Support Coach™

7 TARGET Foundational Mathematics

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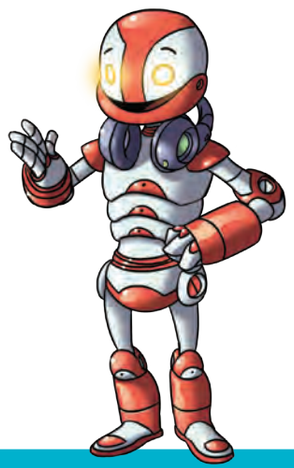
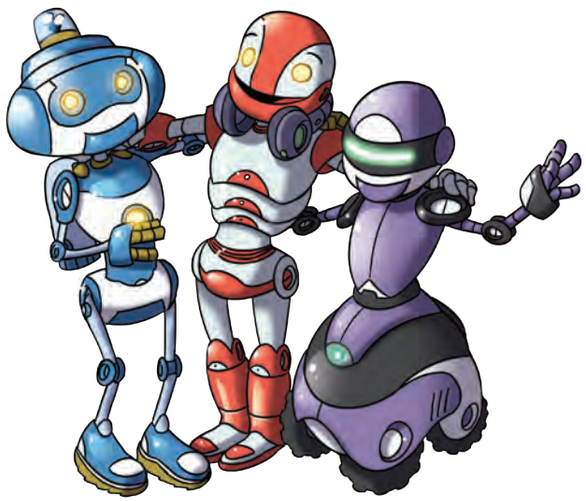




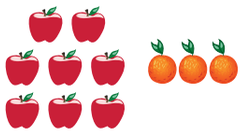
LESSON 1

Computing Unit Rates

PLUG IN Using Ratios

A **ratio** compares two quantities. It can be expressed in different ways.

The ratio of apples to oranges is 8 to 3.



Write: $\frac{8}{3}$ or 8:3 or 8 to 3

Equivalent ratios can be written as the same fraction in simplest form. A table of equivalent ratios shows how two quantities are related.

Ice Cubes Used	3	6	12	24	48
Glasses of Iced Tea	1	2	4	8	16

Ok! I can write a ratio as a fraction, with a colon (:), or with the word "to."

I see! All of the ratios of $\frac{\text{ice cubes}}{\text{glasses}}$ are equivalent because they can be written as the simplified fraction $\frac{3}{1}$.

Words to Know

ratio
a comparison of two quantities
$\frac{6}{5}$ or 6:5 or 6 to 5

equivalent ratios
ratios with the same value that can be expressed as the same fraction in simplest form

DISCUSS How can you use the table above to find the number of ice cubes in a given number of glasses of iced tea?

A You can describe quantities with a ratio.

DO Write the ratio of markers to boxes.

1. Compare the quantities.
2. Write the ratios in 3 different ways.

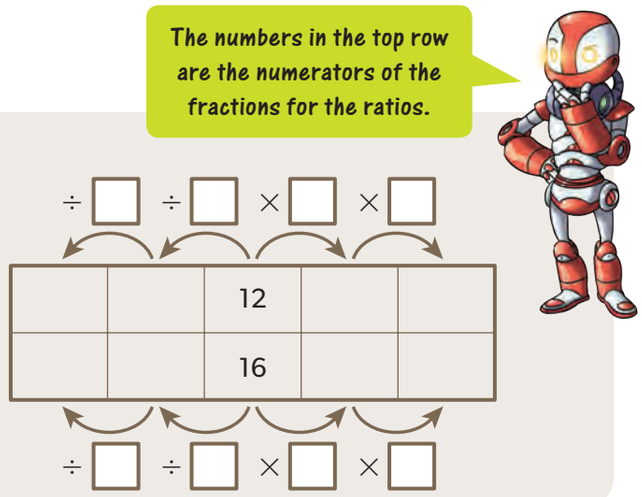
10 markers ____ boxes

$\frac{\square}{\square}$ ____ : ____ ____ to ____

B You can use multiplication and division to find equivalent ratios for $\frac{12}{16}$.

DO Complete the table of equivalent ratios.

1. Multiply both quantities to find equivalent ratios.
2. Divide both quantities to find more equivalent ratios.



C You can use equivalent ratios to solve problems.

DO Janet runs 2,640 feet in 5 minutes. Dan runs 1,730 feet in 3 minutes. If they keep the same paces, who would run farther in 15 minutes?

1. Write the ratio of feet to minutes for each person.
2. Complete the table to write equivalent ratios.
3. Use the table to compare the ratios.

Janet's Running Times				
Feet	2,640			
Minutes	5	10	15	20

Dan's Running Times				
Feet	1,730			
Minutes	3	6	9	15

_____ would run farther in 15 minutes. _____ would run 8,650 feet and _____ would run 7,920 feet.

DISCUSS How could you find the number of feet run for a number of minutes that is not in the table?

PRACTICE

Complete the table of equivalent ratios.

1

Feet	3	**6**	9	
Yards	1	2		

2

Text Messages	1	2		4
Cost ($)	0.20	**0.40**	0.60	

Solve.

3 Alex reads 12 pages in 10 minutes. Jenna reads 15 pages in 12 minutes. They are both reading a 60-page magazine. Who will finish reading the magazine first? _____

POWER UP Finding Rates from Complex Fractions

A **rate** is a ratio that compares quantities with different units of measure.

$$\frac{3 \text{ pounds}}{6 \text{ dollars}}$$

This ratio compares pounds to dollars, so it is a rate.

A **complex fraction** has a fraction in the numerator, denominator, or both.

A complex fraction can be rewritten as a division expression.

$$\frac{\frac{3}{4}}{\frac{2}{3}} = \frac{3}{4} \div \frac{2}{3}$$

I can think of a complex fraction as a fraction divided by a fraction.

A rate that compares fractions can be written as a complex fraction.

A mouse can move about 4 miles in $\frac{1}{2}$ hour.

$$\frac{4}{\frac{1}{2}}$$

This complex fraction has a fraction only in the denominator.

Words to Know

rate
a ratio that compares quantities with different units of measure

$$\frac{150 \text{ miles}}{3 \text{ hours}}$$

complex fraction
a fraction that has a fraction in the numerator, denominator, or both

$$\frac{7}{8} \div \frac{1}{3}$$

DISCUSS Why do you think it will be helpful to write rates as complex fractions in math problems?

A You can use complex fractions to write rates that include a fraction.

DO Alexandra completed $\frac{3}{4}$ of her homework in 2 hours. Write this rate as a complex fraction.

1. Decide what the rate compares.

   The rate compares the **amount of homework** to _____.

2. Write a complex fraction with the given quantities.

$$\frac{\square}{\square}$$

B You can use complex fractions to write rates that compare two fractions.

I get it! The units of the rate, $\frac{\text{miles}}{\text{hours}}$, tell me which values are in the numerator and the denominator of the complex fraction.

DO

Jamal walks $\frac{7}{8}$ mile in $\frac{1}{2}$ hour. How can you write this rate as a complex fraction?

1. Understand which quantities are being compared.
2. Write the complex fraction.

$$\frac{\text{miles}}{\square} = \frac{\square}{\frac{\square}{\square}}$$

DISCUSS

Trevor read $\frac{1}{2}$ of a book in 5 days, and he writes this rate as $\frac{\frac{1}{2}}{\frac{1}{5}}$. What can you tell Trevor about his work?

PRACTICE

Write the rate as a complex fraction.

1 A recipe calls for $\frac{2}{3}$ cup of flour to make $\frac{1}{4}$ of a batch of cookies.

$$\frac{\frac{2}{3}}{\square}$$

2 A band marched $\frac{3}{4}$ of the parade route in $\frac{2}{3}$ hour.

$$\frac{\square}{\frac{\square}{\square}}$$

3 A car used $\frac{3}{5}$ of a tank of gas to travel $\frac{5}{8}$ of the total distance.

$$\frac{\square}{\frac{\square}{\square}}$$

4 A sprinkler system uses $\frac{1}{3}$ gallon of water every $\frac{1}{5}$ hour.

$$\frac{\square}{\frac{\square}{\square}}$$

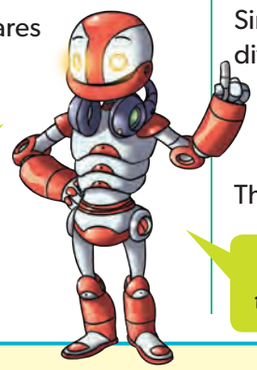
READY TO GO Computing Unit Rates

A **unit rate** is a ratio comparing quantities with different units of measure to a denominator equal to 1.

$$\frac{\frac{7}{8}\text{ inch}}{1\text{ year}}$$

This is a unit rate because it compares $\frac{7}{8}$ inch to 1 year.

A unit rate always compares a quantity to 1 unit of another kind of quantity.



You can express a rate written as a complex fraction as a unit rate.

$$\frac{\frac{3}{4}}{2} = \frac{3}{4} \div \frac{2}{1} = \frac{3}{4} \cdot \frac{1}{2} = \frac{3}{8}$$

Since any number remains the same when divided by 1:

$$\frac{3}{8} = \frac{\frac{3}{8}}{1}$$

The rate $\frac{\frac{3}{4}}{2}$ can be written as the unit rate $\frac{\frac{3}{8}}{1}$.

I get it! I just simplify the complex fraction and then divide the fraction by 1.

Words to Know

unit rate
a ratio that compares the number of units of one quantity to 1 unit of a second quantity.

5 dollars per pound

$$\text{unit rate} = \frac{\text{cost}}{\text{pound}} = \frac{\$5}{1\text{ lb}}$$

65 miles per hour

$$\text{unit rate} = \frac{\text{miles}}{\text{hour}} = \frac{65\text{ mi}}{1\text{ hr}}$$

DISCUSS Why might it be helpful to find unit rates?

LESSON LINK

PLUG IN

A ratio compares two quantities. A ratio can be written in three ways.

$\frac{3}{5}$ 3:5 3 to 5

POWER UP

A ratio that includes a fraction can be written as a complex fraction.

$$\frac{\frac{2}{3}}{\frac{1}{6}}$$

GO!

I see! I can use what I know about ratios and complex fractions to find unit rates. Then I can use unit rates to solve problems.

WORK TOGETHER

You can use labeled Fraction Strips to help you solve unit rate problems involving complex fractions.

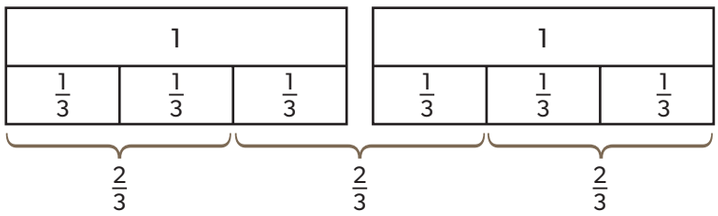
- The rate of cups to hours is written as a complex fraction.
- The complex fraction is written as a division problem and simplified.
- The unit rate is $\frac{3}{1}$.
- The Fraction Strips model the problem.
- Tara will drink 3 cups of water in 1 hour.

Division lets me simplify fractions, even complex fractions! I can use fraction strips to model division.

Tara drinks 2 cups of water in $\frac{2}{3}$ hour. At this rate, how much water will Tara drink in an hour?

$$\frac{\text{cups}}{\text{hours}} = \frac{2}{\frac{2}{3}}$$

$$\frac{2}{\frac{2}{3}} = \frac{2}{1} \div \frac{2}{3} = \frac{2}{1} \times \frac{3}{2} = \frac{6}{2} = \frac{3}{1}$$



A You can use unit rates to solve problems.

DO

A recipe calls for $\frac{2}{3}$ cup of sugar to make $\frac{4}{5}$ gallon of iced tea. How much sugar is needed to make 1 gallon of iced tea?

Fraction Strips can be found on p. 209.

1. Write the rate of sugar to iced tea as a complex fraction.
2. Write the complex fraction as a division problem, then rewrite as multiplication.
3. Divide both the numerator and the denominator by the denominator to find the unit rate.

$$\frac{\text{sugar}}{\text{iced tea}} = \frac{\frac{2}{3}}{\frac{4}{5}}$$

$$\frac{\frac{2}{3}}{\frac{4}{5}} = \frac{\square}{\square} \div \frac{\square}{\square} = \frac{\square}{\square} \times \frac{\square}{\square} = \frac{\square}{\square}$$

$$\frac{\square}{\square} = \frac{\square \div 12}{\square \div 12} = \frac{\frac{\square}{\square}}{1} = \frac{\frac{\square \div 2}{\square \div 2}}{1} = \frac{\frac{\square}{\square}}{1}$$

The unit rate is _____.

_____ cup of sugar is needed to make 1 gallon of iced tea.

DISCUSS How can you be sure that you have found the unit rate?

READY TO GO

PRACTICE

Find the unit rate. Use Fraction Strips to help you.

Fraction Strips can be found on p. 211.

1 A recipe calls for 5 eggs for every $\frac{1}{2}$ teaspoon of salt.

$$\frac{\square}{\frac{\square}{\square}}$$

$$= \frac{\square}{\square} \div \frac{\square}{\square} = \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square}$$

The unit rate is _____ eggs for 1 teaspoon.

2 Kathy's heart beats 60 times in $\frac{3}{4}$ minute.

$$\frac{\boxed{60}}{\frac{\boxed{3}}{\boxed{4}}}$$

$$= \frac{\square}{\square} \div \frac{\square}{\square} = \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

The unit rate is _____ times in 1 minute.

Find the unit rate.

3 $\frac{3}{4}$ mile in $\frac{2}{3}$ hour

$$\frac{\square}{\frac{\square}{\frac{\square}{\square}}}$$

$$= \frac{\square}{\square} \div \frac{\square}{\square} = \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\frac{\square}{\square}}$$

The unit rate is _____ miles in 1 hour.

4 10 words in $\frac{2}{5}$ minute

REMEMBER
A unit rate compares units of one quantity to 1 unit of a different quantity.

$$\frac{\boxed{10}}{\frac{\square}{\square}}$$

$$= \frac{\square}{\square} \div \frac{\square}{\square} = \frac{\square}{\square} \times \frac{\square}{\square}$$

$$= \frac{\square}{\square} = \frac{\square}{\square}$$

The unit rate is _____ words in 1 minute.

Compare the unit rates.

5 Alice skates $\frac{2}{5}$ mile in $\frac{1}{5}$ hour. Elizabeth skates $\frac{2}{3}$ mile in $\frac{2}{9}$ hour. Who skates farther in 1 hour?

Alice's Rate

Elizabeth's Rate

Alice skates _____ miles in 1 hour.

Elizabeth skates _____ miles in 1 hour.

_____ skates farther in 1 hour.

Solve.

6 Maurice walked 6 miles on the treadmill in $\frac{3}{2}$ hours. How many miles per hour did Maurice walk?

_____

7 On average, a person who weighs 130 pounds burns 83 calories in $\frac{1}{6}$ hour while playing basketball. At this rate, how many calories are burned in 1 hour?

_____

DISCUSS

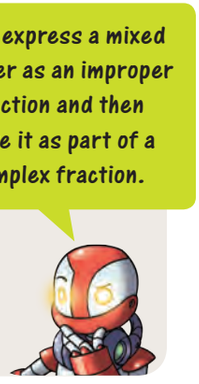
Determine the Rate

Rachel wants to find the best unit price for potatoes at a grocery store. She sees a 10-pound bag for $5.90, a 5-pound bag for $2.75, and a $1\frac{1}{2}$-pound bag for $0.99.

How can Rachel find the price per pound?

Which bag has the least unit price?

What is the unit price for this bag?



PROBLEM SOLVING

CHANGING THE PACE

READ

Gabby has 5 weeks to read a novel. She reads 15 pages of a novel in $\frac{3}{7}$ week. At this rate, will Gabby read the 200-page book in time?

PLAN

- What is the problem asking you to find?

  whether Gabby can read _____ pages in _____ weeks

- What do you need to know to solve the problem?

  Gabby reads _____ pages in _____ week.

- How can you solve the problem?

  Find the unit rate. Then multiply the unit rate by _____ weeks. Compare the number to 200 pages.

SOLVE

Write the rate as a complex fraction.

$$\frac{\boxed{15}}{\frac{\boxed{3}}{\boxed{7}}}$$

Write the complex fraction as a division problem. Then rewrite as multiplication. $\frac{15}{\frac{3}{7}} =$ _____ ÷ _____ = _____ × _____

Multiply and simplify. = _____ = _____ pages per week

Find the number of pages she can read in 5 weeks. _____ × _____ = _____ pages

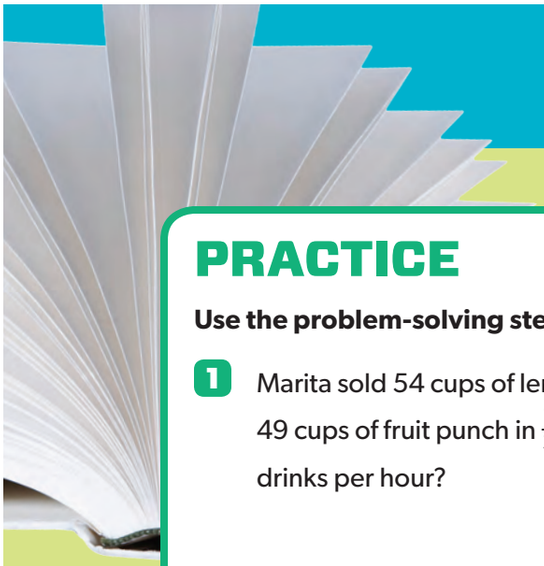
CHECK

Multiply the unit rate you found by $\frac{3}{7}$ week.

$\frac{\square \text{ pages}}{1 \text{ week}} \times \frac{3}{7} =$ _____ = _____ pages

The number of pages should be 15 with this rate.

Will Gabby finish the 200-page book in time? _____



I remember! I need to find the unit rate first. Then I'll use the unit rate to find the answer.

PRACTICE

Use the problem-solving steps to help you.

1 Marita sold 54 cups of lemonade in $\frac{1}{2}$ hour. Jennifer sold 49 cups of fruit punch in $\frac{1}{3}$ hour. Which girl sold more drinks per hour?

CHECKLIST
- ☐ READ
- ☐ PLAN
- ☐ SOLVE
- ☐ CHECK

2 A $\frac{3}{4}$-pound box contained 36 fruit tarts. How many tarts would be in a one-pound box?

CHECKLIST
- ☐ READ
- ☐ PLAN
- ☐ SOLVE
- ☐ CHECK

3 A coach compared the scoring of four players over the season. Lorraine played in 8 games and scored 128 points. Jana played in 12 games and scored 168 points. Maggie played in 9 games and scored 135 points. Nikki played in 17 games and scored 136 points. Which player scored the greatest number of points per game?

CHECKLIST
- ☐ READ
- ☐ PLAN
- ☐ SOLVE
- ☐ CHECK