3 Find Your Stride Length and Walking Rate

Overview and Connection to the Culminating Project

Students will find their walking rates and stride lengths, and use ratios and unit rates to compare the two. They will use this information to determine the time it will take someone to walk to different locations in their tour.

NOTE

You may need to take students outside the classroom to do this activity. If your school has a running track, have students work in their teams to use both of the straight parts of the track.

NOTE

For this activity to be accessible to all students—in particular, students who have difficulty walking or use wheelchairs or other aids for mobility—you may need to make some adjustments to the lesson. There are a number of ways to do this, and discussing options with those students and their families privately is a great way to figure out the best alternative. For example, your student may choose to partner with another student and use his/her walking rates or stride lengths. Or, your student may choose to still participate in all of the data collection and analysis. The only questions that your student might not be able to answer are the questions regarding how many steps it takes to walk the straightaway. Students who use wheelchairs can use their wheelchair to find their "walking" or casual pace and their "running" or fast pace. A third option is to use an activity tracker or phone app. Here are some other resources:

http://www.nchpad.org/368/2064/What~is~a~Pedometer~and~How~Can~I~Benefit~from~Using~One~

http://www.walkforwellnesschallenge.ca/participants_of_all_abilities.php)

Learning Objectives

Students will be able to

- Use unit rates and other ratio reasoning to find missing information.
- Use ratios to convert units of measurement.
- Apply the use of ratios to find information about time, distance, and rate.
- Collaborate with peers.
- Confer with their peers about rates using the academic language of ratios.

Driving Questions

- What is the connection between the number of steps you take and your stride length?
- How do you determine walking rate?

Assessment

Check for Understanding • Unit Rates

Timeline

Lesson 1 • Stride Length

Lesson 2 • Walking Rate

Lesson 3 • Distance, Rate, Time, and Steps

Check for Understanding • Unit Rates

Materials, Supplies, and Technology

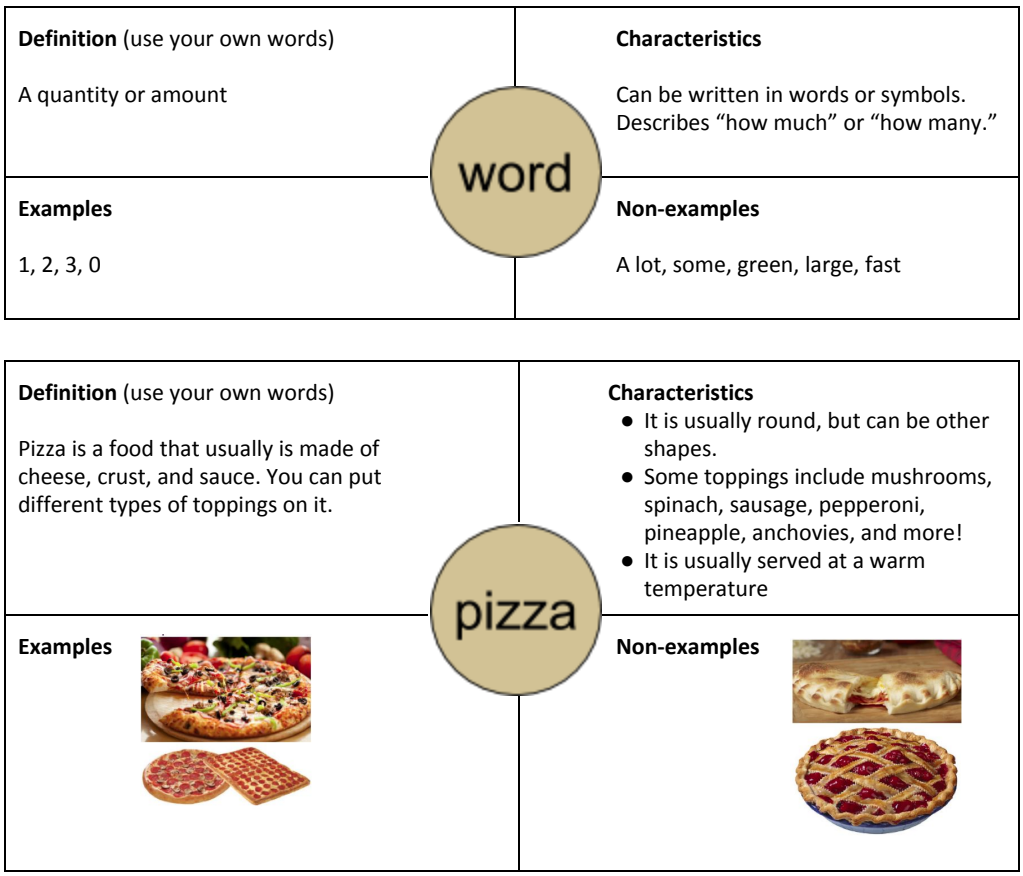
- Measuring tape (for each group)
- Timer (for each group)
- Computer to use Google Maps
- Copies of Check for Understanding • Unit Rates (see Handouts and Assessments)

LESSON 1
STRIDE LENGTH

WARM-UP

Frayer Model

- Show students examples from the sample Frayer Models in their Student Edition. Have them complete the Frayer Models for the words "ratio," "rate," and "unit rate."
- Tell students that for the example and non-examples, they can use either words or drawings.
- Use a gallery walk, class discussion, or other strategy to share, combine, and revise ideas. Compile the revised ideas into large Frayer Models that you post so students can refer to them for the rest of the Learning Task.



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ratio

Definition (use your own words)
Answers will vary.
A ratio is a comparison of two quantities by division.

Characteristics
Answers will vary.
Two quantities, compared by division

Examples
Answers will vary.
dogs to cats 2 : 4
students to computers 3: 1

Non-examples
Answers will vary.
$\frac{2}{3}$ *, 0.5, cats*

rate

Definition (use your own words)
Answers will vary.
A rate is a ratio between two related quantities.

Characteristics
Answers will vary.
Two quantities, compared by division, a ratio, per

Examples
Answers will vary.
50 miles per 2 hours.
4 cats per 2 dogs

Non-examples
Answers will vary.
$\frac{2}{3}$ *, 0.5, cats*

unit rate

Definition (use your own words)
Answers will vary.
A rate expresses two different quantities when they are combined together.

Characteristics
Answers will vary.
per, a quantity per one of a second quantity,

Examples
Answers will vary.
miles per hour
feet per mile

Non-examples
Answers will vary.
$\frac{2}{3}$ *, 0.5, time*

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PROJECT ACTIVITY

Find Your Stride Length

- Tell students to work as a team to decide on a method for finding stride length.
- They should record the plan, answer the questions in the Student Edition, and find and record the stride length of each team member.

NOTE

Discourage students from measuring their stride lengths by taking a single step. Discuss how and why other methods—such as walking a set distance or number of steps (collecting data about multiple steps)—might be more accurate.

Discuss and decide as a team how you will find your stride length. Stride length is how far you walk (in inches) in a single step. Use what you know about ratios to make a plan to find the connection between how many inches you travel and how many steps you take.

Describe Your Plan

Answers will vary.

Represent Your Work

1. Create a double number line to represent the ratio connection between how many **inches** you travel and how many **steps** you take.
   Answers will vary.
2. Create a table to represent the ratio connection between how many **inches** you travel and how many **steps** you take.
   Answers will vary.
3. Use one other method to represent the ratio connection between how many **inches** you travel and how many **steps** you take. (This can be a picture, words, double number line, or something else.)
   Answers will vary.
4. Which way(s) of representing the ratio connection between **inches** and **steps** did you find to be most useful? Why?
   Answers will vary.

STUDENT EDITION

5. Complete the table below to record the stride lengths for the members of your team. Write the stride lengths as **unit rates** with labels.

Student	Stride Length (written as a unit rate)	Student	Stride Length (written as a unit rate)
Answers will vary.			

6. Which student on your team has the longest stride length?
   Answers will vary.
7. Which student on your team would take the most steps to travel 10 feet?
   Answers will vary.
8. Was your answer the same for both questions 6 and 7? Why or why not?
   Answers will vary.
9. What other question could you ask about the data you collected? How might you find the answer to that question?
   Answers will vary.

STUDENT EDITION

Math Curricular Connections

Mathsnacks: Ratey the Math Cat (rates video)

Engage NY: Module 1, Topics A and B

Khan Academy: Intro to rates

Learnzillion: Ratios and Proportional Relationships

LESSON 2
WALKING RATE

WARM-UP

Word Problems

- Have students work on the warm-up activity in their Student Edition.

1. Paul says that 36 inches is equal to 432 feet because 36 times 12 equals 432. Do you agree with his reasoning? Why or why not?

   36 inches is equal to 3 feet. There are 12 inches in a foot, so the ratio is 12 : 1. Because inches are smaller, you should have more inches than feet. Paul should have divided by 12 rather than multiplying by 12.

2. Desiree can do 30 push-ups in 20 seconds. Lucio can do 50 push-ups in 40 seconds. Colette says that Lucio does push-ups at the same rate as Desiree because 50 minus 30 is 20, and 40 minus 20 is 20. Do you agree with Colette's reasoning? Why or why not?

   Colette subtracted instead of divided.
   Desiree's rate is 30 push-ups in 20 seconds, or 1.5 per second.
   Lucio's rate is 50 push-ups in 40 seconds, or 1.25 per second.
   Desiree's rate is faster. She will do 60 push-ups in 40 seconds.

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PROJECT ACTIVITY

Find Your Walking Rate

- Have the teams find the walking rate of each team member.
- They should record the walking rate and answer the questions in the Student Edition.

Use the timer and tape measure to find the walking rate in feet per minute of each member of your team. Walking rate is how far you walk per minute. Determine the distance your team will walk. Time three trials of each team member walking that distance.

Student: _____

Distance Traveled: _____

Trial	Time
1	*Answers will vary.*
2	
3	

- What is this student's average (mean) time?
  Answers will vary.
- Using the average time, how many feet does this student walk in 1 minute?
  Answers will vary.

STUDENT EDITION

Math Curricular Connections and Mini-Lessons

Mathsnacks: Ratey the Math Cat (rates video)

Engage NY: Module 1, Topics A and B

Khan Academy: Intro to rates

Learnzillion: Ratios

LESSON 3

DISTANCE, RATE, TIME, AND STEPS

WARM-UP

Price of Bananas

- Have students work on the warm-up activity in their Student Edition.

Nick wants to complete the table below.

Price	Number of Bananas
$2.67	3
$5.34	6
$13.35	15
$18.69	21

He says that 15 bananas must cost $10.68 because you multiply 5.34 times 2 to get the answer.
Do you agree with his reasoning? Why or why not? If not, provide the correct answer in the table.

Nick needs to multiply by 5, not 2. 15 is 5 times 3. So, $13.35 is 5 times $2.37.

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PROJECT ACTIVITY

Distance, Rate, Time, and Steps

- Tell students that they will use information from the Learning Tasks 2 and 3 to determine the number of steps and time it will take them to walk between three important locations in the tour.
- They may need to convert the units of measure of the distances they found in the last Learning Task.
- Have them fill in the tables in their Student Edition.

1. Use your information from Learning Task 2 and Lessons 1 and 2 in this Learning Task to complete the tables below.

2. In the first table, write your walking rate and stride length as a unit rate.

3. In the second table, record the distances between three points of interest at your tour location (you found this in the previous Learning Task). Then determine the number of steps and amount of time it would take you to walk the distances. You will use this information for your Community Tour Project.

Your Walking Rate (written as unit rate)	*Answers will vary.*
Your Stride Length (written as unit rate)	

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Starting Point	Stopping Point	Walking Distance (in feet)	Number of Steps It Would Take You (using your stride length)	Amount of Time It Would Take You (walking at your rate)
Answers will vary.				

4. Show how you found the number of steps it would take for you to walk one of these distances.

   Answers will vary.

5. Show how you found the amount of time it would take for you to walk one of these distances.

   Answers will vary.

STUDENT EDITION

Math Curricular Connections

Mathsnacks: Ratey the Math Cat (rates video)

Engage NY: Module 1, Topics A and B

Khan Academy: Intro to rates

Learnzillion: Ratios and Proportional Relationships

CHECK FOR UNDERSTANDING

Unit Rates

- Distribute the Learning Task 3 assessment—Check for Understanding • Unit Rates.

Magda left her homework on top of a table, and her pet dog ate the top half of the paper! Help her figure out what her unit rates are so she doesn't have to measure them again. Show how you did this.

Your Walking Rate (written as unit rate)	
Your Stride Length (written as unit rate)	

Starting Point	Stopping Point	Walking distance (choose the best unit)	Number of Steps It Would Take You (using your stride length)	Amount of Time It Would Take You (walking at your rate)
Home	Pet Food Store	1.2 miles	3,456 steps	23 minutes

Show:

Walking rate

1.2 miles in 23 minutes
Change miles to feet (5,280 • 1.2 = 6,336)
6,336 feet in 23 minutes
Magda's walking rate is approximately 275.49 feet per minute.

Stride length

1.2 miles in 3,456 steps
Change miles to inches (5,280 • 1.2 • 12 = 72,032)
72,032 inches in 3,456 steps
Magda's stride length is 22 inches per step.

WARM-UP

Working with Scale

Have students complete the warm-up activity.

A scaled map is a special map in which the distances are in a fixed ratio to the distances in real life. For example, every square on a map's grid could represent 1 mile in real life. The ratio would be 1 square : 1 mile.

1. Record the real distances between the points of interest at your tour location. You found these during Learning Task 2.
2. Using a full sheet of graph paper, decide how many feet or meters each box will represent. Each team member should use a different ratio (for example, 1 box : 1 foot, or 1 box : 20 feet). Choose a ratio that will make your map of the three points of interest large enough to see clearly, but small enough to fit on your paper.
3. Draw the points of interest on your graph paper "to scale" (that is, using your scale).

Starting Point	Stopping Point	Real Distance	Map Distance

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PROJECT ACTIVITY

Work on the Culminating Project

- Make sure students create a map and a tour guide for their chosen location.
- Give student teams time to finish their Community Tour Culminating Project. Refer them to the rubric and checklist in Learning Task 1. Students should make sure that they have completed all the items on the checklist, and have assessed their project using the rubric. Then have students present their tour to the class either through presentations or a gallery walk.

> - Create a map and a tour guide for your chosen location. Your team will present in class to your classmates (and possibly to outside guests and other teachers). Your audience might also include other teachers, outside guests, and other members of the community.
> - Finish your work on the Culminating Project. Make sure you have completed all the items on the Community Tour Culminating Project checklist and assessed your project using the Community Tour Rubric (both the checklist and rubric are from Learning Task 1, Lesson 1).

STUDENT EDITION

INDIVIDUAL PERFORMANCE TASK (including a Group Preview)

- Arrange students in groups and have them work on the Group Preview (see Handouts and Assessments). An answer key for the Group Preview is found in the Overview section of this Teacher Edition. If you feel it would be helpful, discuss the Group Preview.
- Then administer the Individual Performance Task (see Handouts and Assessments). A rubric and answer key are provided in the Overview section of this Teacher Edition.