



**THIRD SPACE  
LEARNING**

# Math Intervention Pack

Calculating unit rates with  
fractions

**Grade 7**

## How To Use This Resource

### 1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

### 2. Prior Learning

Use this slide to review the knowledge that will be required to be successful in this lesson. If students feel confident on the prior learning section of the Title Slide then this slide can be skipped

### 3. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

### 4. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

### 5. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

### 6. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

## How To Use This Resource

### 7. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

### 8. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

## Standard

**7.RP.A.1** - Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks  $\frac{1}{2}$  mile in each  $\frac{1}{4}$  hour, compute the unit rate as the complex fraction  $\frac{1/2}{1/4}$  miles per hour, equivalently 2 miles per hour.

## Key Mathematical Ideas

1. Compare and contrast different strategies for solving a problem involving ratios with fractional quantities.
2. Find and use a unit rate to solve a problem involving fractional quantities.

## Overview

### Terminology

- **Rate:** A ratio that compares two quantities with unlike units of measure, such as 100 miles every 2 hours.
- **Unit Rate:** Compares a quantity to 1 unit of another quantity.

### Sentence Stems

- When I divide the first quantity by the second I...
- \_\_\_\_ divided by \_\_\_\_ equals \_\_\_\_



## Overview

### Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Understanding that unit rate is an amount over 1, not to be confused with a regular rate.	Highlight what a unit rate is - we are looking for the amount for 1 of something. Use relevant examples like miles <b>per</b> hour and emphasize that this is a rate of many miles in 1 hour.	Provide opportunities for students to show their understanding of unit rate by explaining it in context for each question.
Forgetting to multiply by the reciprocal when dividing fractions.	Remind students that dividing fractions is multiplying by the reciprocal. Remind students to reduce.	Utilize the 'follow me' to fill in the blanks with students to highlight the process of multiplying by the reciprocal

## Title Slide

### If students...

- get both sections correct:
  - start at You do
- miss the learning goal section only:
  - start at Let's Learn
- miss the prior learning section:
  - start at Prior Learning

## Prior Learning

### If stuck

- Re-write the ratio of miles to hours in another form - with the ratio symbol (:), as fractions or as a vertical table. Whichever form the student best understands.
- Draw an arrow from “4 pancakes” to “1 pancake” and then label it as  $\div 4$ . Discuss how that relationship is used to figure out the rest of the recipe.

## Let's Learn

### If stuck

- Have the student explain the real world problem in their own words. Add to their explanation where needed.
- The Prior learning slide goes over how to find equivalent ratios with whole numbers. Use this to review.

### Questions

- a) What is  $\frac{3}{4}$  divided by 3? ( $\frac{1}{4}$ .)
- a) How do we calculate the other part of the ratio? (We need to also divide the lemons by 3, to keep the ratio equivalent.)
- a) What is  $\frac{1}{4}$  times 4? ( $\frac{4}{4}$  or 1.)
- a) How do we calculate the other part of the ratio? (We need to also multiply the lemons by 4, to keep the ratio equivalent.)
- a) Why did we calculate  $\frac{1}{4}$  when we want 1 whole? (We used an equivalent ratio that was easier to solve, to work our way to 1.)
- b) What is 6 divided by  $\frac{3}{4}$ ? (8.)
- What is 6 times  $\frac{4}{3}$ ? ( $\frac{24}{3}$  which simplified to 8.)
- Which method is more efficient? (Dividing one quantity by itself is more efficient, because it is just one calculation. However, both solving methods are valid.)

### Watch out for

- Students who do not multiply by the reciprocal in b.

### Answers

- a)  $6 \div 3 = 2$ ,  $2 \times 4 = 8$
- b)  $6 \div \frac{3}{4} = \frac{24}{3} = 8$

## Follow Me

### Modeling prompts

- First, identify that the rate needed is per second, which means 1 second and  $\frac{1}{10} \div \frac{1}{10} = 1$  second.
- Then, divide the other side by  $\frac{1}{10}$  to create the equivalent ratio for 1 second by multiplying by the reciprocal.
- Finally, write the unit rate as 10 miles per second.

### Answers

- a)  $1 \div \frac{1}{10} = 1 \times \frac{10}{1}$
- b) 10 miles per second

## Your Turn

### If stuck

- Use similar guidance given in the Modeling prompts.

### Questions

- What's the relationship between 5 minutes and 1 minute? (Divide by 5 - or times  $\frac{1}{5}$ .)
- What do you divide the other side of the ratio by? Why? (It is also divided by 5 to create an equivalent ratio.)
- What are the steps for dividing fractions? (Dividing by a fraction is the same as multiplying by the reciprocal, so change the operation to multiplication and flip the fraction.)
- What are the final units? Why? (Classrooms per minute, since minute is the part of the rate that is equal to 1.)

### Watch out for

- Students who do not multiply by the reciprocal in a.

### Answers

- a)  $\frac{1}{3} \div 5 = \frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$
- b)  $\frac{1}{15}$  of a classroom per minute

## You do

### If stuck

- Help students identify what the question is asking them to find. (a. The unit rate of time per vase.  
b. The unit rate of gallons per minute.  
c. The unit rates of minutes per lap.)
- Help students determine the increments needed to get to 1 whole based on the fraction they are given. Let students use the tables on the Classroom tools slide if necessary or use the Support slide for part b.

### Questions

- a.  $\frac{1}{3} \div ? = 1$ ? (Any number divided by itself is 1, so  $\frac{1}{3}$ .)
- c. How can you define the rate? (Laps per minute is the preferred rate modeled on these slides, but minutes per lap would also work.)
- c. To find a unit rate per lap, which part of the ratio needs to be 1? (The laps.)
- c. What's the relationship between  $\frac{1}{4}$  of a lap and 1 lap? (Divide by  $\frac{1}{4}$  or multiply by 4.)
- c. What's the relationship between  $\frac{2}{5}$  of a lap and 1 lap? (Divide by  $\frac{2}{5}$  or multiply by  $\frac{5}{2}$ .)

### Watch out for

- Students making calculation errors.
- Students creating equivalent ratios incorrectly - by adding/subtracting or not doing the same operation to both parts of the ratio.

### Answers

- a)  $\frac{1}{3} \div \frac{1}{3} = \frac{1}{3} \times \frac{3}{1}$
- $8 \div \frac{1}{3} = 8 \times \frac{3}{1} = 24$
- b)  $4 \div \frac{5}{6} = 4 \times \frac{6}{5} = \frac{24}{5}$
- c)  $\frac{1}{4} \div 2 \frac{1}{2} = \frac{1}{4} \div \frac{5}{2} = \frac{1}{4} \times \frac{2}{5} = \frac{2}{20} = \frac{26}{260}$  Marcus is slower
- $\frac{2}{5} \div 3 \frac{1}{4} = \frac{2}{5} \div \frac{13}{4} = \frac{2}{5} \times \frac{4}{13} = \frac{8}{65} = \frac{32}{260}$  Sarai is faster

## Go further

### If stuck...

- Help students identify what the question is asking them to find. (The unit rate of rooms per hour and the unit rate of hours per room.)
- Encourage students to show their thinking - how could they get from  $\frac{1}{5}$  to 1 whole and  $\frac{1}{3}$  to 1 whole in increments. Use the tables on the Classroom tools slide if necessary.

### Questions

- Why are the two unit rates different, even though they represent the same rate? (Since they are not in the same terms, one is per hour - 1 hour and the other is per room - 1 room, the ratios are different. However, they are equivalent. If you use the unit rates to find a certain number of hours or minutes, both unit rates would result in the same answer.)

### Watch out for

- Students who think the two unit rates should be the same.

### Answers

- $\frac{1}{3} \div \frac{1}{5} = \frac{1}{3} \times \frac{5}{1} = \frac{5}{3} (= 1\frac{2}{3})$
- The housekeeper cleaned  $1\frac{2}{3}$  first floor rooms per hour.
- $\frac{1}{5} \div \frac{1}{3} = \frac{1}{5} \times \frac{3}{1} = \frac{3}{5}$
- The housekeeper takes  $\frac{3}{5}$  of an hour to clean 1 first floor room.

## Support for Slide(s)

### Questions

- What is 4 divided by 5? ( $\frac{4}{5}$ )
- What is  $\frac{4}{5}$  times 6? ( $\frac{24}{5}$ )
- Why did we calculate  $\frac{1}{6}$  when we want 1 whole? (We used equivalent ratios that were easier to solve, to work our way to 1.)
- What does  $\frac{4}{1} \div \frac{5}{6}$  represent? (Since the unit rate is in minutes and there is  $\frac{5}{6}$  of a minute and  $\frac{5}{6} \div \frac{5}{6} = 1$  minute, we divide the other part of the ratio by  $\frac{5}{6}$  to see the gallons per minute.)
- Which method is more efficient? (Dividing one quantity by itself is more efficient, because it is just one calculation. However, both solving methods are valid.)

### Answers

- $4 \div 5 \times 6 = \frac{24}{5}$  ( $= 4 \frac{4}{5}$ )
- $\frac{4}{1} \div \frac{5}{6} \dots = \frac{24}{5}$  ( $24 \div 5 = 4 \frac{4}{5}$  gallons per minute)

## Check your Understanding

### Correct answer:

- \$25.05 per hour

Today you will learn about

# Calculating unit rates with fractions



## Learning Goal

Riley earned \$6 for  $\frac{3}{4}$  of an hour of babysitting.

What is her hourly rate?

.....

## Prior Learning

Find the unit rate.

If all rows have the same number of seats, and there are 10 seats in 2 rows, then there are

..... seats per row.



# Prior learning

Before unit rates with fractions, we need to understand unit rates.

A **unit rate** compares a quantity to 1 unit of another quantity. We use the word **per** to describe unit rates.

Find the unit rate per hour below.

		100	200	400
Miles				
Hours		2	4	8

Multiply or divide by the same number to create equivalent ratios.

Use what you know about unit rates to find the recipe for 1 pancake.

Recipe for 4 pancakes

100g plain flour

2 large eggs

300ml milk

1 tbsp vegetable oil

Recipe for 1 pancake

..... plain flour

..... large eggs

..... milk

..... vegetable oil

# Let's learn

A **unit rate** compares a quantity to 1 unit of another quantity. When a rate is given as a fraction, you can use operations with fractions to find the unit rate.

Danielle used 6 lemons to make  $\frac{3}{4}$  cups of lemonade.  
How many lemons would it take to make 1 cup?  
Write your answer in lemons per cup.

a Find the unit rate using a ratio table.

Lemons	Cups
6	$\frac{3}{4}$
.....	$\frac{1}{4}$
.....	$\frac{4}{4} = 1$

.....  $\div 3$

.....  $\times 4$

b Find the unit rate by dividing one quantity by itself.

$\frac{3}{4}$ cup	6
1 cup	.....

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

To divide by  $\frac{3}{4}$  multiply by its **reciprocal**,  $\frac{4}{3}$ .

$$6 \div \frac{3}{4} = 6 \times \frac{4}{3} = \frac{\boxed{\dots}}{3} = \dots$$

The unit rate is defined by the quantity that is 1.

In this example, cups is the part of the rate that is 1, so the answer represents the lemons **per cup**.

Follow me

The Atlas V Rocket could go 1 mile in just  $\frac{1}{10}$  of a second. How fast did it travel in miles per second?

$\div \frac{1}{10}$

$\frac{1}{10}$ sec	1 mile
1 sec	.....

$\div$  .....

Find the unit rate by dividing the number of miles the rocket travels, 1, by the number of seconds, .....

To divide by  $\frac{1}{10}$  multiply by its reciprocal, .....

a  $1 \div \frac{1}{10} = 1 \times \text{.....} = \frac{10}{1}$

b ..... per .....

Find the unit rates.

Dividing a number by itself is always a quotient of 1.

Your turn

A school custodian has mopped  $\frac{1}{3}$  of a classroom in 5 minutes. How much of a classroom can be mopped per minute?

$\div$  .....

$\frac{1}{3}$ classroom	5 minutes
.....	1 minute

$\div$  .....

Find the unit rate by dividing the the fraction of the classroom mopped,  $\frac{1}{3}$ , by the number of minutes the custodian has mopped,

a .....  $\div$  ..... = .....  $\times$  ..... = .....

b ..... per .....

a Harriet painted  $\frac{1}{3}$  of a vase in 8 minutes. How long will it take Harriet to paint one vase?

÷  
.....

÷  
.....

$\frac{1}{3}$ vase	8 minutes
1 vase	.....

.....

b Using her garden hose, Cameron filled a 4-gallon bucket in  $\frac{5}{6}$  of a minute.  
At what rate does water flow through the hose per minute?

.....

c Marcus walked  $\frac{1}{4}$  of a lap in  $2\frac{1}{2}$  minutes.

Sarai walked  $\frac{2}{5}$  of a lap in  $3\frac{1}{4}$  minutes.

.....

Who walked at a slower rate?

A hotel housekeeper has cleaned  $\frac{1}{3}$  of a first floor room in  $\frac{1}{5}$  of an hour.

Define the rate she is cleaning per hour and per room.

Explain your thinking.

.....

Let's look at this rate in a table.

Using her garden hose, Cameron filled a 4-gallon bucket in just  $\frac{5}{6}$  of a minute. At what rate does water flow through the hose per minute?

We can use a **ratio table** to help us find the unit rate.

÷  
.....

×

.....

.....

×

.....

Gallons	4		
Minutes	$\frac{5}{6}$	$\frac{1}{6}$	1

We can also divide 4 by  $\frac{5}{6}$  as shown to find the unit rate.

To do this, multiply by the **reciprocal**!

$$\frac{4}{1} \div \frac{5}{6} = \frac{4}{1} \times \frac{6}{5} = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}}$$

Divide the numerator by the denominator to convert to a mixed number.

.....

÷

.....

=

.....

..... gallons per minute

## Check your understanding

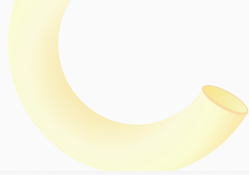
A trampoline park charges \$16.70 for  $\frac{2}{3}$  hour.  
What does is the cost per hour?

.....

Why do I need to try this question  
on my own first?

- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing





# Classroom Tools





## Do you have a group of students who need a boost in math?

Each student could receive personalized lessons every week from our specialist one-on-one math tutors.




- ✓ Differentiated instruction for each student
- ✓ Aligned to your state's standards
- ✓ Scaffolded learning to close gaps

“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,  
Sherwood Forest Elementary, Washington

## Speak to us

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