TEXAS MATH SOLUTION

Grade 7

Student Edition

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LONG + LIVE + MATH

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"Mathematics is so much more than memorizing rules. It is learning to reason, to make connections, and to make sense of the world. We believe in Learning by Doing(TM)—you need to actively engage with the content if you are to benefit from it. The lessons were designed to take you from your intuitive understanding of the world and build on your prior experiences to then learn new concepts. My hope is that these instructional materials help you build a deep understanding of math."

Sandy Bartle Finocchi, Chief Mathematics Officer

"My hope is that as you work through this course, you feel capable—capable of exploring new ideas that build upon what you already know, capable of struggling through challenging problems, capable of thinking creatively about how to fix mistakes, and capable of thinking like a mathematician."

Amy Jones Lewis, Senior Director of Instructional Design

"At Carnegie Learning we have created an organization whose mission and culture is defined by your success. Our passion is creating products that make sense of the world of mathematics and ignite a passion in you. Our hope is that you will enjoy our resources as much as we enjoyed creating them."

Barry Malkin, CEO

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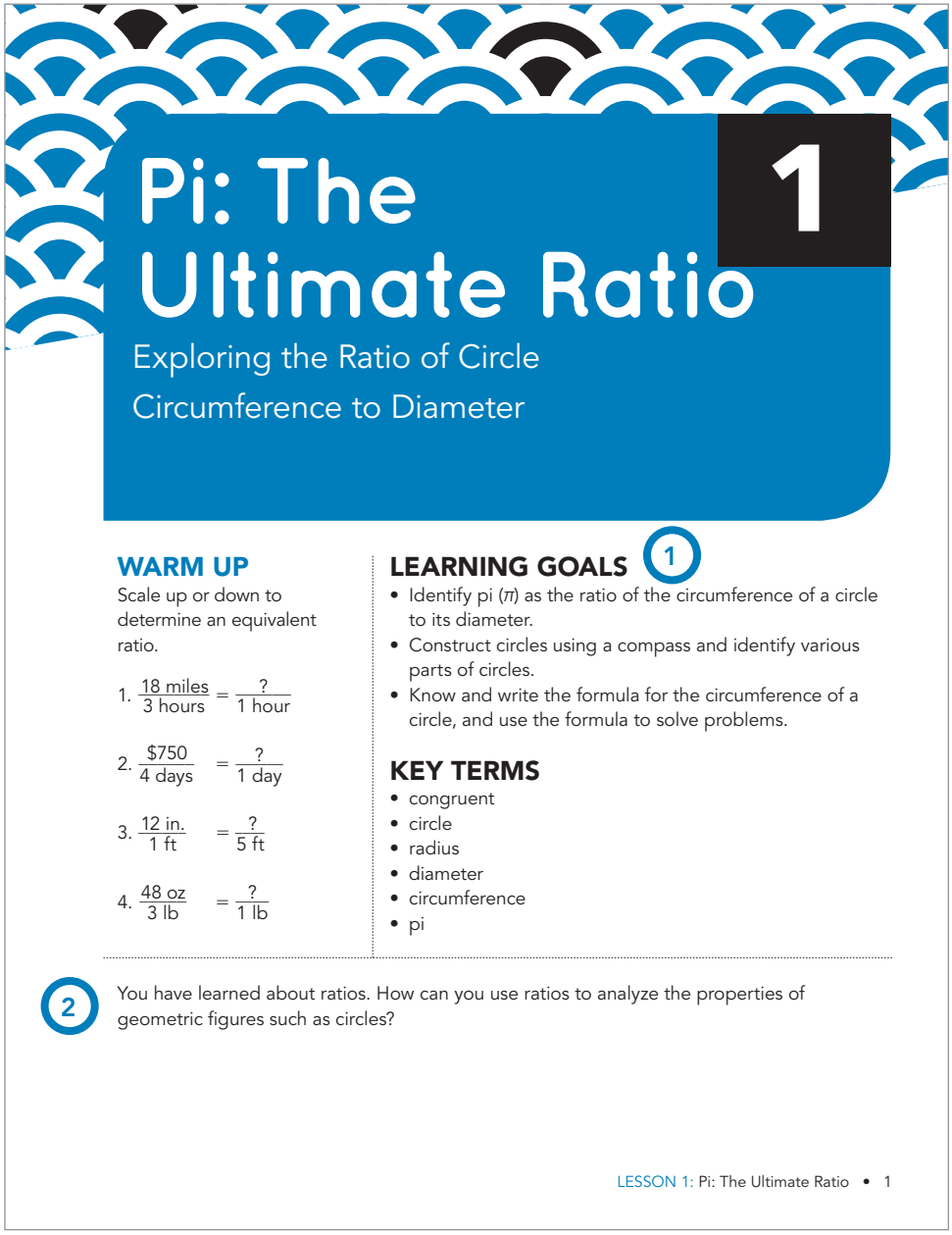
Glossary

Lesson Structure

1. Learning Goals
Learning goals are stated for each lesson to help you take ownership of the learning objectives.

2. Connection
Each lesson begins with a statement connecting what you have learned with a question to ponder.

Return to this question at the end of this lesson to gauge your understanding.



Pi: The Ultimate Ratio 1

Exploring the Ratio of Circle Circumference to Diameter

WARM UP

Scale up or down to determine an equivalent ratio.

1. $\frac{18 \text{ miles}}{3 \text{ hours}} = \frac{?}{1 \text{ hour}}$

2. $\frac{\$750}{4 \text{ days}} = \frac{?}{1 \text{ day}}$

3. $\frac{12 \text{ in.}}{1 \text{ ft}} = \frac{?}{5 \text{ ft}}$

4. $\frac{48 \text{ oz}}{3 \text{ lb}} = \frac{?}{1 \text{ lb}}$

LEARNING GOALS 1

- Identify pi (π) as the ratio of the circumference of a circle to its diameter.
- Construct circles using a compass and identify various parts of circles.
- Know and write the formula for the circumference of a circle, and use the formula to solve problems.

KEY TERMS

- congruent
- circle
- radius
- diameter
- circumference
- pi

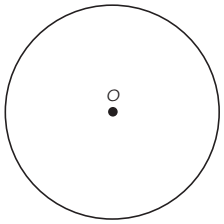
2 You have learned about ratios. How can you use ratios to analyze the properties of geometric figures such as circles?

LESSON 1: Pi: The Ultimate Ratio • 1

3 Getting Started

Across and Around

A circle is shown with a point drawn at the center of the circle. The name of the point is *O*, so let's call this Circle *O*.



1. Analyze the distance around the circle.

a. Use a string and a centimeter ruler to determine the distance around the circle.

b. How does your measurement compare to your classmates' measurements? Summarize the similarities and differences.

2. Draw a line from a point on the circle to the center of the circle, point *O*.

a. Measure your line using your centimeter ruler.

b. How does your measurement compare to your classmates' measurements? Summarize the similarities and differences.

3. Getting Started

Each lesson begins with a Getting Started. When working on the Getting Started, use what you know about the world, what you have learned previously, or your intuition. The goal is just to get you thinking and ready for what's to come.

4. Activities

You are going to build a deep understanding of mathematics through a variety of activities in an environment where collaboration and conversations are important and expected.

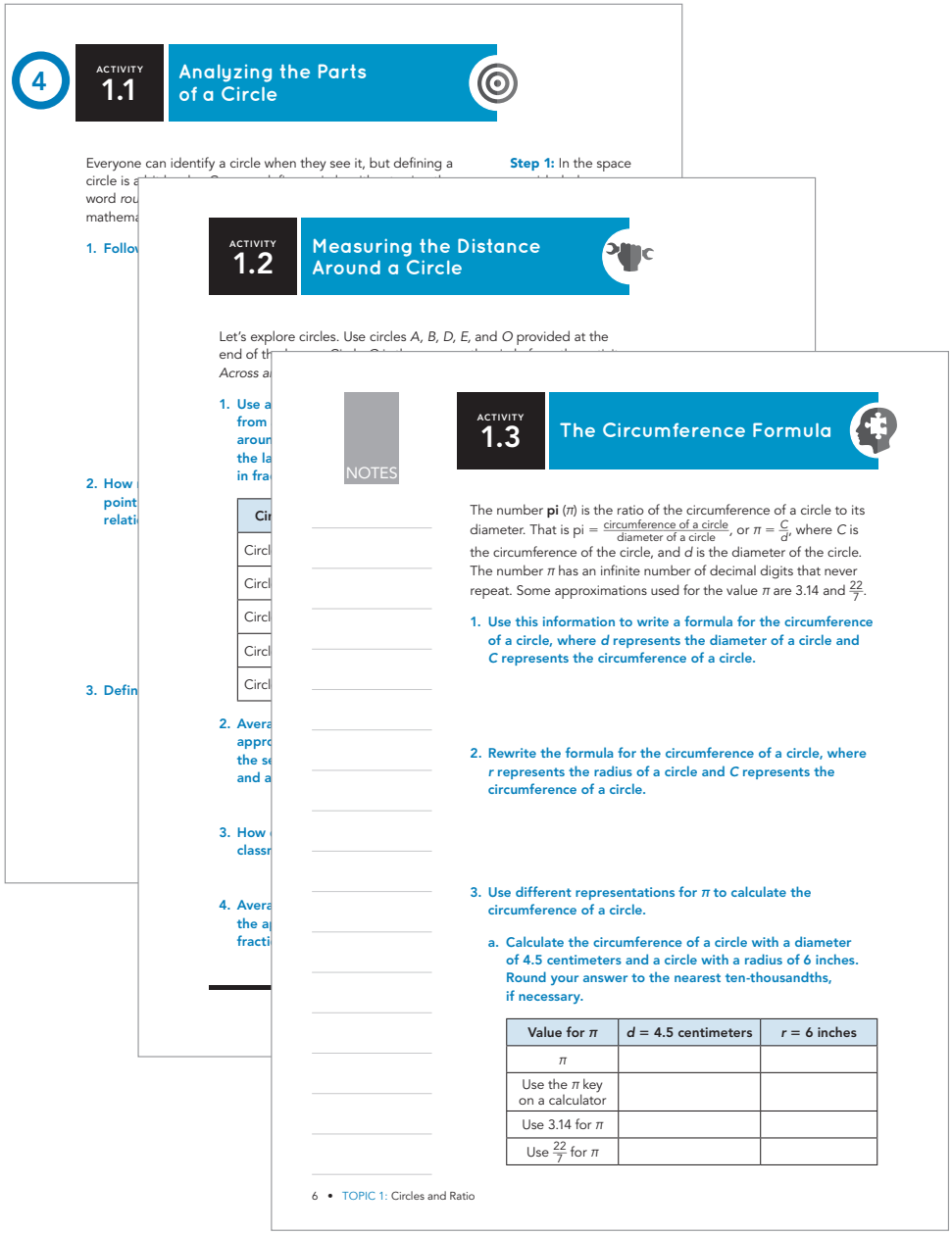
You will learn how to solve new problems, but you will also learn why those strategies work and how they are connected to other strategies you already know.

Remember:

- It's not just about answer-getting. The process is important.
- Making mistakes is a critical part of learning, so take risks.
- There is often more than one way to solve a problem.

Activities may include real-world problems, sorting activities, Worked Examples, or analyzing sample student work.

Be prepared to share your solutions and methods with your classmates.



4

ACTIVITY 1.1

Analyzing the Parts of a Circle

Everyone can identify a circle when they see it, but defining a circle is a

Step 1: In the space

word *rou*

mathema

1. Follo

ACTIVITY 1.2

Measuring the Distance Around a Circle

Let's explore circles. Use circles *A*, *B*, *D*, *E*, and *O* provided at the end of th

Across a

1. Use a from arou the la in fra

2. How point relati

3. Defin

Cir

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2. Avera appro the s and a

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NOTES

ACTIVITY 1.3

The Circumference Formula

The number **pi** (π) is the ratio of the circumference of a circle to its diameter. That is pi $= \frac{\text{circumference of a circle}}{\text{diameter of a circle}}$, or $\pi = \frac{C}{d}$, where C is the circumference of the circle, and d is the diameter of the circle. The number π has an infinite number of decimal digits that never repeat. Some approximations used for the value π are 3.14 and $\frac{22}{7}$.

1. **Use this information to write a formula for the circumference of a circle, where *d* represents the diameter of a circle and *C* represents the circumference of a circle.**

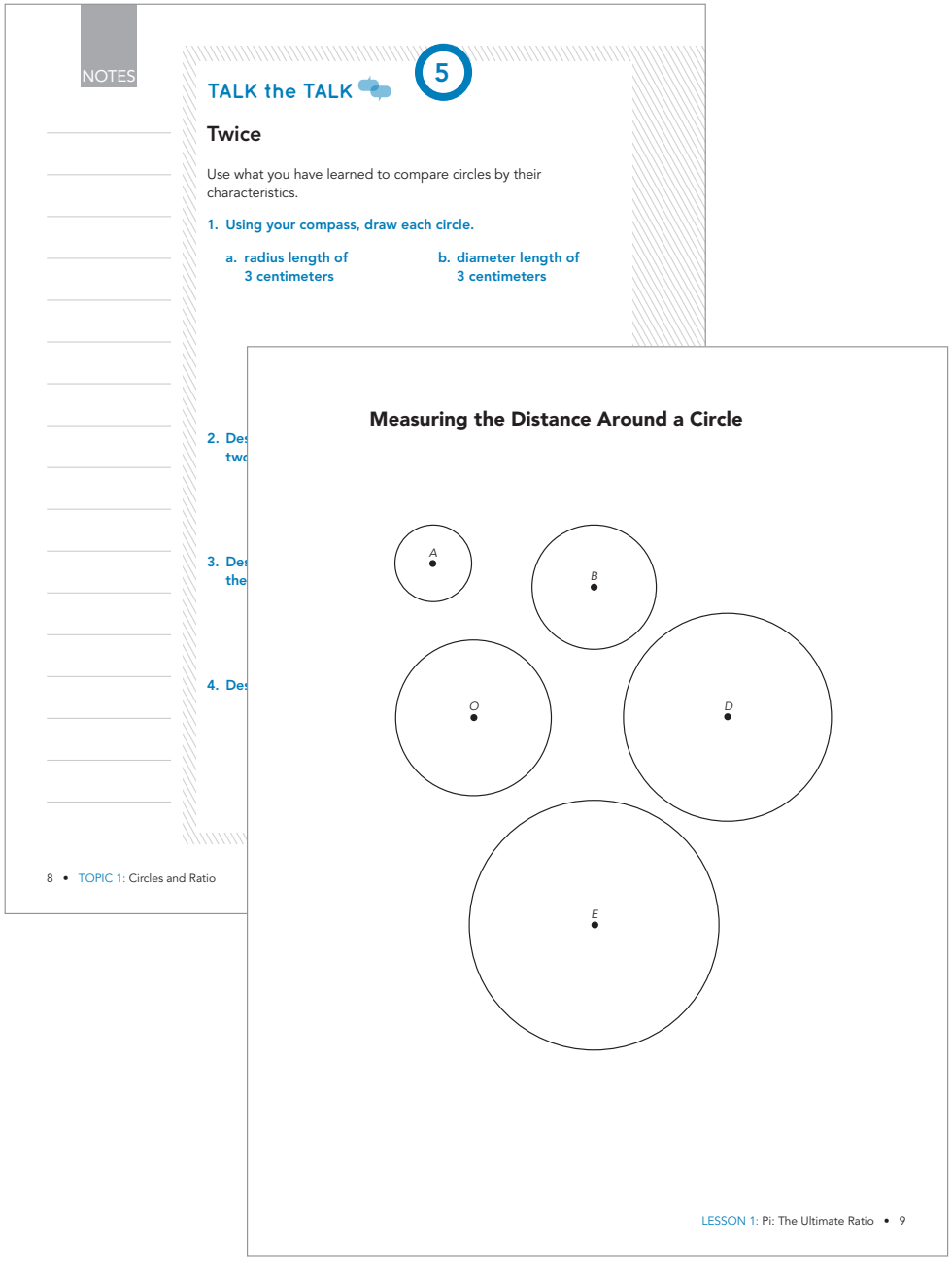
2. **Rewrite the formula for the circumference of a circle, where *r* represents the radius of a circle and *C* represents the circumference of a circle.**

3. **Use different representations for π to calculate the circumference of a circle.**

   a. **Calculate the circumference of a circle with a diameter of 4.5 centimeters and a circle with a radius of 6 inches. Round your answer to the nearest ten-thousandths, if necessary.**

Value for π	d = 4.5 centimeters	r = 6 inches
π		
Use the π key on a calculator		
Use 3.14 for π		
Use $\frac{22}{7}$ for π		

6 • TOPIC 1: Circles and Ratio



5. Talk the Talk

Talk the Talk gives you an opportunity to reflect on the main ideas of the lesson.

- Be honest with yourself.
- Ask questions to clarify anything you don't understand.
- Show what you know!

Don't forget to revisit the question posed on the lesson opening page to gauge your understanding.

Assignment

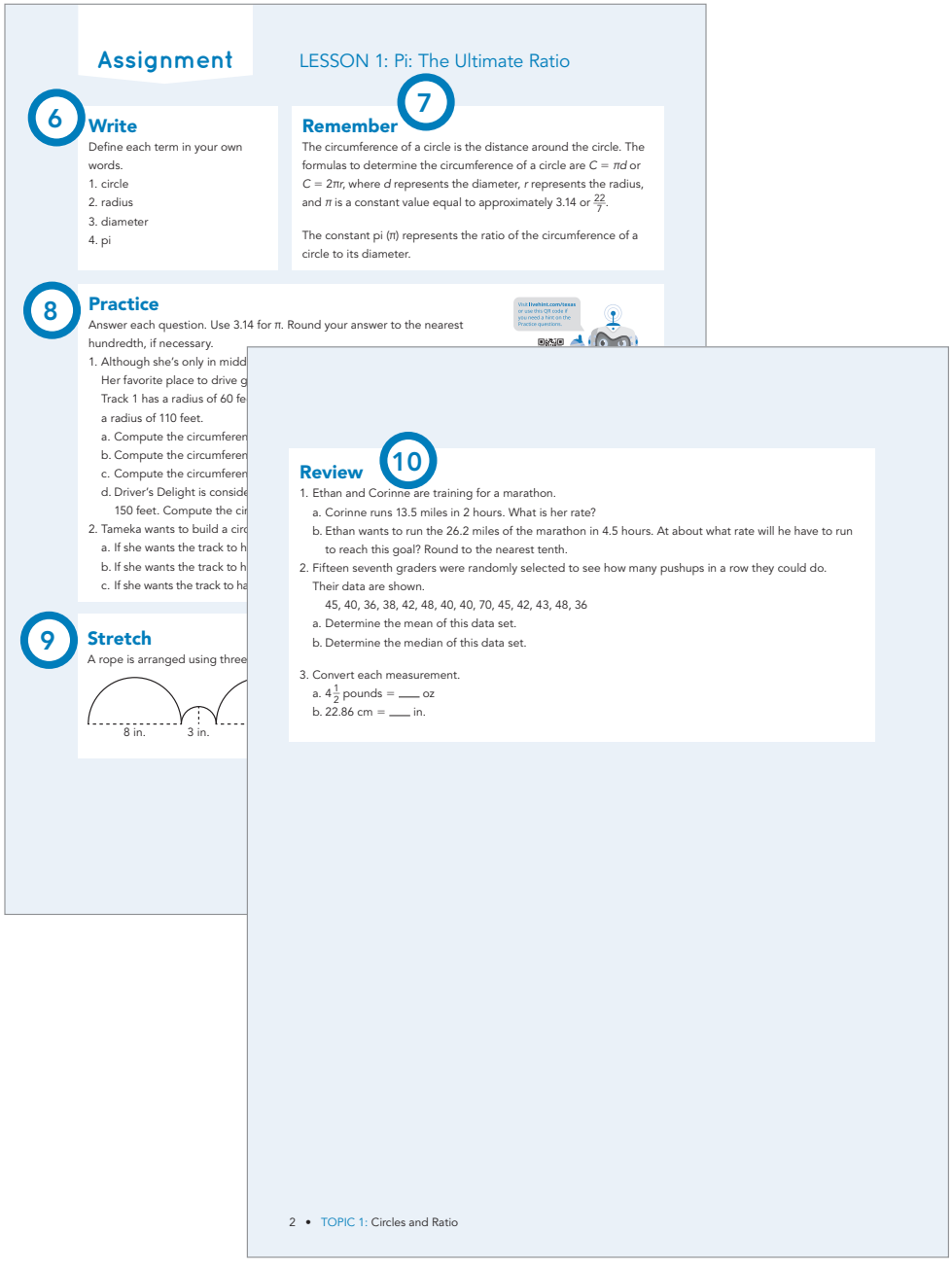
6. Write
Reflect on your work and clarify your thinking.

7. Remember
Take note of the key concepts from the lesson.

8. Practice
Use the concepts learned in the lesson to solve problems.

9. Stretch
Ready for a challenge?

10. Review
Remember what you've learned by practicing concepts from previous lessons and topics.



Assignment

LESSON 1: Pi: The Ultimate Ratio

6 **Write**

Define each term in your own words.

1. circle
2. radius
3. diameter
4. pi

7 **Remember**

The circumference of a circle is the distance around the circle. The formulas to determine the circumference of a circle are $C = \pi d$ or $C = 2\pi r$, where d represents the diameter, r represents the radius, and π is a constant value equal to approximately 3.14 or $\frac{22}{7}$.

The constant pi (π) represents the ratio of the circumference of a circle to its diameter.

8 **Practice**

Answer each question. Use 3.14 for π. Round your answer to the nearest hundredth, if necessary.

1. Although she's only in midd
   Her favorite place to drive g
   Track 1 has a radius of 60 fe
   a radius of 110 feet.
   a. Compute the circumferen
   b. Compute the circumferen
   c. Compute the circumferen
   d. Driver's Delight is conside
   150 feet. Compute the cir
2. Tameka wants to build a circ
   a. If she wants the track to h
   b. If she wants the track to h
   c. If she wants the track to ha

9 **Stretch**

A rope is arranged using three

8 in. 3 in.

10 **Review**

1. Ethan and Corinne are training for a marathon.
   a. Corinne runs 13.5 miles in 2 hours. What is her rate?
   b. Ethan wants to run the 26.2 miles of the marathon in 4.5 hours. At about what rate will he have to run to reach this goal? Round to the nearest tenth.
2. Fifteen seventh graders were randomly selected to see how many pushups in a row they could do. Their data are shown.
   45, 40, 36, 38, 42, 48, 40, 40, 70, 45, 42, 43, 48, 36
   a. Determine the mean of this data set.
   b. Determine the median of this data set.
3. Convert each measurement.
   a. $4\frac{1}{2}$ pounds = ___ oz
   b. 22.86 cm = ___ in.

2 • TOPIC 1: Circles and Ratio

Problem Types You Will See

WORKED EXAMPLE

	$\frac{11}{3}x + 5 = \frac{17}{3}$	$\frac{1}{2}x + \frac{3}{4} = 2$
Step 1:	$3\left(\frac{11}{3}x + 5\right) = 3\left(\frac{17}{3}\right)$	$4\left(\frac{1}{2}x + \frac{3}{4}\right) = 4(2)$
Step 2:	$11x + 15 = 17$	$2x + 3 = 8$
Step 3:	$x = \frac{17 - 15}{11}$	$x = \frac{8 - 3}{2}$
	$= \frac{2}{11}$	$= \frac{5}{2}$

Worked Example

When you see a Worked Example:

- Take your time to read through it.
- Question your own understanding.
- Think about the connections between steps.

Ask Yourself:

- What is the main idea?
- How would this work if I changed the numbers?
- Have I used these strategies before?

Thumbs Up

When you see a Thumbs Up icon:

- Take your time to read through the correct solution.
- Think about the connections between steps.

Ask Yourself:

- Why is this method correct?
- Have I used this method before?

Thumbs Down

When you see a Thumbs Down icon:

- Take your time to read through the incorrect solution.
- Think about what error was made.

Ask Yourself:

- Where is the error?
- Why is it an error?
- How can I correct it?

Analyze the solution strategy and solution for each inequality.

Ella

$$-\frac{1}{2}x + \frac{3}{4} < 2$$

$$-4\left(-\frac{1}{2}x + \frac{3}{4} < 2\right)$$

$$2x - 3 > -8$$

$$2x > -5$$

$$x > \frac{-5}{2}$$

$$x > -2.5$$

Describe the strategy that Ella used correctly.

Jeff

$$-12x + 20 < 32$$

$$\frac{-12x + 20}{-4} < \frac{32}{-4}$$

$$3x - 5 < -8$$

$$3x < -3$$

$$x < -1$$

Identify the error in Jeff's strategy and determine the correct solution.

Who's Correct

When you see a Who's Correct icon:

- Take your time to read through the situation.
- Question the strategy or reason given.
- Determine correct or not correct.

Ask Yourself:

- Does the reasoning make sense?
- If the reasoning makes sense, what is the justification?
- If the reasoning does not make sense, what error was made?

Vanessa was given a math problem to determine how many different rectangles can be constructed with an area of 12 square inches.

Vanessa thinks that there are only two: one with a width of 2 inches and a length of 6 inches, and another with a width of 3 inches and a length of 4 inches.
Is she correct? Explain your reasoning.

The Crew

The Crew is here to help you on your journey. Sometimes they will remind you about things you already learned. Sometimes they will ask you questions to help you think about different strategies. Sometimes they will share fun facts. They are members of your group—someone you can rely on!

Teacher aides will guide you along your journey. They will help you make connections and remind you to think about the details.

Mathematical Process Standards

Texas Mathematical Process Standards

Effective communication and collaboration are essential skills of a successful learner. With practice, you can develop the habits of mind of a productive mathematical thinker. The "I can" expectations listed below align with the TEKS Mathematical Process Standards and encourage students to develop their mathematical learning and understanding.

▶ Apply mathematics to problems arising in everyday life, society, and the workplace.

I can:

- use the mathematics that I learn to solve real world problems.
- interpret mathematical results in the contexts of a variety of problem situations.

▶ Use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying a solution, and evaluating the problem solving process and reasonableness of the solution.

I can:

- explain what a problem "means" in my own words.
- create a plan and change it if necessary.
- ask useful questions in an attempt to understand the problem.
- explain my reasoning and defend my solution.
- reflect on whether my results make sense.

► Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate; and techniques including mental math, estimation, and number sense as appropriate, to solve problems.

I can:

- use a variety of different tools that I have to solve problems.
- recognize when a tool that I have to solve problems might be helpful and when it has limitations.
- look for efficient methods to solve problems.
- estimate before I begin calculations to inform my reasoning.

► Communicate mathematical ideas, reasoning, and their implications using multiple representations including symbols, diagrams, graphs, and language as appropriate.

I can:

- communicate and defend my own mathematical understanding using examples, models, or diagrams.
- use appropriate mathematical vocabulary in communicating mathematical ideas.
- make generalizations based on results.
- apply mathematical ideas to solve problems.
- interpret my results in terms of various problem situations. interpret my results in terms of various problem situations.

► Create and use representations to organize, record, and communicate mathematical ideas.

I can:

- consider the units of measure involved in a problem.
- label diagrams and figures appropriately to clarify the meaning of different representations.
- create an understandable representation of a problem situation.

Academic Glossary

Visit the Students & Caregivers Portal on the Texas Support Center at www.CarnegieLearning.com/texas-help to access the Mathematics Glossary for this course anytime, anywhere.

There are important terms you will encounter throughout this book. It is important that you have an understanding of these words as you get started on your journey through the mathematical concepts. Knowing what is meant by these terms and using these terms will help you think, reason, and communicate your ideas.

ANALYZE

Related Phrases

- Examine
- Evaluate
- Determine
- Observe
- Consider
- Investigate
- What do you notice?
- What do you think?
- Sort and match

Definition

To study or look closely for patterns. Analyzing can involve examining or breaking a concept down into smaller parts to gain a better understanding of it.

Ask Yourself

- Do I see any patterns?
- Have I seen something like this before?
- What happens if the shape, representation, or numbers change?

EXPLAIN YOUR REASONING

Related Phrases

- Show your work
- Explain your calculation
- Justify
- Why or why not?

Definition

To give details or describe how to determine an answer or solution. Explaining your reasoning helps justify conclusions.

Ask Yourself

- How should I organize my thoughts?
- Is my explanation logical?
- Does my reasoning make sense?
- How can I justify my answer to others?

REPRESENT

Definition

To display information in various ways. Representing mathematics can be done using words, tables, graphs, or symbols.

Ask Yourself

- How should I organize my thoughts?
- How do I use this model to show a concept or idea?
- What does this representation tell me?
- Is my representation accurate?

Related Phrases

- Show
- Sketch
- Draw
- Create
- Plot
- Graph
- Write an equation
- Complete the table

ESTIMATE

Definition

To make an educated guess based on the analysis of given data. Estimating first helps inform reasoning.

Ask Yourself

- Does my reasoning make sense?
- Is my solution close to my estimation?

Related Phrases

- Predict
- Approximate
- Expect
- About how much?

DESCRIBE

Definition

To represent or give an account of in words. Describing communicates mathematical ideas to others.

Ask Yourself

- How should I organize my thoughts?
- Is my explanation logical?
- Did I consider the context of the situation?
- Does my reasoning make sense?

Related Phrases

- Demonstrate
- Label
- Display
- Compare
- Determine
- Define
- What are the advantages?
- What are the disadvantages?
- What is similar?
- What is different?