Common Core State Standards

Station Activities

for Mathematics I

WALCH EDUCATION®

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Number and Quantity

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

N–Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.⋆

A–CED.1 Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*⋆

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
6. 13.5 feet
7. 3 quarts = 0.75 gallons
8. 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

1. His friend measures temperature in Celsius, and Evan measures it in Fahrenheit. $F = 95°$
2. $P = 36.67$ yards; $P = 1{,}320$ inches, $A = 77.78$ yds^2; $A = 100{,}800$ in^2
3.

	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

1. 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.
2. There are 40 marbles so 24/40 = 60% green marbles; 100% – 60% = 40% or 16/40 = 40%
3. 9 yellow marbles; student drawings should depict 9 yellow marbles and 12 green marbles.
4. 24(1/4) = 6 or 24(0.25) = 6
5. 17(2/1) = 34 or 17(2.0) = 34
6. 10(14) = 140 in^2; increased dimensions by 200% then found the area of the photograph

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.

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

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

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

Number and Quantity

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

Number and Quantity

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?

Number and Quantity

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

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?

Number and Quantity

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 student 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

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 in. by 7 in. photo that he wants to enlarge by 200%. What is the area of the new photo? Explain your answer in the space below.

Number and Quantity

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:

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

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

Number and Quantity

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.