

Hands-On Standards[®], Common Core Edition

Grade 6

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hand2mind 78870

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Introduction

How do we help students find meaning in mathematics? That is, how do we give students more than a rote script for reciting facts and churning out computations? How do we help students develop understanding?

Hands-On Standards®, Common Core Edition Grade 6 is an easy-to-use reference manual for teachers who want to help students discover meaning in mathematics. Each of the manual's 29 lessons demonstrates a hands-on exploration using manipulatives. The goal is to help students get a physical sense of a problem—to help students get their hands on the concepts they need to know and to help them “see” the meaning.

Each lesson in *Hands-On Standards* targets a clearly stated objective. The main part of a lesson offers a story problem that students can relate to and has students work on the problem using a hands-on approach. Full-color photographs demonstrate the suggested steps. In addition to the main activity, each lesson includes suggested points of discussion, ideas for more exploration, a formative assessment item, and practice pages to help students solidify their understanding. The instructional model is a progression from concrete to abstract.

This book is divided into five sections—Ratios and Proportional Relationships, The Number System, Expressions and Equations, Geometry, and Statistics and Probability. These correspond to the five content domains for Grade 6 as cited in the *Common Core State Standards for Mathematics*.

Each lesson in this book features one of the following manipulatives:

**Algeblocks® • AngLegs® • Centimeter Cubes • Color Tiles •
Cuisenaire® Rods • Deluxe Rainbow Fraction® Circles •
Fraction Tower® Equivalency Cubes • Geoboard •
Pattern Blocks • Relational GeoSolids® •
Snap Cubes® • XY Coordinate Pegboard**

Read on to find out how *Hands-On Standards, Common Core Edition Grade 6* can help the students in your class find meaning in math and build a foundation for future math success!



A Walk Through a Lesson

Each lesson in *Hands-On Standards* includes many features, including background information, objectives, pacing and grouping suggestions, discussion questions, and ideas for further activities, all in addition to the step-by-step, hands-on activity instruction. Take a walk through a lesson to see an explanation of each feature.

Try It! Arrow

In order to provide a transition from the introduction to the activity, an arrow draws attention to the Try It! activity on the next page. When the activity has been completed, return to the first page to complete the lesson.

Lesson Introduction

A brief introduction explores the background of the concepts and skills covered in each lesson. It shows how they fit into the larger context of students' mathematical development.

Objective

The **Objective** summarizes the skill or concept students will learn through the hands-on lesson.

Common Core State Standards

Each lesson has been created to align with one or more of the **Common Core State Standards for Mathematics**.

Talk About It

The **Talk About It** section provides post-activity discussion topics and questions. Discussion reinforces activity concepts and provides the opportunity to make sure students have learned and understood the concepts and skills.

Solve It

Solve It gives students a chance to show what they've learned. Students are asked to return to and solve the original word problem. They might summarize the lesson concept through drawing or writing, or extend the skill through a new variation on the problem.

LESSON
1

Objective

Use ratios to represent relationships.

Common Core State Standards

■ **6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

Ratios and Proportional Relationships

Ratios

Students use ratios to show various relationships between quantities, including whole to part, part to whole, and part to part. With an understanding of ratio, students can engage in proportional reasoning, which is a major component of a student's foundation in math.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Ask:** How many yellow rods did you use? What is the ratio of yellow to orange? What is the ratio of orange to yellow? Are these ratios the same? Why or why not?
- **Ask:** How many red rods make one orange rod? What is the ratio of red to orange? Orange to red? What is the ratio of white to yellow? Yellow to white?
- **Ask:** Is the order important when we describe the ratio?

Solve It

Reread the problem with students. As they represent and identify the ratios, have them write the ratios in words and in numbers. Help them identify whether the ratio is whole to part, part to whole, or part to part.

More Ideas

For other ways to teach ratios—

- Use Two-Color Counters to solve problems such as *The ratio of frogs to ducks in a pond is 5 to 3. Write three ratios to represent this situation.* Have students represent the frogs with the yellow side of the counters and the ducks with the red side of the counters. **Say:** The total number of ducks and frogs is 8, so the ratio of frogs to the total number of ducks and frogs is 5 to 8. Guide students to write other ratios.
- Extend the lesson using Cuisenaire® Rods to generate equal ratios. Provide a scenario such as *A trail mix recipe calls for 1 cup of raisins and 3 cups of peanuts. Find the amounts of raisins and peanuts in three different-size batches of this recipe.* Have students build trains on the Centimeter Grid (BLM 10) for each ratio.

Formative Assessment

Have students try the following problem.

There are 3 parrots, 7 parakeets, and 2 finches at a pet store. What is the ratio of parakeets to birds?

- A. 12 to 7 B. 7:5 C. $\frac{7}{12}$ D. 5 to 7

More Ideas

More Ideas provides additional activities and suggestions for teaching about the lesson concept using a variety of manipulatives. These ideas might be suggestions for additional practice with the skill or an extension of the lesson.

Formative Assessment

Formative assessments allow for on-going feedback on students' understanding of the concept.

Try It!

The **Try It!** activity opens with **Pacing** and **Grouping** guides. The **Pacing** guide indicates about how much time it will take for students to complete the activity, including the post-activity discussion. The **Grouping** guide recommends whether students should work independently, in pairs, or in small groups.

Next, the **Try It!** activity is introduced with a real-world story problem. Students will “solve” the problem by performing the hands-on activity. The word problem provides a context for the hands-on work and the lesson skill.

The **Materials** box lists the type and quantity of materials that students will use to complete the activity, including manipulatives such as Color Tiles and Pattern Blocks.

This section of the page also includes any instruction that students may benefit from before starting the activity, such as a review of foundational mathematical concepts or an introduction to new ones.

Try It!

20 minutes | Groups of 4

Here is a problem about ratios.

An animal habitat includes 3 snakes, 2 alligators, and 5 lizards. What are three ratios you can use to describe the relationships between these animals?

Introduce the problem. Then have students do the activity to solve the problem. Distribute the Cuisenaire Rods, paper, and pencils to students. Explain that ratios compare wholes to parts, parts to wholes, and parts to parts.

Materials

- Cuisenaire® Rods (1 set per group)
- paper (2 sheets per group)
- pencils (1 per group)
- colored pencils (1 set per group)



1. Have students select an orange rod from their Cuisenaire Rods set. Ask them to create a one-color train the same length as the orange rod using only two rods. **Ask:** Which color did you use?



2. Have students draw and color their representation. **Ask:** How many yellow rods does it take to make a train the same length as the orange rod? Remind students that this comparison of two quantities by division is called a ratio. A ratio comparing two quantities, a and b ($b \neq 0$), can be written in three ways: $\frac{a}{b}$, $a:b$, or a to b .



3. Instruct students to build more one-color trains the same length as the orange rod. Have them re-create these on their paper and then write the different ratios; e.g., yellow to white, white to orange, and red to yellow. After students display the ability to identify ratios, have them apply their learning to the Try It! question.

Look Out!

Some students may write 7 to 3 or 5 to 5 when writing the ratios for animals to snakes or lizards to animals. Stress that snakes and lizards are parts of the total number of animals, so they must include them in the whole when comparing a whole to a part or a part to a whole. Have students write ratios for other whole-to-part or part-to-whole comparisons to make sure they understand the concept.

Look Out!

Look Out! describes common errors or misconceptions likely to be exhibited by students at this age dealing with each skill or concept and offers troubleshooting suggestions.

Step-by-Step Activity Procedure

The hands-on activity itself is the core of each lesson. It is presented in three—or sometimes four—steps, each of which includes instruction in how students should use manipulatives and other materials to address the introductory word problem and master the lesson's skill or concept. An accompanying photograph illustrates each step.

A Walk Through a Student Page

Each lesson is followed by a corresponding set of student pages. These pages take the student from the concrete to the abstract, completing the instructional cycle. Students begin by using manipulatives, move to creating visual representations, and then complete the cycle by working with abstract mathematical symbols.

Exercise

Concrete and Representational exercises (pictorial representations of the featured manipulative) help students bridge conceptual learning to symbolic mathematics.

Standards-Based Math Practice

Abstract exercises provide standards-based math practice to allow students to deepen their understanding of the featured skill.

Lesson 1

Ratios and Proportional Relationships

Answer Key

Use Cuisenaire Rods to model the ratios shown.

Write the ratio three different ways.

(Check students' work.)

1.



2:4

2 to 4

$\frac{2}{4}$

Using Cuisenaire Rods, model the ratio. Sketch the model. Write the ratio two more ways.

2. 1:3

1 to 3

$\frac{1}{3}$

3. $\frac{2}{5}$

2:5

2 to 5

Write each ratio two more ways.

4. 2:3

2 to 3

$\frac{2}{3}$

5. 1 to 5

1:5

$\frac{1}{5}$

6. 3:4

3 to 4

$\frac{3}{4}$

7. $\frac{2}{1}$

2:1

2 to 1

8. 6:1

6 to 1

$\frac{6}{1}$

9. $\frac{2}{8}$

2:8

$\frac{2}{8}$



Extended Response

Extended Response exercises feature an open-ended constructed response question to help teachers gauge student understanding.

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Answer Key

Challenge! How are the ratios 3 to 7 and 7 to 3 different? Use a diagram to help.

Challenge: (Sample) The ratios are making different comparisons. That's why they are not the same.

Answers for the Teacher

Answers are provided for teachers on the included student pages.

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Answers are provided for teachers on the included student pages.

Student Pages Download
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