

Hands-On Standards[®], Common Core Edition

Grade 7

Hands-On Standards®, Common Core Edition
Grade 7

hand2mind 78871

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Vernon Hills, IL 60061-1862

800-445-5985

www.hand2mind.com

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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?

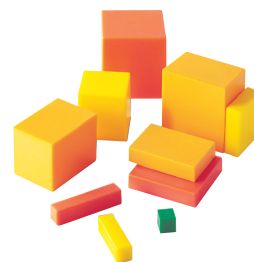
Hands-On Standards®, Common Core Edition Grade 7 is an easy-to-use reference manual for teachers who want to help students discover meaning in mathematics. Each of the manual's 32 lessons demonstrates a hands-on exploration using manipulatives. The goal is to help students get a physical sense of a problem—to 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 the 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 7 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 • Deluxe Rainbow Fraction® Circles • Deluxe Rainbow Fraction Squares • Number Cubes • Pattern Blocks • Polyhedral Dice • Rainbow Fraction Circle Rings • Relational GeoSolids® • Spinners • Two-Color Counters • XY Coordinate Pegboard



Read on to find out how *Hands-On Standards, Common Core Edition Grade 7* 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.

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 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.

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
2

Objective

Determine whether a relationship is proportional by checking for equivalent ratios.

Common Core State Standards

■ **7.RP.2a** Deduce whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

Ratios and Proportional Relationships

Proportional Relationships II

A proportion is an equation that sets two ratios equal to each other. If that equation is true, then the relationship is proportional. Students have checked to see if relationships are proportional by graphing, but now they will check by using their skills with equivalent fractions.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** What was the first ratio, or fraction, you built? ($2:8$, or $\frac{2}{8}$) What does the ratio represent? (the number of green apples to the total number of apples) What was the second ratio, or fraction, you built? ($1:4$, or $\frac{1}{4}$) What does the ratio represent? (the number of green apples to the total number of apples)
- **Ask:** How can you tell if the two ratios are equivalent? (you can build the fractions and compare or simplify)
- **Ask:** Is this a proportional relationship? Why or why not? (yes; the ratios are equivalent)

Solve It

Reread the problem with the students. Have students build the two ratios and draw them on the Fraction Squares BLM. Ask students to explain whether the ratios are equivalent and write an equation to represent the equivalent ratios. ($2:8 = 1:4$, or $\frac{2}{8} = \frac{1}{4}$)

More Ideas

For other ways to teach about proportional relationships and equivalent ratios—

- Have students use Fraction Tower® Equivalency Cubes to build each ratio. Then, they can compare the heights of the towers to see if they are equivalent and therefore represent a proportional relationship.
- Have students make the fractions using Deluxe Rainbow Fraction® Circles. They can measure the fractions with Rainbow Fraction Circle Rings or compare by stacking to determine whether the fractions are equivalent and therefore represent a proportional relationship.

Formative Assessment

Have students try the following problem.

In Rob's group, there are 2 boys and 3 girls. In Caren's group, there are 4 boys and 6 girls. Which equation shows that the groups are proportional?

- A. $\frac{2}{6} = \frac{1}{3}$ B. $\frac{2}{5} = \frac{4}{10}$ C. $\frac{2}{4} = \frac{3}{6}$ D. $\frac{3}{3} = \frac{4}{6}$

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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! 15 minutes | Groups of 4

Here is a problem about proportional relationships.

In a bag of 8 apples, 2 of the apples are green. In a bag of 4 apples, 1 is green. Is this a proportional relationship?

Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

Materials

- Deluxe Rainbow Fraction® Squares
- BLM 2



1. Ask: In the first bag, what is the ratio of green apples to all apples? Have students use Fraction Squares to represent the ratio $2:8$, or $\frac{2}{8}$, on their Fraction Squares BLM.



2. Ask: In the second bag, what is the ratio of green apples to all apples? Have students use Fraction Squares to represent the ratio $1:4$, or $\frac{1}{4}$, on their Fraction Squares BLM.



3. Ask: How can you tell if these ratios are equivalent? Encourage students to stack the fractions to show they are equivalent. Explain that since the ratios are equivalent, the relationship is proportional.

Look Out!

Students might orient the Fraction Squares differently and therefore think they are not equivalent. Encourage students to align the Fraction Squares pieces vertically and start in the top left corner each time.

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.

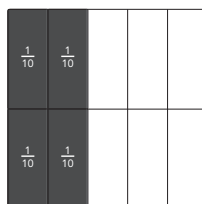
Lesson 2

Ratios and Proportional Relationships

Answer Key

Use Fraction Squares. Complete the model to answer the question. (Check students' work.)

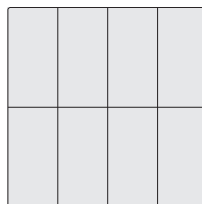
1. In the teacher's pencil jar, there are 10 pencils, 4 of which do not have an eraser. In Julio's pencil bag, there are 5 pencils, 3 of which do not have an eraser. Is the relationship proportional?



No

Using Fraction Squares, model the problem. Draw the model and use it to answer the question.

2. In a bag of 4 instruments, 2 instruments are shakers. In a box of 8 instruments, 4 are shakers. Is the relationship proportional?



Yes

Use Fraction Squares to determine if the relationship is proportional.

3. In PE, 5 of every 6 girls finished a run in less than 10 minutes. Two of every 3 boys finished in less than 10 minutes. Is the relationship proportional?
4. Sal paid \$2 for 4 pounds of grapes. Bo paid \$1 for 2 pounds of grapes. Is the relationship proportional?

No

Yes

Use equivalent ratios to determine if the relationship is proportional.

5. Roberto can ride his bike 4 miles in 20 minutes. Patricia can ride her bike 10 miles in 50 minutes. Is the relationship proportional?
6. Pearl answered 4 of the 5 questions right on the quiz. Then, on the test, she answered 15 of the 20 questions right. Is the relationship proportional?

Yes

No



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! Ms. Turny's class ratio of boys to girls is 2:3, and Mr. Straight's class ratio of boys to girls is 8:12. Explain how you know if the data portrays a proportional relationship.

Challenge: If the data forms equivalent ratios, then the relationship is proportional. Since $2:3 = 8:12$, the data does portray a proportional relationship.

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Answer Key

Challenge! Ms. Turny's class ratio of boys to girls is 2:3, and Mr. Straight's class ratio of boys to girls is 8:12. Explain how you know if the data portrays a proportional relationship.

Challenge: If the data forms equivalent ratios, then the relationship is proportional. Since $2:3 = 8:12$, the data does portray a proportional relationship.

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Answer Key

Challenge! Ms. Turny's class ratio of boys to girls is 2:3, and Mr. Straight's class ratio of boys to girls is 8:12. Explain how you know if the data portrays a proportional relationship.

Challenge: If the data forms equivalent ratios, then the relationship is proportional. Since $2:3 = 8:12$, the data does portray a proportional relationship.

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Answers for the Teacher
Answers are provided for teachers on the included student pages.

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