy = a$.



I found this on page ____ .

6. Vocabulary When two variables have a constant nonzero product, they are said to be ________________ and the relationship is called an ________________ .

Develop & Understand: A

I found this on page ____ .

7. How can you find the reciprocal of a decimal?

____

____

Develop & Understand: B

8. What happens if you double x in the relationship $xy = 6$?

____

____

I found this on page ____ .

9. Vocabulary Inverse variation is also called a ____________ ____________. An example is ________________.

10. Complete the table.

How to Recognize an Inverse Variation		
From a Graph	From a Table	From an Equation

Investigation 3

11. How does the graph of $y = \frac{1}{x}$ change when a constant is added to x? Give an example.

I found this on page ______ .

____

____

12. How does the graph of $y = \frac{1}{x}$ change when a constant is added to the fraction $\frac{1}{x}$? Give an example.

____

____

What Did You Learn?

I need to remember the following about:

inverse variation: ______________________________

____

____

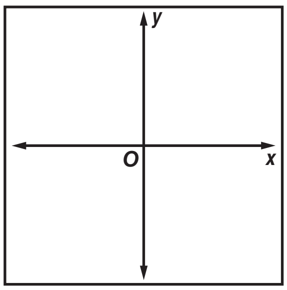
characteristics of hyperbolas: ______________________________

____

____

____

a sample graph of a hyperbola:



LESSON 8.5

Conjectures

In Lesson 8.5, I expect to learn:

____

I found this on page ____.

Vocabulary A ____________________ is an educated guess or a generalization that has not been proven.

Explore

Do you think you would have proven the conjecture if you found it to be true for 100 more examples? Explain.

____

____

Investigation 1

Develop & Understand: A

I found this on page ____.

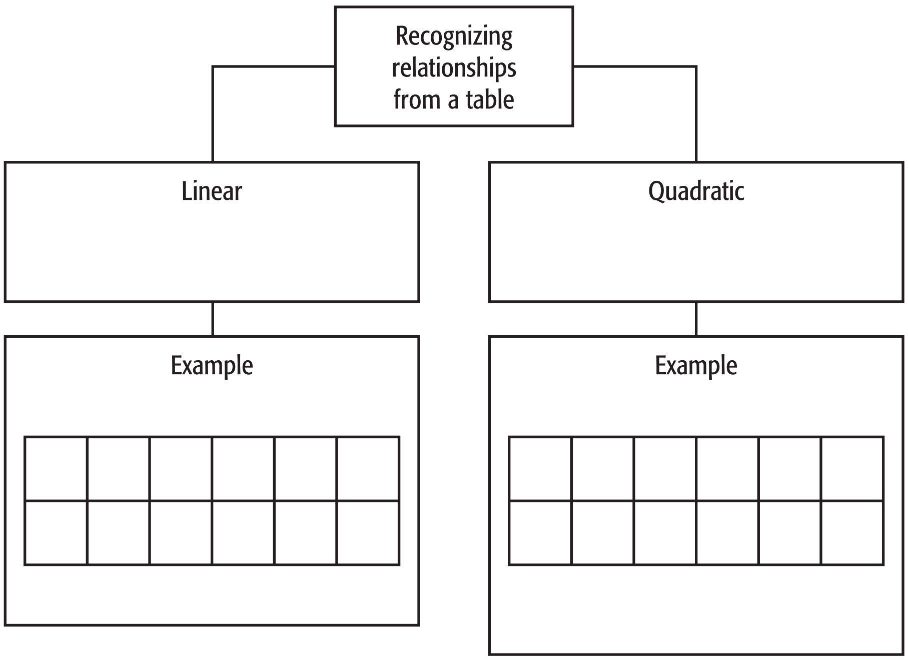
1. What is meant by first differences? By second differences?

____

____

____

2. Complete the graphic organizer.



Investigation 2

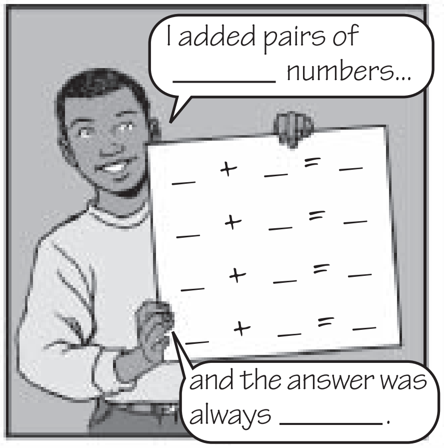
I found this on page ______ .

3. Vocabulary What is a counterexample?

____

4. Fill in the blanks to show what numbers Dante might use if he was conjecturing that the sum of two even numbers was always even.

This cartoon is found on page 452.



5. Give a counterexample for the conjecture: The square of a nonnegative number is always positive. Tell why it is a counterexample.

____

____

6. Give an example of a conjecture that you know is true.

____

____

What Did You Learn?

I need to remember the following about:

conjecture: ____

____

first and second differences: ____

____

COUNTEREXAMPLE: ____

____

CHAPTER 9

Solve Quadratic Equations

Contents in Brief

Real-Life Math

This chapter begins by discussing how computer programmers use expressions and equations in the programs they write. These may include equations for animation, such as quadratic equations for paths, or trajectories of balls in motion.

Think About It

What is the general shape of the basketball's trajectory?

____

How would the shape change if the person stood further away from the basket?

____

Suppose you were to graph the path of the basketball's trajectory, where x is the time in seconds since the person released the ball and y is the ball's height above the ground. Would the point (0, 0) be on the graph? Explain.

____

____

Connections to the Past (Chapter 8)

You studied the graphs of quadratic equations in Chapter 8. What can you say about the values of a, b, and c for the quadratic equation in the form $y = ax^2 + bx + c$ that would model the path of the basketball's trajectory?

a. ______________________________

b. ______________________________

____

c. ______________________________

Vocabulary

In a multiplication problem, the numbers that are multiplied together are called factors. Therefore, writing factors of a number is called *factoring*.

Circle the equations that show factoring.

$5 = 2 + 3$	$9 = 3 \cdot 3$
$10 = 1 \cdot 2 \cdot 5$	$8 = 16 \div 2$
$20x = 4 \cdot 5 \cdot x$	$2x = x + x$

In everyday life, a *factor* is something that contributes to, or is a part of, something else. For example, high speeds and wet roads can be factors in the cause of a car accident. Factors to consider when taking a new job include the salary, benefits, and the length of the commute.

Family Letter

How did you search for real-life situations that can be modeled by quadratic equations?

____

____

____

List some of the real-life situations that you found.

____

____

____

Which method of solving quadratic equations did you enjoy sharing the most? Why?

____

____

LESSON 9.1

Backtracking

In Lesson 9.1, I expect to learn:

____

Investigation 1

Develop & Understand: A

1. Complete the table.

Operation in top of flowchart	Symbol used in flowchart	How to undo operation
Take the square root of a number		
Take the opposite of a number		

I found this on page ____.

2. For the two equations below, which flowchart would show "take the reciprocal" when going from the input to the output? Explain.

$$\frac{2}{x} = 6 \qquad \frac{x}{2} = 6$$

____

____

____

____

I found this on page ____.

3. Complete the table to describe two different methods to solve the equation $\frac{15 - m}{5} = 2$. Then give the value of m.

	Method 1	Method 2
Steps for input to output		
Steps to solve		
The value of *m* is ____.		

4. What operation undoes the "change sign" operation?

____

Think & Discuss

5. When can an equation have two solutions? Why?

6. For what value of a would $x^2 = a$ have only one solution? Why?

Develop & Understand: A

I found this on page ______ .

7. In Exercise 8 Part e about filmmaking, there are two solutions for the equation $120 = \frac{360{,}000}{d^2}$. Why is it only necessary to give the positive solution?

8. Think of another situation where an equation with two solutions may apply but it is only necessary to give the positive solution.

Develop & Understand: B

9. How will checking an approximate solution compare to checking an exact solution?

10. What kind of equations may always have an approximate solution as well as an exact solution? Give two different examples.

11. Use a flowchart and backtracking to solve this equation. Explain your steps.

$$(2x - 3)^2 + 1 = 10$$

What Did You Learn?

I need to remember the following about using backtracking

with a variable in denominator:	when a variable has a coefficient of -1:	when squaring a number:

LESSON 9.2

Factoring

In Lesson 9.2, I expect to learn:

____

____

I found this on page ____.

Vocabulary The process of ______________ means to write a number or algebraic expression as the product of factors.

Think & Discuss

What kinds of numbers will have a factor pair that is made up of the same two numbers? Give an example.

____

____

Investigation 1

Develop & Understand: A

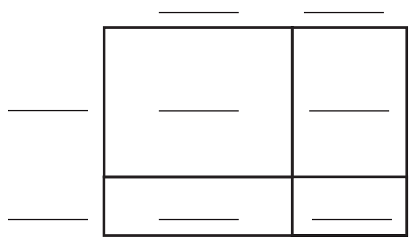
I found this on page ____.

1. When making a rectangle model for $x^2 + 5x + 6$, you need to think about factor pairs of 6. Can you choose 1 and 6? Explain.

____

____

2. Draw a rectangle model to find the binomial factors of $d^2 + 7d + 12$. Explain how you made your choices.



____

Investigation 2

Think & Discuss

3. Suppose that $xy = 0$. Write three possibilities for the values of x and y.

__________ __________ __________

I found this on page ______ .

Develop & Understand: B

4. In the chart, describe the solutions each type of equation has. Then write equations with a quadratic expression on one side of the equal sign and 0 on the other.

Type of expression	Description of solutions	Example
difference of squares		
perfect square trinomial		

5. How can you tell if a quadratic expression is in a special form? Use examples in your explanation.

____

____

____

____

____

____

Investigation 3

I found this on page ______ .

Develop & Understand: A

6. When factoring a quadratic expression, how do you determine the values of *m* and *n*? Give an example.

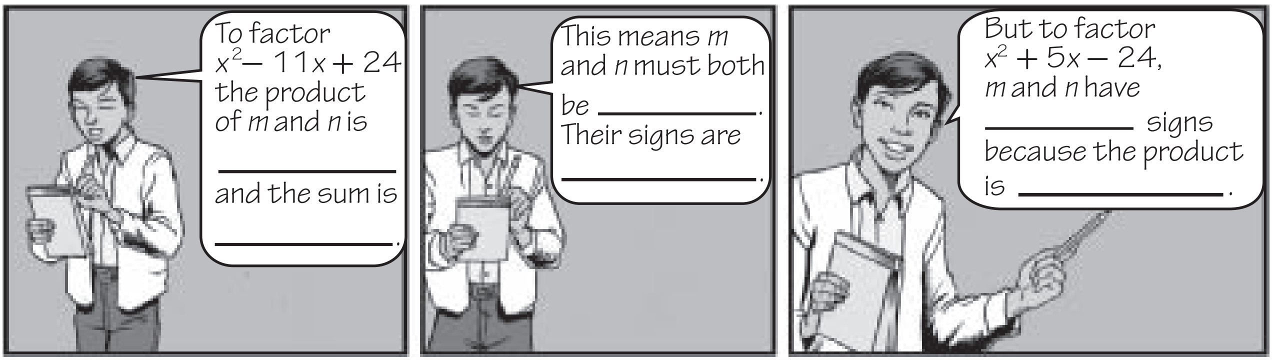
____

____

____

This cartoon is found on page 483.

7. Fill in the blanks with *positive*, *negative*, *the same*, or *different*.



Investigation 4

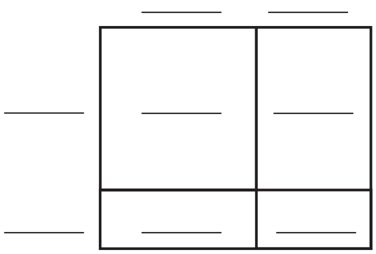
Develop & Understand: A

8. What is the goal when rearranging quadratic equations so that you can solve them by factoring? Why?

What Did You Learn?

I need to remember the following about:

using a rectangle model to find the binomial factors of a trinomial:



solving a quadratic equation by factoring:

how many solutions there will be to a problem like $y(y - 1) = 0$ and why:

finding the values of m and n when solving by factoring:

LESSON 9.3

Completing the Square

In Lesson 9.3, I expect to learn:

Investigation 1

I found this on page ______.

Example

1. What do you have to remember to do when taking the square root of both sides of an equation?

2. What does the symbol $\pm$ indicate?

Develop & Understand: A

3. If you were to solve all of Exercises 1 through 9 on page 493 by doing the same thing to both sides, would the first step always be to take the square root of both sides? Why or why not?

I found this on page ______.

Develop & Understand: B

4. Explain why a perfect square trinomial is a perfect square. Give an example.

Develop & Understand: C

5. In the perfect square trinomial, $x^2 + bx + c$, how are b and c related?

Investigation 2

Develop & Understand: A

6. Complete the table about rewriting expressions as a perfect square trinomial plus or minus a constant.

	Words	Example
A constant is added to the perfect square when…		$x^2 + 8x + 17 = 0$ $(x + 4)^2 + 1 = 0$
A constant is subtracted from the perfect square when…		

This cartoon is found on page 496.

7. Fill in the blanks and show the work described.

$x^2 + 10x + 16 = 0$

$x^2 + 10x + \_\_ - \_\_ = 0$

$(\_\_\_)^2 - \_\_ = 0$

$(\_\_\_)^2 = \_\_$

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

So, ________

What Did You Learn?

I need to remember the following about:

taking the square root of both sides of an equation: ________________________________

____

____

____

solving by completing the square when the coefficient of x^2 is not 1: ________________

____

____

LESSON 9.4

The Quadratic Formula

In Lesson 9.4, I expect to learn:

____

____

I found this on page ______.

The Quadratic Formula states that the solutions of

______________ are ______________, or

______________ and ______________.

Investigation 1

Develop & Understand: A

1. Think about possible values of a, b, and c for an equation in $ax^2 + bx + c = 0$ form. Which values result in quadratic equations?

Is it possible to have…	If no, tell why not. If yes, give an example.
$a = 0$?	
$b = 0$?	
$c = 0$?	

2. What are some advantages and disadvantages of using the Quadratic Formula to solve a quadratic equation?

Advantages	Disadvantages

Investigation 2

I found this on page ______.

Develop & Understand: A

3. In solving a problem that involves finding height in feet after dropping an object or throwing a ball straight up, what will you use for the value of a in the Quadratic Formula? Why?

____

____

I found this on page _____.

4. When an object is thrown straight up, an equation that can be used to approximate its height h in t seconds is ________________. Describe what you know about this equation.

____

____

Investigation 3

Develop & Understand: A

I found this on pages ____________.

5. Complete the table.

A quadratic equation has ________ solution(s),	when the value of $b^2 - 4ac$ is ________,	because ...	Example
			$2x^2 + 4x - 8 = 0$
			$x^2 + 4x + 4 = 0$
			$x^2 + x + 1 = 0$

6. Using your example of a quadratic equation with two solutions, show how you know there are two solutions.

____

____

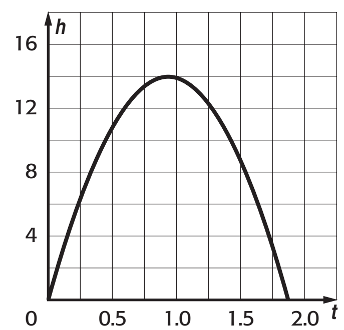
I found this on page _____.

7. For the graph to the right, if you graphed $y = 12$ on the same coordinate plane, what would it show?

____

____

Bouncy Ball Bounce Height



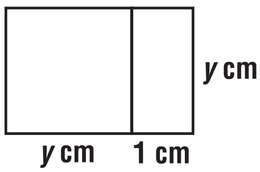
8. What is a golden rectangle? What is special about the ratio of its side lengths?

____

____

____

9. The side lengths of a golden rectangle are shown below. Write an equation that sets the ratios equal to each other to get the golden ratio.



____

What Did You Learn?

I need to remember the following about:

the Quadratic Formula: ____

____

____

using part of the Quadratic Formula to determine the number of solutions:

____

A quadratic equation has ________________ **solution(s) when the value of $b^2 - 4ac$ is** ________________ **because** ______________________

____

A quadratic equation has ________________ **solution(s) when the value of $b^2 - 4ac$ is** ________________ **because** ______________________

____

A quadratic equation has ________________ **solution(s) when the value of $b^2 - 4ac$ is** ________________ **because** ______________________

____

CHAPTER 10

Functions and Their Graphs

Contents in Brief

Real-Life Math

This chapter begins by discussing how mapmakers, or cartographers, use projections to create two-dimensional images of our three-dimensional world.

Think About It

All flat maps of the world have some sort of distortion. What three-dimensional model represents the world without distortion? What geometric figure does it best represent?

____

How does a sphere differ from prisms and pyramids?

____

____

A net is a pattern that can be folded to make a solid. More than one net can form a cube. Draw two nets for the same cube.

Connections to the Past (Chapters 1, 4, and 8)

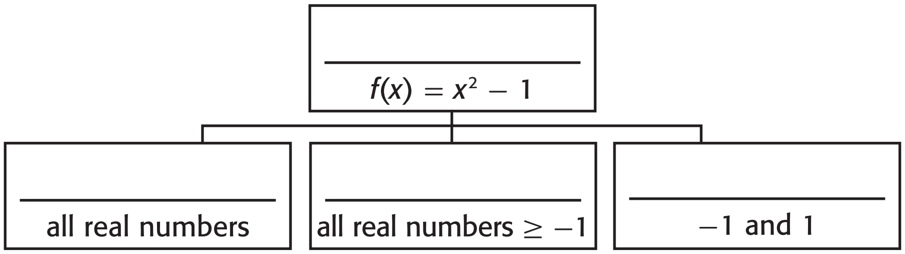
You will study graphs in this chapter. You have studied graphs of several types of relationships so far. Describe the general shape of the graph of each relationship.

Linear	
Exponential	
Inverse	
Quadratic	

Vocabulary

Complete the graphic organizer by writing each of the following terms in the correct place.

domain **function** **range** ***x*-intercepts**



The word *domain* can be used to indicate property owned by or ruled by a certain individual or group. It can be a region of land or a single house. The word domain can also be used to indicate a branch of the Internet.

The word *range* can be used to indicate certain limits. A patient with an injured arm may have limited range of motion. A radio will only pick up a station if it is within range of its signals.

Family Letter

Does tipping at a restaurant always represent a function? Explain.

____

____

____

List some of the situations you and your family thought of that represent functions.

____

____

____

LESSON 10.1

Functions

In Lesson 10.1, I expect to learn:

____

____

I found this on page ______.

Vocabulary A ________________ is a relationship between an input variable and an output variable in which there is only one ________________ for each ________________.

Write *Function* or *Not a Function* in the second column of the table. Then give input/ouput examples of the relationship described.

Relationship	Function or Not a Function?	Example	
		Input	Output
Squaring a number			
Taking the square			

Investigation 1

Develop & Understand: A

I found this on page ______.

1. How are Function A and Function B alike? How are they different?

____

____

____

____

Develop & Understand: B

I found this on page ______.

2. What does the "prime" function machine do? Explain.

____

____

3. Can you input 0 into the "prime" function machine? Explain.

I found this on page ____ .

___

___

Develop & Understand: C

4. Is the "3" machine a linear function machine? Explain.

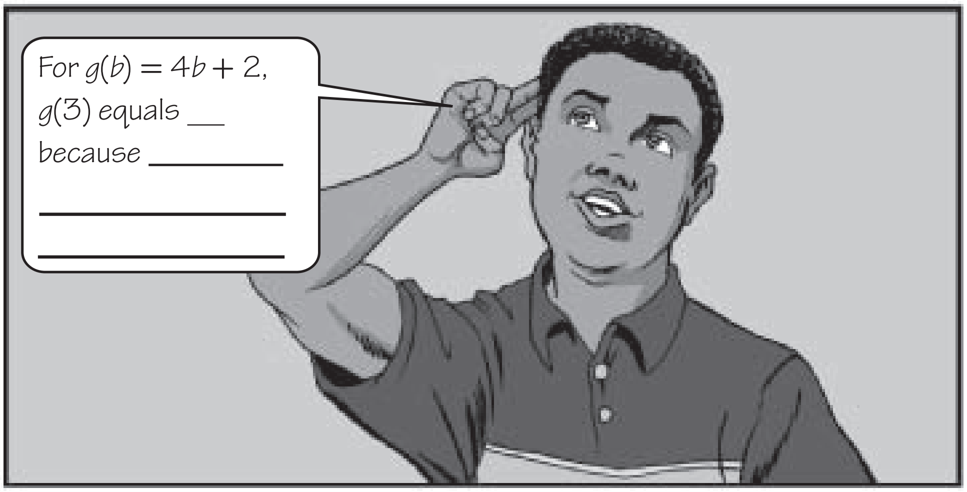
___

___

Investigation 2

5. Complete the cartoon.

This cartoon is found on page 529.



Develop & Understand: B

6. How you tell from the graph of a relationship if the relationship is a function?

___

___

___

Develop & Understand: C

I found this on page ____ .

7. In the skydiver function $f(t) = 4.9t^2$, what is 4.9?

___

___

8. Vocabulary The set of allowable inputs to a function is called the ________________ of that function.

Develop & Understand: D

I found this on page ______.

9. Give an example of a function whose domain is all real numbers except 3. Explain your choice.

Investigation 3

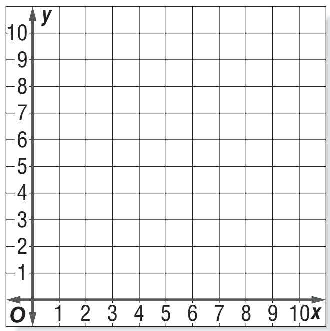
Develop & Understand: A

I found this on page ______.

10. If the graph of a function is a parabola, what is the name of the point at which the maximum or minimum value occurs?

11. What must be true about a quadratic equation if its graph does not have a maximum value?

12. Draw a function that has more than one maximum input value.



Investigation 4

Develop & Understand: A

I found this on page ______.

13. For a fixed perimeter, describe the shape of the rectangle that gives the greatest area and the shape of the rectangle that gives the least area.

Inquiry

Investigation 5

14. Why is it not necessary for your box to have a lid?

____

I found this on page ______ . ____

15. Why is the domain limited for the graph of the function that gives the volume of the box?

____

____

____

____

____

What Did You Learn?

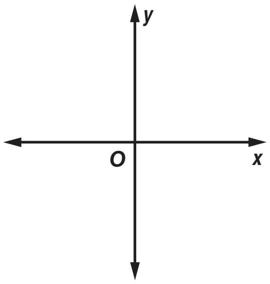
I need to remember the following about:

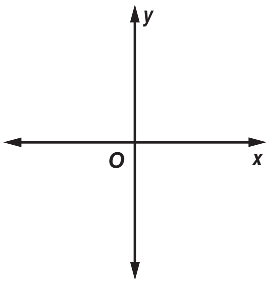
determining if a relationship is a function: ______________________________

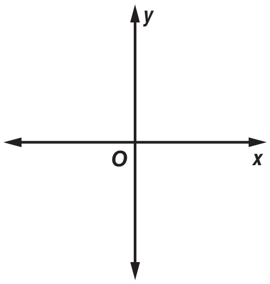
____

how I know a graph is not the graph of function, by example: ______________

____







the domain of a function: ______________________________________

____

____

LESSON 10.2

Graphs of Functions

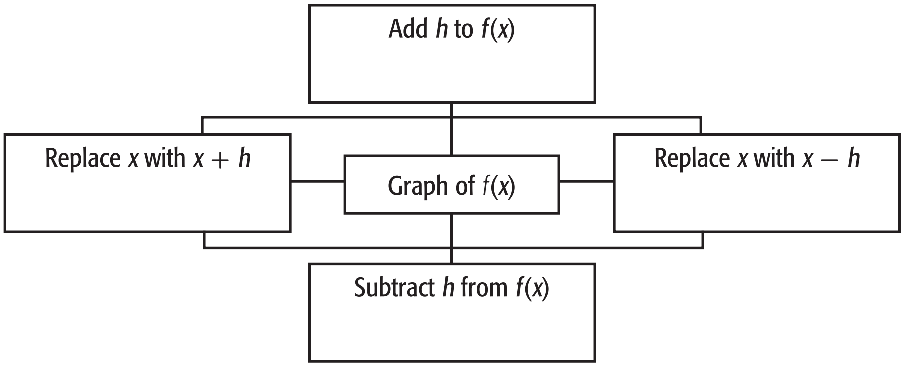
In Lesson 10.2, I expect to learn:

____

Investigation 1

Develop & Understand: A, B, and C

1. Complete the graphic organizer by telling how the graph of the function will change.



Investigation 2

Think & Discuss

2. Describe how you found the values of x for each $f(x)$.

____

____

____

I found this on page ______.

3. Vocabulary All of the possible output values of a function are the ______________ of the function.

4. How do you determine the domain and range of a function from its graph?

____

____

____

____

I found this on page ______.

5. For the general quadratic function, $f(x) = (x - h)^2 + k$,

a. What is the line of symmetry? ______________

b. What is the vertex? ______________

6. If you know the vertex, can you write a quadratic function with that vertex? Is that the only function you can write? Explain. Use the vertex (2, 3) as an example.

____

____

____

Investigation 3

7. Vocabulary The x values at which a graph crosses the x-axis are called the ______________.

8. How are the x-intercepts of the graph of a function $f(x)$ related to the solutions of $f(x) = 0$?

____

Example

I found this on page ______.

9. Explain how to find the vertex of a function if you know the x-intercepts of the function.

____

____

____

____

Investigation 4

10. Describe two methods of estimating solutions of an equation by graphing.

Method 1	Method 2

11. Which method that you described in Exercise 10 would you use to solve the equation $x^3 = 3x - 0.4$? Why?

____

____

____

What Did You Learn?

I need to remember the following about:

translating functions: ____

____

the range of a function: ____

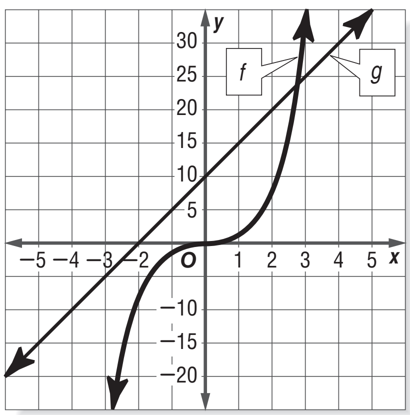
***x*-intercepts and solutions of equations:** ____

____

interpreting a graph to find the solution to an equation like $x^3 = 5x + 10$:

____

____



CHAPTER 11

Data and Probability

Real-Life Math

This chapter begins by discussing anagrams. Anagrams are words that are formed from other words. They have the same exact letters, but the letters appear in a different order.

Contents in Brief

Think About It

The letters in the word *stop* have 24 different combinations, some of which are anagrams. List some of the anagrams you found for the word *stop*.

____

Suppose you had to list all 24 combinations of the word *stop*. Describe an organized way of doing this task.

____

____

____

Connections to the Past (Chapter 8)

You studied first and second differences in Chapter 8. Complete the table and use it to tell if the relationship between the number of letters in a word and the possible number of combinations is linear, quadratic, or neither. Explain. (Note: Assume all of the letters in each word are different.)

Number of Letters in Word	2	3	4	5
Number of Combinations			24	120

____

____

____

Vocabulary

Answer each question.

▶ Suppose you have a log. How many cuts would you need to make to divide the log into four pieces? Why?

____

____

▶ The word *quartile* comes from the Latin word, *quartus*, meaning *fourth*. Quartiles divide sets of numbers into four groups. How many quartiles will a data set have?

____

Use three vertical lines to divide the data set below into four equal groups.

1 2 3 4 5 6 7 8

▶ The set of all possible outcomes for a particular situation is the

____________________ .

Family Letter

Does your state have lottery games? If yes, describe one of the games, the number of possible combinations, and/or the probability of winning.

____

____

If you played a game that involved dice, spinners, or probability, describe one of the probabilities that you determined while playing.

____

____

LESSON 11.1

Counting Strategies

In Lesson 11.1, I expect to learn:

____

____

I found this on page ____ .

Probability is a number between ____________ and ____________ . To find a probability, you first have to find the number of possible ____________ .

Inquiry

Investigation 1

I found this on page ____ .

1. When listing pizza topping possibilities, would you count *mushrooms and artichokes* and *artichokes and mushrooms* separately? Why or why not?

____

2. There are ____________ possibilities that have ____________ toppings.

When there are n toppings, there are...

____________ one-topping possibilities

____________ n-topping possibilities

____________ total possibilities

Investigation 2

3. Vocabulary For a particular situation, the set of all possible outcomes is the ____________ .

I found this on page ____ .

Develop & Understand: B

4. Vocabulary What does it mean to make a selection *randomly*?

____

I found this on page ____ .

5.

Equally likely outcomes are ______________________________

____

Example	Nonexample

Investigation 3

6. How does making a tree diagram compare to making a table to list combinations?

____

____

____

7. How can you find how many entries are in a list without counting them all?

____

Develop & Understand: B

I found this on page _____ .

8. If p is the probability of an event happening, what does $1 - p$ represent? Why?

____

____

____

9. If you use Ajay's method, explain how to find the number of ways to order 6 CDs.

____

____

Investigation 4

I found this on page _____ .

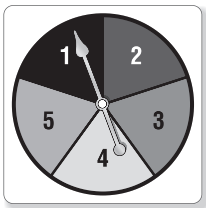
10. Complete the table.

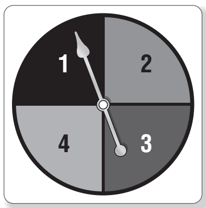
Strategies to Find Size of Sample Space		

Investigation 5

I found this on pages __________ .

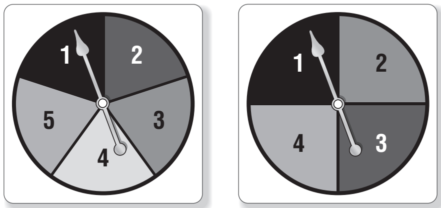
11. Name an outcome where the first spinner would have a greater probability than the second. Then name one where the first spinner would have the lesser probability.





First Spinner has Greater Probability	First Spinner has Lesser Probability

12. Suppose you turned the two spinners below and added the results. Describe an organized way to list the outcomes.



What Did You Learn?

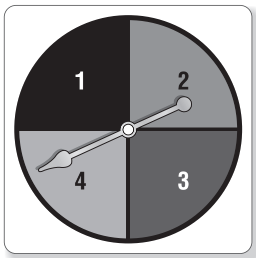
I need to remember the following about:

sample space:

EXAMPLE:

equally likely outcomes and probability:

example using the spinner below:



LESSON 11.2

Modeling with Data

In Lesson 11.2, I expect to learn:

Investigation 1

I found this on page ____.

Develop & Understand: A

1. If you knew you would be computing the medians of the scores for the two towns, how would you have changed your tables? Why? How else can ordering the data in the table be helpful?

Develop & Understand: B

2. Discuss why it is important to look at more than one measure of center (mean, median, mode) when comparing two sets of data.

Investigation 2

I found this on page ____.

Think & Discuss

3. Do the years increase by a constant amount? If so, by how much? Do the prices seem to increase by about the same amount? If so, by about how much?

4. In what ways can a graph of data be more helpful than a table of the same data?

Investigation 3

I found this on page ______.

5. Vocabulary In a box-and-whisker plot, the points that divide the data into four sections are called ____________________.

6. If you are given a set of data to make a box-and-whisker plot, what would be the first thing you would do with the data and why?

____

____

7. Complete the table by telling how to find each of the five important points in a box-and-whisker plot.

Important Point	How to Find
Minimum	
First Quartile	
Second Quartile	
Third Quartile	
Maximum	

What Did You Learn?

I need to remember the following about:

organizing data in graphs: ____

____

____

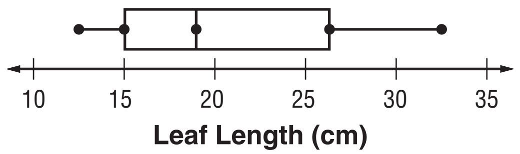
the percent of data in the boxes and whiskers of a box-and-whisker plot: __________

____

____

____

EXAMPLE: Using the box-and-whisker plot below, draw arrows to the quartiles and to the maximum and minimum points.



minimum   1st quartile   2nd quartile, or median   3rd quartile   maximum

CHAPTER 12

Algebraic Fractions

Contents in Brief

Real-Life Math

This chapter begins by discussing what is known in mathematics as a *work problem*. You are told how long it takes two or more people to do a job alone and are asked how long it will take for them to complete the job if they work together.

Think About It

Tell how you know that the time it will take Lakeesha and James to set up the display together is less than 3 hours. Then tell how you know it is less than 2 hours.

____

____

____

What do the fractions $\frac{h}{3}$ and $\frac{h}{2}$ mean if $h = 1$?

____

____

Substitute 1 for h in each expression. Can they set up the display together in less than one hour? Why or why not?

____

____

Connections to the Past (Course 1, Chapter 4)

Simplify.

$\frac{1}{3} + \frac{1}{4} =$ ______ $\qquad \frac{2}{5} \cdot \frac{10}{13} =$ ______ $\qquad \frac{3}{4} \div \frac{1}{3} =$ ______

(Chapter 5)

List each pair of like terms.

$3x \quad 2x^2 \quad -x \quad y \quad -6x^2 \quad -10y$ ______________

Vocabulary

Circle the fractions that are *algebraic fractions*.

$$\frac{1}{x} \qquad \frac{3}{5} \qquad \frac{3}{5x}$$

$$\frac{x+1}{x+3} \qquad \frac{4+7}{9+12}$$

$$\frac{2x}{4xy} \qquad \frac{1}{2} \qquad \frac{2}{2y+x^2}$$

In everyday use, word *fraction* means a small part of a whole. For instance, "the tax is just a fraction of the total cost." It can also mean just a small amount as in "add just a fraction more." The word comes from the Latin *fractionem*, meaning *a breaking into pieces.*

Family Letter

When you reviewed the process for simplifying fractions, how could you tell when a fraction is simplified? Give an example.

Give an example of the process for adding and subtracting fractions with unlike denominators.

Write a real-world situation that can be represented using algebraic fractions.

LESSON 12.1

Work with Algebraic Fractions

In Lesson 12.1, I expect to learn:

____

____

I found this on page ______.

Vocabulary Fractions that involve algebraic expressions are

_____________.

Investigation 1

Develop & Understand: A

1. For what value(s) of the variable is an algebraic fraction undefined?

____

I found this on page ______.

2. An equation where the left side is y and the right side is an algebraic fraction is entered into a graphing calculator. Complete the table below to describe how to use the calculator to find the x values that make the fraction undefined.

From the Table of Values	From the Graph of the Equation

I found this on page ______.

Develop & Understand: B

3. Name some situations for which values for an equation would make mathematical sense but would not make sense in the context of the situation.

____

____

____

____

____

Investigation 2

I found this on page ______ .

4. Describe two methods of simplifying algebraic fractions. Give an example showing how to use each method.

	Description	Example
Method 1		
Method 2		

5. Which of the two methods do you prefer and why?

____

____

____

6. How can you check if you simplified an algebraic fraction correctly?

____

____

What Did You Learn?

I need to remember the following about:

when an algebraic fraction is undefined: ______________________________

____

EXAMPLE: ______________________________

when an algebraic fraction is simplified: ______________________________

____

EXAMPLE: ______________________________

LESSON 12.2

Add and Subtract Algebraic Fractions

In Lesson 12.2, I expect to learn:

____

____

Investigation 1

Develop & Understand: A

1. Simplify each of the following.

a. $\frac{12}{n} + \frac{26}{n}$ ______ **b.** $\frac{13}{2y} - \frac{4}{y}$ ______

2. How do you add and subtract algebraic fractions?

____

____

Example

I found this on page ______.

3. Describe three possible ways of writing algebraic fractions so that they have a common denominator. Comment on each method and give an example.

Method			
Comments			
Example			

Investigation 2

I found this on page ______.

4. To add $\frac{1}{n} + \frac{1}{n-1}$, how can you rewrite 1 to find equivalent fractions with a common denominator?

____

5. When adding and subtracting two algebraic fractions, when do you need to multiply just one of the fractions by a form of one (such as $\frac{m}{m}$ or $\frac{x+2}{x+2}$)?

Develop & Understand: C

6. Show the steps for simplifying $\frac{1}{n} + \frac{1}{n-1}$.

Inquiry

Investigation 3

I found this on page ______ .

7. How does building an algebraic fraction from an expression that is not a fraction, such as 5 or x^2y, differ from building one from an expression that is already a fraction, such as $\frac{y}{(z-4)}$?

Investigation 4

I found this on page ______ .

8. What extra step must you include when solving equations with variables in the denominator of fractions? Why?

Example

9. Describe the process of "clearing" fractions from an equation. Then create an example showing how to use it.

Description of Process	Example

9. How do you solve an algebraic equation by graphing?

10. Why does solving an algebraic equation by graphing work?

11. Is there another way to solve an algebraic equation by graphing? Explain.

What Did You Learn?

I need to remember the following about:

finding common denominators:

using patterns to add and subtract fractions:

solving an algebraic equation by graphing:

IMPACT Mathematics

Course 3 Contents

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