Mathematics
Grade 4
Sample Booklet
All New! Research-Based Program for the CCSS

As educators, we take developing new content seriously. As publishers, we have delivered quality and rigor in standards-based instructional, learning, and assessment materials for more than two decades. Based on thorough research and development, we present an all-new Common Core series that meets the cognitive demands of the new standards and the needs of your students in the classroom.

- Based on the Common Core State Standards (CCSS)
- All new content and strategies for instruction, learning, and assessment
- Focus on open-ended and extended-response items

Sample pages from Book I ................................................................. 2–26
Sample pages from Book II ............................................................... 27–51
Sample pages from Book III ............................................................. 52–76
Table of Contents

What's Inside the Student Work Text? .......................................................... 3
How to Use the Student Work Text ......................................................... 3
Understanding Rigor and Cognitive Complexity .................................... 5
Descriptions of TestSMART® Complexity Levels .................................. 7
Fostering Mathematical Understanding and Inquiry ............................... 9
Definition of the Common Core State Standards .................................. 9
The Precise Language of Mathematics .................................................... 20
Mathematics Manipulatives and Tools ................................................... 22
Text-Marking in Mathematics ................................................................. 24
Integrating the Literacy Strands in the Mathematics Classroom ............. 25
Master Skills List ..................................................................................... 28
Answer Key ............................................................................................. 29
References ............................................................................................... 35
What’s Inside the Student Work Text?

Overview

The TestSMART® Common Core Student Work Text addresses the Common Core State Standards (CCSS) for Mathematics (National Governors Association Center for Best Practices/Council of Chief State School Officers [NGA/CCSSO], 2010b) in separate books. However, students benefit from an integrated view of mathematics (cross-domain experiences). For instance, instead of isolating concepts, this approach groups ideas and draws parallels. Students move beyond memorization and routine procedures to construct mathematics using their own strategies and representations. As they grow in understanding, they begin to generalize and transfer patterns of responding to other mathematical and non-mathematical problems and situations.

The exercises included in the work text focus on the critical areas (major work) of the grade as defined in the CCSS (NGA/CCSSO, 2013). The work text provides practice in a variety of mathematical and real-world contexts. Tasks require appropriate use of manipulatives, tools, and technology.

The TestSMART Common Core Student Work Text should supplement and support research, planning, instruction, and both informal and formal assessment. It is recommended that teachers introduce new math concepts through everyday problems and situations.

How to Use the Student Work Text

Time Requirement

The time requirement depends on the activity type and topic. Activity types include guided (whole-class and small-group), independent, and extension/homework. Most activities will take about 15–30 minutes, and some—such as examining why estimation is a useful math tool and finding multiple patterns on a hundreds board—will take up to 3 days.

Getting Started

Teachers should implement the activities from the TestSMART Common Core Student Work Text in sequential order. The activities logically progress within each domain, building upon prior knowledge and personal experience. The activities also appropriately relate thinking across domains and grades. The activities should move students toward self-directed mathematics learning and problem solving.

Within each activity are opportunities for students to question, think about, and talk about their learning. In addition to the specific mathematic expectations involved, these moments during activities help students develop the following types of skills—

• analytical thinking
• evaluative thinking
• reflective thinking
• metacognitive thinking
• communication
For instance, students may need to connect information with prior knowledge or personal experience, make predictions, infer, determine importance, visualize, synthesize, or monitor comprehension. The Teacher Guide provides specific guidance for supporting students throughout the learning process.

**Lesson Features**

**Think About It:** Students are asked to think about math-related questions and situations and to think about their thinking. Students can think independently, or teachers can guide “think-aloud” sessions in small or large groups (see Box 4 “Scaffolding through ‘Think Aloud,’” page 16).

**Talk About It:** Students are asked to talk about math concepts and situations and to talk about their thinking. This includes examining problem situations, making observations, explaining their problem-solving processes, and discussing math terminology and concepts (see “Math-Talk,” pages 13–14).

**Question:** Students are asked questions that focus on the underlying structures and logic of mathematics.

**Try It:** Students are asked to try a guided example. Teachers can present the guided example in a whole-class or small-group setting. Teachers should engage students in “math-talk” during these examples (see “Math-Talk,” pages 13–14).

**Working Together:** Students are asked to work together, or collaborate, in various guided settings (pairs, small-group, whole-class). Teachers can support students with open-ended questions (see Box 5 “Scaffolding through Open-Ended Questions,” pages 16–18).

**On Your Own:** Students are asked to independently explore a concept or skill, as well as their own ways of problem solving. Teachers can support students with open-ended questions (see Box 5 “Scaffolding through Open-Ended Questions,” pages 16–18).

**Did You Know…?:** Students are given tidbits and trivia about their world and how it works. These relate to the math domains, math vocabulary, the history of mathematics, or real-life applications. The following are suggestions for using these tidbits and trivia:

- Challenge students to find other interesting facts related to the topic. This provides an opportunity for students to learn effective research techniques.
- Create a “Did You Know…?” display where students can post the facts they learn.
- Use the tidbits and trivia as prompts for a class discussion. Talk about what students already know and what they would like to learn more about. Have students generate questions for further research or discussion.
- Have students respond to the tidbits and trivia in their math journals. Provide time for students to share their journal entries with classmates. (Students may benefit from a guiding question related to the tidbit or trivia.)
- Have students represent the idea(s) from the tidbits and trivia in a new way. Provide time for students to share their representations with classmates.
Descriptions of TestSMART® Complexity Levels

The following descriptions provide an overview of the three complexity levels used to align the TestSMART® Common Core Student Work Text items to the Common Core State Standards (CCSS) for Mathematics (NGA/CCSSO, 2010b). Each explanation details the kinds of activities that occur within each level. However, they do not represent all of the possible thought processes for each level.

Low Complexity (L)

Low-complexity items align with the CCSS at Level 1 of the Webb (2002a) model. Activities and problems at this level require routine, single-step methods. An item may ask students to recognize or restate a fact, definition, or term. For example, students may need to identify the attributes of a geometric figure. Items of this complexity may require students to follow a basic procedure with clearly defined steps. At this cognitive level, students may need to apply a formula or perform a simple algorithm. Some major concepts represented at this level include arithmetic facts, perimeter, and converting units of measure. A low-complexity item may ask students to identify, recognize, use, or measure information and concepts.

Moderate Complexity (M)

Moderate-complexity items align with the CCSS at Level 2 of the Webb model. Items of moderate complexity involve both comprehension and the subsequent processing of information. Activities at this level demand more than one step in the reasoning process. Students are asked to determine how to best solve the problem. An item may ask students to generate a table of paired numbers based on a real-life situation. Items may involve using a model to solve a problem. At this cognitive level, students will need to visualize for tasks such as extending patterns and determining nonexamples. Items may involve interpreting information from a simple graph, table, or diagram. Some major concepts represented at this level include classifying geometric figures and using strategies to estimate. Items of this complexity may ask students to classify, organize, observe, collect and display data, or compare data. Some items also require students to apply low-complexity skills and concepts.

### Low Complexity

#### Problems With Remainders

**Directions:** Read and solve each problem below.

1. A bakery has orders for 28 wedding cakes this week. The bakery can make only 8 wedding cakes each day. What is the fewest number of days the bakery will need to make all 28 wedding cakes?

   Answer: ________________________

2. Mrs. Carson has 40 feet of red ribbon. She uses 6 feet of red ribbon on each quilt she makes.
   a. What is the greatest number of quilts she can make with the red ribbon she has?
   b. How much red ribbon will she have left?

### Moderate Complexity

#### Problems With Remainders

**Directions:** Read and solve each problem below.

1. A bakery has orders for 28 wedding cakes this week. The bakery can make only 8 wedding cakes each day. What is the fewest number of days the bakery will need to make all 28 wedding cakes?

   Answer: ________________________

2. Mrs. Carson has 40 feet of red ribbon. She uses 6 feet of red ribbon on each quilt she makes.
   a. What is the greatest number of quilts she can make with the red ribbon she has?
   b. How much red ribbon will she have left?

3. What is the greatest number of quilts she can make with the remaining red ribbon?
   a. 3
   b. 4
   c. 5
   d. 6
   e. 7
High Complexity (H)

High-complexity items align with the CCSS at Level 3 and/or 4 of the Webb model. Items of high complexity require students to use strategic, multi-step thinking; develop a deeper understanding of the information; and extend thinking. The problems at this level are non-routine and more abstract. Students are asked to demonstrate more flexible thinking, apply prior knowledge, make and test conjectures, and support their responses. High-complexity items may require students to make generalizations from patterns. Items may involve interpreting information from a complex graph, table, or diagram. At this cognitive level, students must justify the reasonableness of a solution process when more than one solution exists. Students will use concepts to solve and explain problems, such as how changes in dimensions affect the volume of a figure. A high-complexity item may ask students to plan, reason, explain, compare, differentiate, draw conclusions, cite evidence, analyze, synthesize, apply, or prove. Some items also require students to apply low- and/or moderate-complexity skills and concepts.

* Note: Although the CCSS or state standards may include expectations that require extended thinking, many large-scale assessment activities are not classified as Level 4. Performance and open-ended assessment may require activities at Level 4.
Fostering Mathematical Understanding and Inquiry

Common Core State Standards*

The Common Core State Standards (CCSS) (NGA/CCSSO, 2012) is a standards-based U.S. education reform initiative sponsored by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO). The initiative seeks to provide a set of national curriculum standards to create more rigorous, consistent instruction and learning across the country. These standards were developed based on models from various states and countries, as well as recommendations from K–12 educators and students. The expectations, aimed at college and career readiness, focus on core concepts and processes at deep and complex levels. The curriculum standards for ELA/literacy and mathematics were released in 2010. Science and history standards are in development.

Forty-five states and the District of Columbia have adopted the standards, but Alaska, Minnesota, Nebraska, Texas, and Virginia have yet to adopt them. During the 2014–2015 academic year, adopting states should begin formal CCSS assessments. Assessments will include the following types of items:

- selected-response items (multiple-choice items)
- constructed-response items
- technology-enhanced items/tasks
- performance tasks

For more information about the CCSS initiative, please visit http://www.corestandards.org.

* This information was current at time of publication.

Box 2: Definition of the Common Core State Standards

Mathematics Instruction and Learning

Mathematics is a study of patterns, relationships, measurement, and properties in numbers, quantity, magnitude, shape, space, and symbols. Effective mathematics instruction requires students to mindfully attend to elements of structure and content—including patterns and language choice. This disciplined study involves trying and retrying during problem solving to better understand how structure and content work together in systems of meaning (Paul & Elder, 2008). The ability to recognize, analyze, and use patterns and relationships is essential to problem solving.

Mathematical thinking skills are closely tied to skills that are essential for success in school, career/work, and life, such as—

- critical/evaluative thinking
- creative/innovative thinking
- elaborative thinking
- problem solving
- decision making
- researching
- collaboration
- communication
- organizing and connecting ideas
These skills are essential to achieving learning goals in the areas of information and communication technology (ICT) literacy and science. As students develop in mathematics, they should also see connections in reading, language arts, social studies, history, art, music, physical education and sports, and other areas of the curriculum.

Research (e.g., Fennema & Romberg, 1999; Hiebert et al., 1997; Simon, 2006; Skemp, 1976) supports a focus on teaching for meaning and understanding. Fluency with computational procedures and basic facts allows students to expend less cognitive energy when problem solving. However, drilling on isolated skills can become meaningless (e.g., Grouws, 2004; Schoenfeld, 1988). In addition, these rote activities sometimes involve the use of mnemonic devices. These types of “tricks” are not suggested strategies for achieving long-term understanding and flexible use of skills. Students understand more when they actively construct meaning during rich, complex tasks (e.g., Fosnot, 1996; Fosnot, 2005; Noddings, 1990).

Appropriate Tasks

The CCSS emphasize the need for understanding and its impact on carrying out effective mathematical practices and true mastery of mathematical content (NGA/CCSSO, 2010b). (Refer to Box 1 “Balance in Rigorous Mathematics Instruction” on page 6 for a list of the Standards for Mathematical Practice.) Rich mathematics tasks often involve persistent problem solving and, therefore, can require time. Rich tasks allow all students—even struggling learners—the opportunity to adequately explore and discuss complex problems, situations, and ideas. Rich mathematics experiences provide students with opportunities to see structure, patterns, and relationships in many different contexts.

Rich, complex mathematics tasks—

- begin with a clear, explicit, reasonable, actionable learning goal
- incorporate the use of sound number sense and basic computational skills
- rely on the integrated development of mathematical skills and understandings
- build on prior knowledge and personal experience
- utilize a variety of settings in which to explore and share mathematical ideas with others (i.e., paired, small-group, whole-class)
- encourage risk-taking to further the learning process
- encourage students to work and think mathematically
- invite all students to participate in constructive math inquiries and discussions
- promote complex thinking and transfer of understanding by focusing on the “big ideas” and “essential questions”
- apply mathematical ideas to a broad range of real-life and imagined situations
- help students learn to use the precise language of mathematics for specific purposes
- require students to make conjectures, hypothesize, test and retest ideas, justify thinking, represent findings in meaningful ways, and reflect
- require students to look for and utilize the underlying order and logic of mathematics when problem solving
Answer Key

Section I—Operations & Algebraic Thinking

pp. 4–5
Try It–1: younger brother's age (3 years) x 3 = Jake's age 
OR 3 x 3 = 9 Talk About It–1: Jake's brother is 3 years old, and Jake is 3 times older than his brother; multiplication; Students should understand that the word “times” indicates multiplication; yes, 3 x 3 = 9, The first 3 is Jake's brother's age and the second 3 is how many times the first 3 should be counted. 

Try It–2: Kelly's 5 hair bows x 4 = Gina's hair bows OR 5 x 4 = 20 Talk About It–2: Discussions will vary but should include that Kelly has 5 hair bows and Gina has 4 times as many hair bows as Kelly, multiplication should be used to solve the problem, and the equation 5 x 4 = 20 can be used to solve the problem. 

p. 6
1. comparing how far Amy walks to and from school

pp. 12–13
Drawings will vary. 1. 80¢, 10 x 8 = 80 2. 4 ft, 6 x 3 = 18 3. 6 x 3 = 18 4. 24 ft, 3 x 8 = 24 5. 8 x 5 = 40 6. 24, 3 x 8 = 24 7. 9 x 4 = 36 8. 8 x 6 = 48

pp. 14–15
Talk About It: Jackie's largest tomato plant has 20 tomatoes, which is 4 times the number of tomatoes on Jackie's smallest tomato plant; 20 = 4 x n OR 20 ÷ 4 = n; multiplication OR division; Answers will vary. 

Working Together: 20 pounds of hay; 60 ÷ 3 = n OR 60 = 3 x n; Drawings will vary. 

pp. 16–17
Drawings will vary. 1. 3 in.; 9 ÷ 3 = 3 OR 3 x 3 = 9 2. 7.42 ± 6 = 7 OR 6 x 7 = 42 3. 4; 24 ± 6 = 4 OR 4 x 6 = 24 4. 5.9; 18 ± 2 = 9 OR 2 x 9 = 18 5. 6; 18 ± 3 = 6 OR 3 x 6 = 18 6. 6.24 ± 4 = 6 OR 4 x 6 = 24 7. 4; 28 ± 7 = 4 OR 4 x 7 = 28 8. 7.56 ± 8 = 7 OR 7 x 8 = 56 

pp. 18–19

TestSMART® Common Core Sample Booklet
References

* All Web sites listed were active at time of publication.


Section I
Operations & Algebraic Thinking ................................................................. 3

Section II
Geometry ..................................................................................................... 93

Reference Materials .................................................................................. 123

Mathematics Vocabulary .......................................................................... 127

Scratch Paper ............................................................................................ 128
Section I—Operations & Algebraic Thinking

4.OA—Use the four operations with whole numbers to solve problems

1. Interpret a multiplication equation as a comparison. Represent verbal statements of multiplicative comparisons as multiplication equations.

2. Multiply or divide to solve word problems involving multiplicative comparison.

3. Solve multi-step word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

4.OA—Gain familiarity with factors and multiples

4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

4.OA—Generate and analyze patterns

5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Note: The Common Core State Standards (CCSS) identify developing understanding and fluency with multi-digit multiplication and developing understanding of dividing to find quotients involving multi-digit dividends as one of three critical areas of instruction for Grade 4.
Problem Solving With Diagrams

Read the following problem, and think about how you might solve it.

At a restaurant, one bowl of soup costs $5. A whole meal costs 3 times as much as one bowl of soup. How much does a whole meal cost?

Let’s solve the problem by using a picture. As always, begin with what you know.

Talk About It–1

• After reading the problem, what do you know?
• How could you show this information in a picture?

In the picture below, the $5 bill shows the cost of one bowl of soup.

= one bowl of soup

The problem states that a whole meal costs 3 times as much as one bowl of soup. Look at the picture below.

= a whole meal

Talk About It–2

• Why are three $5 bills used to show the cost of a whole meal?
• How could you use addition to solve the problem?
• How could you use multiplication to solve the problem?
• What is the price of a whole meal at the restaurant?
• What is the difference between the cost of one bowl of soup and a whole meal?
• How much would you pay for one bowl of soup and a whole meal?
Reviewing Four Math Operations

Addition

You **add** to solve problems that involve combining two or more amounts. Sometimes (but not always!) problems have **clue words** that tell you to use addition. Words like **sum**, **total**, and **in all** may be hints that you will add to solve the problem.

**Addition Example**

If a store made 115 pizzas in the morning and 352 more pizzas in the evening, how many pizzas did the store make altogether?

In the example above, the words **more** and **altogether** are clue words that tell you to add to solve the problem.

You can write the problem as an equation. In the equation, the letter \( n \) stands for “the total number of pizzas the store made.”

\[
115 + 352 = n
\]

To solve the problem, you set it up vertically (up and down), as shown below.

\[
\begin{array}{c}
115 \\
+ 352 \\
\hline
467
\end{array}
\]

Subtraction

You **subtract** to solve problems that involve finding which amount is less (or more), or how much is left over. Sometimes (but not always!) problems have clue words that tell you to use subtraction. Words like **difference**, **left over**, and **less** may be hints that you will subtract to solve the problem.

**Subtraction Example**

Rita’s class collected 395 pounds of newspaper for recycling. Manuel’s class collected 496 pounds of newspaper for recycling. How many more pounds of newspaper did Manuel’s class collect than Rita’s class?

In the example above, the words **how many more** and **than** are clue words that tell you to subtract to solve the problem.
Section I—Operations & Algebraic Thinking

Standard 4.OA.3 (H)

Problem Solving III

You have already solved multi-step problems that take two or more steps to solve. Each problem below is a multi-step problem that requires using more than one operation.

Directions: Solve each problem below. Write the answer and the equations that you use for each problem. The first one is completed for you.

1. To raise money for new library books, a school’s PTA asked each class to sell 200 boxes of candy. In Mr. Lincoln’s class, 5 boys each sold 8 boxes of candy, and 4 girls each sold 7 boxes of candy. How many more boxes of candy does Mr. Lincoln’s class need to sell?

\[
\begin{align*}
5 \times 8 &= n \\
4 \times 7 &= b \\
40 + 28 &= 68 \\
200 - 68 &= 132
\end{align*}
\]

Answer: 132

2. Isa had 4 red beads. She had 10 more blue beads than red beads. She had 3 times as many yellow beads as red beads. How many beads did Isa have in all?

Answer: 20
More Compatible Numbers

You used multiplication facts to find compatible numbers for the equation $63 \div 8 = n$. You can also use rounding to find compatible numbers. Look at the equation below.

$$188 + 106 = n$$

To find the exact value of $n$, you would probably write the problem like this.

$$\begin{align*}
188 & \quad \text{addend} \\
+ 106 & \quad \text{addend} \\
\hline 
294 & \quad \text{sum}
\end{align*}$$

However, you can round the addends (the numbers you are adding together) to estimate the sum (the answer in an addition problem).

$$200 + 100 = 300$$

Talk About It–1: Is 300 a reasonable answer? Why or why not?

Rounding to find compatible numbers also works for subtraction. Look at the equation below.

$$502 - 119 = n$$

To find the exact value of $n$, you would probably write the problem like this.

$$\begin{align*}
502 & \quad \text{minuend} \\
- 119 & \quad \text{subtrahend} \\
\hline 
383 & \quad \text{difference}
\end{align*}$$

However, you can round the minuend (the number to be subtracted from) and the subtrahend (the number to be subtracted) to estimate the difference (the answer in a subtraction problem).

$$500 - 100 = 400$$

Talk About It–2: Is 400 a reasonable answer? Why or why not?
Standard 4.OA.4 (L–M)

Prime & Composite Numbers

All whole numbers except 1 are either prime numbers or composite numbers.

A prime number is a whole number that has only 2 factors, 1 and itself. The number 3 is a prime number. It has only two factors, 1 and 3.

A composite number is a whole number that has more than 2 factors. The number 8 is a composite number. It has the following factors: 1, 2, 4, and 8.

The number 1 is neither a prime number nor a composite number.

Try It: Look at each number below. Write a “P” beside each prime number. Write a “C” beside each composite number.

a. 12 _______ e. 13 _______
b. 6 _______ f. 15 _______
c. 11 _______ g. 17 _______
d. 20 _______ h. 24 _______

Talk About It: How did you decide which numbers were prime and which numbers were composite?

On Your Own: Choose a prime number and a composite number from the list above. In the space below, show why each number is either prime or composite. An example is completed for you.

The number 12 is a composite number because it has more than 2 factors. The factors of 12 are 1, 2, 3, 4, 6, and 12.

\[ 1 \times 12 = 12 \quad 2 \times 6 = 12 \quad 3 \times 4 = 12 \]
Standard 4.OA.5 (M–H)

**Noticing Features in Number Patterns**

**Directions:** Look at each number pattern below. Write the rule and the missing number(s) for each pattern. Then, write at least one other feature of the number pattern. The first one is completed for you.

1. 1, 3, 5, 7, 9, __, __, 13
   - Rule: _______________
   - Other feature(s): Every number in the pattern is an odd number.

2. 10, 100, 1000, 10000, __________
   - Rule: _______________
   - Other feature(s): _______________

3. 96, 88, 80, 72, __, __, __, __
   - Rule: _______________
   - Other feature(s): _______________

4. 1, 3, __, 27, 81, 243
   - Rule: _______________
   - Other feature(s): _______________

5. 6, 15, 24, 33, 42, 51, __, __
   - Rule: _______________
   - Other feature(s): _______________

6. 0, 7, 14, __, 28, __, 42
   - Rule: _______________
   - Other feature(s): _______________
Section II—Geometry

4.G—Draw and identify lines and angles, and classify shapes by properties of their lines and angles

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures, and draw lines of symmetry.

Note: The Common Core State Standards (CCSS) identify understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry as one of three critical areas of instruction for Grade 4.
Standard 4.G.1 (L)

**Identifying Lines, Points, Rays, & Line Segments**

**Directions:** Use the figure below to answer each question.

![Diagram of points and lines]

1. Which of the following is a line?
   - a. BG
   - b. GB
   - c. PT
   - d. PT

2. Which of the following is a line segment?
   - a. MF
   - b. PT
   - c. FM
   - d. B

3. Which of the following is a ray?
   - a. FM
   - b. TP
   - c. MB
   - d. BG

4. Which of the following is a line segment?
   - a. PT
   - b. FG
   - c. PT
   - d. GF

5. Which of the following is a point?
   - a. PT
   - b. MF
   - c. BG
   - d. G

6. Which of the following is a ray?
   - a. BG
   - b. BG
   - c. BG
   - d. BG
Standard 4.G.1 (L–M)

What's the angle?

**Angles** are formed when lines come together and meet at the same endpoint. The shared point is called the **vertex**. (The plural of vertex is **vertices**.) The 2 lines are called the **arms** of the angle. As the arms turn, the distance between them changes, too.

There are different types of angles. Look at the angle below.

In the angle above, the 2 arms meet to form a **right angle**. A right angle measures 90 degrees. You may notice that this angle forms the letter L. The little square at the vertex tells you that this is a perfect right angle.

Now, look at the two angles below.

In angle A, the 2 arms meet to form an **acute angle**. Acute angles measure less than 90 degrees. In angle B, the 2 arms meet to form an **obtuse angle**. Obtuse angles measure more than 90 degrees.
Types of Triangles

Triangles can be classified by 2 different sets of characteristics: angle size and side length. Let’s look at angle sizes first.

Triangles by Angle Size

You have already learned about acute, obtuse, and right angles. You can use these same terms to describe triangles.

On Your Own–1: Look at the triangles above. Use what you know about angles to fill in the blanks below.

Triangle A is a(n) ________________ triangle because all of its angles are ___________ 90 degrees.

Triangle B is a(n) ________________ triangle because 1 of its angles is ___________ 90 degrees.

Triangle C is a(n) ________________ triangle because 1 of its angles is ___________ 90 degrees.

Talk About It–1

• Would you classify the triangles below as acute, obtuse, or right? Explain your reasoning.

• Can a right triangle ever have more than one 90-degree angle? Why or why not?

• Can an obtuse triangle ever have more than 1 obtuse angle? Why or why not?

• Do all 3 angles in an acute triangle need to be less than 90 degrees? Why or why not?
Working Together: Look at the triangles below, and draw the lines of symmetry on each triangle.

Now, on a separate sheet of paper, complete the following with a partner.
6. Classify each triangle.
7. How many lines of symmetry does triangle A have? How do you know?
8. How many lines of symmetry does triangle B have? How do you know?
9. How many lines of symmetry does triangle C have? How do you know?
10. In what way is triangle C different from triangles A and B?
11. Write a general rule for finding symmetry in an isosceles triangle. Explain. (Remember that equilateral triangles are a type of isosceles triangle.)
12. Write a general rule for finding symmetry in a scalene triangle. Explain.
13. Write a general rule for finding symmetry in a right triangle. Explain.
14. What do you notice about the location of each line of symmetry in triangles?

A. Directions: In the box below, draw 2 examples of right triangles that are symmetrical and 2 examples of right triangles that are asymmetrical (not symmetrical).

B. Directions: On the lines below, describe how the symmetrical and asymmetrical right triangles differ. Explain how the differences affect their symmetry.
Standard 4.G.3 (M–H)

Symmetry in Pentagons

The pentagon below looks like it will have many lines of symmetry. How many lines of symmetry do you think it has? ______________

[Diagram of a pentagon]

On Your Own–1

1. Draw all the lines of symmetry on the pentagon above. The pentagon has ________ line(s) of symmetry.

2. Do the lines of symmetry intersect (cross) the edges of the pentagon at a vertex, a side, or both? Explain. __________________________________________________________
   ____________________________________________________________________

Talk About It: Look at the 2 pentagons below.

• How many lines of symmetry does pentagon A have? How many lines of symmetry does pentagon B have?
• Do pentagon A and pentagon B have the same number of lines of symmetry? Why or why not?

Pentagon A is a regular polygon. In regular polygons, all sides and angles are equal. Pentagon B is NOT a regular polygon because its sides are not the same length and its angles are not all equal.

continue to next page
# Table of Contents

1. What's Inside the Student Work Text? ................................................................. 3
2. How to Use the Student Work Text ................................................................. 3
3. Understanding Rigor and Cognitive Complexity .............................................. 5
4. Descriptions of TestSMART® Complexity Levels ............................................. 7
5. Fostering Mathematical Understanding and Inquiry ......................................... 9
6. Definition of the Common Core State Standards .............................................. 9
7. The Precise Language of Mathematics ............................................................ 20
8. Mathematics Manipulatives and Tools ............................................................ 22
9. Text-Marking in Mathematics ........................................................................ 24
10. Integrating the Literacy Strands in the Mathematics Classroom .................... 25
11. Master Skills List ............................................................................................. 28
12. Answer Key ..................................................................................................... 30
13. References ...................................................................................................... 36
14. Blackline Masters ......................................................................................... 39
What’s Inside the Student Work Text?

Overview
The TestSMART® Common Core Student Work Text addresses the Common Core State Standards (CCSS) for Mathematics (National Governors Association Center for Best Practices/Council of Chief State School Officers [NGA/CCSSO], 2010b) in separate books. However, students benefit from an integrated view of mathematics (cross-domain experiences). For instance, instead of isolating concepts, this approach groups ideas and draws parallels. Students move beyond memorization and routine procedures to construct mathematics using their own strategies and representations. As they grow in understanding, they begin to generalize and transfer patterns of responding to other mathematical and non-mathematical problems and situations.

The exercises included in the work text focus on the critical areas (major work) of the grade as defined in the CCSS (NGA/CCSSO, 2013). The work text provides practice in a variety of mathematical and real-world contexts. Tasks require appropriate use of manipulatives, tools, and technology.

The TestSMART Common Core Student Work Text should supplement and support research, planning, instruction, and both informal and formal assessment. It is recommended that teachers introduce new math concepts through everyday problems and situations.

How to Use the Student Work Text

Time Requirement
The time requirement depends on the activity type and topic. Activity types include guided (whole-class and small-group), independent, and extension/homework. Most activities will take about 15–30 minutes.

Getting Started
Teachers should implement the activities from the TestSMART Common Core Student Work Text in sequential order. The activities logically progress within each domain, building upon prior knowledge and personal experience. The activities also appropriately relate thinking across domains and grades. The activities should move students toward self-directed mathematics learning and problem solving.

Within each activity are opportunities for students to question, think about, and talk about their learning. In addition to the specific mathematic expectations involved, these moments during activities help students develop the following types of skills—

- analytical thinking
- evaluative thinking
- reflective thinking
- metacognitive thinking
- communication
For instance, students may need to connect information with prior knowledge or personal experience, make predictions, infer, determine importance, visualize, synthesize, or monitor comprehension. The Teacher Guide provides specific guidance for supporting students throughout the learning process.

**Lesson Features**

**Think About It:** Students are asked to think about math-related questions and situations and to think about their thinking. Students can think independently, or teachers can guide “think-aloud” sessions in small or large groups (see Box 4 “Scaffolding through Think Aloud,” page 16).

**Talk About It:** Students are asked to talk about math concepts and situations and to talk about their thinking. This includes examining problem situations, making observations, explaining their problem-solving processes, and discussing math terminology and concepts (see “Math-Talk,” pages 13–14).

**Try It:** Students are asked to try a guided example. Teachers can present the guided example in a whole-class or small-group setting. Teachers should engage students in “math-talk” during these examples (see “Math-Talk,” pages 13–14).

**Working Together:** Students are asked to work together, or collaborate, in various guided settings (pairs, small-group, whole-class). Teachers can support students with open-ended questions (see Box 5 “Scaffolding through Open-Ended Questions,” pages 16–18).

**On Your Own:** Students are asked to independently explore a concept or skill, as well as their own ways of problem solving. Teachers can support students with open-ended questions (see Box 5 “Scaffolding through Open-Ended Questions,” pages 16–18).

**Did You Know…?** Students are given tidbits and trivia about their world and how it works. These relate to the math domains, math vocabulary, the history of mathematics, or real-life applications. The following are suggestions for using these tidbits and trivia:

- Challenge students to find other interesting facts related to the topic. This provides an opportunity for students to learn effective research techniques.
- Create a “Did You Know…?” display where students can post the facts they learn.
- Use the tidbits and trivia as prompts for a class discussion. Talk about what students already know and what they would like to learn more about. Have students generate questions for further research or discussion.
- Have students respond to the tidbits and trivia in their math journals. Provide time for students to share their journal entries with classmates. (Students may benefit from a guiding question related to the tidbit or trivia.)
- Have students represent the idea(s) from the tidbits and trivia in a new way. Provide time for students to share their representations with classmates.
Mathematics, Grade 4—Book II

Descriptions of TestSMART® Complexity Levels

The following descriptions provide an overview of the three complexity levels used to align the TestSMART® Common Core Student Work Text items to the Common Core State Standards (CCSS) for Mathematics (NGA/CCSSO, 2010b). Each explanation details the kinds of activities that occur within each level. However, they do not represent all of the possible thought processes for each level.

Low Complexity (L)

Low-complexity items align with the CCSS at Level 1 of the Webb (2002a) model. Activities and problems at this level require routine, single-step methods. An item may ask students to recognize or restate a fact, definition, or term. For example, students may need to identify the attributes of a geometric figure. Items of this complexity may require students to follow a basic procedure with clearly defined steps. At this cognitive level, students may need to apply a formula or perform a simple algorithm. Some major concepts represented at this level include arithmetic facts, perimeter, and converting units of measure. A low-complexity item may ask students to identify, recognize, use, or measure information and concepts.

Moderate Complexity (M)

Moderate-complexity items align with the CCSS at Level 2 of the Webb model. Items of moderate complexity involve both comprehension and the subsequent processing of information. Activities at this level demand more than one step in the reasoning process. Students are asked to determine how to best solve the problem. An item may ask students to generate a table of paired numbers based on a real-life situation. Items may involve using a model to solve a problem. At this cognitive level, students will need to visualize for tasks such as extending patterns and determining nonexamples. Items may involve interpreting information from a simple graph, table, or diagram. Some major concepts represented at this level include classifying geometric figures and using strategies to estimate. Items of this complexity may ask students to classify, organize, observe, collect and display data, or compare data. Some items also require students to apply low-complexity skills and concepts.

Multiplying & Dividing by 10

Directions: Find the value of \( n \) in each equation below. You may use a place value chart to help you.

1. \( 5,000 \times 10 = n \)  
2. \( 600,000 \div 10 = n \)  
3. \( 450 \div 10 = n \)  
4. \( 3,540 \times 10 = n \)  
5. \( 4,210 \div 10 = n \)  
11. \( 698,000 \div 10 = n \)  
12. \( 823,980 \div 10 = n \)  
13. \( 59,280 \times 10 = n \)  
14. \( 5,630 \div 10 = n \)  
15. \( 28,930 \times 10 = n \)
High Complexity (H)

High-complexity items align with the CCSS at Level 3 and/or 4 of the Webb model. Items of high complexity require students to use strategic, multi-step thinking; develop a deeper understanding of the information; and extend thinking. The problems at this level are non-routine and more abstract. Students are asked to demonstrate more flexible thinking, apply prior knowledge, make and test conjectures, and support their responses. High-complexity items may require students to make generalizations from patterns. Items may involve interpreting information from a complex graph, table, or diagram. At this cognitive level, students must justify the reasonableness of a solution process when more than one solution exists. Students will use concepts to solve and explain problems, such as how changes in dimensions affect the volume of a figure. A high-complexity item may ask students to plan, reason, explain, compare, differentiate, draw conclusions, cite evidence, analyze, synthesize, apply, or prove. Some items also require students to apply low- and/or moderate-complexity skills and concepts.

* Note: Although the CCSS or state standards may include expectations that require extended thinking, many large-scale assessment activities are not classified as Level 4. Performance and open-ended assessment may require activities at Level 4.

Mathematics, Grade 4—Book II

Directions:
Write a word problem for each equation below. Then, solve each problem. The first one is started for you.

1. 624 + 328 = n
At a theater, 624 people watched an action movie and 328 people watched a comedy. How many people watched the two movies in all?
Answer: __________________
These skills are essential to achieving learning goals in the areas of information and communication technology (ICT) literacy and science. As students develop in mathematics, they should also see connections in reading, language arts, social studies, history, art, music, physical education and sports, and other areas of the curriculum. Research (e.g., Fennema & Romberg, 1999; Hiebert et al., 1997; Simon, 2006; Skemp, 1976) supports a focus on teaching for meaning and understanding. Fluency with computational procedures and basic facts allows students to expend less cognitive energy when problem solving. However, drilling on isolated skills can become meaningless (e.g., Grouws, 2004; Schoenfeld, 1988). In addition, these rote activities sometimes involve the use of mnemonic devices. These types of “tricks” are not suggested strategies for achieving long-term understanding and flexible use of skills. Students understand more when they actively construct meaning during rich, complex tasks (e.g., Fosnot, 1996; Fosnot, 2005; Noddings, 1990).

Appropriate Tasks

The CCSS emphasize the need for understanding and its impact on carrying out effective mathematical practices and true mastery of mathematical content (NGA/CCSSO, 2010b). (Refer to Box 1 “Balance in Rigorous Mathematics Instruction” on page 6 for a list of the Standards for Mathematical Practice.) Rich mathematics tasks often involve persistent problem solving and, therefore, can require time. Rich tasks allow all students—even struggling learners—the opportunity to adequately explore and discuss complex problems, situations, and ideas. Rich mathematics experiences provide students with opportunities to see structure, patterns, and relationships in many different contexts.

Rich, complex mathematics tasks—

• begin with a clear, explicit, reasonable, actionable learning goal
• incorporate the use of sound number sense and basic computational skills
• rely on the integrated development of mathematical skills and understandings
• build on prior knowledge and personal experience
• utilize a variety of settings in which to explore and share mathematical ideas with others (i.e., paired, small-group, whole-class)
• encourage risk-taking to further the learning process
• encourage students to work and think mathematically
• invite all students to participate in constructive math inquiries and discussions
• promote complex thinking and transfer of understanding by focusing on the “big ideas” and “essential questions”
• apply mathematical ideas to a broad range of real-life and imagined situations
• help students learn to use the precise language of mathematics for specific purposes
• require students to make conjectures, hypothesize, test and retest ideas, justify thinking, represent findings in meaningful ways, and reflect
• require students to look for and utilize the underlying order and logic of mathematics when problem solving
These skills are essential to achieving learning goals in the areas of information and communication technology (ICT) literacy and science. As students develop in mathematics, they should also see connections in reading, language arts, social studies, history, art, music, physical education and sports, and other areas of the curriculum.

Research (e.g., Fennema & Romberg, 1999; Hiebert et al., 1997; Simon, 2006; Skemp, 1976) supports a focus on teaching for meaning and understanding. Fluency with computational procedures and basic facts allows students to expend less cognitive energy when problem solving. However, drilling on isolated skills can become meaningless (e.g., Grouws, 2004; Schoenfeld, 1988). In addition, these rote activities sometimes involve the use of mnemonic devices. These types of “tricks” are not suggested strategies for achieving long-term understanding and flexible use of skills. Students understand more when they actively construct meaning during rich, complex tasks (e.g., Fosnot, 1996; Fosnot, 2005; Noddings, 1990).

Appropriate Tasks

The CCSS emphasize the need for understanding and its impact on carrying out effective mathematical practices and true mastery of mathematical content (NGA/CCSSO, 2010b). (Refer to Box 1 “Balance in Rigorous Mathematics Instruction” on page 6 for a list of the Standards for Mathematical Practice.) Rich mathematics tasks often involve persistent problem solving and, therefore, can require time. Rich tasks allow all students—even struggling learners—the opportunity to adequately explore and discuss complex problems, situations, and ideas. Rich mathematics experiences provide students with opportunities to see structure, patterns, and relationships in many different contexts.

Rich, complex mathematics tasks—

• begin with a clear, explicit, reasonable, actionable learning goal
• incorporate the use of sound number sense and basic computational skills
• rely on the integrated development of mathematical skills and understandings
• build on prior knowledge and personal experience
• utilize a variety of settings in which to explore and share mathematical ideas with others (i.e., paired, small-group, whole-class)
• encourage risk-taking to further the learning process
• encourage students to work and think mathematically
• invite all students to participate in constructive math inquiries and discussions
• promote complex thinking and transfer of understanding by focusing on the “big ideas” and “essential questions”
• apply mathematical ideas to a broad range of real-life and imagined situations
• help students learn to use the precise language of mathematics for specific purposes
• require students to make conjectures, hypothesize, test and retest ideas, justify thinking, represent findings in meaningful ways, and reflect
• require students to look for and utilize the underlying order and logic of mathematics when problem solving
Answer Key

Section I—Number and Operations in Base Ten

pp. 4–5
On Your Own: 100; 1,000; 10,000; 100,000; 1,000,000
Talk About It–1: The value of each place is 10 times the value of the place to its right. Talk About It–2: division Talk About It–3: multiplication; multiplying by 10 Talk About It–4: 80; add a zero and move the 8 to the hundreds place, 800; remove a zero and move the 8 to the ones place, 8

pp. 6–7
1. a. 200 b. 2,000 c. 20 2. a. 7,000 b. 70,000 c. 700
3. a. 50,000 b. 500,000 c. 5,000 d. 4 a. 300,000
b. 3,000,000 c. 30,000 Talk About It: Answers will vary, but students should understand that a zero is added for each place the number is moved to the left and that a zero is removed for each place the number is moved to the right. Students should also be correct.

pp. 15–16
2. a. 6,319,872 b. 6,3 3. a. 30,928 b. 0 9 4. a. 912,083
b. 8 2 5. a. 7,356,049 b. 5 7 6. a. 90,535 b. 5 0
7. a. 55,555 b. 5 8 a. 1,040,506 b. 5 0

p. 17
Answers will vary. Suggestions: 2. 3,004,000 3. 700,007
4. 9,900 5. 50,080 6. 700,005 7. 700 8. 89 9. 5,000,000
10. 100,035

pp. 18–19
Try It: 1. The paragraph is confusing and hard to read because the numbers are written in words. It could be made clearer by using numerals. 2. 24,902; 24,860; 196,940,400; 6,000,000,000; 915,064; 3/4; 915,064

p. 20
1. five thousand six hundred twenty-four 2. seven thousand four hundred ninety-three 3. sixteen thousand nine hundred thirty-two 4. seventy-six thousand hundred four thousand eighty-three 5. ninety-three thousand ninety-three
References

* All Web sites listed were active at time of publication.


Selected pages from

TestSMART®
Common Core
Student Work Text

Mathematics
Grade 4, Book II
Number and Operations in Base Ten
Number and Operations–Fractions

Lori Mammen
Editorial Director

ISBN: 978-1-60539-875-4

Copyright infringement is a violation of Federal Law.

©2013 by ECS Learning Systems, Inc., Bulverde, Texas. All rights reserved. No part of this publication may be reproduced, translated, stored in a retrieval system, or transmitted in any way or by any means (electronic, mechanical, photocopying, recording, or otherwise) without prior written permission from ECS Learning Systems, Inc.

Reproduction of any part of this publication for an entire school or for a school system, by for-profit institutions and tutoring centers, or for commercial sale is strictly prohibited.

Printed in the United States of America.

Disclaimer Statement

ECS Learning Systems, Inc. recommends that the purchaser/user of this publication preview and use his/her own judgment when selecting lessons and activities. Please assess the appropriateness of the content and activities according to grade level and maturity of your students. The responsibility to adhere to safety standards and best professional practices is the duty of the teachers, students, and/or others who use the content of this publication. ECS Learning Systems is not responsible for any damage, to property or person, that results from the performance of the activities in this publication.

TestSMART is a registered trademark of ECS Learning Systems, Inc.
Section I—Number and Operations in Base Ten

4.NBT—Generalize place value understanding for multi-digit whole numbers

1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.

2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

3. Use place value understanding to round multi-digit whole numbers to any place.

4.NBT—Use place value understanding and properties of operations to perform multi-digit arithmetic

4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.

5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Note: The Common Core State Standards (CCSS) identify developing understanding and fluency with multi-digit multiplication and developing understanding of dividing to find quotients involving multi-digit dividends as one of three critical areas of instruction for Grade 4.
Standard 4.NBT.2 (L)

Using Expanded Form

Look at the expression below. It shows a number written in expanded form.

\[ 10,000 + 5,000 + 600 + 20 + 1 \]

When you write a number in expanded form, you write it to show the value of each of its digits. A digit is a symbol used in math. There are ten digits in our number system: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

A digit’s position in a number determines its value. This is what we mean when we talk about “place value.” A digit’s value depends on its position, or place, in a number.

Directions: Answer each of the following.

1. Write the number that appears in expanded form above. _____________________

2. What digit appears in the ten-thousands place? _____________________
   How many ten-thousands are in the number? _____________________

3. What digit appears in the thousands place? _____________________
   How many thousands are in the number? _____________________

4. What digit appears in the hundreds place? _____________________
   How many hundreds are in the number? _____________________

5. What digit appears in the tens place? _____________________
   How many tens are in the number? _____________________

6. What digit appears in the ones place? _____________________
   How many ones are in the number? _____________________

Talk About It: In the number shown above, the digit “1” appears twice. Do both 1s mean the same thing in the number? Why or why not?
Section I—Number and Operations in Base Ten

Standard 4.NBT.2 (L)

**Using Standard Form**

In math, you usually write numbers in **standard form**. A number written in standard form has only one digit for each place value.

Here is a number written in expanded form.

\[ 4,000 + 600 + 20 + 8 \]

Here is the same number written in standard form.

\[ 4,628 \]

**A. Directions:** The numbers below appear in expanded form. Write each number in standard form.

<table>
<thead>
<tr>
<th>Expanded Form</th>
<th>Standard Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( 80,000 + 9,000 + 400 + 70 + 5 )</td>
<td>__________________________</td>
</tr>
<tr>
<td>2. ( 6,000 + 300 + 30 + 2 )</td>
<td>__________________________</td>
</tr>
<tr>
<td>3. ( 300,000 + 20,000 + 4,000 + 900 + 20 )</td>
<td>__________________________</td>
</tr>
<tr>
<td>4. ( 60,000 + 8,000 + 100 + 50 + 7 )</td>
<td>__________________________</td>
</tr>
<tr>
<td>5. ( 30,000 + 400 + 80 + 2 ) (This one is tricky!)</td>
<td>__________________________</td>
</tr>
</tbody>
</table>

**B. Directions:** The numbers below appear in standard form. Write each number in expanded form.

<table>
<thead>
<tr>
<th>Standard Form</th>
<th>Expanded Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. 4,619</td>
<td>__________________________</td>
</tr>
<tr>
<td>7. 34,593</td>
<td>__________________________</td>
</tr>
<tr>
<td>8. 217,845</td>
<td>__________________________</td>
</tr>
<tr>
<td>9. 76,639</td>
<td>__________________________</td>
</tr>
<tr>
<td>10. 80,786 (This one is tricky!)</td>
<td>__________________________</td>
</tr>
</tbody>
</table>
Standard 4.NBT.2 (L)

Comparing Numbers

Look at the two numbers below.

56,927       56,937

Which of the two numbers is greater? Let’s write both numbers on a place value chart and compare them.

<table>
<thead>
<tr>
<th>Millions</th>
<th>Hundred-thousands</th>
<th>Ten-thousands</th>
<th>Thousands</th>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>9</td>
<td>3</td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To compare the two numbers, begin with the digit farthest to the left in each number. In the example above, you begin by looking at the ten-thousands place. The digit 5 is in the ten-thousands place for both numbers. Continue moving to the right, and look at the thousands place. A 6 is in the thousands place for both numbers. Up to this point, the numbers seem to be equal.

Continue moving to the right until you find the place value where the digit is not the same in both numbers. For the numbers above, you must move to the tens place before you find digits that are different. At this point, determine which digit (2 or 3) is greater. The number with the greater digit in the tens place is the greater number of the two.

To compare the two numbers, you use one of the following symbols.

> (is greater than)
< (is less than)
= (is equal to OR equals)

You would compare the two numbers this way:

56,927 < 56,937

You read the comparison as “56,927 is less than 56,937.”
Standard 4.NBT.4 (L–M)

Regrouping to Add Multi-Digit Numbers

Look at each problem below.

A. 921
   + 53
   ---
B. 129
   + 45
   ---

Talk About It–1

• How would you begin to solve Problem A?
• What is the sum for Problem A?
• How would you begin to solve Problem B?
• How is Problem B different from Problem A?

You begin solving Problem B in the same way you begin solving Problem A—in the ones column. You add 9 + 5 for a sum of 14, but you can’t put 14 ones in the ones column.

Talk About It–2

• What is the greatest digit you can have in the ones column?
• How could writing the number 14 in expanded form help you solve the problem?

If you write the number 14 in expanded form, it will look like this:

10 + 4

The number 14 is really 1 ten and 4 ones.

Let’s think about adding 129 and 45 again. You begin in the ones column. You add 9 + 5 for a sum of 14. You write the 4 ones in the ones place of the answer. You regroup the 1 ten to the tens column. Regrouping is the process of moving a digit from one column to another. Regrouping is sometimes called “carrying” or “borrowing.”
Standard 4.NBT.5 (L–M)

**Multiplication: Addition, Pictures, & Facts**

You already know the basic multiplication facts. Did you know you can use the multiplication facts to multiply multi-digit numbers?

Look at the multiplication problem below.

\[ 12 \times 3 = n \]

You can solve this problem in different ways. One way to solve it is with repeated addition.

**Talk About It–1**

- What are two ways to solve the problem with repeated addition?
- Which way is easier? Why?

You can also solve the problem by drawing a picture.

**On Your Own:** In the box below, draw a picture that shows the solution to \(12 \times 3\).

Finally, you can use basic multiplication facts to solve the problem. To do that, let’s write the factors in a different way.

\[
\begin{array}{c}
12 \\
\times 3 \\
\end{array}
\]

Now, use the multiplication facts to find the product. Begin in the ones column.

\[ 3 \text{ ones} \times 2 \text{ ones} = 6 \text{ ones} \]
Challenger III

Directions: Write a word problem for each equation below. Then, solve each problem. The first one is started for you.

1. \( 624 + 328 = n \)
   At a theater, 624 people watched an action movie and 328 people watched a comedy. How many people watched the two movies in all?

   Answer: ________________

2. \( 7,842 - 5,929 = n \)

   Answer: ________________

3. \( 24 \times 12 = n \)

   Answer: ________________

continue to next page
Section II—Number and Operations–Fractions

4.NF—Extend understanding of fraction equivalence and ordering

1. Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

4.NF—Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers

3. Understand a fraction a/b with a > 1 as a sum of fraction 1/b.
   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.
   c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction and/or by using properties of operations and the relationship between addition and subtraction.
   d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
   a. Understand a fraction a/b as a multiple of 1/b.
   b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number.
   c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.

4.NF—Understand decimal notation for fractions, and compare decimal fractions

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.

6. Use decimal notation for fractions with denominators 10 or 100.

7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

Note: The Common Core State Standards (CCSS) identify developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers as one of three critical areas of instruction for Grade 4.
Standard 4.NF.1 (L)

**Identifying Equivalent Fractions**

**Directions:** Look at the figures beside each fraction. Circle the letter beside the figure with the shaded portion that is equivalent to the fraction shown.

1. $\frac{1}{4}$
   - a. 
   - b. 

2. $\frac{2}{3}$
   - a. 
   - b. 

3. $\frac{3}{5}$
   - a. 
   - b. 

4. $\frac{1}{3}$
   - a. 
   - b. 

5. $\frac{5}{6}$
   - a. 
   - b.
Section II—Number and Operations–Fractions

Standard 4.NF.2 (L–M)

Comparing Fractions With the Same Denominator

When you compare fractions with the same denominator, you only need to look at the numerator to decide which is greater.

Look at the circles below.

Talk About It

• Which circle has the largest shaded area?
• What do you notice about the denominators and numerators in these fractions?

When fractions have the same denominator, that number is called a common denominator.

Remember: You can compare fractions by using these symbols: >, <, and =.

> is the “greater than” symbol.
< is the “less than” symbol.
= means “is equal to.”

You can compare Circle A and Circle B using the number sentence $\frac{2}{6} > \frac{1}{6}$.

Write another number sentence comparing Circle A and Circle B. _______________________

Circle A

Circle B

$\frac{2}{6}$

$\frac{1}{6}$
Standard 4.NF.3 (L–M)

**Composing and Decomposing Fractions**

You can compose (join) or decompose (separate) fractions with the same denominator. When you compose parts of the same whole, you add. When you decompose parts of the same whole, you subtract.

When you decompose a fraction, you break it apart. We can use models to help us understand this.

\[
\frac{3}{5} = \frac{1}{5} + \frac{1}{5} + \frac{1}{5}
\]

In the example above, we separated \(\frac{3}{5}\) into a sum of unit fractions. But we can also separate it another way.

\[
\frac{3}{5} = \frac{2}{5} + \frac{1}{5}
\]

**Example #1**

Mike, Dave, and Justin each have a canister of tennis balls. Each canister contains 4 balls, which is the most possible. Each boy gives Madison 1 tennis ball to put into her empty canister.

**Think About It–1:** What fraction of a canister does 1 tennis ball represent? ______________

Circle the tennis balls that each boy gave Madison. Then, draw tennis balls in Madison’s canister to represent what she received from Mike, Dave, and Justin.
Standard 4.NF.4 (L)

Multiplying With Fractions

You have already learned how to multiply. Consider $3 \times 5$. This means that you have three $5$s. You can rewrite the multiplication problem as an addition problem: $5 + 5 + 5 = 15$. This is represented by the number line below.

Now, we will multiply fractions and whole numbers. For example:

$$3 \times \frac{1}{5}$$

Just like with $3 \times 5$, you can write $3 \times \frac{1}{5}$ as an addition problem: $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$. Look at the number line below.

As you can see, $3 \times \frac{1}{5} = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{3}{5}$.

Try It: Use the number lines to help you solve each problem below.

1. $4 \times \frac{1}{3}$
2. $7 \times \frac{1}{2}$
3. $5 \times \frac{1}{4}$
Standard 4.NF.5; 4.NF.6 (L–M)

Decimal Fractions

You read a fraction with a denominator of 10 as “tenths” \( \frac{7}{10} = \text{seven tenths} \). You read a fraction with a denominator of 100 as “hundredths” \( \frac{32}{100} = \text{thirty-two hundredths} \).

Fractions with denominators of 10 or 100 can also be expressed as decimals. A decimal is a number written using base ten. The word decimal comes from the Latin word decimus, meaning “tenth.” A decimal can also be called a decimal fraction because it represents a fraction with a denominator that is a power of ten. When a number is written as a decimal (using decimal notation), a decimal point (.) separates the whole number from the fraction. The tenths place in a decimal is to the right of the decimal point. The hundredths place in a decimal is to the right of the tenths place.

The following numbers are examples of decimals.

\[ 0.91 \quad 0.3 \quad 2.29 \quad 6.07 \]

Let’s take a closer look at the decimal 0.91.

\[
\begin{array}{c|c|c|c}
\text{Hundreds} & \text{Tens} & \text{Ones} & \text{Tenths} & \text{Hundredths} \\
\hline
0 & . & 9 & 1 \\
\end{array}
\]

Try It–1: How can we convert 0.91 to a fraction? Let’s walk through the process.

1. In what place is the 0 located in the decimal? 
2. In what place is the 9 located in the decimal? 
3. In what place is the 1 located in the decimal? 
4. How do the place value names help you convert decimals to fractions? 
5. Write an equation that shows 0.91 converted to a fraction.

continue to next page
Table of Contents

What's Inside the Student Work Text? .................................................. 3
How to Use the Student Work Text ..................................................... 3
Understanding Rigor and Cognitive Complexity ................................. 5
Descriptions of TestSMART® Complexity Levels ................................ 7
Fostering Mathematical Understanding and Inquiry ............................... 9
Definition of the Common Core State Standards .................................. 9
The Precise Language of Mathematics .............................................. 20
Mathematics Manipulatives and Tools .............................................. 22
Text-Marking in Mathematics .......................................................... 24
Integrating the Literacy Strands in the Mathematics Classroom ........... 25
Master Skills List .............................................................................. 28
Answer Key ...................................................................................... 29
References ...................................................................................... 35
Blackline Masters ............................................................................ 39
What’s Inside the Student Work Text?

Overview
The TestSMART® Common Core Student Work Text addresses the Common Core State Standards (CCSS) for Mathematics (National Governors Association Center for Best Practices/Council of Chief State School Officers [NGA/CCSSO], 2010b) in separate books. However, students benefit from an integrated view of mathematics (cross-domain experiences). For instance, instead of isolating concepts, this approach groups ideas and draws parallels. Students move beyond memorization and routine procedures to construct mathematics using their own strategies and representations. As they grow in understanding, they begin to generalize and transfer patterns of responding to other mathematical and non-mathematical problems and situations.

The exercises included in the work text focus on the critical areas (major work) of the grade as defined in the CCSS (NGA/CCSSO, 2013). The work text provides practice in a variety of mathematical and real-world contexts. Tasks require appropriate use of manipulatives, tools, and technology.

The TestSMART Common Core Student Work Text should supplement and support research, planning, instruction, and both informal and formal assessment. It is recommended that teachers introduce new math concepts through everyday problems and situations.

How to Use the Student Work Text

Time Requirement
The time requirement depends on the activity type and topic. Activity types include guided (whole-class and small-group), independent, and extension/homework. Most activities will take about 15–40 minutes, and a few—such as going on a metric hunt—will take up to 3 days.

Getting Started
Teachers should implement the activities from the TestSMART Common Core Student Work Text in sequential order. The activities logically progress within each domain, building upon prior knowledge and personal experience. The activities also appropriately relate thinking across domains and grades. The activities should move students toward self-directed mathematics learning and problem solving.

Within each activity are opportunities for students to question, think about, and talk about their learning. In addition to the specific mathematic expectations involved, these moments during activities help students develop the following types of skills—

• analytical thinking
• evaluative thinking
• reflective thinking
• metacognitive thinking
• communication
For instance, students may need to connect information with prior knowledge or personal experience, make predictions, infer, determine importance, visualize, synthesize, or monitor comprehension. The Teacher Guide provides specific guidance for supporting students throughout the learning process.

**Lesson Features**

**Think About It:** Students are asked to think about math-related questions and situations and to think about their thinking. Students can think independently, or teachers can guide “think-aloud” sessions in small or large groups (see Box 4 “Scaffolding through ‘Think Aloud,’” page 16).

**Talk About It:** Students are asked to talk about math concepts and situations and to talk about their thinking. This includes examining problem situations, making observations, explaining their problem-solving processes, and discussing math terminology and concepts (see “Math-Talk,” pages 13–14).

**Question:** Students are asked open-ended questions that focus on the underlying structures and logic of mathematics.

**Try It:** Students are asked to try a guided example. Teachers can present the guided example in a whole-class or small-group setting. Teachers should engage students in “math-talk” during these examples (see “Math-Talk,” pages 13–14).

**Working Together:** Students are asked to work together, or collaborate, in various guided settings (pairs, small-group, whole-class). Teachers can support students with open-ended questions (see Box 5 “Scaffolding through Open-Ended Questions,” pages 16–18).

**On Your Own:** Students are asked to independently explore a concept or skill, as well as their own ways of problem solving. Teachers can support students with open-ended questions (see Box 5 “Scaffolding through Open-Ended Questions,” pages 16–18).

**Did You Know…?:** Students are given tidbits and trivia about their world and how it works. These relate to the math domains, math vocabulary, the history of mathematics, or real-life applications. The following are suggestions for using these tidbits and trivia:

- Challenge students to find other interesting facts related to the topic. This provides an opportunity for students to learn effective research techniques.
- Create a “Did You Know…?” display where students can post the facts they learn.
- Use the tidbits and trivia as prompts for a class discussion. Talk about what students already know and what they would like to learn more about. Have students generate questions for further research or discussion.
- Have students respond to the tidbits and trivia in their math journals. Provide time for students to share their journal entries with classmates. (Students may benefit from a guiding question related to the tidbit or trivia.)
- Have students represent the idea(s) from the tidbits and trivia in a new way. Provide time for students to share their representations with classmates.
The following descriptions provide an overview of the three complexity levels used to align the TestSMART® Common Core Student Work Text items to the Common Core State Standards (CCSS) for Mathematics (NGA/CCSSO, 2010b). Each explanation details the kinds of activities that occur within each level. However, they do not represent all of the possible thought processes for each level.

**Low Complexity (L)**

Low-complexity items align with the CCSS at Level 1 of the Webb (2002a) model. Activities and problems at this level require routine, single-step methods. An item may ask students to recognize or restate a fact, definition, or term. For example, students may need to identify the attributes of a geometric figure. Items of this complexity may require students to follow a basic procedure with clearly defined steps. At this cognitive level, students may need to apply a formula or perform a simple algorithm. Some major concepts represented at this level include arithmetic facts, perimeter, and converting units of measure. A low-complexity item may ask students to identify, recognize, use, or measure information and concepts.

**Moderate Complexity (M)**

Moderate-complexity items align with the CCSS at Level 2 of the Webb model. Items of moderate complexity involve both comprehension and the subsequent processing of information. Activities at this level demand more than one step in the reasoning process. Students are asked to determine how to best solve the problem. An item may ask students to generate a table of paired numbers based on a real-life situation. Items may involve using a model to solve a problem. At this cognitive level, students will need to visualize for tasks such as extending patterns and determining nonexamples. Items may involve interpreting information from a simple graph, table, or diagram. Some major concepts represented at this level include classifying geometric figures and using strategies to estimate. Items of this complexity may ask students to classify, organize, observe, collect and display data, or compare data. Some items also require students to apply low-complexity skills and concepts.
High Complexity (H)

High-complexity items align with the CCSS at Level 3 and/or 4 of the Webb model.* Items of high complexity require students to use strategic, multi-step thinking; develop a deeper understanding of the information; and extend thinking. The problems at this level are non-routine and more abstract. Students are asked to demonstrate more flexible thinking, apply prior knowledge, make and test conjectures, and support their responses. High-complexity items may require students to make generalizations from patterns. Items may involve interpreting information from a complex graph, table, or diagram. At this cognitive level, students must justify the reasonableness of a solution process when more than one solution exists. Students will use concepts to solve and explain problems, such as how changes in dimensions affect the volume of a figure. A high-complexity item may ask students to plan, reason, explain, compare, differentiate, draw conclusions, cite evidence, analyze, synthesize, apply, or prove. Some items also require students to apply low- and/or moderate-complexity skills and concepts.

* Note: Although the CCSS or state standards may include expectations that require extended thinking, many large-scale assessment activities are not classified as Level 4. Performance and open-ended assessment may require activities at Level 4.

Mathematics, Grade 4—Book III

Measurement and Data

Problem Solving X

Directions: Solve each problem below. Show your work. You may include pictures and diagrams, including number lines.

1. Matthew lives 1.5 miles east of a flower shop. Brian lives 2.5 miles west of the flower shop. What is the distance, in feet, between Matthew’s and Brian’s houses?

Answer: ____________________

2. Mariah planted corn 2 feet to the left of the t  d peppers 3 feet. She planted cucumbers 2 f

Answer: ____________________

This page may not be reproduced.
Fostering Mathematical Understanding and Inquiry

Common Core State Standards*

The Common Core State Standards (CCSS) (NGA/CCSSO, 2012) is a standards-based U.S. education reform initiative sponsored by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO). The initiative seeks to provide a set of national curriculum standards to create more rigorous, consistent instruction and learning across the country. These standards were developed based on models from various states and countries, as well as recommendations from K–12 educators and students. The expectations, aimed at college and career readiness, focus on core concepts and processes at deep and complex levels. The curriculum standards for ELA/literacy and mathematics were released in 2010. Science and history standards are in development.

Forty-five states and the District of Columbia have adopted the standards, but Alaska, Minnesota, Nebraska, Texas, and Virginia have yet to adopt them. During the 2014–2015 academic year, adopting states should begin formal CCSS assessments. Assessments will include the following types of items:

• selected-response items (multiple-choice items)
• constructed-response items
• technology-enhanced items/tasks
• performance tasks

For more information about the CCSS initiative, please visit http://www.corestandards.org.

* This information was current at time of publication.

Box 2: Definition of the Common Core State Standards

Mathematics Instruction and Learning

Mathematics is a study of patterns, relationships, measurement, and properties in numbers, quantity, magnitude, shape, space, and symbols. Effective mathematics instruction requires students to mindfully attend to elements of structure and content—including patterns and language choice. This disciplined study involves trying and retrying during problem solving to better understand how structure and content work together in systems of meaning (Paul & Elder, 2008). The ability to recognize, analyze, and use patterns and relationships is essential to problem solving.

Mathematical thinking skills are closely tied to skills that are essential for success in school, career/work, and life, such as—

• critical/evaluative thinking
• creative/innovative thinking
• elaborative thinking
• problem solving
• decision making
• researching
• collaboration
• communication
• organizing and connecting ideas
Research supports a focus on teaching for meaning and understanding. Rich mathematics experiences provide students with opportunities to see structure, patterns, and relationships in many different contexts. These skills are essential to achieving learning goals in the areas of information and communication technology (ICT) literacy and science. As students develop in mathematics, they should also see connections in reading, language arts, social studies, history, art, music, physical education and sports, and other areas of the curriculum. Research (e.g., Fennema & Romberg, 1999; Hiebert et al., 1997; Simon, 2006; Skemp, 1976) supports a focus on teaching for meaning and understanding. Fluency with computational procedures and basic facts allows students to expend less cognitive energy when problem solving. However, drilling on isolated skills can become meaningless (e.g., Grouws, 2004; Schoenfeld, 1988). In addition, these rote activities sometimes involve the use of mnemonic devices. These types of “tricks” are not suggested strategies for achieving long-term understanding and flexible use of skills. Students understand more when they actively construct meaning during rich, complex tasks (e.g., Fosnot, 1996; Fosnot, 2005; Noddings, 1990).

Appropriate Tasks

The CCSS emphasize the need for understanding and its impact on carrying out effective mathematical practices and true mastery of mathematical content (NGA/CCSSO, 2010b). (Refer to Box 1 “Balance in Rigorous Mathematics Instruction” on page 6 for a list of the Standards for Mathematical Practice.) Rich mathematics tasks often involve persistent problem solving and, therefore, can require time. Rich tasks allow all students—even struggling learners—the opportunity to adequately explore and discuss complex problems, situations, and ideas. Rich mathematics experiences provide students with opportunities to see structure, patterns, and relationships in many different contexts.

Rich, complex mathematics tasks—

• begin with a clear, explicit, reasonable, actionable learning goal
• incorporate the use of sound number sense and basic computational skills
• rely on the integrated development of mathematical skills and understandings
• build on prior knowledge and personal experience
• utilize a variety of settings in which to explore and share mathematical ideas with others (i.e., paired, small-group, whole-class)
• encourage risk-taking to further the learning process
• encourage students to work and think mathematically
• invite all students to participate in constructive math inquiries and discussions
• promote complex thinking and transfer of understanding by focusing on the “big ideas” and “essential questions”
• apply mathematical ideas to a broad range of real-life and imagined situations
• help students learn to use the precise language of mathematics for specific purposes
• require students to make conjectures, hypothesize, test and retest ideas, justify thinking, represent findings in meaningful ways, and reflect
• require students to look for and utilize the underlying order and logic of mathematics when problem solving
Mathematics, Grade 4—Book III

- allow for diversity in thinking and offer many valid entry points to mathematical challenges for all students (e.g., multiple solution paths, multiple representations)
- explore and reinforce concepts through hands-on activities involving the use of technology, manipulatives, tools, and play
- allow students to generalize and transfer patterns of responding to other mathematical and non-mathematical problems and situations
- require extended engagement (e.g., Hiebert et al., 1997; National Council of Teachers of Mathematics [NCTM], 2000)

TestSMART® Common Core Teacher Guide—Mathematics, Grade 4—Book III

Answer Key

Measurement and Data

p. 4
Answers will vary. a. a ruler; measuring length b. a scale; measuring weight c. a measuring cup; measuring volume d. a balance; comparing weights e. a measuring tape; measuring length

Think About It: Answers will vary. We use measurement to help us compare 2 or more things based on their characteristics, such as length, weight, volume, time, etc.

Try It: Answers will vary.

p. 6
Talk About It: millimeters; centimeters; kilometers; Explanations will vary.

pp. 7–8
From Centimeters to Millimeters 2—20, 3—30, 4—40, 5—50, 6—60, 7—70, 8—80, 9—90, 10—100; From Meters to Centimeters 2—200, 3—300, 4—400, 5—500, 6—600, 7—700, 8—800, 9—900, 10—1,000; From Kilometers to Meters 2—2,000, 3—3,000, 4—4,000, 5—5,000, 6—6,000, 7—7,000, 8—8,000, 9—9,000, 10—10,000; From Meters to Kilometers 2—0.002, 3—0.003, 4—0.004, 5—0.005, 6—0.006, 7—0.007, 8—0.008, 9—0.009, 10—0.010, measure things with a body part because the human body changes and grows and different people have different-sized body parts. A body part as a unit of measure is not consistent.

pp. 10–11
1. 300 centimeters ÷ 100 = n meters; 3 meters x 3 = n meters; 9 m 2. 110 centimeters x 10 = n millimeters; 110 mm 3. 6 kilometers x 1,000 = n meters; 6,000 m 4. 15 centimeters x 10 = n millimeters; 150 mm 5. 4 meters x 100 = n centimeters; 400 cm 6. 600 millimeters x 10 = n centimeters; 60 cm 7. a. 2 kilometers x 1,000 = n meters; 2,000 meters b. 2,000 meters x 100 = n centimeters; 200,000 cm c. 200,000 centimeters x 10 = n millimeters; 2,000,000 mm

pp. 13–14
From Feet to Inches 2—24, 3—36, 4—48, 5—60, 6—72, 7—84, 8—96, 9—108, 10—120; From Yards to Feet 2—6, 3—9, 4—12, 5—15, 6—18, 7—21, 8—24, 9—27, 10—30; From Feet to Yards 2—0.666, 3—1.0, 4—1.333, 5—1.666, 6—2.0, 7—2.333, 8—2.666, 9—3.0, 10—3.333; From Feet to Yards 2—0.666, 3—1.0, 4—1.333, 5—1.666, 6—2.0, 7—2.333, 8—2.666, 9—3.0, 10—3.333.
Mathematics, Grade 4—Book III

References

* All Web sites listed were active at time of publication.


Measurement and Data ................................................................. 3
Reference Materials ................................................................. 128
Mathematics Vocabulary .......................................................... 129

Credits
Page 70—Pam Brophy
Page 100—© 2004, Jeremy Atherton

ECS Learning Systems, Inc.
P. O. Box 440
Bulverde, TX 78163-0440
cslearning.com
1.800.688.3224 (t)
1.877.688.3226 (f)
customercare@cslearning.com
Measurement and Data

4.MD—Solve problems involving measurement and conversion of measurements from a larger to a smaller unit

1. Know relative sizes of measurement units within one system of units (km, m, cm; kg, g; lb, oz; L, mL; hr, min, sec). Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.

2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

3. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.

4.MD—Represent and interpret data

4. Make a line plot to display a data set of measurements in fractions of a unit (\(\frac{1}{2}\), \(\frac{1}{4}\), \(\frac{1}{8}\)). Solve problems involving addition and subtraction of fractions by using information presented in line plots.

4.MD—Geometric measurement: Understand concepts of angle and measure angles

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
   a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles.
   b. An angle that turns through \(n\) one-degree angles is said to have an angle measure of \(n\) degrees.

6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems.

Note: The Common Core State Standards (CCSS) identify understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry as one of three critical areas of instruction for Grade 4.
Standard 4.MD.1 (L–M)

Measuring Length & Distance (Metric System)

When you measure anything, you can choose from different units of measure. A unit of measure is a set quantity used to measure something in the physical world. For example, you use units of measure to find the length of a pencil. You might use a different unit of measure to find the distance between your home and your school.

In math, you can also use different systems of measurement to describe the things around you. In the metric system of measurement, you measure length and/or distance in millimeters, centimeters, meters, and kilometers. The line below has a length of one centimeter.

\[1 \text{ cm}\]

Of the four metric units listed above, the millimeter is the shortest. The list below shows other units of measure. The list also shows the abbreviation (shortened form) for each unit of measure.

**Metric Units of Length/Distance**

- 1 millimeter (1 mm)
- 1 centimeter (1 cm) = 10 millimeters (10 mm)
- 1 meter (1 m) = 100 centimeters (100 cm)
- 1 kilometer (1 km) = 1,000 meters (1,000 m)

Listed from shortest to longest, these measurements of length are:

- millimeter
- centimeter
- meter
- kilometer

Using the list above, you can convert (change) a measurement from one unit of measure to another unit of measure. Look at the examples on page 6.
Standard 4.MD.1 (M)

**Going on a Metric Hunt**

**Directions:** Look around your classroom and home to find things that measure about 1 centimeter or 1 meter. List the items in the correct sections of the chart below. Then, find things that measure about 10 centimeters or 3 meters. List those items in the correct sections of the chart also. Two examples are completed for you.

<table>
<thead>
<tr>
<th>Things that Measure About 1 Centimeter</th>
<th>Things that Measure About 1 Meter</th>
</tr>
</thead>
<tbody>
<tr>
<td>the width of an adult’s pinkie fingernail</td>
<td>the width of a dining-room table</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Things that Measure About 10 Centimeters</th>
<th>Things that Measure About 3 Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Talk About It:** After sharing your list of items with your classmates, discuss the following questions.

- Did your classmates agree with the items you listed in each column of the chart? Why or why not?
- Was it easier to find things that measured 1 centimeter or 10 centimeters? Why?
- Was it easier to find things that measured 1 meter or 3 meters? Why?
- Is it practical to measure things with a body part, like a fingernail? Why or why not?
Standard 4.MD.1 (L–M)

Converting Cups, Pints, Quarts, & Gallons

Directions: Write the correct conversions to complete each table below. The first item in each table is completed for you.

<table>
<thead>
<tr>
<th>Cups (c)</th>
<th>Ounces (oz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quarts (qt)</th>
<th>Pints (pt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pints (pt)</th>
<th>Cups (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gallons (gal)</th>
<th>Quarts (qt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Talk About It: Review the tables you completed above.

- What patterns do you notice in each table?
- Why do these patterns appear in the tables?
- If you continued each table, what numbers would you write in the next three rows? Why?
- The equation for converting cups to ounces would be written like this:

  \[ \text{cup(s)} \times 8 = \text{ounces} \quad \text{OR} \quad c \times 8 = \text{oz} \]

- What is the equation for converting pints to cups?
- What is the equation for converting quarts to pints?
- What is the equation for converting gallons to quarts?
- How could you use tables like these to convert gallons to pints? gallons to cups? gallons to ounces?
Standard 4.MD.2 (M–H)

Solving Word Problems About Time

You already know how to convert units of measurement, so you can solve many different measurement problems.

Look at the problem below.

John traveled 2.5 hours from his house to his grandmother’s house. How many minutes did John travel from one house to the other?

**Talk About It—1**

- You already know how to convert hours to minutes. Why might this problem be more difficult for you solve?
- What strategy could you use to solve this problem?

Let's begin with what you know. To solve the problem, you must multiply the number of hours (2.5) times the number of minutes in each hour (60). The equation below shows how to solve the problem. In the equation, \( m \) represents the number of minutes John spent traveling from his house to his grandmother’s house.

\[
2.5 \times 60 = m
\]

This problem could be more difficult to solve because you may not know how to multiply by decimals yet. You can still solve the problem by working with what you do know. Begin by writing 2.5 in a different way.

\[
2.5 = 2 + 0.5
\]

Now, you can multiply 2 (hours) times 60 (minutes in one hour).

\[
2 \times 60 = 120
\]

Now, look at 0.5. You know that this decimal (0.5) equals \( \frac{1}{2} \). In this problem, 0.5 represents \( \frac{1}{2} \) of one hour. If there are 60 minutes in one hour, how many minutes are in \( \frac{1}{2} \) hour? One half of 60 equals 30. With this information, you can solve the problem.

\[
2 \times 60 = 120 \quad \frac{1}{2} \text{ of } 60 = 30 \quad 120 + 30 = 150
\]

John spent 150 minutes traveling from his house to his grandmother’s house.

**Question:** What other strategies could you have used to solve this problem?
Standard 4.MD.3 (M)

**Perimeter Practice**

**Directions:** Find the perimeter of each rectangle below. Write the formula you used to find the perimeter of each rectangle. Include the correct unit of measure (meters, feet, etc.) with each of your answers. The first one is completed for you.

1. \[ P = (2 \times 8) + (2 \times 10) \]
   \[ P = 16 + 20 \]
   \[ P = 36 \text{ in.} \]

2. \[ P = \text{________________} \]

3. \[ P = \text{________________} \]

4. \[ P = \text{________________} \]

5. \[ P = \text{________________} \]

6. \[ P = \text{________________} \]
Standard 4.MD.3 (L–M)

**Learning About Area**

Perimeter is a measure of the distance around a figure, but area is a measure of the total space within a figure. Suppose you want new carpet for your bedroom floor. To buy the right amount of carpet, you need to know the total amount of space to be covered by the carpet.

Let’s see how this works. The diagram below shows a hallway that is 4 feet wide and 10 feet long.

Imagine that you want to carpet the entire hallway in the diagram. You need to know the total area you will carpet. You measure area in square units. In other words, you want to know how many small squares of carpet you need to cover all the floor space in the hallway.

You could divide the area into small squares. Then you would count all the small squares to find the hallway’s area.

**Talk About It–1**

- How many small squares of carpet would you need to cover the entire hallway?
- Is counting the small squares a good way to find the area of a space? Why or why not?

Let’s look at what you know about the hallway in the diagram above. You know the hallway’s length (10 feet) and its width (4 feet). We divided the hallway into square units and counted the square units, too. So you know the hallway’s area (40 square feet).

**Try It:** Write the correct numbers below.

**Hallway Measurements**

<table>
<thead>
<tr>
<th>Length =</th>
<th>Width =</th>
<th>Area =</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

continue to next page
Standard 4.MD.3 (M)

**More Area Practice**

**Directions:** The area is given in each problem below. Use the area formula to find the missing length or width for each rectangle. The first one is completed for you.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$A = 21$ sq in.</td>
<td>3 in.</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>$l$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = l \times w$</td>
<td>$2l = l \times 3$</td>
<td>$2l + 3 = 7$</td>
<td>$w =$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>$A = 12$ sq cm</td>
<td>2 cm</td>
<td>4.</td>
</tr>
<tr>
<td></td>
<td>$l$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = l \times w$</td>
<td></td>
<td></td>
<td>$7 m$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>$A = 8$ sq ft</td>
<td>1 ft</td>
<td>6.</td>
</tr>
<tr>
<td></td>
<td>$l$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$A = l \times w$</td>
<td></td>
<td></td>
<td>$w =$</td>
</tr>
</tbody>
</table>

TestSMART® Common Core Student Work Text—Mathematics, Grade 4—Book III
Collecting & Using Data

A graph is a drawing that shows data in an organized way. Data is information collected from the world around you. Look at the two graphs below.

Graph A

Horses in Four Corrals

![Graph showing horses in four corrals.]

Graph B

Free-Throw Contest

![Graph showing free-throw contest results.]

Talk About It

• What data appears in Graph A?
• What kind of graph is Graph A?
• How is the data in Graph A organized?
• What data appears in Graph B?
• What kind of graph is Graph B?
• How is the data in Graph B organized?

You probably noticed that Graph A and Graph B each give quite a bit of information in a small amount of space. You could say that graphs are “shortcuts” for sharing large amounts of information. By studying the information displayed (shown) on a graph, you can compare and contrast different sets of data. You can also answer questions about the graph’s data.
Standard 4.MD.4 (M)

Problem Solving XVII

Directions: Read each item, and study each line plot below. Use the line plots and information given to answer the questions.

1. Janet measured the lengths of each insect she caught in her backyard. She plotted the length of each insect on the line plot below.

   **Lengths of Insects**
   
   ![Line plot of insect lengths]

   a. How many insects did Janet measure? _______

   b. What is the difference in length between the longest and shortest insects that Janet caught? ______________

2. Travis recorded the number of miles he jogged every day for two weeks. He plotted that data on the line plot below.

   **Travis' Jogging Distances**
   
   ![Line plot of jogging distances]

   a. What is the total distance Travis jogged during that two-week period? _______

   b. What is the difference between the longest and shortest distances that Travis jogged? ___________________
Standard 4.MD.6 (L–M)

**Benchmark Angles**

In future lessons, you will use a protractor to measure angles. If you do not have a protractor, it’s useful to know some **benchmark angles**. You can use **benchmark angles** to estimate the measure of other angles. Here are some common benchmark angles.

\[ \angle LMN = 90^\circ \]
\[ \angle RST = 180^\circ \]
\[ \angle ABC = 270^\circ \]

**Try It:** Let’s see if you can use these angles to sketch different benchmark angles. Use the benchmark angles above to sketch a different angle below.

1. Sketch a 45° angle.

2. Sketch a 30° angle.

3. Sketch a 130° angle.

4. Sketch a 90° angle.

**Talk About It:** How did you use the benchmark angles to sketch each angle above?
**Standard 4.MD.7 (M)**

**Another Look at Decomposing Angles**

Angles may be decomposed in different ways. For example, an angle may be decomposed to form three smaller angles. If you have enough information, you can still calculate the measure of each angle. Let's look at an example.

In the diagram to the right, $\angle RST = 90^\circ$.

**Question:** What information does the diagram provide?

**On Your Own–1:** Write two or more conclusions based on information in the diagram. A sample answer is given.

1. $\angle RST$ is decomposed to form three other angles.
2. __________________________________________
3. __________________________________________
4. __________________________________________

**On Your Own–2:** Solve each equation below based on the diagram above. Write your answer in symbols as well as in angle measurements. A sample answer is given.

5. $\angle RSV + \angle VST = \angle RST$ $60^\circ + 30^\circ = 90^\circ$
6. $\angle RSU + \angle UST = \angle RST$ $\angle RST$ $\angle RST$ $\angle RST$
7. $\angle R SU + \angle USV = \angle RST$ $\angle RST$ $\angle RST$ $\angle RST$
8. $\angle R SU + \angle USV + \angle VST = \angle RST$ $\angle RST$ $\angle RST$ $\angle RST$

**Talk About It**

- Share your conclusions and equations with your classmates.
- How did information in the diagram help you form your answers?
Standard 4.MD.7 (M)

More Missing Measurements

In the diagram to the right, \( \angle QRS = 80^\circ \).

Talk About It

- How can you use the information in the diagram to find the measure of \( \angle QRT \)?
- What equation would you use to find the measure of \( \angle QRT \)?
- What is the measure of \( \angle QRT \)?

On Your Own: Look at each diagram below. Write the measurement of the unknown angle in each diagram.

1. \( \angle ABC = 140^\circ \)
   \( \angle ABD = \)_______

2. \( \angle DEF = 65^\circ \)
   \( \angle GEF = \)_______

3. \( \angle WXY = 95^\circ \)
   \( \angle XZY = \)_______

4. \( \angle TUV = 45^\circ \)
   \( \angle TUW = \)_______

5. \( \angle QRS = 150^\circ \)
   \( \angle QRT = \)_______

6. \( \angle MNO = 75^\circ \)
   \( \angle PNO = \)_______