

Mathematics Station Activities

for Common Core State Standards
Grade 7



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Introduction

This revised edition of the *Mathematics Station Activities for Common Core State Standards, Grade 7* includes a collection of updated and improved station-based activities to provide students with opportunities to practice and apply the mathematical skills and concepts they are learning. It contains sets of activities that are tightly aligned to both the Mathematical Practices and the five Grade 7 Common Core Mathematics domains: Ratios and Proportional Relationships; The Number System; Expressions and Equations; Geometry; and Statistics and Probability. These enhancements have been carried out based on continuing refinement of Common Core implementation. You may use these activities in addition to direct instruction, or instead of direct instruction in areas where students understand the basic concepts but need practice. The Discussion Guide included with each set of activities provides an important opportunity to help students reflect on their experiences and synthesize their thinking. It also provides guidance for ongoing, informal assessment to inform instructional planning.

Implementation Guide

The following guidelines will help you prepare for and use the activity sets in this book.

Setting Up the Stations

Each activity set consists of four stations. Set up each station at a desk, or at several desks pushed together, with enough chairs for a small group of students. Place a card with the number of the station on the desk. Each station should also contain the materials specified in the teacher's notes, and a stack of student activity sheets (one copy per student). Place the required materials (as listed) at each station.

When a group of students arrives at a station, each student should take one of the activity sheets to record the group's work. Although students should work together to develop one set of answers for the entire group, each student should record the answers on his or her own activity sheet. This helps keep students engaged in the activity and gives each student a record of the activity for future reference.

Forming Groups of Students

All activity sets consist of four stations. You might divide the class into four groups by having students count off from 1 to 4. If you have a large class and want to have students working in small groups, you might set up two identical sets of stations, labeled A and B. In this way, the class can be divided into eight groups, with each group of students rotating through the "A" stations or "B" stations.

Introduction

Assigning Roles to Students

Students often work most productively in groups when each student has an assigned role. You may want to assign roles to students when they are assigned to groups and change the roles occasionally. Some possible roles are as follows:

- Reader—reads the steps of the activity aloud
- Facilitator—makes sure that each student in the group has a chance to speak and pose questions; also makes sure that each student agrees on each answer before it is written down
- Materials Manager—handles the materials at the station and makes sure the materials are put back in place at the end of the activity
- Timekeeper—tracks the group’s progress to ensure that the activity is completed in the allotted time
- Spokesperson—speaks for the group during the debriefing session after the activities

Timing the Activities

The activities in this book are designed to take approximately 15 minutes per station. Therefore, you might plan on having groups change stations every 15 minutes, with a two-minute interval for moving from one station to the next. It is helpful to give students a “5-minute warning” before it is time to change stations.

Since the activity sets consist of four stations, the above time frame means that it will take about an hour and 10 minutes for groups to work through all stations. If this is followed by a 20-minute class discussion as described on the next page, an entire activity set can be completed in about 90 minutes.

Guidelines for Students

Before starting the first activity set, you may want to review the following “ground rules” with students. You might also post the rules in the classroom.

- All students in a group should agree on each answer before it is written down. If there is a disagreement within the group, discuss it with one another.
- You can ask your teacher a question only if everyone in the group has the same question.
- If you finish early, work together to write problems of your own that are similar to the ones on the student activity sheet.
- Leave the station exactly as you found it. All materials should be in the same place and in the same condition as when you arrived.

Introduction

Debriefing the Activities

After each group has rotated through every station, bring students together for a brief class discussion. At this time, you might have the groups' spokespersons pose any questions they had about the activities. Before responding, ask if students in other groups encountered the same difficulty or if they have a response to the question. The class discussion is also a good time to reinforce the essential ideas of the activities. The questions that are provided in the teacher's notes for each activity set can serve as a guide to initiating this type of discussion.

You may want to collect the student activity sheets before beginning the class discussion. However, it can be beneficial to collect the sheets afterward so that students can refer to them during the discussion. This also gives students a chance to revisit and refine their work based on the debriefing session.

Standards Correlations

The standards correlations below and on the next page support the implementation of the Common Core State Standards. This book includes station activity sets for the Common Core domains of Ratios and Proportional Relationships; The Number System; Expressions and Equations; Geometry; and Statistics and Probability. The table that follows provides a listing of the available station activities organized by Common Core standard.

The left column lists the standard codes. The first number of the code represents the grade level. The grade number is followed by the initials of the Common Core domain name, which is then followed by the standard number. The middle column of the table lists the title of the station activity set that corresponds to the standard, and the right column lists the page number where the station activity set can be found.

Standard	Set title	Page number
7.RP.1.	Ratios and Proportions	1
7.RP.2.	Ratios and Proportions	1
7.RP.2.	Analyzing and Describing Relationships	21
7.RP.2.	Graphing Relationships	28
7.RP.2.	Representing Patterns and Relationships	37
7.RP.3.	Ratios and Proportions	1
7.RP.3.	Problem Solving with Rational Numbers	14
7.EE.3.	Problem Solving with Rational Numbers	14
7.NS.1.	Adding and Subtracting Rational Numbers	45
7.NS.2.	Multiplying and Dividing Rational Numbers	53
7.EE.3.	Multi-Step Real-Life Problems with Rational Numbers	61
7.EE.4.	Using Variables to Construct Equations and Inequalities	69
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Standards Correlations

Standard	Set title	Page number
7.G.1.	Similarity and Scale	85
7.G.2.	Similarity and Scale	85
7.G.3.	Sketching, Modeling, and Describing 3-D Figures	93
7.SP.5.	Collecting, Organizing, and Analyzing Data	100
7.SP.5.	Theoretical Probability	108
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7.SP.6.	Theoretical Probability	108
7.SP.6.	Experimental Probability	115
7.SP.7.	Collecting, Organizing, and Analyzing Data	100
7.SP.7.	Experimental Probability	115
7.SP.8.	Collecting, Organizing, and Analyzing Data	100

Materials List

Station Sets

- 2 bags (to hold cubes/blocks/etc.)
- 2 spinners (one divided evenly into red, green, blue, and yellow sections; the other divided evenly into black and white sections)
- 3 blocks (red, green, and blue)
- 3 marshmallows
- box of toothpicks
- clay
- colored cubes (one each of red, blue, and green; two yellow)
- graph paper
- integer chips
- list of 100 randomly generated numbers (1–9)
- marbles (24 green, 16 yellow)
- model car with scale factor
- *optional*: tape measure; water; separate containers to hold 1 cup, 1 quart, and 1 gallon of water
- plastic knives
- rectangular prism
- tiles or small pieces of paper (several small square tiles; several small round tiles; 8 large blue algebra tiles; 20 small yellow algebra tiles)

Class Sets

- calculators
- protractors
- rulers

Ongoing Use

- index cards (prepared according to specifications in teacher notes for many of the station activities)
- number cubes (several numbered 1–6; one numbered 4, 2, 2, 1, 3, 3; one numbered 6, 1, 3, 5, 4, 8)
- pencils
- pennies
- scrap/scratch paper

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to unit conversion, finding percents, simplifying algebraic ratios, and solving algebraic proportions

Common Core State Standards

Ratios and Proportional Relationships

Analyze proportional relationships and use them to solve real-world and mathematical problems.

- 7.RP.1.** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
- 7.RP.2.** Recognize and represent proportional relationships between quantities.
 - a.** Decide 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.
 - b.** Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
 - c.** Represent proportional relationships by equations.
- 7.RP.3.** Use proportional relationships to solve multi-step ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Student Activities Overview and Answer Key

Station 1

Students will be given 12 index cards with pairs of equivalent units of measurement written on them. They will work together to match the cards that are an equivalent unit of measurement. Then they will perform unit conversion.

Answers

1. 10 mm = 1 cm; 12 in. = 1 ft; 3 ft = 1 yd; 2 pints = 1 quart; 4 quarts = 1 gallon; 1 ton = 2,000 pounds
2. 8 pints in a gallon; 2 pints = 1 quart and 4 quarts = 1 gallon, so $2(4) = 8$ pints
3. 18 inches; $1/2$ yard = 1.5 feet and 12 inches = 1 foot, so $12(1.5) = 18$ inches
4. 5,000 pounds
5. 850 mm

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Instruction

- 13.5 feet
- 3 quarts = 0.75 gallons
- Answers will vary. Possible answers include: cooking, when modifying recipes for more or fewer people; carpentry, when creating custom-size cabinetry

Station 2

Students will be given a calculator to help them solve the problems. They work as a group to solve real-world applications of unit conversions.

Answers

- His friend measures temperature in Celsius, and Evan measures it in Fahrenheit. $F = 95^\circ$
- $P = 36.67$ yards; $P = 1,320$ inches, $A = 77.78$ yds²; $A = 100,800$ in²
-

	Feet	Yards	Meters	Time
Tim	300	100	91.44	12 seconds
Jeremy	400	133.33	121.95	12 seconds
Martin	229.66	76.55	70	12 seconds

Jeremy, Tim, Martin; Tim = 25 feet/sec, Jeremy = 33.33 feet/sec; Martin = 19.14 feet/sec

Station 3

Students will be given a bag containing 24 green marbles and 16 yellow marbles. They will use the marbles to create ratios and percents. They will then solve percent problems.

Answers

- Answers will vary. Possible answers include: green = 1; yellow = 7; total = 8. Find $1/8 = 0.125 = 12.5\%$; 12.5% were green. Subtract 12.5% from 100% to get 87.5% or $7/8 = 87.5\%$; 87.5% were yellow.
- There are 40 marbles so $24/40 = 60\%$ green marbles; $100\% - 60\% = 40\%$ or $16/40 = 40\%$
- 9 yellow marbles; student drawings should depict 9 yellow marbles and 12 green marbles.
- $24(1/4) = 6$ or $24(0.25) = 6$
- $17(2/1) = 34$ or $17(2.0) = 34$
- $10(14) = 140$ in²; increased dimensions by 200% then found the area of the photograph

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Instruction

Station 4

Students will be given 8 large blue algebra tiles and 20 small yellow algebra tiles. Students visually depict ratios and proportions with the algebra tiles. They then solve proportions for a specified variable including a real-world application.

Answers

1. $\frac{8 \text{ blue}}{20 \text{ yellow}} = \frac{2}{5}$

2. $\frac{2 \text{ blue}}{3 \text{ yellow}} = \frac{4 \text{ blue}}{6 \text{ yellow}}$

3. $8/20 = x/100$, so $x = 40$ blue

4. $8/20 = x/15$, so $x = 6$ blue

5. $x = 4$

6. $x = 40$

7. $\frac{\text{blue}}{\text{yellow}} = \frac{6}{10} = \frac{3}{5}$

Let x = number of blue pencils and $24 - x$ = number of yellow pencils.

$$\frac{3}{5} = \frac{x}{(24 - x)}, \text{ so } x = 9 \text{ blue pencils and } 24 - x = 15 \text{ yellow pencils}$$

Materials List/Setup

- Station 1** 12 index cards with the following written on them:
10 millimeters, 12 inches, 3 feet, 2 pints, 4 quarts, 1 ton, 1 centimeter, 1 foot,
1 yard, 1 quart, 1 gallon, 2,000 pounds
- Station 2** calculator
- Station 3** 24 green marbles; 16 yellow marbles
- Station 4** 8 large blue algebra tiles; 20 small yellow algebra tiles

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Instruction

Discussion Guide

To support students in reflecting on the activities and to gather some formative information about student learning, use the following prompts to facilitate a class discussion to “debrief” the station activities.

Prompts/Questions

1. How do you perform unit conversion?
2. When would you use unit conversion in the real world?
3. What are two ways to find the percent of a number?
4. What is a ratio?
5. How do you know if two ratios are equivalent?
6. What is a proportion?
7. When would you use ratios and proportions in the real world?

Think, Pair, Share

Have students jot down their own responses to questions, then discuss with a partner (who was not in their station group), and then discuss as a whole class.

Suggested Appropriate Responses

1. Use ratios and proportions to convert units.
2. Answers will vary. Possible answers include: creating scale models of buildings; using the metric system instead of U.S. customary units; converting Celsius to degrees Fahrenheit and vice versa
3. Multiply the number by a decimal or fraction that represents the percentage.
4. A ratio is a comparison of two numbers by division.
5. Two ratios are equivalent if, when simplified, they are equal.
6. A proportion is when two ratios are set equal to each other.
7. Answers will vary. Possible answers include: enlarging photos; scale models; modifying quantities of ingredients in a recipe

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Instruction

Possible Misunderstandings/Mistakes

- Not keeping track of units and using incorrect unit conversions
- Not recognizing that terms must have the same units in order to compare them
- Setting up proportions with one of the ratios written with the incorrect numbers in the numerator and denominator
- Not recognizing simplified forms of ratios in order to find equivalent ratios

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Station 1

You will be given 12 index cards with the following written on them:

10 millimeters, 12 inches, 3 feet, 2 pints, 4 quarts, 1 ton, 1 centimeter, 1 foot, 1 yard,
1 quart, 1 gallon, 2,000 pounds

Shuffle the index cards and deal a card to each student in your group until all the cards are gone. As a group, show your cards to each other and match the cards that are an equivalent unit of measurement.

1. Write your answers on the lines below. The first match is shown:

10 mm = 1 cm	_____
_____	_____
_____	_____

2. Find the number of pints in a gallon. Explain how you can use your answers in problem 1 to find the number of pints in a gallon.
3. Find the number of inches in half of a yard. Explain how you can use your answers in problem 1 to find the number of inches in half of a yard.

continued

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Perform the following unit conversions by filling in the blanks.

4. 2.5 tons = _____ pounds

5. 85 cm = _____ mm

6. 4.5 yd = _____ ft

7. 6 pints = _____ quarts = _____ gallons

8. When would you use unit conversions in the real world?

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Station 2

You will be given a calculator to help you solve the problems. Work as a group to solve these real-world applications of unit conversions.

1. Evan has a friend in England. His friend said the temperature was very hot at 35° . Evan thought he heard his friend incorrectly since 35° is cold. What caused his misunderstanding?

(Hint: $C = (F - 32) \frac{5}{9}$)

Find the equivalent temperature in the United States that would make the claim of Evan's friend valid. Write your answer in the space below.

2. Anna is going to build a patio. She wants the patio to be 20 feet by 35 feet. What is the perimeter of the patio in yards?

What is the perimeter of the patio in inches?

What is the area of the patio in yards?

continued

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

What is the area of the patio in inches?

3. Tim claims he can run the 100-yard dash in 12 seconds. Jeremy claims he can run 400 feet in 12 seconds. Martin claims he can run 70 meters in 12 seconds. (*Hint: 1 yard = 0.9144 meters and 1 yard = 3 feet.*)

Fill in the table below to create equivalent units of measure.

	Feet	Yards	Meters	Time (seconds)
Tim				
Jeremy				
Martin				

List the three boys in order of fastest to slowest:

How fast did each boy run in feet/second?

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Station 3

You will be given a bag containing 24 green marbles and 16 yellow marbles. You will use the marbles to create ratios and percents. You will then solve percent problems. Work together as a group to solve the following problems.

1. Shake the bag of green and yellow marbles so that the colors are mixed. Have each group member select 2 marbles from the bag without looking. Group all your marbles together by color.

How many green marbles did you draw? _____

How many yellow marbles did you draw? _____

What was the total number of marbles drawn? _____

How can you determine the percentage of marbles that were green?

Find the percentage of marbles you drew that were green.

Name two ways you can find the percentage of marbles you drew that were yellow.

Find the percentage of marbles you drew that were yellow.

2. Take all the marbles out of the bag. How can you determine what percentage of all the marbles are green?

How can you determine what percentage of all the marbles are yellow?

continued

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

3. Place 12 green marbles on the table. How many yellow marbles do you need to have 75% as many yellow marbles on the table?

Draw a picture of the number of green marbles and yellow marbles you have placed on the table.

4. Use equations to show two ways you can find 25% of 24.
5. Use equations to show two ways you can find 200% of 17.
6. Real-world application: Bryan is a photographer. He has a 5 inch by 7 inch photo that he wants to enlarge by 200%. What is the area of the new photo? Explain your answer in the space below.

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Station 4

You will be given 8 large blue algebra tiles and 20 small yellow algebra tiles. Work as a group to arrange the algebra tiles so they visually depict the ratio of blue to yellow algebra tiles.

1. What is this ratio? _____

Rearrange the tiles to visually depict the following ratios:

$$\frac{2 \text{ blue}}{3 \text{ yellow}} \quad \frac{1 \text{ blue}}{10 \text{ yellow}} \quad \frac{4 \text{ blue}}{6 \text{ yellow}} \quad \frac{1 \text{ blue}}{1 \text{ yellow}}$$

2. Which ratios are equivalent ratios? Explain your answer.

3. Keeping the same ratio of yellow to blue tiles, if there were 100 yellow algebra tiles, how many blue algebra tiles would there be? Use a proportion to solve this problem. Show your work in the space below. (*Hint: A proportion is two ratios that are equal to each other.*)

4. Keeping the same ratio of yellow to blue tiles, if there were 15 yellow algebra tiles, how many blue algebra tiles would there be? Use a proportion to solve this problem. Show your work in the space below.

continued

NAME: _____

Ratios and Proportional Relationships

Set 1: Ratios and Proportions

Work together to solve the following proportions for the variable.

5. $\frac{2}{7} = \frac{x}{14}; x =$

6. $\frac{8}{x} = \frac{2}{10}; x =$

Use the following information to answer problem 7:

Allison has 6 blue pencils and 10 yellow pencils. Sadie has 24 pencils that are either blue or yellow. The ratio of blue pencils to yellow pencils is the same for both Allison and Sadie.

7. How many blue pencils and yellow pencils does Sadie have? Show your work in the space below by setting up a proportion using a variable, x .