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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 2

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 2

Table of Contents

CHAPTER 1

Expressions

Contents in Brief

Real-Life Math

The equation $t = 15s + 3$ can be used to estimate the air temperature in degrees Celsius (t) based on the speed at which ants crawl in centimeters per second (s).

Think About It

Suppose the ants in Ethan's backyard are crawling at a speed of 2 centimeters per second. Explain how to find the air temperature. Include your calculated temperature in your explanation.

How do the variables t and s in the equation $t = 15s + 3$ help you remember the relationship that the equation describes? Describe the reltionship in your own words.

Connections to the Past (Course 1, Chapter 9)

The table shows the relationship between the number of rows in a garden and the total number of plants. Write a rule that describes this relationship. Use letters for the variables in your rule. Explain what each letter represents.

Rows	4	6	9	12
Plants	42	62	92	122

Vocabulary

Complete the table. Write the meanings in your own words.

Word	Everyday Meaning	Mathematical Meaning
variable	changeable	
backtracking		
equivalent expressions		
flowchart		
formula		

Family Letter

How did your temperature conversions compare when you checked them with the formula? How accurate is the thermometer?

List three examples of the expressions and formulas you found in everyday situations.

Everyday situation	Expression or formula

If a student wanted to make a spreadsheet of expenses for a family outing, what suggestions would you make?

LESSON 1.1

Variables and Expressions

In Lesson 1.1, I expect to learn:

_____

_____

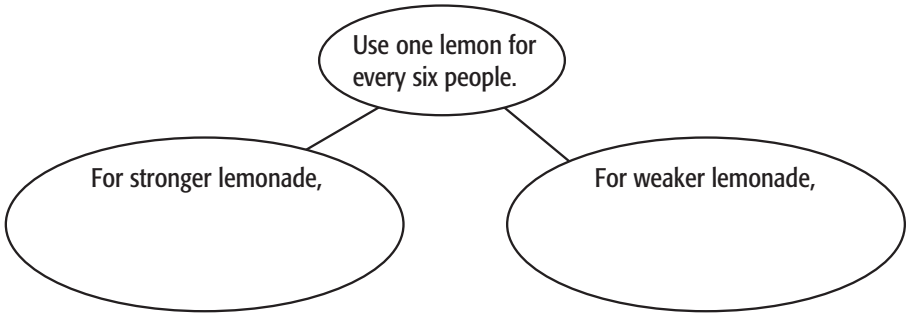
_____

Investigation 1

I found this on page _____.

Develop & Understand: B

1. Kate uses this rule to make lemonade. Create two more rules.



Develop & Understand: C

I found this on page _____.

2. Rewrite the rule to give an approximation of the exact result.

Multiply by 2.9 and add 12.3.	

3. Explain the similarities and differences between a *precise rule* and a rule that gives an *approximation*. Give an example of when you would use each type of rule.

_____

_____

_____

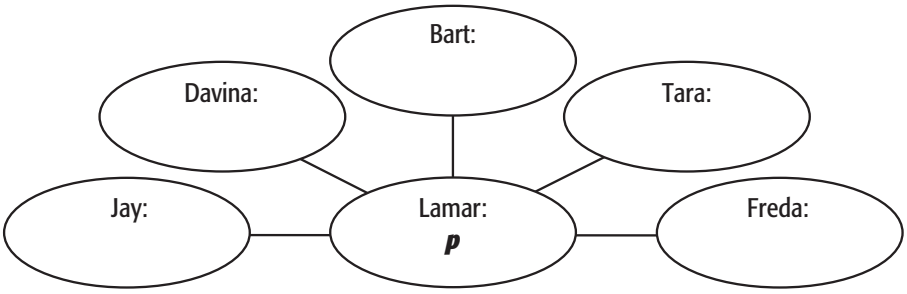
_____

Investigation 2

Develop & Understand: A

4. Review the expressions that you wrote for Exercise 2 on page 9. Let p represent the number of DVDs that Lamar has. Write new expressions for the number of DVDs that each person has.

I found this on page _____.



I found this on page _____.

5. Vocabulary Explain the difference between a variable that represents *a quantity that can change* and a variable that represents *an unknown quantity*.

Investigation 3

I found this on page _____.

6. Vocabulary When writing an expression, you can show how many times a quantity is multiplied by itself by using a small, raised number called a(n) _____ .

Think & Discuss

I found this on page _____.

7. Draw a line to match each expression with its meaning.

a. Subtract 3 from 9 squared and then multiply by n. $9 - 3n^2$

b. Multiply 3 by n squared and then subtract from 9. $(9^2 - 3)n$

c. Subtract 3 from the product of 9 and n multiplied by itself. $9n^2 - 3$

I found this on page _____.

Develop & Understand: A

8. Describe how you would evaluate the expression $\frac{(n^2 + 4)}{2}$ for $n = 6$.

Investigation 4

9. The arrows in a flowchart represent *mathematical actions*. What does this mean?

I found this on page _____.

_____

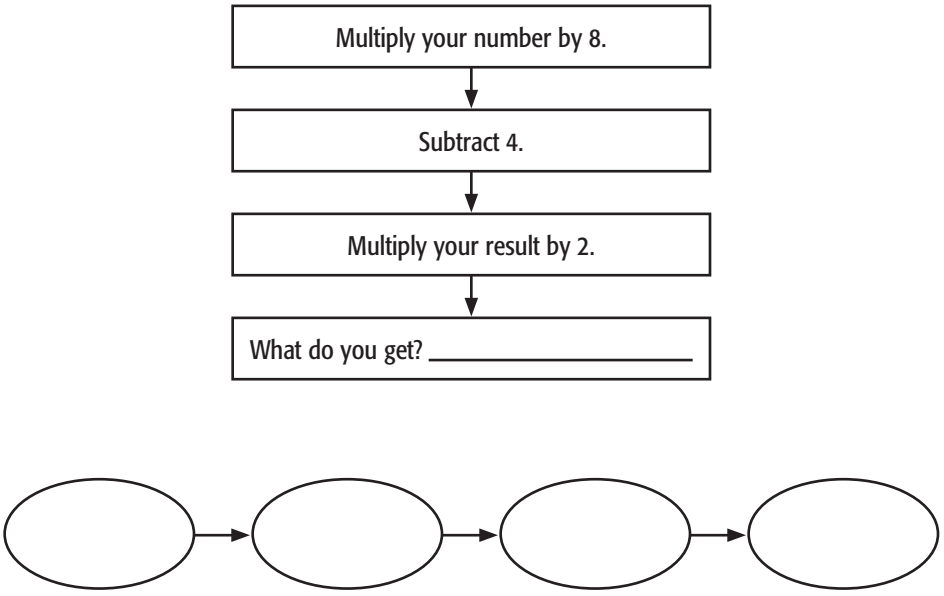
_____

Develop & Understand: C

I found this on page _____.

10. Think of a number. Follow the directions and record your result. Then complete the flowchart to represent the steps you took.

What equation does the flowchart represent?



What Did You Learn?

I need to remember the following about:

rules: _____

expressions: _____

_____

exponents: _____

_____

flowcharts: _____

LESSON 1.2

Expressions and Formulas

In Lesson 1.2, I expect to learn:

I found this on page _____.

Think & Discuss

Suppose Maya sold 28 calendars. Would this change the expression that you wrote? Would it change Maya's total amount? Explain.

Investigation 1

I found this on page _____.

Develop & Understand: A

1. Explain how to find the information that varies in a situation. How can you check that your expression correctly represents the varying information?

2. For what types of situations do you write an expression that multiplies a number by a variable? Adds a number to a variable? Give an example for each operation.

I found this on page _____.

Develop & Understand: B

3. Consider the expression $2d + 5$.

a. If d is the number of tickets purchased, $2d + 5$ could represent _____

_____

b. If d is _____,

$2d + 5$ could represent _____

_____

Investigation 2

Think & Discuss

4. Describe the similarities and differences between the formula $F = \left(\frac{9}{5}\right)C + 32$ and the following rule.

Multiply the degrees in Celsius by 1.8 and add 32.

_____

_____

_____

I found this on page _____.

5. Vocabulary There are several examples of formulas given in this investigation. Based on these examples, explain what qualifies something as a *formula* rather than just a *rule* or an *expression*.

_____

_____

I found this on page _____.

Develop & Understand: A

6. Pastry formulas show a relationship between flour F and shortening S. Find the amount of shortening that you would need to make each type of pastry with the given amount of flour.

	Short Pastry Formula: $S = \left(\frac{1}{2}\right)F$	**Flaky Pastry Formula: $S = \left(\frac{3}{4}\right)F$**
F = 300 grams	S = _____	S = _____
F = 600 grams	S = _____	S = _____
F = 900 grams	S = _____	S = _____

7. Look at the results from the two formulas. Which formula shows a relationship where the amount of flour and amount of shortening are closer to being equal? Would you expect this type of pastry to be moister or drier than the other kind? Explain.

_____

_____

Inquiry

Investigation 3

8. When Jo sets up her spreadsheet, she uses one column as a "variable" column. Which column is this? Explain how you know.

I found this on page _____.

_____

_____

_____

9. Jo's friend writes a formula where P represents the price and N represents the number of packs ordered. Circle the formula that represents this situation.

$P = 15N$ $\quad P = P \cdot N \cdot 15$ $\quad P = N + 15$

What Did You Learn?

I need to remember the following about:

variables: _____

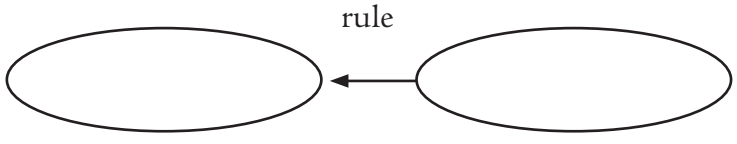
_____

formulas: _____

_____

backtracking: _____

_____



output: _____

LESSON 1.3

The Distributive Property

In Lesson 1.3, I expect to learn:

_____

_____

_____

I found this on page _____.

Think & Discuss

Whose method do you prefer for finding the total number of blocks, Sona's or Omar's? Explain why you prefer this method. Then, explain why a classmate might prefer the other method.

_____

_____

_____

_____

Investigation 1

1. When you are working with bags and blocks, what is the varying information? What constant information are you given?

_____

_____

Develop & Understand: A

I found this on page _____.

2. There can _____.

3. There are _____.

4. When two different methods are used correctly to find the total number of blocks in a given situation, the results are

_____.

5. There are _____.

_____.

Investigation 2

6. Vocabulary Luis says that $5(n - 3)$ and $5n - 15$ are *equivalent expressions*. What does this mean?

I found this on page _____.

_____

Develop & Understand: B

7. Use symbols to write two equivalent rules for the ordered pairs in the table.

I found this on page _____.

	3	4	7	9
	44	48	60	68

Rule 1:

Rule 2:

Investigation 3

8. Vocabulary Complete the table.

I found this on page(s) _____.

Word	Meaning	Mathematical Actions	Example
	remove parentheses		
	insert parentheses		

Develop & Understand: A

9. Suppose you rewrite an expression by either expanding or factoring. How can you check that the new expression is equivalent to the original?

I found this on page _____.

_____

_____

Investigation 4

I found this on page(s) _____.

10. Vocabulary Complete the table.

Word	Meaning	Three Examples	Three Non-Examples
monomial			
polynomial			
like terms			

I found this on page _____.

Develop & Understand: B

11. Describe how to combine like terms, and explain why doing so *simplifies* a polynomial.

_____

_____

_____

_____

_____

What Did You Learn?

I need to remember the following about:

distributive property: _____

_____

combining like terms: _____

_____

equivalent expressions: _____

_____

CHAPTER 2

Exponents

Contents in Brief

Real-Life Math

Astronomical distances, such as the distance from the Sun to Earth, are easier to write in a shorthand notation that uses exponents.

Think About It

Look for a pattern in the way the distances given in the opening paragraph are written in shorthand.

What do you notice about where the decimal is inserted when 35,980,000 is written as 3.598×10^7 and when 2,796,000,000 is written as 2.796×10^9?

Over the course of its mission, the Mars Pathfinder returned 2,600,000,000 bits of information to the scientists at NASA. How would you write this amount without listing all the zeros?

Connections to the Past (Course 1, Chapter 3)

Complete the table.

Multiplication Expression	Exponential Form	Whole Number
$10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$		1,000,000
	1^8	
$4 \cdot 4$		
	2^5	
$5 \cdot 5 \cdot 5$		125

Vocabulary

Do you agree with each statement? Write *yes* or *no*.

Agree?	Statement
	The numbers 4 and 6 are a **factor pair** for 12 because both 4 and 6 divide into 12 without a remainder.
	A **prime number** has exactly two whole number factors, itself and 1.
	The **prime factorization** of 45 is $3 \cdot 3 \cdot 5$.
	Two composite numbers are **relatively prime** if their only common factor is 1.
	The numbers 8 and 10 are **common multiples** of 40 and 80.
	In the expression $\left(\frac{1}{3}\right)^2$, $\frac{1}{3}$ is the **base**, and 2 is the **exponent**.
	A **factor** is a number that you add to another number.

Family Letter

Describe three situations that commonly use exponents.

_____

_____

_____

List at least three ways that you used exponents to represent large numbers. If necessary, round numbers to three decimal places when you write them with exponents.

_____

_____

_____

_____

Where did you look to find large numbers?

_____

LESSON 2.1

Factors and Multiples

In Lesson 2.1, I expect to learn:

_____

_____

_____

I found this on page _____.

Think & Discuss

Suppose you put a 1-foot chain into the × 5 machine twice. Write an expression that represents the outcome. _____

Investigation 1

Develop & Understand: B

I found this on page _____.

1. Suppose a stretching machine breaks down. Describe the steps you would take to find two machines that you can connect to replace the broken machine.

_____

_____

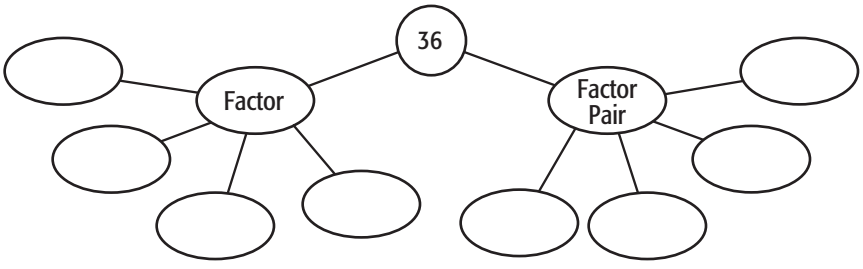
_____

_____

_____

I found this on page _____.

2. Vocabulary Fill in the graphic organizer with examples for the vocabulary words.



3. What are other examples that you did not include?

_____

Develop & Understand: C

4. Explain the difference between a *factor* and a *factor pair*.

Investigation 2

I found this on page _____.

5. Vocabulary Use what you know about *factors* and *prime numbers* to explain what the *prime factorization* of a number is in your own words.

I found this on page _____.

Develop & Understand: B

6. Explain why you sometimes use *exponents* when you are writing the prime factorization of a number? Use an example in your explanation.

Investigation 3

I found this on page _____.

Explore

7. Suppose you and Winnie receive the six orders below at the same time. How can you use common factors to schedule the orders so that all of the orders are successfully completed in an hour?

Order 1 stretch ×10	Order 2 stretch ×25	Order 3 stretch ×27	Order 4 stretch ×33	Order 5 stretch ×8	Order 6 stretch ×55

I found this on page _____.

8. Schedule the orders so that neither of you needs to wait for a machine.

Time	Your Orders	Winnie's Orders
1:00 PM		
1:30 PM		
2:00 PM		

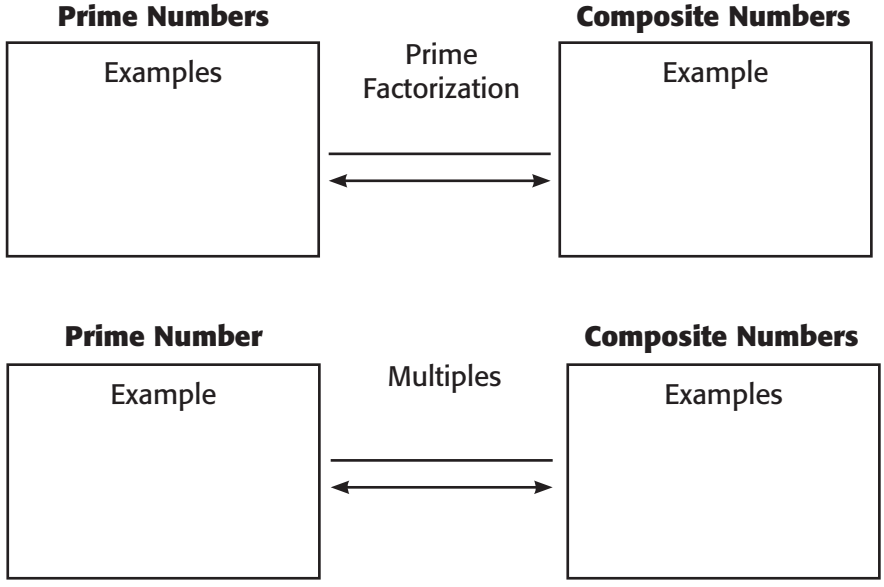
Investigation 4 *Develop & Understand: B*

I found this on page _____.

9. In the previous investigation, you found the *greatest* common factor. In this investigation, you are finding the *least* common multiple. Does it make sense to go in the other direction and find the *least* common factor or the *greatest* common multiple? Explain.

What Did You Learn?

Fill in the boxes below with numbers that connect the concepts.



LESSON 2.2

Exponent Machines

In Lesson 2.2, I expect to learn:

_____

_____

_____

Think & Discuss

I found this on page _____.

What single machines would you use twice to stretch a one-inch piece of taffy to lengths between 1 and 30 inches?

_____

What single machines would you use three times to stretch a one-inch piece of taffy to lengths between 1 and 30 inches?

_____

Investigation 1

1. Vocabulary Label the parts of the expression. Fill in the blank.

I found this on page _____.

6^3 This expression is read "six to the third _____".

Develop & Understand: B

2. Explain how you use a repeater machine to represent an expression involving exponents.

I found this on page _____.

_____

_____

_____

3. Does the phrase *repeater machine* make sense as a model for these expressions? Explain.

_____

_____

_____

Develop & Understand: C

I found this on page _____.

4. Why does a machine with a fraction for a base, such as $\frac{1}{5}$, *shrink* the original inserted length?

I found this on page _____.

5. Design a connection using a whole number repeater machine and a fraction repeater machine. What single machine will do the same job as your connection?

Investigation 2

Develop & Understand: A

I found this on page _____.

6. One of the *product laws of exponents* says that $a^b \cdot a^c = a^{b+c}$. Explain what the law means in your own words. Give an example.

Develop & Understand: B

I found this on page _____.

7. When is it *not* possible to rewrite an expression involving exponents using a single base? Give an example.

Example

8. Fill in the reasons for simplifying the expression below.

$5x^4 \cdot 3x^2$	Reason
$= 5 \cdot x^4 \cdot 3 \cdot x^2$	
$= 5 \cdot 3 \cdot x^4 \cdot x^2$	
$= 15 \cdot x^4 \cdot x^2$	
$= 15x^6$	

Investigation 3

Example

I found this on page _____.

9. Maya multiplied $4^2 \cdot 3^2$ by thinking about stretching machines. How can you use algebraic symbols and properties of multiplication to show that $5^3 \cdot 4^3 = 20^3$?

Develop & Understand: B

I found this on page _____.

10. Are there any laws for sums of exponential expressions? Explain.

What Did You Learn?

I need to remember the following about:

a typical situation when I should use the LCM: _____

Product Laws for Exponents	
Law	**Exponent**

LESSON 2.3

More Exponent Machines

In Lesson 2.3, I expect to learn:

I found this on page _____.

Think & Discuss

Do all the machines with ÷ symbols shrink things? Why or why not?

Investigation 1

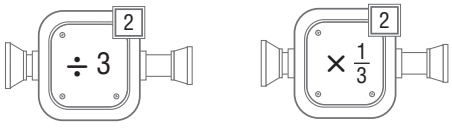
I found this on page _____.

Develop & Understand: A

1. How is working with shrinking repeater machines different from working with regular repeater machines?

2. Suppose an 80-inch string is put into a $\div 4^2$ repeater machine. Describe two ways to find its length when it exits.

3. Describe how these two machines are similar.



Investigation 2 Develop & Understand: A and B

I found this on pages _____.

4. Use what you learned about the quotient laws of exponents to complete the table.

Quotient Laws of Exponents	Expressions with the Same Base	Expressions with the Same Exponent
Write with symbols. Use *x*, *y*, and *z*.		
Explain with words.		
Give a numeric example.		

5. Write *true* if the equation is true. If the equation is false, change it and write a true equation.

$4^8 \div 4^3 = 4^5$ _____ $5^3 \div 7^3 = \left(\frac{5}{7}\right)^3$ _____

$1.8^5 \div 1.8^2 = 1.8^3$ _____ $4^5 \div 2^2 = 2^3$ _____

$3^3 \div 2^2 = 1$ _____ $20^2 \div 4^2 = 5^2$ _____

Investigation 3 Develop & Understand: A

I found this on page _____.

6. How does a *super machine* work?

_____

_____

7. Describe what a $\times (3^2)^3$ machine does.

_____

I found this on page _____.

Example

8. Consider the diagram that shows that $(4^3)^2 = 4^6$. Use similar reasoning with numbers to show that $(3^2)^3 = 3^6$.

_____

Inquiry

Investigation 4

I found this on page _____.

9. Suppose your goal is to move all of the pieces of the puzzle to the middle position. If you start with an even number of disks, in which position do you want to place your first disk to make this happen? Does your first move change if you start with an odd number of disks? Explain.

10. Describe the system that you discovered for moving the disks.

What Did You Learn?

I need to remember the following about:

division machines with exponents: _____

Division Laws for Exponents	
Law	**Exponent**

CHAPTER 3

Signed Numbers

Contents in Brief

Real-Life Math

The height of a mountain and the depth of an ocean can be represented using signed numbers.

Think About It

The elevation of Death Valley is −282 feet. How does this value indicate that Death Valley is below sea level?

Mt. Everest is approximately 29,028 feet above sea level, and the Dead Sea is 30,324 feet lower than Mt. Everest. Can you subtract 30,324 from 29,028 and get a number greater than zero as a result? Explain.

The approximate elevation of Denver is 5,280 feet. If the elevation of Lake Eyre, the lowest point in Australia, is 5,329 feet less than Denver's elevation, is it below sea level? Explain.

Connections to the Past (Course 1, Chapters 2 and 4)

Order the numbers from least to greatest.

1.8, 2, 1, 0.5, 0.8, 2.1 _____

$\frac{1}{6}, \frac{3}{8}, \frac{5}{12}, \frac{7}{24}, \frac{9}{16}, \frac{11}{20}$ _____

Find the sum or difference.

$15 - 12$ ____ $7 + 8$ ____ $4.15 - 3.8$ ____ $1\frac{5}{9} + \frac{4}{9}$ ____

Vocabulary

Suppose that you and a group of students are working with a data set. As each student in your group makes a statement, you think about the data terms that apply.

For each statement, write *range*, *mode*, *mean*, or *median*. Write as many terms as apply to the statement. You may use a term more than once.

Student's Statement	Term(s)
To find this measure, I order the values of the data set from least to greatest.	
To find this measure, I use addition and division and, in some cases, I may use multiplication.	
To find this measure, I add two values and divide by 2 when there is an even number of values.	
The only operation I use is subtraction.	
This word also means "middle."	
I look for the value that occurs most often.	
This is the distribution of the total of the values in the data set among the members of the data set.	
Sometimes these measures are equal to each other.	

Family Letter

Write three sentences describing things that are below sea level. Be sure to include the elevation in each sentence.

List four below-zero temperature readings. When and where did these temperatures occur?

LESSON 3.1

Add and Subtract with Negative Numbers

In Lesson 3.1, I expect to learn:

I found this on page _____.

Vocabulary

Complete the table.

Word	Definition	Example with a Positive Number	Example with a Negative Number
absolute value			

I found this on page _____.

Think & Discuss

If you ordered the absolute values of 4, −5, 0, −3.5, 4.2, −0.25, and 1.75, would you get the same result as ordering the numbers themselves? Explain.

Investigation 1

I found this on pages _____.

Develop & Understand: A

1. Why is −2 + 2 called a *zero pair*? Is −2 + 2 the same as 2 + (−2)? Explain.

Develop & Understand: B and C

2. Describe how you would use chip models to find $9 + (-11)$ and $9 - (-11)$. Point out the similarities and differences in your methods.

Inquiry

Investigation 2

I found this on page _____.

3. What three pieces of information did the cubes give the victim?

Investigation 3

I found this on pages _____.

4. Think about the direction that the pointer faces and moves for each scenario. Complete the table.

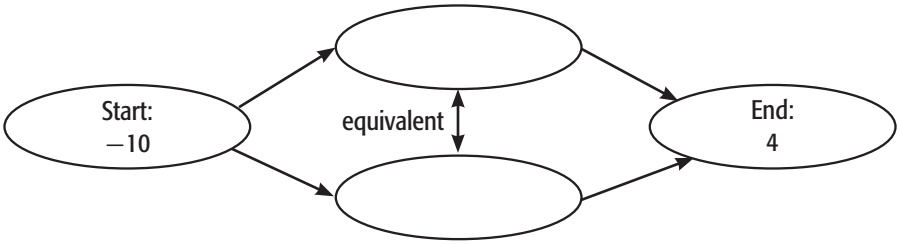
	The pointer faces	The pointer moves	An example number sentence is
The operation is addition, and the number being added is positive.			
The operation is subtraction, and the number being subtracted is positive.			
The operation is addition, and the number being added is negative.			
The operation is subtraction, and the number being subtracted is negative.			

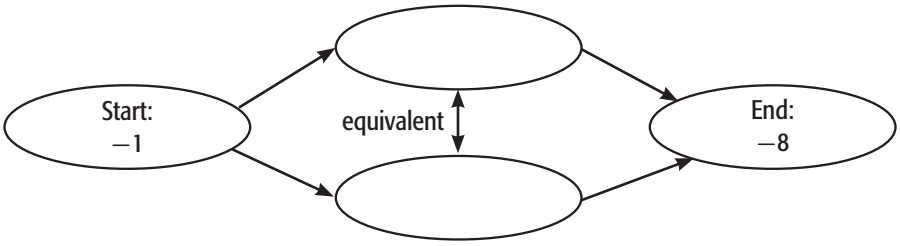
Investigation 4

Think & Discuss

I found this on page _____.

5. Fill in the graphic organizers with equivalent operations to get from the starting number to the ending number.





Develop & Understand: B

I found this on page _____.

6. What do you notice about the absolute values of the numbers that you are adding and subtracting in each set of equivalent operations? What do you think this means in terms of the number of units you are moving along the number line?

_____

_____

Investigation 5

Develop & Understand: A and B

I found this on pages _____.

7. When completing the table, consider what happens when starting with both a positive and a negative number.

	Positive number	Negative number
What can you add to a number to get a sum less than 0?		
What can you add to a number to get a sum greater than 0?		
What number can you subtract from a number to get a difference greater than 0?		
What number can you subtract from a number to get a difference less than 0?		

I found this on page _____.

Develop & Understand: C

8. Suppose you are determining the values of x that make $3x + 1$ less than -8. What steps would you take?

Investigation 6

I found this on page _____.

Develop & Understand: B

9. Give examples showing all combinations of adding or subtracting positive or negative numbers to get the result shown below.

Sum or difference > 0	Sum or difference < 0

What Did You Learn?

I need to remember the following about:

ways to model operations with signed numbers: _____

predicting signs of sums and differences: _____

positive + positive	negative + negative	positive − negative
Sign: Example:	Sign: Example:	Sign: Example:

sums or differences that are sometimes positive and sometimes negative:

LESSON 3.2

Multiply and Divide with Negative Numbers

In Lesson 3.2, I expect to learn:

_____

_____

Investigation 1

I found this on page _____.

Develop & Understand: A and B

1. When do you need to place a negative sign in the product? Does it matter whether the numbers being multiplied are even, odd, fractions, or decimals? Explain.

_____

_____

2. Describe how to find the product of a negative number and a positive number.

_____

_____

Develop & Understand: C

I found this on page _____.

3. Suppose you are told that the product of two integers is a negative integer. Explain how you would find two possible integer factors.

_____

_____

_____

_____

Investigation 2

I found this on pages _____.

4. Determine if the following products would be *positive* or *negative*.

Product	Positive or Negative
The signs of two numbers being multiplied are the same.	
The signs of two numbers being multiplied are different.	
A negative number is raised to an odd power.	
A negative number is raised to an even power.	

Develop & Understand: C

I found this on page _____.

5. Consider what you learned about raising negative numbers to powers. Decide whether the product of $(-3) \cdot (-2) \cdot (-4)$ will be positive or negative. Explain your answer.

6. Give a rule to predict the product of a given number of negative numbers.

Odd Number of Negatives	Even Number of Negatives
Sign of product: Example:	Sign of product: Example:

Investigation 3 Think & Discuss

I found this on page _____.

7. Think about the relationship between multiplication and division. Would you expect that to find that the rules for the signs of products are similar to the rules for the signs of quotients? Explain.

Develop & Understand: A

8. Explain the rules for placing negative signs in quotients. Use the words *dividend*, *divisor*, and *quotient* in your explanation.

Investigation 4

I found this on pages _____.

9. Explain how to compute each measure when you are given a data set. Then list things you need to consider in the computation process when the data contains negative numbers.

Measure	How to Compute	Things to Consider
range		
mode		
median		
mean		

What Did You Learn?

I need to remember the following about:

adding and subtracting with signed numbers: _____

_____

_____

multiplying and dividing with signed numbers: _____

_____

_____

_____

working with data sets that include signed numbers: _____

_____

_____

CHAPTER 4

Magnitude of Numbers

Contents in Brief

Real-Life Math

The distances from the Sun to each planet in the solar system are listed. Some distances are given using exponents, and some distances are given without using exponents.

Think About It

Consider the steps you take when you are ordering a set of numbers that contains both fractions and decimals. How can you use similar reasoning to order the planet distances?

The distances of Venus and Earth from the Sun are both given as a decimal value multiplied by 10^7. Which is greater? Why?

There are five planets whose distances are not written with exponents. List those planets in ascending order according to their distances from the Sun.

Connections to the Past (Chapter 2)

Write each of the following as a repeated multiplication. Then write each product as a whole number.

10^5 _____ 10^3 _____

Rewrite each expression using a single base.

$10^4 \cdot 10^8$ _____ $(10^3)^5$ _____ $10^9 \div 10^2$ _____

Vocabulary

Give five examples of each type of notation.

Term	Examples in Standard Notation	Examples in Scientific Notation
▶ greater numbers		
▶ lesser numbers		

Family Letter

Describe two real-world situations that involve very large or very small numbers.

What numbers did you find when you looked through different types of reading materials? Did you need to spend time looking for very large or very small values, or were you able to express average, everyday amounts into scientific notation?

LESSON 4.1

Scientific Notation

In Lesson 4.1, I expect to learn:

_____

_____

Think & Discuss

I found this on page _____.

Do you think the rock in the cartoon is really 1 million 3 years old? Explain.

_____

_____

_____

_____

Investigation 1

1. What is a *power of 10*?

I found this on page _____.

_____

Think & Discuss

2. What repeater machine would stretch each input streamer into each output streamer?

1 million inches to 1 billion inches _____

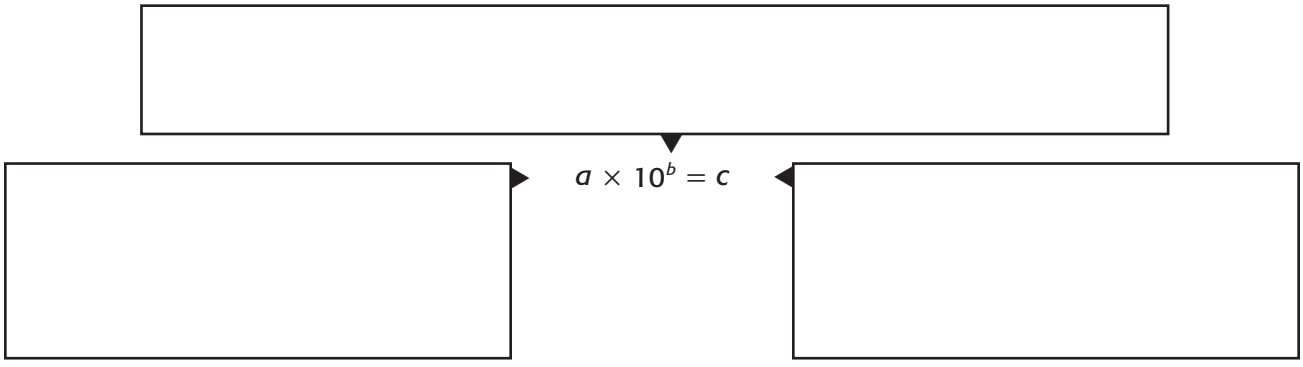
1 million inches to 1 trillion inches _____

1 billion inches to 1 trillion inches _____

Develop & Understand: B

I found this on page _____.

3. Describe how to find each part of the equation (a, b, or c) if you are given the other two parts.



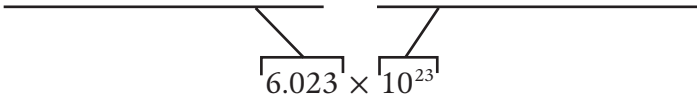
Investigation 2

I found this on page _____.

4. Vocabulary

Examples of Greater Numbers	Real-life Situation using this Number

5. Fill in the blanks for a number properly expressed in *scientific notation*.



Example: _____

Nonexample: _____

I found this on page _____.

Develop & Understand: A

6. If a whole number is greater than 10, how do you write it in scientific notation?

7. If you compare two numbers in scientific notation, which is larger?

Different Exponents	Same Exponents

Develop & Understand: B

I found this on page _____.

8. Explain how to write 0.421 × 106 in scientific notation.

Investigation 3

Think & Discuss

I found this on page _____.

9. How does a calculator determine the number of decimal places to show? How does it show a higher power of 10?

_____

_____

Develop & Understand: B

I found this on page _____.

10. What do you think a calculator will show as a result when you type in $5.3 \times 10^{32} - 2.18 \times 10^{18}$? Explain.

_____

_____

_____

_____

Inquiry

Investigation 4

11. Vocabulary How do you find the *relative error* for predicting voter turnout in an election?

I found this on page _____.

_____

_____

I found this on page _____.

12. Does the number of decimal places matter when you are writing a value in scientific notation? Explain.

_____

_____

What Did You Learn?

I need to remember the following about:

scientific notation: _____

_____

_____

the distance from the planets to the Sun: _____

_____

_____

LESSON 4.2

Negative Exponents

In Lesson 4.2, I expect to learn:

_____

_____

_____

Think & Discuss

How are multiplication and division related to one another?

_____

Investigation 1

Think & Discuss

I found this on page _____.

1. Suppose Jordan's coworker, Ron, is assigned to all of the machines with base 4. Each time the number of repeats is reduced by 1, how do you expect the resulting length to respond? Why?

_____

_____

Develop & Understand: B

I found this on page _____.

2. How do you find other repeater machines that do the same thing as a machine with a negative exponent, such as $\times 4^{-2}$?

_____

_____

_____

_____

Investigation 2

Example

I found this on page _____.

3. Look at the exponents in the expression $2^{-3} \cdot 2^2 = 2^{-1}$. Think of an addition sentence where you could combine -3 and 2 to get -1.

_____

Develop & Understand: B

I found this on page _____.

4. Describe the expression with words.

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

Investigation 3

Develop & Understand: A

5. Use the laws of exponents to write out the solution steps to rewrite each expression using a single base and a single exponent.

I found this on page _____.

$1.85^{-4} \cdot 1.85^{6}$	
$(-2)^{-8} \cdot (-5)^{-8}$	
$((-4)^{-7})^{-2}$	

Develop & Understand: B

I found this on page _____.

6. Describe how to write a decimal less than 1, such as 0.049, in scientific notation.

_____

_____

_____

_____

7. How do you compare 2.58×10^{-4} and 2.58×10^{-8}?

_____

_____

What Did You Learn?

I need to remember the following about:

evaluating expressions with negative exponents: _____

_____

_____

_____

CHAPTER 5

Geometry in Three Dimensions

Contents in Brief

Real-Life Math

This chapter begins by describing how architects use geometry in three dimensions. Two different types of drawings are discussed, including drawings that show different elevations of a house and blueprint drawings.

Think About It

When you walk through a store and look at items in boxes, what do the pictures or drawings on the boxes tell you? Which careers or businesses do you think have contributed to these drawings?

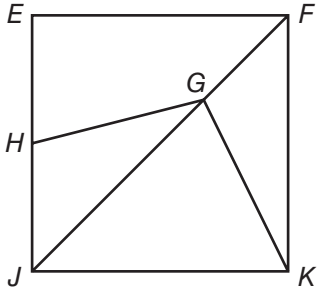
Name two other professions involving designs that need to use two-dimensional drawings to represent three-dimensional objects. Describe the types of drawings they may use.

Profession	Types of Drawings

Connections to the Past (Course 1, Chapter 1)

List all of the polygons in the figure.

Polygon	Names
Triangles	
Quadrilaterals	
Pentagons	
Hexagons	



Vocabulary

Place each term in the appropriate category.

Terms	Type of Solid	Metric Units	Customary Units	Type of Measurement
cylinder grams mass ounces pounds prism surface area tons volume weight				

Family Letter

Which objects did you deconstruct to make nets? Describe your experience with two objects, one that folded into a prism and one that folded into a cylinder.

Object 1:	Object 2:

List four objects for which you estimated mass and weight. Give your estimates with the units of measure you used for each.

Object	Estimated Mass	Estimated Weight

LESSON 5.1

Surface Area and Volume

In Lesson 5.1, I expect to learn:

Investigation 1

1. Vocabulary Name three characteristics that all *prisms* share.

I found this on page _____.

2. Explain the difference between *surface area* and *volume.*

Develop & Understand: A

I found this on page _____.

3. Describe how you can think about cubes filling a space when you are calculating the volume of a rectangular prism.

Develop & Understand: C

I found this on page _____.

4. Explain the effects on surface area and volume when one dimension of a prism is increased one unit while the others remain the same.

Investigation 2

5. Vocabulary How many *bases* does a prism have? Explain how you know. What shapes can bases be?

I found this on page _____.

6. Did you find that your method for finding the volume of a rectangular prism works for other types of prisms? Explain.

I found this on page _____.

7. Vocabulary Tell how *cylinders* are similar to prisms and how they are different.

Similarities	Differences

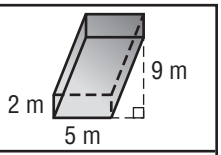
I found this on page _____.

Develop & Understand: B

8. Explain the difference between a *right prism* and an *oblique prism* that have identical bases and identical heights. Will they have the same volume?

I found this on page _____.

9. Use the formulas that you wrote for the volume of a prism and the volume of a cylinder to find each volume. Show how you substitute values in your formula to get each result.

Prism length 3 ft, width 6 ft, height 2 ft		Cylinder radius 4 cm, height 12 cm

Inquiry Investigation 3

I found this on pages _____.

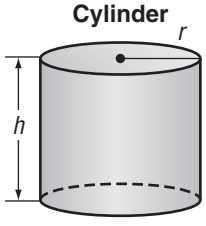
10. When you were thinking about designing different types of cylindrical containers for the Bursting Bubbles beverage company, what did you notice about how a change in height affects the radius of the base circle? Why do you think this happens?

What Did You Learn?

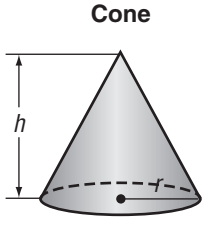
I need to remember the following about:

volume: _____

comparing the formulas for the volume of a cylinder and the volume of a cone:



Volume = base area × height, or $\pi r^2 h$



Volume = $\frac{1}{3}$ base area × height, or $\frac{1}{3}\pi r^2 h$

LESSON 5.2

Nets and Solids

In Lesson 5.2, I expect to learn:

I found this on page _____.

Vocabulary

Describe a *net* and a *solid* in your own words.

Explore

Consider all of the nets that fold into a cube. What do they all have in common?

Investigation 1

I found this on pages _____.

Develop & Understand: A

1. Describe three things for which you need to look when determining whether a net folds into a solid.

Investigation 2 Develop & Understand: A

I found this on pages _____.

2. How can you use a net to find the surface area of a solid? Why does this method work?

I found this on pages _____.

3. Describe two ways you can use a net to find the volume of a prism or cylinder.

Method 1	Method 2

I found this on page _____.

4. Sometimes, when you are using a net to find surface area or volume, you may find that a few of the shapes have sides that are not labeled. What can you do to find these unlabeled sides?

Investigation 3

Develop & Understand: B

I found this on page _____.

5. Describe a low-cost method for investigating different types of solids with the same volume to see which dimensions for the solid use the least surface material.

_____

_____

_____

_____

_____

_____

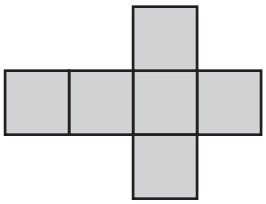
_____

What Did You Learn?

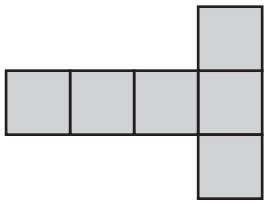
I need to remember the following about:

nets: _____

_____



Cube Net



Cube Net

using a net to find the surface area of a solid: _____

_____

using a net to find the volume of a solid: _____

_____

_____

finding the smallest possible surface area for a given volume of a solid:

_____

_____

LESSON 5.3

Mass and Weight

In Lesson 5.3, I expect to learn:

I found this on page _____.

Vocabulary

Describe how *mass* and *weight* are related to each other.

Think & Discuss

Are mass and weight closer in value on Earth or on the moon? Explain.

If you know the weight of an object on Earth, how would you approximate the weight of the same object on the moon?

Investigation 1

I found this on page _____.

1. Explain the general relationship between units in the metric system. How are kilograms and grams related?

I found this on page _____.

Develop & Understand: A

2. Describe how you can use scientific notation to express conversions between two units in the metric system.

Example conversions:

Smaller Unit to Larger Unit	Larger Unit to Smaller Unit

I found this on page _____.

Develop & Understand: B

3. When you are using a scale to measure mass, why is it important to make sure its initial reading is 0?

I found this on page _____.

4. Why do you think two objects can be the same size and yet have different masses? Give an example.

Investigation 2

Develop & Understand: D

I found this on page _____.

5. What does it mean to use known masses as benchmarks to estimate masses of objects? Describe what is required of you and what is involved in this process.

6. Number these objects in order from least mass (1) to greatest mass (5). Explain how you arrived at your answer.

bicycle	chipmunk	button	ream of paper	ruler

Investigation 3

Develop & Understand: A

I found this on pages _____.

7. Fill in the blanks to make each equation true. Explain how you found your answer.

54 ounces = _____ or _____ pounds

6.75 pounds = _____ pounds _____ ounces

6,500 pounds = _____ or _____ tons

I found this on page _____.

8. Explain how you decide which type of scale to use when you are measuring an object in the customary system. Use example objects in your explanation.

9. Draw a line to match each set of objects to an appropriate estimated weight.

full barrel on a cement truck	1 pound
five seventh graders	10 pounds
glass pitcher	75 pounds
large dog	400 pounds
bag containing five pairs of shoes	2 tons

What Did You Learn?

I need to remember the following about:

measuring and estimating mass: _____

_____

_____

_____

measuring weight: _____

_____

_____

_____

determining the most appropriate metric units to use when measuring mass:

_____

_____

_____

why benchmark masses are important to use when estimating the mass of an object:

_____

_____

CHAPTER 6

Data and Probability

Contents in Brief

Real-Life Math

The Gallup Organization has been conducting surveys for more than 60 years to find out what Americans think about a variety of topics. This group surveys a small population and uses those results to make conclusions about the entire population.

Think About It

Do you think the students in your class are typical of the students in your school? Why or why not?

Think about the results that you would get if you conducted a survey about favorite types of music in your classroom and then conducted the same survey throughout your school. How might the results compare?

Connections to the Past (Course 1, Chapter 10)

A whole number is chosen at random from the numbers 20 to 40.

What is the probability that the number is a multiple of 4? _____

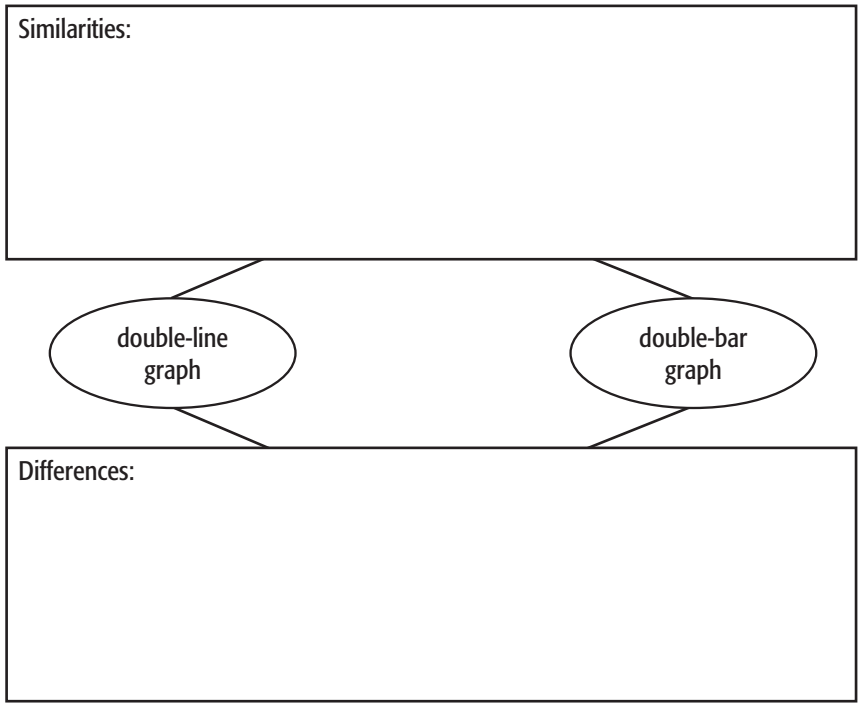
What is the probability that the number is even? _____

What is the probability that the number is a factor of 100? _____

What is the probability that the number is less than 15? _____

Vocabulary

▶ List the similarities and differences for the vocabulary terms.



Family Letter

Describe two games of chance that you could play at home where each player has an equal chance of winning. How many rounds would you play?

Game 1	Game 2

▶ How have you used probability in your everyday life?

LESSON 6.1

Dependence

In Lesson 6.1, I expect to learn:

_____

_____

_____

I found this on page _____.

Think & Discuss

How do you decide which event is *most likely*?

_____

_____

Investigation 1

Develop & Understand: B

I found this on page _____.

I found this on page _____.

1. Suppose you are working with numbered blocks in a bag. Describe how you find the probabilities below. Assume you have the same bag of blocks each time. How would these probabilities change if you use the exact same bag of blocks, but you do not replace the first block? Explain why these changes occur.

Probability of specific event if the first block is replaced.	
Probability of specific event if the first block is not replaced.	

Investigation 2 — Develop & Understand: B

I found this on page _____.

2. Draw a tree diagram to show the combinations of getting heads and/or tails when you toss one coin three times in a row. Circle the specific combination of getting all heads. How many outcomes are there? _____ How many outcomes are all heads? _____

3. Suppose you used a computer program to generate 1,000 coin tosses and then tallied the results. Show sample tally results you would expect in the table below. Assume the computer truly gave you random results.

TTT	TTH	THT	THH	HTT	HTH	HHT	HHH

4. What is the probability of getting at least two heads?

_____

Investigation 3 — Develop & Understand: A

5. Is it possible that during 10 rounds of this game, you and your friend each earn the same number of points? Explain.

_____

_____

_____

_____

I found this on page _____.

6. When should each player receive an equal number of points in a game?

_____

Develop & Understand: B

7. If the conditions of a game are not fair because the probabilities for each outcome are different, how can you reassign the points to make the game fair without changing the outcomes? Describe an example situation that shows how this works.

Inquiry

Investigation 4

I found this on page _____.

8. In this investigation, you performed ten trials where the contestant *never* changed his or her mind and ten trials where the contestant *always* changed his or her mind? What is the reasoning behind this method of testing?

What Did You Learn?

I need to remember the following about:

combinations and probability: _____

fair games: _____

LESSON 6.2

Make Predictions

In Lesson 6.2, I expect to learn:

I found this on page _____.

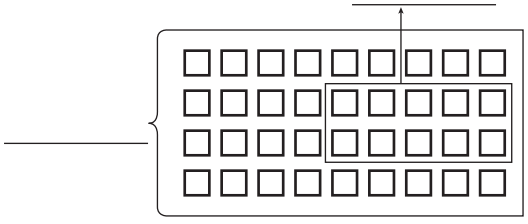
Explore

When you are playing *What's in the Bag*, how do you use the tiles chosen from the bag to predict the contents of the bag?

Investigation 1

I found this on page _____.

1. Vocabulary Which group is the *sample*? Which group is the *population*? Write the appropriate term in each blank.



Develop & Understand: A

I found this on page _____.

2. Do you expect to make a more accurate prediction from examining 10 samples or from examining 20 samples? Explain.

Investigation 2

3. How would you describe the relationship between the sample size and the accuracy of the prediction?

I found this on page _____.

I found this on page _____.

Develop & Understand: A

4. When you are trying to determine the mean word length for a poem, what things should you consider when you are selecting a sample?

Investigation 3

Think & Discuss

5. What is the *population* for Alison's statistics project?

I found this on page _____.

6. Name two things that you would consider in the process of deciding on an appropriate sample for Alison's project.

Develop & Understand: A

I found this on page _____.

7. There are three important questions to ask when examining a survey method. List each question. Explain why it is important.

Question	Why is it important?

Develop & Understand: B

8. If your sample is representative, how can you use your survey results to make predictions about the population? Provide an example with your explanation.

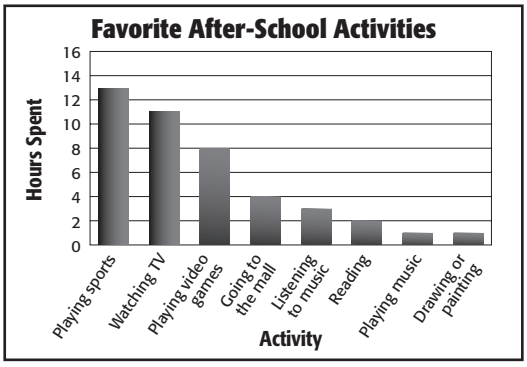
What Did You Learn?

I need to remember the following about:

using samples to make predictions:

sample sizes and representative samples:

making predictions from a given graph like the one shown below for a student survey of favorite activities:



LESSON 6.3

Data Graphs

In Lesson 6.3, I expect to learn:

I found this on page _____.

Think & Discuss

Why is it important to select an appropriate type of graph to represent data? Give an example.

Investigation 1

I found this on pages _____.

Develop & Understand: A

1. Describe how to incorporate each item when you are creating a double-bar graph. Then explain what you must keep in mind about the item when you are working with two sets of data.

Item	How do you incorporate it?	What must you keep in mind?
categories		
vertical axis		
bars		

I found this on page _____.

Develop & Understand: C

2. When might a double-line graph be useful?

_____

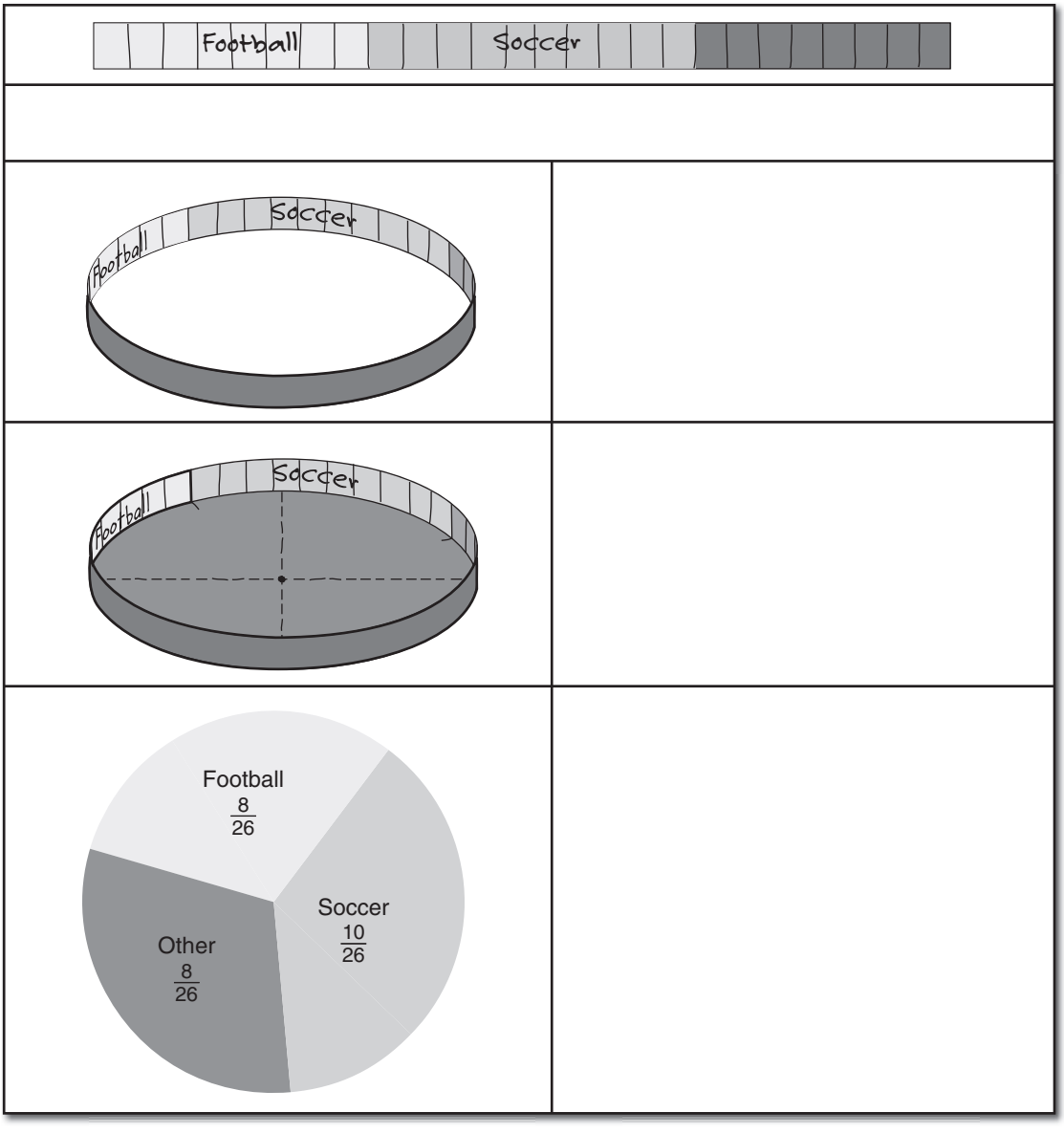
_____

Investigation 2

I found this on pages _____.

Develop & Understand: A

3. How did you determine the size of each section on the circle graph? Write the description below for the following survey results.



Develop & Understand: D

4. Name two things that you can determine from a double-line graph that you could not determine from a double-bar graph.

I found this on page _____.

Investigation 3

Develop & Understand: A

5. How does a stem-and-leaf plot help you easily find range, median, and mode?

I found this on page _____.

Develop & Understand: B

I found this on page _____.

6. State how many digits you would use for the stems and leaves for each set of values in a stem-and-leaf plot.

Data Values	Number of digits to use for each stem	Number of digits to use for each leaf
23, 34, 23, 33, 44, 33, 23, 12, 34, 25		
415, 420, 413, 468, 485, 423, 424		
four-digit data values		
five-digit data values		

Investigation 4

Develop & Understand: A

7. Explain how using different interval sizes can misrepresent data.

I found this on page _____.

Develop & Understand: B

8. Why is it important to use mean and median in the correct context?

Develop & Understand: C

9. Why do you think a person might create a misleading graph?

What Did You Learn?

I need to remember the following about:

double bar graphs:	Example:
double line graphs:	Example:
circle graphs:	Example:
stem-and-leaf plots:	Example:
misleading statistics:	Example:

CHAPTER 7

Real Numbers

Contents in Brief

Real-Math

This chapter begins by describing the path that Malina takes when she bikes to school. Due to an abandoned factory, she travels two miles east and one mile north. However, if this factory is replaced with a park that has bike paths, Malina may be able to travel a direct route from her house to the school.

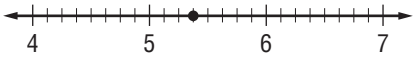
Think About It

Which do you think is a shorter route, Malina's current route or a possible new route directly from her house to the school? Explain.

Suppose the intersection of McKinley Avenue and Roosevelt forms a right angle. If you were to draw a line directly from Malina's house to the school, what type of figure would you form with this line and the two streets? Be as specific as possible.

Connections to the Past (Course 1, Chapter 2)

What number is indicated by the point? Write your answer as an improper fraction, mixed number, and decimal.



Write $<$, $>$, or $=$ in each blank to make a true statement.

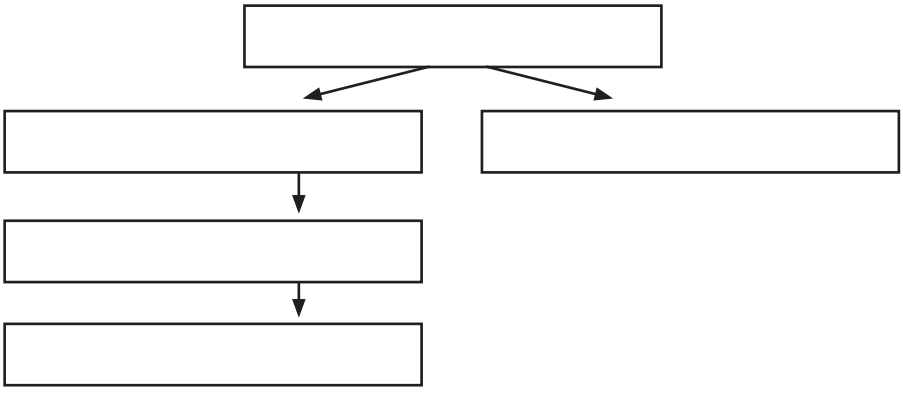
$\frac{4}{7}$ _____ $\frac{5}{9}$ $\quad$ $\frac{3}{5}$ _____ $\frac{4}{5}$ $\quad$ $\frac{7}{10}$ _____ $\frac{9}{13}$

5.850 _____ 5.85 $\quad$ 6.19 _____ 6.31 $\quad$ 0.72 _____ 0.75

$\frac{5}{12}$ _____ 0.35 $\quad$ 0.65 _____ $\frac{9}{14}$ $\quad$ $\frac{17}{20}$ _____ 0.85

Vocabulary

▶ Use the terms *irrational numbers, natural numbers, rational numbers, real numbers,* and *whole numbers* to fill in the flowchart. Be sure the flowchart represents the relationships among the sets of numbers in the chart.



▶ Explain each term using your own words.

Pythagorean Theorem	Distance Formula

Family Letter

Name some places where you might find numbers to compare and order.

Describe how you would determine the horizontal and vertical distances between two towns on a map.

LESSON 7.1

Rational Numbers

In Lesson 7.1, I expect to learn:

_____

_____

I found this on page _____.

Think & Discuss

Explain how to decide whether a given number is a rational number.

_____

Investigation 1

Develop & Understand: A

I found this on page _____.

1. Describe how to determine whether a given statement is true for a particular number set.

_____

_____

_____

_____

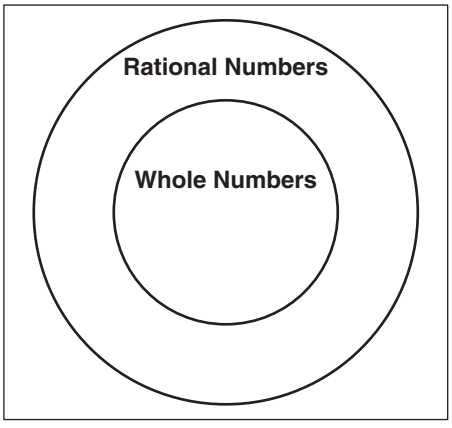
_____

_____

Develop & Understand: B

I found this on page _____.

2. Look at the Venn diagram below. It shows that all _____ numbers are _____ numbers.



I found this on page _____.

3. Add -15, $-\frac{1}{4}$, 0, $\frac{1}{4}$, and 15 to the Venn diagram. Does each number belong in one specific place, or are there numbers that can belong in two or three places? Explain why you put each number where you did.

Develop & Understand: C

I found this on pages _____.

4. Describe your thought process as you read each clue to find Antonio's new secret number. Assume that the secret number lies between -10 and 10.

Antonio's Clues	Thoughts
My number is not a whole number.	
The quotient of my number and -4 is a positive integer.	
The product of my number and -6 is a multiple of 16.	

Investigation 2

Think & Discuss

I found this on page _____.

5. How many rational numbers are there between any two integers? Explain.

Develop & Understand: A

I found this on page _____.

6. Describe how you would label a number line to show the graph a set of rational numbers. Is this always practical? Why or why not?

Think & Discuss

7. What strategy do you use when you are comparing and ordering rational numbers? Why does this work best for you?

I found this on page _____.

Develop & Understand: B

8. Describe some strategies that you can use to mark the approximate location of a given rational number on a number line.

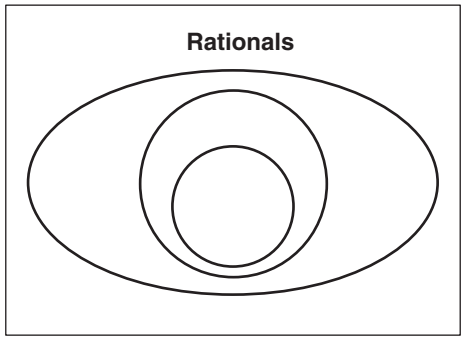
I found this on page _____.

9. Suppose you are drawing a number line so that you can reasonably graph a set of rational numbers. List some things that you will need to consider.

What Did You Learn?

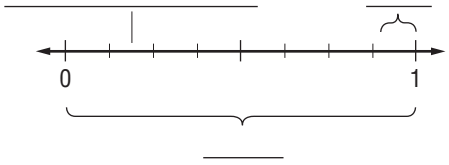
I need to remember the following about:

number sets:



comparing and ordering rational numbers:

graphing rational numbers on a number line: Label the graph of $\frac{3}{16}$ with each of the following words: range, scale, approximate location, $\frac{3}{16}$.



LESSON 7.2

Irrational Numbers

In Lesson 7.2, I expect to learn:

_____

_____

I found this on page _____.

Think & Discuss

Do you think it is possible to always find a number that you can multiply by itself to obtain a given product? Explain.

_____

_____

_____

Investigation 1

Develop & Understand: A

1. How can you create a list of *perfect squares*?

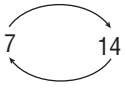
I found this on page _____.

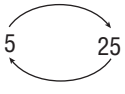
_____

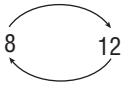
_____

_____

2. Give sample *inverse operations* that are used to create each set of values. You can list more than one set of operations.







I found this on page _____.

3. Vocabulary Decimal numbers that never end or repeat are called _____.

An example is _____.

I found this on pages _____.

Develop & Understand: B and D

4. Use an example to describe how to estimate the decimal equivalent of the square root of an irrational number. Would you expect a calculator to give you the same value? Explain.

Investigation 2

5. Vocabulary Describe the relationships among *rational numbers, irrational numbers,* and *real numbers.*

I found this on page _____.

I found this on page _____.

Develop & Understand: A

6. Classify each number as a *terminating decimal*; a *nonterminating, repeating decimal*; or a *nonterminating, nonrepeating decimal*. Then state whether the number is *rational* or *irrational*. Explain each classification.

Number	Classification and Explanation
128.44981	
$\frac{8}{3}$	
$\sqrt{16}$	
$\sqrt{50}$	
$4.\overline{15}$	
$\sqrt{\frac{25}{64}}$	

I found this on page _____.

Develop & Understand: C

7. Why is it possible to use a number line to approximate the values of irrational numbers?

What Did You Learn?

I need to remember the following about:

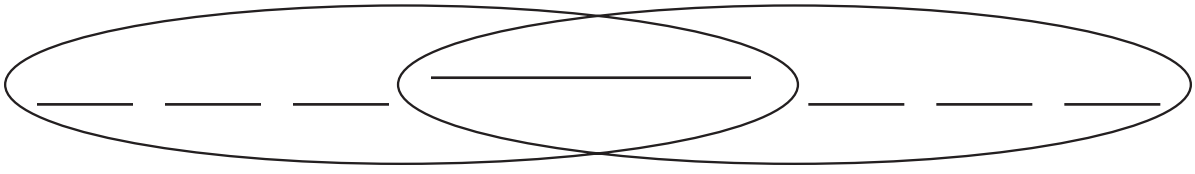
squares and square roots: _____ operations

squares _____

perfect squares: _____

finding square roots of numbers that are not perfect squares: _____

irrational numbers and rational numbers:



_____ numbers _____ numbers

three types of decimals:

Number	Classification

LESSON 7.3

The Pythagorean Theorem

In Lesson 7.3, I expect to learn:

_____

_____

Investigation 1

Develop & Understand: A

I found this on pages _____.

1. Suppose a classmate gives you an incomplete table showing the exact area of each square built on to the three sides of a right triangle. Complete the table based on the pattern that you discovered in this investigation.

Area of Square on Side *a* (units²)	Area of Square on Side *b* (units²)	Area of Square on Side *c* (units²)
49	576	
	144	169
225		289

I found this on page _____.

2. Vocabulary Describe the *Pythagorean Theorem* in your own words. Use the terms *hypotenuse* and *legs*.

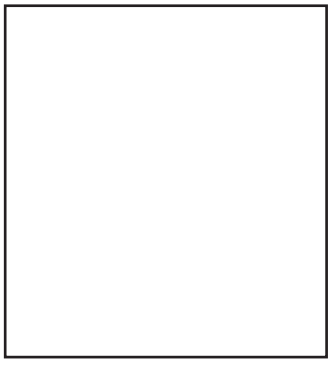
_____

_____

_____

I found this on page _____.

3. Draw a right triangle. Label the sides with variables. Then draw the squares along the sides of the triangle that would demonstrate the Pythagorean Theorem. Write the Pythagorean Theorem for your triangle under your drawing.



_____

Develop & Understand: B

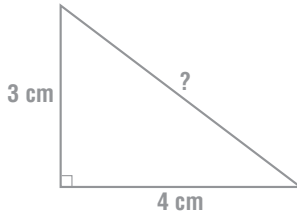
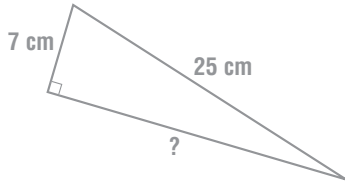
4. When you are using paper triangles and squares to construct a proof of the Pythagorean Theorem, does the size of first right triangle matter? What about the size of the remaining right triangles? Should you always be able to make two squares that have the same area no matter what side lengths you use for the right triangle? Explain.

Investigation 2

I found this on page _____.

Develop & Understand: B

5. Suppose you know the lengths of two sides of a right triangle. Describe how you can find the length of third side in each situation.

Situation	How to find the missing length	Example
You know the lengths of both legs.		
You know the length of the hypotenuse and the length of one leg.		

Inquiry

Investigation 3

I found this on page _____.

6. Explain the relationship between the *distance formula* and the *Pythagorean Theorem*. Does it matter which point you use for (x_1, y_1)? Explain.

What Did You Learn?

I need to remember the following about:

the Pythagorean Theorem:

EXAMPLE: A right triangle has legs 5 cm and 12 cm. What is the length of the hypotenuse? Justify your answer.

EXAMPLE: A right triangle has a leg 7 in. and hypotenuse 25 in. What is the length of the other leg? Justify your answer.

the distance formula:

CHAPTER 8

Linear Relationships

Contents in Brief

Real-Life Math

This chapter begins by explaining that speed is a relationship between time and distance. The British Eurostar is introduced, and it is described as reaching speeds of 186 mph on land and 80 mph in the Chunnel, the tunnel under the English Channel that connects Britain to France.

Think About It

Do you think it would take the Eurostar longer to travel 160 miles on land or through the Chunnel? How do you know?

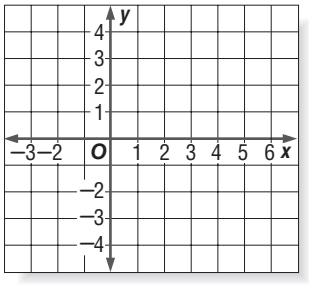
How do you think you could find the distance that the Eurostar travels on land in 30 minutes?

Connections to the Past (Course 1, Chapter 8)

Plot each point on the coordinate grid. Label each point with its letter.

Point *A*: (−2, −1) Point *B*: (0, 1)

Point *C*: (3, 2.5) Point *D*: (−3, −1.5)



Vocabulary

Give an example to illustrate each term. Then, describe the meaning of the term in your own words.

Term	Example	In Your Own Words
rate		
linear relationship		
proportional		
slope		
speed		
velocity		
y-intercept		

Family Letter

Name a few real-life jobs where you think you might need to work with linear relationships.

Suppose you and a classmate are planning to calculate payments for jobs. Describe how you might work together to accomplish this.

LESSON 8.1

Rates

In Lesson 8.1, I expect to learn:

I found this on page _____.

Think & Discuss

How are the quantities that a rate describes *not* like each other? Use an example to explain.

Investigation 1

Develop & Understand: A

1. Vocabulary How can you tell if a rate describes a *linear relationship*?

I found this on pages _____.

2. What makes a relationship linear?

I found this on page _____.

3. Sometimes when you are graphing a rate, it makes sense to use a straight line to connect the points. Other times, it does not make sense to connect the points. Describe a situation for each case.

I found this on page _____.

Develop & Understand: B

4. Complete the table. Rewrite the fact using the word *per*. Then write an algebraic rule for the fact.

Relationship	Rewrite using per	Algebraic Rule
One tablespoon of water contains about half an ounce of water		

5. Suppose you graph the algebraic rule you wrote in the table above. How would you use the graph to find the number of ounces that corresponds to a given number of tablespoons?

_____

_____

_____

Investigation 2

I found this on pages _____.

Develop & Understand: A and B

6. Suppose you want to compare the rates of pay for two different jobs. Complete the table to explain how using different methods to express rates can be useful when making this type of comparison.

Method	How is this method useful?

I found this on page _____.

Develop & Understand: C

7. Consider a situation with two weekend workers, Worker A and Worker B. Both workers earn a set amount per hour if they have to work on the weekend. Additionally, Worker A earns a fixed amount for the weekend even if there is no work. Draw a sample graph illustrating each situation.

Investigation 3

8. Vocabulary What is the difference between a linear relationship that is proportional and a linear relationship that is *not* proportional?

I found this on pages _____.

Develop & Understand: A

I found this on page _____.

9. Give an example of a rule that describes two variables that are proportional to each other.

Develop & Understand: B

I found this on page _____.

10. How can you determine whether a relationship is proportional by using doubling, tripling, or halving?

Inquiry

Investigation 4

I found this on pages _____.

11. Describe a four-step process that you can follow when you conduct an experiment to investigate the relationship between two variables.

Step 1. _____

_____

Step 2. _____

_____

Step 3. _____

_____

Step 4. _____

_____

What Did You Learn?

I need to remember the following about:

rates: _____

_____

linear relationships: _____

_____

how this graph shows proportional relationships:

_____

_____

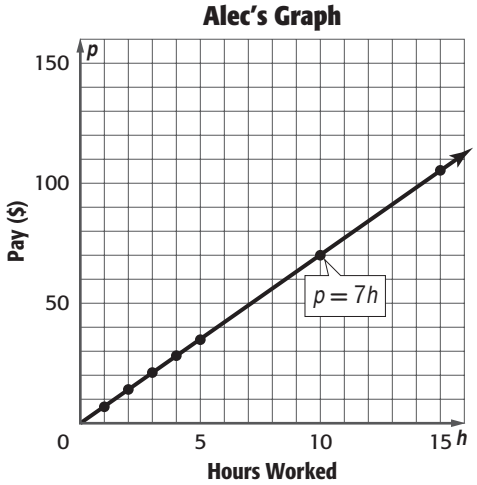
_____

_____

_____

_____

_____



LESSON 8.2

Speed and Slope

In Lesson 8.2, I expect to learn:

Explore

When you are comparing two speeds to determine which is faster, can you just look at the values of the speeds? Explain.

Investigation 1

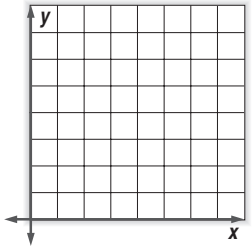
Develop & Understand: A and B

I found this on page _____.

1. If someone is traveling at a *constant speed,* would you always expect the distance traveled to be proportional to the time? Explain.

I found this on pages _____.

2. Vocabulary Explain what *slope* is in your own words. Draw and label a sample graph to support your explanation. State the slope of the line in your graph. Explain how you found it.



Investigation 2 — Develop & Understand: A and B

3. Provide a description of each item when you are working with a specific situation involving distance and time.

I found this on pages _____.

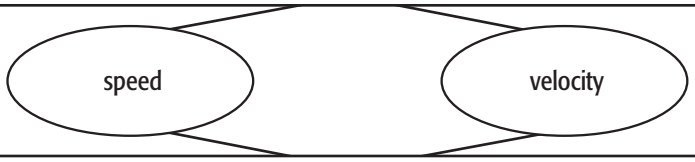
Item	Distance increases over time	Distance decreases over time
table of values comparing time and distance		
algebraic rule that shows the relationship between distance and time		
slope of line when relationship between distance and time is graphed		

Investigation 3 — Develop & Understand: A

4. Vocabulary List the similarities and differences for *speed* and *velocity*.

I found this on page _____.

Similarities:

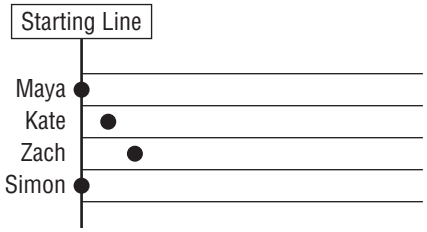


Differences:

Investigation 4 — Develop & Understand: A and B

5. If two lines are graphed to show the constant speeds of two objects, and the lines intersect at a point other than the origin, what does this usually mean?

6. Consider the diagram below showing runners at various starting positions for a race. Assuming the runners travel at a constant speed, identify each runner whose distance will be proportional to time. Explain how you know.



I found this on page _____.

7. Vocabulary Suppose you write the rule $d = 8t + 3$ to show the relationship between d meters and t seconds. Name the *y-intercept* and *velocity* in the rule.

What Did You Learn?

I need to remember the following about:

distance and time:

speed and velocity:

***y*-intercept:**

LESSON 8.3

Recognize Linear Relationships

In Lesson 8.3, I expect to learn:

Investigation 1

I found this on page _____.

Develop & Understand: A

1. Describe some techniques you use when you are finding and writing an algebraic rule for a visual pattern.

I found this on pages _____.

Develop & Understand: B and C

2. Suppose you design a pattern of squares that starts with 5 squares and grows by 4 squares from one stage to the next stage. What do you think a rule for this pattern would be? How does each part of your rule relate to the pattern?

Investigation 2

I found this on page _____.

Think & Discuss

3. Why would you use a dashed line to connect the points in a graph?

I found this on page _____.

Develop & Understand: B

4. Can you use a dashed line to find slope and y-intercept? Explain.

Investigation 3

I found this on page _____.

Develop & Understand: A

5. Describe the similarities and differences that you would find in the graphs of the two given rules.

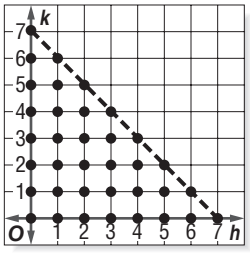
Rules	Similarities	Differences
$y = -4x + 9$ and $y = -4x + 3$		
$y = 2x + 9$ and $y = -2x + 9$		
$y = 15 - 4x$ and $y = 5 + 4x$		
$y = -5x + 2$ and $y = 2 - 5x$		

Investigation 4

I found this on page _____.

Develop & Understand: B

6. Does the rule $h + k = 7$ match the graph to the right? Why or why not?



Develop & Understand: B

7. The outputs in this table increase by equal amounts, but you cannot tell whether the relationship is linear. Why?

_____

Input	35	99	195	323	483
Output	6	10	14	18	22

I found this on page _____.

8. State whether you would expect the graph of each table of input/output values to be linear. Explain your decision.

Input: 2, 3, 4, 5, 6 Output: 7, 12, 19, 28, 29	
Input: 4, 5, 6, 7, 8 Output: 11, 13, 15, 17, 19	
Input: 1, 2, 3, 4, 5 Output: −22, −24, −26, −28, −30	

What Did You Learn?

I need to remember the following about:

writing rules to describe patterns: _____

_____

_____

matching rules with their corresponding graphs: _____

_____

_____

finding a rule that describes a set of input/output values: _____

_____

deciding whether a set of input/output values is part of a linear relationship:

_____

_____

_____

CHAPTER 9

Equations

Contents in Brief

Real-Life Math

This chapter begins by discussing how equations are used in the design of amusement parks, specifically in engineering and sales.

Think About It

How much would you spend to buy four sandwiches and two small lemonades? Write an equation to represent this total cost.

For what types of situations do you think engineers use equations when they are designing "gravity-defying" rides?

Connections to the Past (Course 1, Chapter 9)

Make a flowchart to represent $8 \cdot (a + 5) = 56$.
Then use backtracking to solve the equation. _____

(Course 2, Chapter 1)

Use the distributive property to expand each expression.

$3(b + 12)$ _____ $2(9d + 5)$ _____

$4(c - 1)$ _____ $8(6x - 4)$ _____

Vocabulary

Write the everyday meaning and the mathematical meaning for each term.

Term	Everyday Meaning	Mathematical Meaning
conjecture		
model		
inequality		
solution set		

Family Letter

Suppose you and a classmate plan to review the backtracking and guess-check-and-improve methods of equation solving. Describe how you might structure your review session.

Name four examples of daily situations for which you could write equations.

LESSON 9.1

Find a Solution Method

In Lesson 9.1, I expect to learn:

I found this on page _____.

Think & Discuss

How does the number of ovals in a flowchart relate to the equation you are solving?

Investigation 1

Develop & Understand: A

I found this on page _____.

1. Describe the strategy that you follow when you use guess-check-and-improve to solve an equation.

I found this on pages _____.

2. Complete the table to compare the solution methods.

	Backtracking	Guess-Check-and-Improve
List some benefits of this solving method.		
List some disadvantages of this solving method.		
Describe the type of equation for which this method of solving works best.		

Develop & Understand: B

3. How can you check your solution when you are solving an equation for a real situation?

I found this on page _____.

4. Identify some types of real situations where each method may give an advantage.

Guess-Check-and-Improve	Backtracking

Inquiry Investigation 2

I found this on pages _____.

5. Describe how to use a spreadsheet to solve by guess-check-and-improve. Where in this process must you be very careful?

6. Explain why someone might prefer to use a spreadsheet rather than pencil and paper to guess-check-and-improve.

What Did You Learn?

I need to remember the following about:

backtracking:

guess-check-and-improve:

choosing a solution method:

why backtracking (B) or guess-check-and-improve (G) could be used to solve each of the following equations:

$y^2 + 2y = 8$

$2x^2 = 32$

$h^3 - h^2 = 16$

$\frac{1}{k+2} = 15$

$w(w+4) = 72$

LESSON 9.2

A Model for Solving Equations

In Lesson 9.2, I expect to learn:

Vocabulary

I found this on page _____.

When is a *model* useful in mathematics? How would you describe a *mathematical model*?

Explore

I found this on page _____.

What does the balance represent in an equation? How do you know?

Investigation 1

Develop & Understand: A

I found this on page _____.

1. Describe how to create a balance puzzle.

Investigation 2 — Develop & Understand: A

I found this on page _____.

2. How do you solve a balance puzzle by *keeping things balanced*? How do you think this strategy helps you solve equations?

_____

_____

_____

_____

Investigation 3 — Develop & Understand: A and B

I found this on page _____.

3. Show how the given problem situation can be expressed as an equation and by using a balance puzzle. What is the solution? _____

Problem Situation	Equation	Balance Puzzle
If you multiply a number by 5 and then add 8, you get the same result as when you multiply the number by 6 and then add 4.		

What Did You Learn?

I need to remember the following about:

using a model: _____

_____

modeling an equation with a balance puzzle:

Balance Puzzle	Equation
bags	
blocks	
balance	

LESSON 9.3

Solve Equations

In Lesson 9.3, I expect to learn:

Investigation 1

I found this on page _____.

Develop & Understand: A

1. Imagine a balance puzzle for the equation $12x + 6 = 6x + 18$. What would you do first when solving the balance puzzle? How does this translate into using symbols to solve the equation?

Develop & Understand: B

2. Solve the equation $9x + 3 = 8x + 8$ by showing how the equation changes at each step. Label each step with a description.

Solution Steps	Description

Investigation 2

I found this on page _____.

Develop & Understand: A

3. Why is it sometimes best not to think about a balance puzzle when you are doing the same thing to both sides of an equation? Give an example.

Develop & Understand: B

I found this on page _____.

4. Given the many possibilities for performing operations on an equation, what are some things to consider when you are solving an equation by doing the same thing to both sides? Give some examples of techniques you might use when solving by this method.

Investigation 3

Develop & Understand: A

I found this on page _____.

5. For each equation, state what you would do to both sides as a first step and give a reason for your decision.

Equation	First Step	Reason
$17 - 3x = 14x$		
$\frac{5}{2}x + 8 = 6x + 1$		

I found this on pages _____.

Develop & Understand: B

6. Explain how you would create a *complicated* equation. Why is the word *complicated* an appropriate description?

Investigation 4

7. Vocabulary Describe the similarities and differences between an *equation* and an *inequality*.

I found this on pages _____ .

Similarities	Differences

I found this on page _____ .

Develop & Understand: A

8. Complete the table by putting a check mark in the column that is true when you perform an operation on both sides of an inequality.

Operation on Inequality	Does Not Change the Direction of Inequality	Does Change the Direction of Inequality
Add or subtract a positive number to both sides.		
Multiply or divide both sides by a positive number.		
Add or subtract a negative number to both sides.		
Multiply or divide both sides by a negative number.		

9. Vocabulary When you solve an equation, you find a *solution*. Why is it more appropriate to use the term *solution set* when you are solving an inequality?

I found this on page _____.

Develop & Understand: B and C

10. How can you check that the solution set of an inequality is correct?

Develop & Understand: C

11. Solve and graph each inequality. Explain what each part of the graph indicates.

Inequality	Solution	Graph	Explanation
$x + 12 \leq 40$			
$-5x + 12 > 17$			

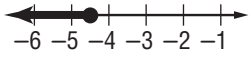
What Did You Learn?

I need to remember the following about:

doing the same thing to both sides of an equation: _____

inequalities: _____

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



LESSON 9.4

Solve Equations with Parentheses

In Lesson 9.4, I expect to learn:

Investigation 1

I found this on page _____.

Develop & Understand: C

1. Rewrite each equation without parentheses. Describe the method that you used.

Original Equation	Rewritten Equation	Method
$b + (b - 1) = 24$		
$6(3 - a) + 2 = 2(2 - 5a)$		

Investigation 2

I found this on page _____.

2. Vocabulary When is a person's statement called a *conjecture*?

I found this on pages _____.

Develop & Understand: C and D

3. How is proving that $a - (b - c) = a - b + c$ different from proving that $a - (b + c) = a - b - c$?

Investigation 3

I found this on pages _____.

Develop & Understand: A and B

4. Rewrite each equation without parentheses. Describe the method that you used.

Original Equation	Rewritten Equation	Method
$7x - (2x + 1) = 14$		
$9(4 - x) + 2x = 22$		
$6x - 4(3 - 2x) = 8$		

What Did You Learn?

I need to remember the following about:

rewriting equations involving addition with parentheses: _____

_____

_____

_____

rewriting equations involving subtraction with parentheses: _____

_____

_____

_____

conjectures: _____

_____

_____

CHAPTER 10

Proportional Reasoning and Percents

Contents in Brief

Real-Life Math

This chapter begins by stating the height of the Empire State Building and giving the height of a replica made by Maya and Darnell. First, you are asked to find the scale that Maya and Darnell used. Then you are asked to write a proportion to find the height of a similar replica Maya and Darnell might make of the Space Needle.

Think About It

Describe how you might use the given information to find the scale that Maya and Darnell used for making the replica of the Empire State Building.

What does it mean to make a replica *to scale*?

Connections to the Past (Chapter 8)

Suppose an employee earns $8.25 per hour. Complete the table to show the amount of pay the employee should receive for different numbers of worked hours.

Worked Hours	3	6	9	12
Pay				

Vocabulary

▶ Write a sentence using the word *proportion* and the word or phrase to which it is connected.

Word	Connection to Proportions
currency	
map scale	
percent	
similarity	

Family Letter

Suppose you and your father are planning a route for a family road trip. Explain how you would determine each of the following items.

total distance

total cost of gasoline

LESSON 10.1

Ratios

In Lesson 10.1, I expect to learn:

Investigation 1

I found this on pages _____.

Develop & Understand: A

1. Describe how to write the ratio of black squares to white squares in this pattern. Then explain how you would use your ratio to find the number of white squares if the pattern were extended to include 15 black squares.

2. Suppose a car is traveling at a rate of 45 miles per hour. Show how you would find the number of miles you would expect the car to travel in 3 hours.

Investigation 2

I found this on page _____.

Develop & Understand: A

3. How do you compare two ratios? Give an example.

4. Describe different methods you can use to find equivalent ratios. Give an advantage and disadvantage of each method.

Description of Method	Advantage	Disadvantage

Develop & Understand: B

I found this on page _____.

5. For what types of situations would it be very useful to use a ratio table to find equivalent ratios? Give some example situations.

6. Explain how to create and complete a ratio table for a given situation.

7. Suppose you create a ratio table such that the values in the first row increase by the same increment from column to column. Describe what happens to the values in the second row. Why does this happen?

What Did You Learn?

I need to remember the following about:

writing a ratio to express a relationship between two quantities:

using a given rate to find values in real situations:

comparing ratios:

using ratio tables to scale ratios:

Sample ratio table:

LESSON 10.2

Proportions and Similarity

In Lesson 10.2, I expect to learn:

I found this on page _____.

Think & Discuss

Suppose you plan to graph a proportional relationship. Describe some characteristics that you would expect your graph to have with respect to its origin, slope, and points.

Investigation 1

1. Vocabulary How can you use ratios to identify a proportional relationship?

I found this on page _____.

Develop & Understand: A

2. Suppose you create a mixture of paint called Island Blue with 2 blue containers and 3 white containers. In the table on page 107, explain how you can use each method to test for proportionality when you make a bigger batch that has 8 blue containers and 12 white containers.

Method	Explanation
graph	
same ratio	

Investigation 2

I found this on page _____.

Develop & Understand: A and B

3. Describe different ways that you can use ratios to solve exercises involving proportional relationships. Give an advantage and disadvantage of each method.

Description of Method	Advantage	Disadvantage

Investigation 3

I found this on page _____.

4. Vocabulary Describe what a *proportion* is in your own words.

_____

_____

I found this on pages _____.

Develop & Understand: A and B

5. What must you keep in mind about ratios when you are writing a proportion from given information?.

_____

_____

_____

_____

Investigation 4

I found this on page _____.

6. Vocabulary What does a *map scale* tell you?

Develop & Understand: A

I found this on page _____.

7. Describe how you can use a map scale and a proportion to estimate an actual distance.

Investigation 5

Explore

I found this on page _____.

8. Describe the triangles that are used to estimate heights when you are working with shadows cast from the sun. Explain how the height of the object and the length of the shadow are represented in each triangle.

Develop & Understand: A

I found this on page _____.

9. Suppose you are using the length of your shadow to estimate the height of a building. Use the phrases *height of building, my height, length of building's shadow,* and *length of my shadow* to write a proportion. Explain how you know where to place each phrase.

Inquiry

Investigation 6

I found this on pages _____.

10. Vocabulary Describe the *angle of elevation* as it applies to a situation where you are estimating the height of a tall object. How do you use this angle in the estimation process?

_____

_____

_____

_____

_____

What Did You Learn?

I need to remember the following about:

ratios and proportional relationships: _____

_____

writing and solving proportions: _____

_____

_____

using a map to estimate the distance between two cities: _____

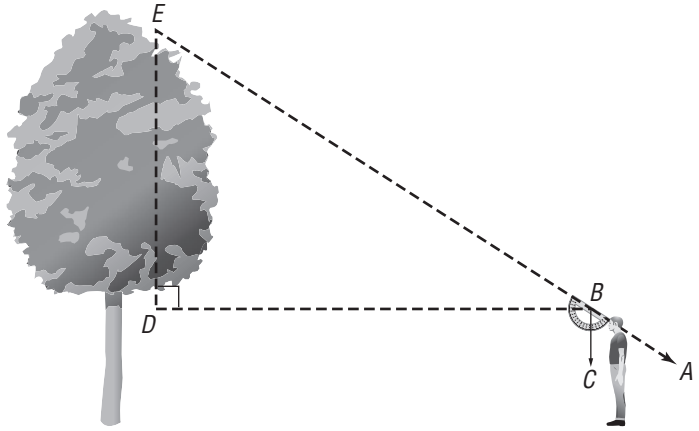
_____

_____

_____

using similarity to estimate heights of tall objects: _____

_____



LESSON 10.3

Percents and Proportions

In Lesson 10.3, I expect to learn:

Investigation 1

Think & Discuss

I found this on page _____.

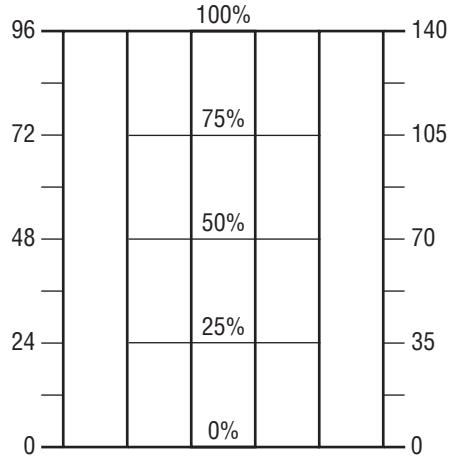
1. Look at the percent diagram that represents the seventh and eighth grade ticket sales. Why does it make sense that the percent scale is common for the two different ratios that are represented in the diagram?

I found this on page _____.

Develop & Understand: A

2. Describe how to use the percent diagram to find each item.

a. 25% of each 140



b. the percent equivalent of the ratio 72:96

I found this on page _____.

Develop & Understand: B

3. Explain how to use percentages as a common scale to compare two ratios that are given in the form a to b and c to d.

Investigation 2

I found this on page _____.

Develop & Understand: A

4. Explain how you would decide if a $900 computer on sale for 30% off has a better sale price than an $800 computer on sale for 20% off.

5. How do you represent a given percent when you are writing a proportion to represent a percent situation?

6. How would you write a proportion to represent a percent situation where you are trying to find a percent when you are given two values?

7. What proportion can you use to find the sale price in Exercise 4 for the $900 computer? Show the solution.

Develop & Understand: B

I found this on page _____.

8. Draw a percent diagram and write a proportion to represent each situation. Then solve for the unknown value.

Situation	Percent Diagram	Proportion and Unknown Value
What is 65% of 140 meters?		
What percent of 40 yards is 5 yards?		

What Did You Learn?

I need to remember the following about:

using percent diagrams: _____

_____

_____

using percents to compare ratios: _____

_____

writing proportions to represent percent situations: _____

_____

_____

_____

EXAMPLE: Write a proportion to find 32% of 84. _____

LESSON 10.4

Rates

In Lesson 10.4, I expect to learn:

I found this on page _____.

Investigation 1

I found this on pages _____.

Develop & Understand: A and B

1. Explain how you would find the unit price or rate in each situation. Show two different methods.

Situation	Explanation
The cost of eight ounces of cheese is $4.96.	
Mr. Baur drives 156 miles in 3.5 hours.	

I found this on page _____.

Develop & Understand: C

2. Suppose you are planning to stain your wooden fence. The length of the fence is 248 feet, and its height is 6 feet. A gallon of stain costs $30 and covers 250 square feet. You plan to stain both sides of the fence, and you want to spend $300. Is this possible? Describe a step-by-step procedure involving unit rates that you would follow to answer this question.

Investigation 2

I found this on page _____.

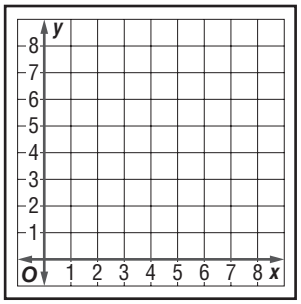
Develop & Understand: A

3. Suppose you are planning to travel to Switzerland. Your mother checks the newspaper and finds that the exchange rate is 1 U.S. dollar equals 1.22143 francs. Write a proportion that you could use to find how much $900 would be worth in Swiss francs. Explain why your proportion makes sense.

I found this on page _____.

Develop & Understand: B

4. Explain how to solve an equation representing the relationship 1 U.S. dollar = 0.50307 British pounds in terms of British pounds. Then graph the new equation in the graph to the right.



5. Explain why it may be helpful to graph the relationship between two currencies.

What Did You Learn?

I need to remember the following about:

finding unit rates: _____

converting currencies: _____

graphing the relationship between two currencies: _____

IMPACT Mathematics

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