Grade Level/Course: 7

Lesson/Unit Plan Name: Identifying Proportional and Nonproportional Relationships in Tables and in Graphs

Rationale/Lesson Abstract: This lesson focuses on students examining the characteristics of proportional relationships and determining when and why two quantities are actually in a proportional relationship.

Timeframe: 2 class periods with a possible 1 class extension

Common Core Standard(s):

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.

Mathematical Practices:

MP.1 …students solve problems involving ratios and rates and discuss how they solved them.

MP.3 Students construct arguments with verbal or written explanations accompanied by models, graphs, and tables. They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. Students should be encouraged to answer questions such as these: "How did you get that?" "Why is this true?" "Does that always work?"

MP.4 Proportional relationships present opportunities for modeling. For example, for modeling purposes, the number of people who live in an apartment building might be taken as proportional to the number of stories in the building. Students should be encouraged to answer questions such as, "What are some ways to represent the quantities?" or "How might it help to create a table, chart, or graph?"

Day 1: Identifying Proportional Relationships in Tables

Instructional Resources/Materials: Pencil, paper, handout

Prior Knowledge: Simplifying ratios, proportional relationships

Activity/Lesson (20-25 minutes):

Students will work on completing tables for Example 1 independently (5 minutes). Students will then collaborate with a partner (if seated in pairs) or their group to discuss the results of their tables and work on each of the follow-up questions together (10 minutes). Group norm: no student is allowed to proceed to the next question until everyone has written down an answer to the current question. Lastly, students will share their solutions with the whole class (5-10 minutes). There are often times multiple ways that a problem may have been completed or explained, so the teacher should circulate during the group work time to select students who have differing approaches to present to the class.

EXAMPLE 1: Running the Race

You have decided to join a long distance running team. There are two teams that you can join. Team A runs at a constant rate of 3 miles per hour. Team B runs 4 miles the first hour and then 2 miles per hour after that.

Your task: Complete the table for each team showing the distances that would be run for times of 1, 2, 3, 4, 5, and 6 hours. Using your tables, answer the questions that follow.

Team A	
Time (hrs)	Distance (miles)
1	3
2	6
3	9
4	12
5	15
6	18

Team B	
Time (hrs)	Distance (miles)
1	4
2	6
3	8
4	10
5	12
6	14

1) For which team is distance proportional to time? Explain your reasoning.

Team A since all the ratios comparing distance to time are equivalent. The equivalent ratio is 3. Every measure of time can be multiplied by 3 to give the corresponding measures of distance.

2) Explain how you know the distance for the other team is not proportional to time?

The ratios are not equivalent for Team B. The ratios are 4, 3, 8/3, 2.5, 12/5, and 14/6 (7/3). Every measure of time cannot be multiplied by a constant to give each corresponding measure of distance.

3) If the members on the team ran for 10 hours, how far would each member run on each team?

Team A = 30 miles
Team B = 22 miles

4) If the race were 3 miles long, which team would win? Explain.

Team B would win because more distance was covered in less time.

5) If the race were 7 miles long, which team would win? Explain.

Team A would win because more distance was covered in less time.

Example 1 Takeaway: Two quantities are **proportional** if they have a constant ratio or unit rate. For relationships in which the ratio is not constant, the two quantities are **nonproportional**.

EXAMPLE 2 (5 minutes): Andrew earns $18 per hour mowing lawns. Is the amount of money he earns proportional to the number of hours he spends mowing? Complete the table and provide an explanation of your reasoning.

Earnings ($)	18	36	54	72
Time (h)	1	2	3	4

Prompting questions from teacher:

- **What do you need to find?** *Whether the amount of money he earns is proportional to the number of hours he spends mowing.*

- **How would you represent the amount of money Andrew earns per hour as a unit ratio?**

$$\frac{\$18}{1 \text{ hour}}$$

- **How would you determine how much he makes for each number of hours worked?**
  Multiply the number of hours worked by $18. Or add an additional $18 for each hour worked.

- **What will you need to do to determine if the relationship is proportional?**
  Write the relationship between the amount he earned and hours worked as a ratio in simplest form for each number of hours worked

$$\frac{\text{amount earned}}{\text{number of hours}} \rightarrow \frac{18}{1} \text{ or } 18 \qquad \frac{36}{2} \text{ or } 18 \qquad \frac{54}{3} \text{ or } 18 \qquad \frac{72}{4} \text{ or } 18$$

- **Are the two quantities proportional? Justify your thinking.**
  All of the ratios between the two quantities can be simplified to 18. The amount of money he earns is proportional to the number of hours he spends mowing.

EXAMPLE 3 (5 minutes): Ticket Servant charges $7 per baseball game ticket plus a $3 processing fee per order. Is the cost of an order proportional to the number of tickets ordered? Complete the table and provide an explanation for your reasoning.

Cost ($)	10	17	24	31
Tickets Ordered	1	2	3	4

Prompting questions from teacher:

- **What do you need to find?** *If the cost of an order is proportional to the number of tickets.*

- **How would you represent the cost of ordering one ticket as a unit ratio?** $\frac{\$10}{1 \text{ ticket}}$

- **How would you determine the cost of ordering two tickets?**
  Figure out the cost of 2 tickets ($14) and then add the $3 processing fee. Or add $7 to the total cost of ordering one ticket.

- **What will you need to do to determine if the relationship is proportional?**
  Write the relationship between the cost and number of tickets as a ratio in simplest form for each number of tickets.

$$\frac{\text{cost of order}}{\text{tickets ordered}} \rightarrow \frac{10}{1} \text{ or } 10 \qquad \frac{17}{2} \text{ or } 8.5 \qquad \frac{24}{3} \text{ or } 8 \qquad \frac{31}{4} \text{ or } 7.75$$

- **Are the two quantities proportional? Justify your thinking.**
  Since the ratios of the two quantities are not the same, the cost of an order is not proportional to the number of tickets ordered.

YOU TRY 1 (7 minutes): The tables shown below represent the number of pages Miguel and Karlee read over time. Write down at least three observations you can make about the two tables (hint: proportional and/or nonproportional relationships should be included in at least two of the observations). Provide justification for your observations.

Pages Miguel Read	2	4	6
Time (min)	5	10	15

Pages Karlee Read	3	4	7
Time (min)	5	10	15

- *All of the ratios between Miguel's quantities are* $\frac{2}{5}$ *so Miguel's reading rate represents a proportional relationship.*

$$\frac{\text{pages}}{\text{minutes}} \rightarrow \frac{2}{5} \qquad \frac{4}{10} \text{ or } \frac{2}{5} \qquad \frac{6}{15} \text{ or } \frac{2}{5}$$

- *The ratios between Karlee's quantities are not the same so Karlee's reading rate does not represent a proportional relationship.*

$$\frac{\text{pages}}{\text{minutes}} \rightarrow \frac{3}{5} \qquad \frac{4}{10} \text{ or } \frac{2}{5} \qquad \frac{7}{15}$$

- *Miguel and Karlee read the same amount of pages after 10 minutes.*
- *Karlee read more pages than Miguel after 15 minutes.*

Extension questions for You Try 1:

a) How many pages do you think Miguel will have read after 20 minutes? How do you know?
Miguel will likely read 8 pages after 20 minutes based on his reading rate of 2 pages every 5 minutes.

b) How many pages do you think Karlee will have read after 20 minutes? How do you know?
It is impossible to determine how many pages she will have read based on the information given.

c) Why is it more difficult to determine how many pages Karlee will read?
Because her reading rate is not constant.

YOU TRY 2 (7 minutes): The tables shown below represent the amount of money earned per hour for John and Jackie.

John's Earnings ($)	12	20	31
Time (h)	1	2	3

Jackie's Earnings ($)	12	24	36
Time (h)	1	2	3

Question 1: Which situation represents a proportional relationship between the hours worked and the amount earned? Provide justification for each of the tables.

The ratios between John's quantities are not the same so John's earning rate does not represent a proportional relationship.

$$\frac{\text{earnings (\$)}}{\text{hours (h)}} \rightarrow \frac{12}{1} \text{ or } 12 \qquad \frac{20}{2} \text{ or } 10 \qquad \frac{31}{3}$$

All of the ratios between Jackie's quantities are 12 so Jackie's earning rate represents a proportional relationship.

$$\frac{\text{earnings (\$)}}{\text{hours (h)}} \rightarrow \frac{12}{1} \text{ or } 12 \qquad \frac{24}{2} \text{ or } 12 \qquad \frac{36}{3} \text{ or } 12$$

Question 2: How much would each earn if they worked a fourth hour?

Because John's earning rate is not constant, we cannot determine how much he would make after four hours of work. Jackie would make $48.

Closing question: How does knowing whether two quantities are proportional help answer questions about the quantities? For example, if we know 1 cup = 8 oz, what does that allow us to do?

Understanding the relationship can allow you to find missing quantities. For the above example, one cup can be substituted for 8 ounces or vice versa.

EXIT TICKET (5 minutes): Sara ran laps around a gym. Her times are shown in the table below. Sara thinks the number of laps is proportional to the time because the number of laps always increases by 2. Is she correct? Provide justification for your answer.

Time (min)	2	3	4	5
Laps	3	5	7	9

It is not proportional because the ratio of laps to time is not consistent.

$$\frac{\text{number of laps}}{\text{time (min)}} \rightarrow \frac{3}{2} \text{ or } 1.5 \quad \frac{5}{3} \quad \frac{7}{4} \text{ or } 1.75 \quad \frac{9}{5} \text{ or } 1.8$$

Day 2: Identifying Proportional Relationships in Graphs

Instructional Resources/Materials: Pencil, paper, ruler, handout

Prior Knowledge: The coordinate plane, plotting points, quadrants, ordered pairs, x- axis, y-axis, origin, determining proportional relationships in tables.

Activity/Lesson:

Opening activity (10 minutes):

A group (or pair) of students will receive all four half sheets of tables and graphs. For each problem, students will determine whether the two quantities in the table represent a proportional relationship. When they are finished, they are to set aside the problems for the time being. **STUDENTS DO NOT GRAPH THE INFORMATION FROM THE TABLES… YET.**

The Coordinate Plane Review (5-7 minutes):

Teacher should project a coordinate plane (doc cam or computer) and have students help label the various parts of the grid (the four quadrants, the axes).

Some questions to discuss:

- **What is an ordered pair?**
  A pair of numbers, such as (1, 3) used to locate or graph points on a coordinate grid.

- **What is the origin and where is it located?**
  The point where the x and y axis intersect, at ordered pair (0, 0).

- **When we are plotting a point, where do we count from?**
  The origin, (0, 0).

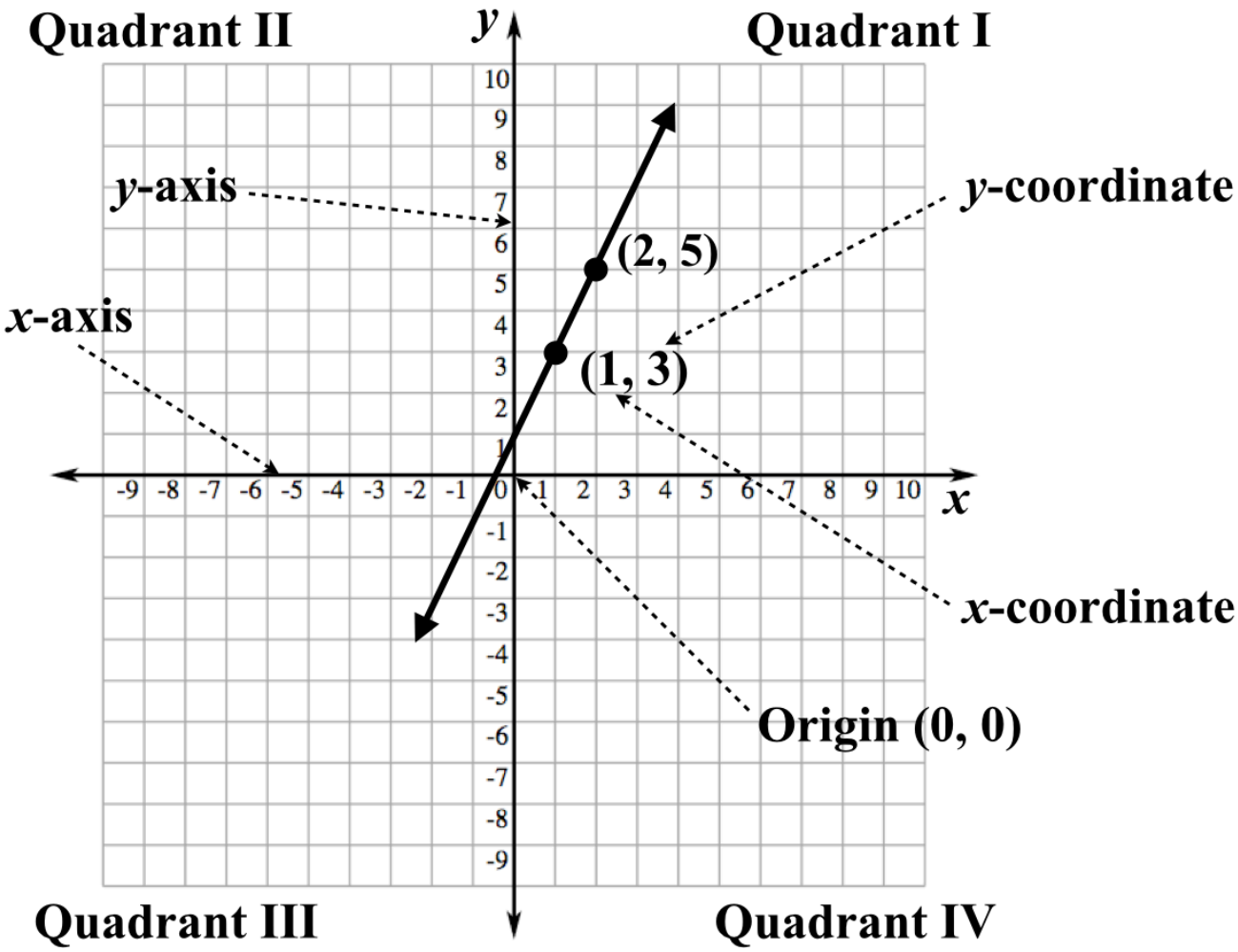
- **Why are we only focusing on quadrant 1?**
  All of the values are positive. Since we are measuring or counting quantities (number of video games rented and cost), the numbers in our ratios will positive.

Show students how to plot the point (1, 3) and label the *x*- and *y*- coordinate.

- **How would we plot the point, (2, 5)?**
  From the origin, we go 2 to the right on the x-axis and then up 5 on the y-axis.

After graphing the points (1, 3) and (2, 5), connect the two points on the coordinate plane.

- **How would you describe the graph?**
  The points form a straight line.



Students should locate their piles of tables and refer to Example 1 (video game example).

From a Table to Graph – Examples 1 and 2 (5-10 minutes):

EXAMPLE 1: A swimming pool is currently filled with one gallon of water. A garden hose is used to fill the pool at a constant rate. From the information from the table, determine whether the number of gallons is proportional to the number of minutes.

Filling the Swimming Pool	
Time (Minutes)	Number of Gallons
1	3
2	5
3	7
4	9

Is the relationship proportional or nonproportional? Provide justification for your reasoning.

It is not proportional because the ratio of cost to games is not consistent.

$$\frac{\text{number of gallons}}{\text{time (min)}} \rightarrow \frac{3}{1} \text{ or } 3 \quad \frac{5}{2} \text{ or } 2.5 \quad \frac{7}{3} \quad \frac{9}{4} \text{ or } 2.25$$

Teacher should model how to graph the information shown in the table.

- **Before you can graph, what do you need to know?**
  The ordered pairs.

- **How can you find the ordered pairs?**
  Use the table.

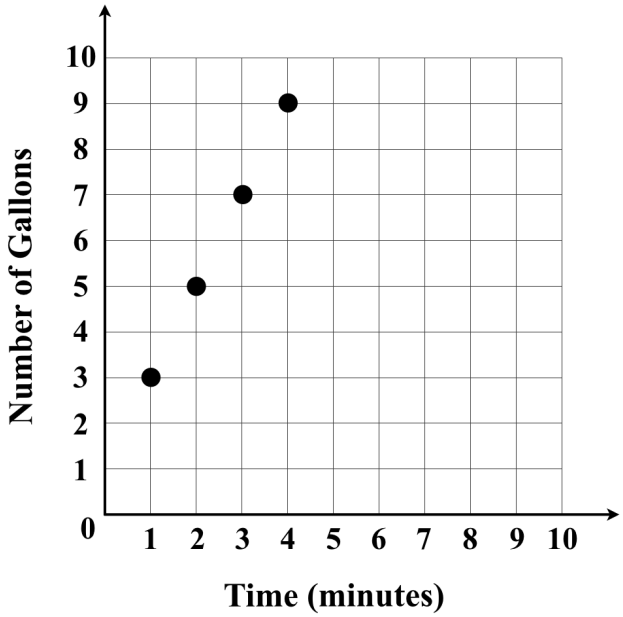
- **What will the *x*-values represent?**
  The time in minutes.

- **What will the *y*-values represent?**
  The number of gallons in the pool.

- **How do we plot the first ratio pair?**
  If the relationship is 1:3, where 1 represents 1 minute and 3 is the number of gallons, then from the first point, we go 1 to the right on the x-axis and then up 3 on the y-axis.

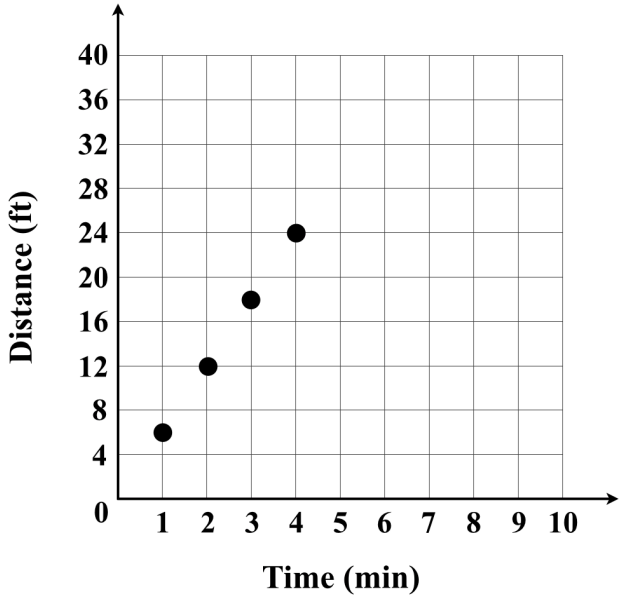
- **How do we plot the second ratio pair?**
  If the relationship is 2:5, where 2 represents 2 minutes and 5 is the number of gallons, then from the first point, we go 2 to the right on the x-axis and then up 5 on the y-axis.

Students should graph the rest of the points (3, 7) and (4, 9).



EXAMPLE 2: The slowest mammal on Earth is the tree sloth. It moves at a speed of 6 feet per minute. Complete the table, determine whether the number of feet the sloth moves is proportional to the number of minutes it moves, and explain your reasoning.

Time (min)	1	2	3	4
Distance (ft)	6	12	18	24



Is the relationship proportional or nonproportional? Provide justification for your reasoning.

It is proportional because the ratio between the distance and time is always 6.

$\frac{\text{distance (ft)}}{\text{time (min)}} \rightarrow \frac{6}{1}$ or 6 $\quad \frac{12}{2}$ or 6 $\quad \frac{18}{3}$ or 6 $\quad \frac{24}{4}$ or 6

At this point, if students are comfortable graphing (in pairs or in groups), they should graph Example 2. If the majority of the students are not comfortable yet, the teacher should graph the points for Example 2 with them.

Comparing the Graphs – Examples 1 and 2 (7 minutes):

Have students compare Examples 1 and 2 side by side.

Have the students make observations about the two graphs (Example 1 - nonproportional relationship and Example 2 - proportional relationship) and record the statements side by side. (Using a doc cam, white board, or poster.)

Nonproportional Relationship (Ex. 1)	Proportional Relationship (Ex. 2)
• points all fall on a straight line • line doesn't go through the origin	• points all fall on a straight line • line goes through the origin

- **What are some similarities between the two examples?**
  Both have points that lie on a straight line.

- **What are some differences between the two examples?**
  The line for Example 1 does not go through the origin, but the line for Example 2 does.

- **Why are the lines straight?**
  For every increase of 1 on the x-axis, there is an increase of the same amount on the y-axis.

- **In example 1, are we able to infer how much a fifth game would cost?**
  Yes, the cost of each rental goes up by $2 for each rental (after the first rental) so 5 games would cost $11.

- **In example 2, can we infer how far the sloth would walk after five minutes?**
  Yes, the sloth walks 6 ft per minute according to the table so after five minutes, the sloth would walk 30 feet.

- **What can we infer about graphs of two quantities that are proportional to each other?**
  The graph will be a straight line that goes through the origin.

- **Based on these two graphs, what common error might a student make when deciding whether a graph of the quantities represents a proportional relationship?**
  A student might believe that both graphs show a proportional relationship because the points lie on a straight line, but the line of a graph that represents a proportional relationship must also go through the origin.

Making Predictions – Examples 3 and 4 (10 minutes):

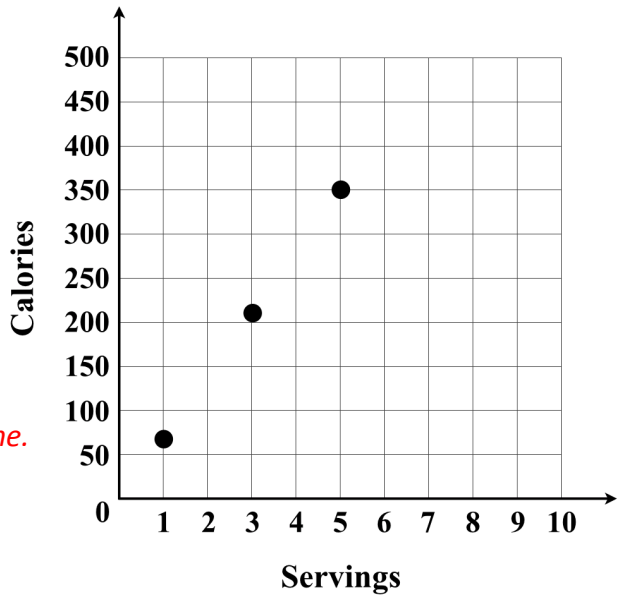
Before students graph the information from the table in Example 3, the teachers should ask the following questions.

- **For Example 3, does the table represent a proportional relationship?**
  Yes.

- **If we graph the information from the table, what can you predict about the graph?**
  Share your thoughts with a neighbor.
  The points will lie on a straight line and will go through the origin.

EXAMPLE 3: A particular brand of fruit cups has 70 calories in 1 serving, 210 calories in 3 servings, and 350 calories in 5 servings. Complete the table, determine whether the relationship between the two quantities are proportional, and explain your reasoning.

Calories in Fruit Cups	
Servings	Calories
1	70
3	210
5	350



Is the relationship proportional or nonproportional? Provide justification for your reasoning.

It is proportional because all of the ratios are the same.

$\frac{\text{calories}}{\text{servings}} \rightarrow \frac{70}{1}$ or 70 $\quad \frac{210}{3}$ or 70 $\quad \frac{350}{5}$ or 70

- **Was your prediction correct?**
  Yes, the points lie on a straight line and the line goes through the origin.

- **Are we able to infer how many calories 6 servings might have?**
  Yes. There are 70 calories per serving, so 6 servings would have 420 calories.

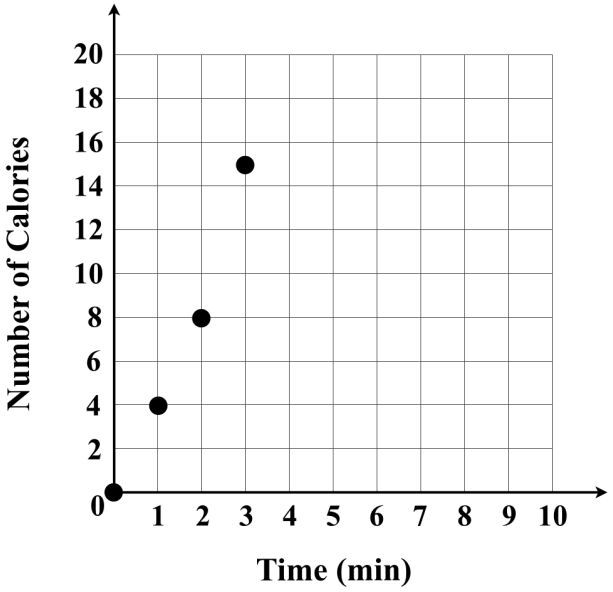
Before students graph the information from the table in Example 4, the teachers should ask the following questions.

- **For Example 4, does the table represent a proportional relationship?**
  No.

- **If we graph the information from the table, what can you predict about the graph? Share your thoughts with a neighbor.**
  The points will lie on a straight line and will not go through the origin.

EXAMPLE 4: The table shows the number of calories an athlete burned per minute of exercise. Use the table to determine whether the number of calories burned is proportional to the number of minutes.

Calories Burned	
Number of Minutes	Number of Calories
0	0
1	4
2	8
3	15



Is the relationship proportional or nonproportional? Provide justification for your reasoning.

It is not proportional because the ratio of calories burned to time is not consistent.

$$\frac{\text{number of calories}}{\text{time (min)}} \rightarrow \frac{4}{1} \text{ or } 4 \qquad \frac{8}{2} \text{ or } 4 \qquad \frac{15}{3} \text{ or } 5$$

- **Was your prediction correct?**
  No, the points do not lie on a straight line, but the points go through the origin.

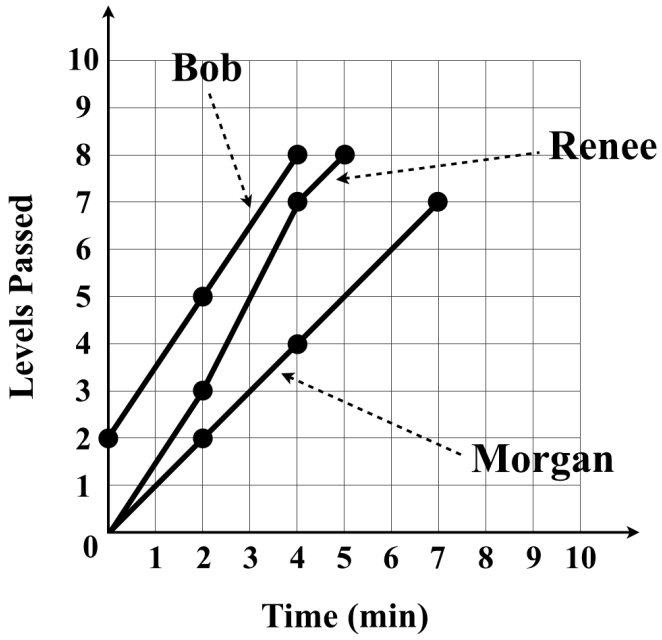
- **Are we able to infer how many calories the athlete might burn after 4 minutes?**
  No. The ratios of calories to minutes are not equal.

- **If we were to draw a line through the points, would we be able to extend the line?**
  No. Because the ratios are not equal, we cannot accurately predict where the next point would be.

- **Are there any conclusions we can make about the graphs of two quantities that are proportional to each other?**
  When two proportional quantities are graphed on a coordinate plane, the graph is represented by a straight line through the origin.

- **Based on all four graphs, what common errors might a student make when deciding whether a graph of the quantities represents a proportional relationship?**
  Points that lie on a straight line does not necessarily mean the graph represents a proportional relationship. The graph must also go through the origin. In addition, a graph could go through the origin, but the points must be a straight line in order for the quantities to be in a proportional relationship.

EXIT TICKET (5 minutes): Which video game player(s) represents a proportional relationship between the time and the number of levels passed? Provide justification for each of the three graphs.



Morgan's graph is a straight line through the origin and therefore represents a proportional relationship.

Renee's graph is not a straight line so the relationship between time and levels passed is not proportional.

Bob's graph is a straight line, but does not pass through the origin so it does not represent a proportional relationship.

Day 3 (Extension): Identifying Proportional Relationships – Group Activity

Instructional Resources/Materials: Pencils, poster paper, scratch paper, graph paper, ruler, post-its, envelopes with the problem and ratios inside.

Prior Knowledge: Content from Lessons 1 and 2.

Activity/Lesson: This is an extension of Lessons 1 and 2. Students will be working in groups to create tables and graph the information in the tables to identify whether or not the two quantities represented are proportional to each other.

Opening activity (10 minutes):

In their groups (of three or four students), hand out the materials needed for this activity.

- Have the groups take out the contents of the envelope and state the problem
- Have the groups arrange the ratios "in order", create a table, and graph the information
- Students should use multiple methods to show whether the quantities represented in the envelope are proportional to each other or not
- Divide the poster paper into four quadrants (might be easiest to just have students fold the poster paper into quarters)
- Label as follows: Quadrant 1 – Table; Quadrant 2 – Problem; Quadrant 3 – Graph; Quadrant 4 – Proportional or Not, Explain

Working Collaboratively (15 minutes):

Students will have 15 minutes to discuss the problem and record their responses onto the poster paper. Teacher should circulate and praise students who are working collaboratively, dialoguing about the math associated with the problem, engaged in the conversation, making posters that clearly present their findings (visually appealing). Have students place their finished posters around the classroom. Feel free to designate where each group puts up their poster (teacher could put up signs around the classroom for each group).

Gallery Walk (15 minutes – 3 minutes per poster):

Have each group of students start at a different poster (one group per poster if possible). They have 3 minutes to write any thoughts on post-its and stick them to the posters. Have students answer the questions on their Gallery Walk Handout.

Teacher should let students know when to move on to the next poster.

Closing (10 minutes):

- **Why is it beneficial to make posters with other students? Why not simply do this activity on your own?**

  We can talk about the problem with others and learn from our conversation about the problem. Some students might come up with something we hadn't thought of. We're able to share information with the others.

- **What does it mean for a display to be both visually appealing and informative?**

  The reader/viewer should be able to find data and results fairly quickly. Looking at and reading the poster should be somewhat enjoyable (easy to understand).

- **How much time did your group spend on the content of your poster versus the time spent making the poster visually appealing? Which is more important?**

  They're both important. It's important for the information to be accurate, but it's also important for others to see how we determined our answer. If they don't understand our thought process from our poster, we didn't do a good job of presenting the information.

Identifying Proportional Relationships in Tables

Name: _____

7.RP.2a Decide whether two quantities are in a proportional relationships

Date: _____

Period: _____

EXAMPLE 1: Running the Race

You have decided to join a long distance running team. There are two teams that you can join. Team A runs at a constant rate of 3 miles per hour. Team B runs 4 miles the first hour and then 2 miles per hour after that.

Your task: Complete the table for each team showing the distances that would be run for times of 1, 2, 3, 4, 5, and 6 hours. Using your tables, answer the questions that follow.

Team A	
Time (hrs)	Distance (miles)
1	3
2	
3	
4	
5	
6	

Team B	
Time (hrs)	Distance (miles)
1	4
2	
3	
4	
5	
6	

a) For which team is distance proportional to time? Explain your reasoning.

b) Explain how you know the distance for the other team is not proportional to time?

c) If the members on the team ran for 10 hours, how far would each member run on each team?

d) If the race were 3 miles long, which team would win? Explain.

e) If the race were 7 miles long, which team would win? Explain.

EXAMPLE 2: Andrew earns $18 per hour mowing lawns. Is the amount of money he earns proportional to the number of hours he spends mowing? Complete the table and provide an explanation of your reasoning.

Earnings ($)				
Time (h)				

EXAMPLE 3: Ticket Servant charges $7 per baseball game ticket plus a $3 processing fee per order. Is the cost of an order proportional to the number of tickets ordered? Complete the table and provide an explanation for your reasoning.

Cost ($)				
Tickets Ordered				

YOU TRY 1: The tables shown below represent the number of pages Miguel and Karlee read over time. Write down at least three observations you can make about the two tables (hint: proportional and/or nonproportional relationships should be included in at least two of the observations). Provide justification for your observations.

Pages Miguel Read	2	4	6
Time (min)	5	10	15

Pages Karlee Read	3	4	7
Time (min)	5	10	15

YOU TRY 1: Extension Questions

a) How many pages do you think Miguel will have read after 20 minutes? How do you know?

b) How many pages do you think Karlee will have read after 20 minutes? How do you know?

c) Why is it more difficult to determine how many pages Karlee will read?

YOU TRY 2: The tables shown below represent the amount of money earned per hour for John and Jackie.

John's Earnings ($)	12	20	31
Time (h)	1	2	3

Jackie's Earnings ($)	12	24	36
Time (h)	1	2	3

Question 1: Which situation represents a proportional relationship between the hours worked and the amount earned? Provide justification for each of the tables.

Question 2: How much would each earn if they worked a fourth hour?

Closing question: How does knowing whether two quantities are proportional help answer questions about the quantities? For example, if we know 1 cup = 8 oz, what does that allow us to do?

EXIT TICKET: Sara ran laps around a gym. Her times are shown in the table below. Sara thinks the number of laps is proportional to the time because the number of laps always increases by 2. Is she correct? Provide justification for your answer.

Time (min)	2	3	4	5
Laps	3	5	7	9

EXIT TICKET: Sara ran laps around a gym. Her times are shown in the table below. Sara thinks the number of laps is proportional to the time because the number of laps always increases by 2. Is she correct? Provide justification for your answer.

Time (min)	2	3	4	5
Laps	3	5	7	9

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Time (min)	2	3	4	5
Laps	3	5	7	9

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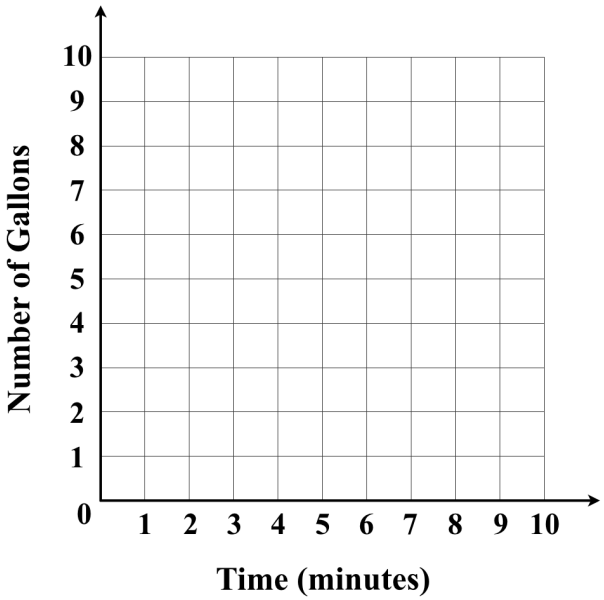
Time (min)	2	3	4	5
Laps	3	5	7	9

EXAMPLE 1: A swimming pool is currently filled with one gallon of water. A garden hose is used to fill the pool at a constant rate. From the information from the table, determine whether the number of gallons is proportional to the number of minutes.

Filling the Swimming Pool	
Time (Minutes)	Number of Gallons
1	3
2	5
3	7
4	9

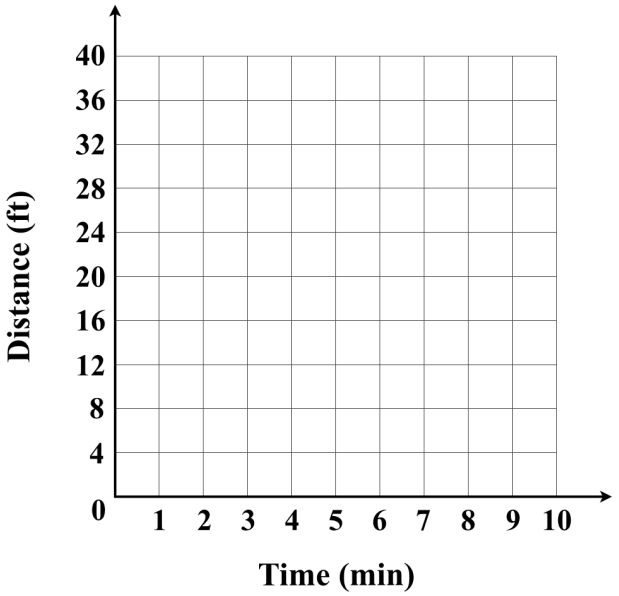
Is the relationship proportional or nonproportional? Provide justification for your reasoning.



EXAMPLE 2: The slowest mammal on Earth is the tree sloth. It moves at a speed of 6 feet per minute. Complete the table, determine whether the number of feet the sloth moves is proportional to the number of minutes it moves, and explain your reasoning.

Time (min)	1	2	3	4
Distance (ft)	6			

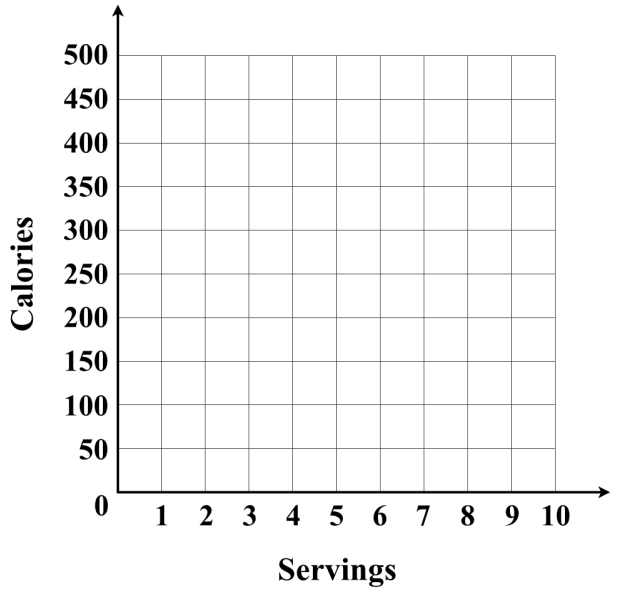
Is the relationship proportional or nonproportional? Provide justification for your reasoning.



EXAMPLE 3: A particular brand of fruit cups has 70 calories in 1 serving, 210 calories in 3 servings, and 350
calories in 5 servings. Complete the table, determine whether the relationship between the two quantities are proportional, and explain your reasoning.

Calories in Fruit Cups	
Servings	Calories
1	

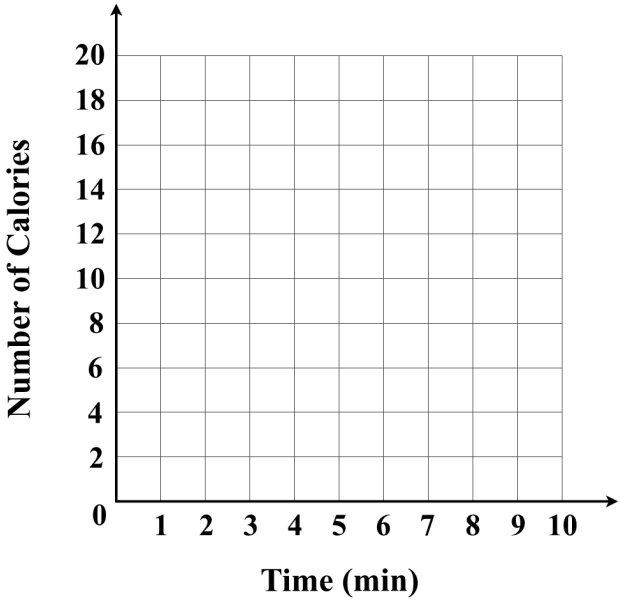
Is the relationship proportional or nonproportional? Provide justification for your reasoning.



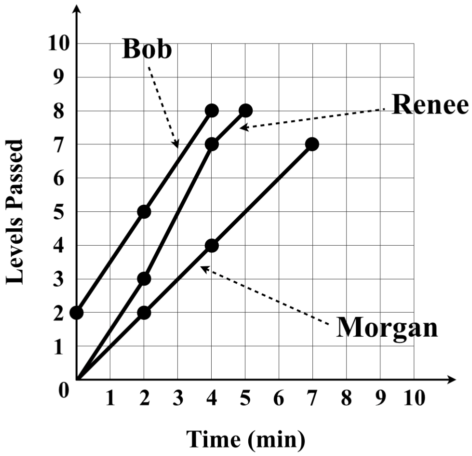
EXAMPLE 4: The table shows the number of calories an athlete burned per minute of exercise. Use the table to determine whether the number of calories burned is proportional to the number of minutes.

Calories Burned	
Number of Minutes	Number of Calories
0	0
1	4
2	8
3	15

Is the relationship proportional or nonproportional? Provide justification for your reasoning.



EXIT TICKET: Which video game player(s) represents a proportional relationship between the time and the number of levels passed? Provide justification for each of the three graphs.



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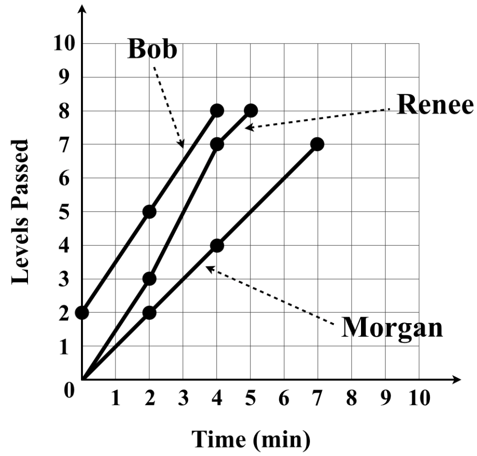

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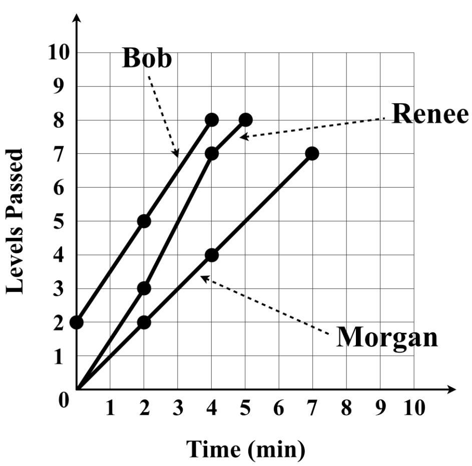
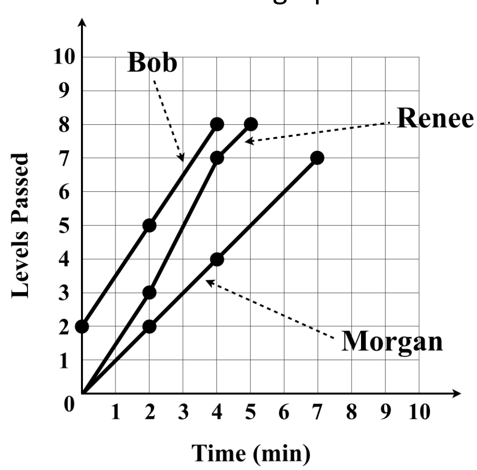
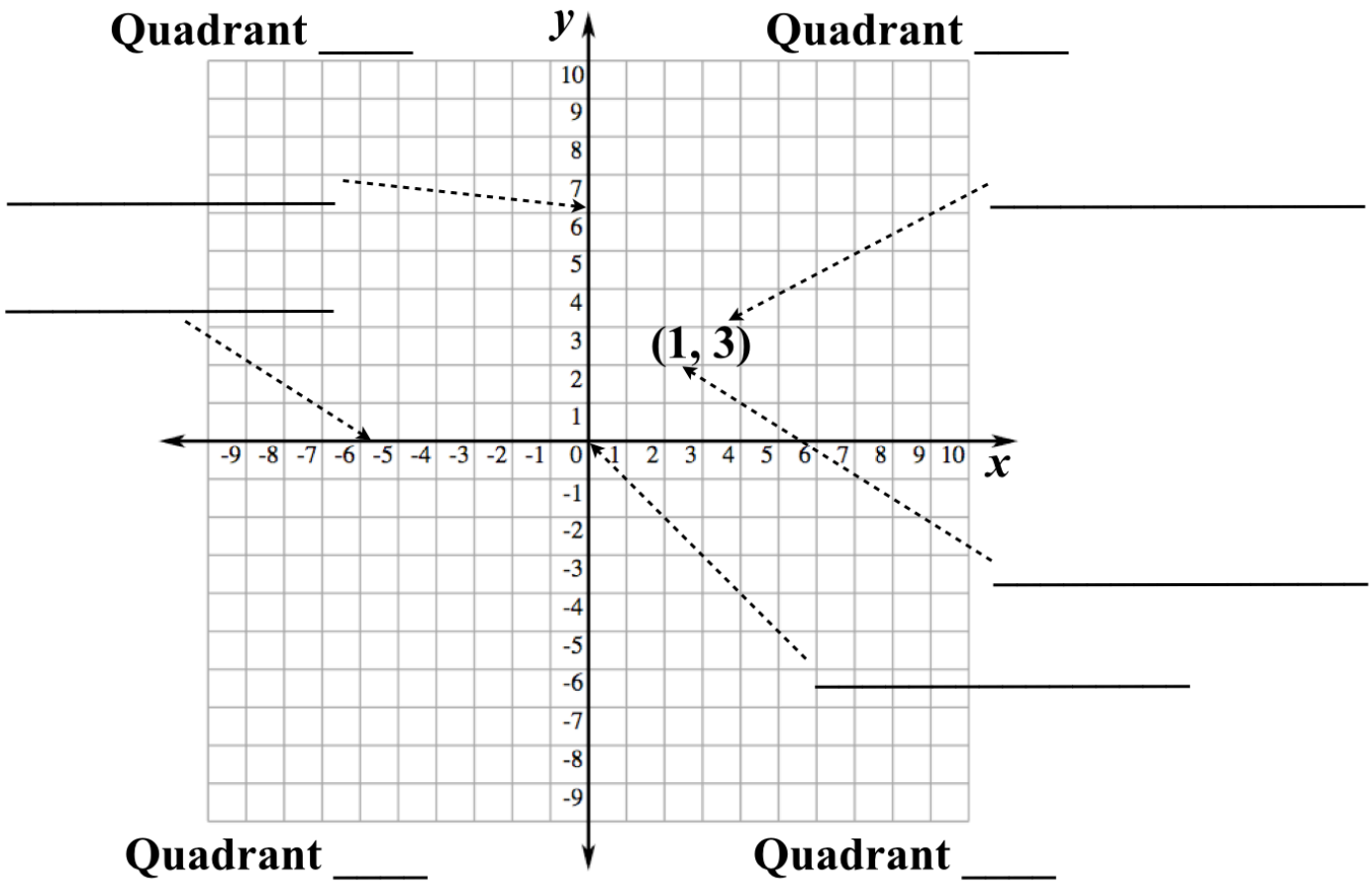


EXIT TICKET: Which video game player(s) represents a proportional relationship between the time and the number of levels passed? Provide justification for each of the three graphs.





- **What is an ordered pair?**

- **What is the origin and where is it located?**

- **When we are plotting a point, where do we count from?**

- **Why are we only focusing on quadrant 1?**

Plot the point (1, 3) and label the *x*- and *y*- coordinate.

- **How would we plot the point, (2, 5)?**

After graphing the points (1, 3) and (2, 5), graph a line that goes through the two points.

- **How would you describe the graph?**

Lesson 3 Question Prompts: Cut out the question prompts and ratios and place in a labeled envelope for each group.

Group 1 A local frozen yogurt shop is known for their monster sundaes. The ratios represent the number of toppings to total cost. Create a table, then graph and explain if the quantities are proportional to each other or not.		**Group 2** The school library receives money for every book sold at the school's book fair. The ratios represent the number of books sold to the amount of money the library receives. Create a table, then graph and explain if the quantities are proportional to each other or not.	
4 to 0	6 : 3	1 to 5	2 to 10
$\frac{8}{6}$	The total cost of a 10-topping sundae is \$9.	The library received \$15 for selling 3 books.	4 : 20
12 to 12		5 : 25	
Group 3 Your uncle just bought a hybrid car and wants to take you and your siblings camping. The ratios represent the number of gallons remaining to hours of driving. Create a table, then graph and explain if the quantities are proportional to each other or not.		**Group 4** For a Science project, Eli decided to study colonies of mold. He observed a piece of bread that was molding for a number of days. The ratios represent the number of days passed to colonies of mold on the bread. Create a table, then graph and explain if the quantities are proportional to each other or not.	
8 to 0	After 1 hour of driving, there are 6 gallons of gas left in the tank.	1 to 1	2 to 4
4 : 4	2 to 7	3 : 9	$\frac{4}{16}$
$\frac{0}{8}$		Twenty-five colonies were found on the 5^{th} day.	

Group 5 Frank purchased a pre-paid cell phone plan. The ratios represent Frank's cost to minutes used. Create a table, then graph and explain if the quantities are proportional to each other or not.		**Group 6** A local frozen yogurt shop is known for their monster sundaes. The ratios represent the number of toppings to total cost. Create a table, then graph and explain if the quantities are proportional to each other or not.	
0 : 0	$1.50 for 3 minutes	4 to 0	6 : 3
3 to 6	6 : 12	$\frac{8}{6}$	The total cost of a 10-topping sundae is $9.
$10 for 20 minutes		12 to 12	

Group 7 The school library receives money for every book sold at the school's book fair. The ratios represent the number of books sold to the amount of money the library receives. Create a table, then graph and explain if the quantities are proportional to each other or not.		**Group 8** Your uncle just bought a hybrid car and wants to take you and your siblings camping. The ratios represent the number of gallons remaining to hours of driving. Create a table, then graph and explain if the quantities are proportional to each other or not.	
1 to 5	2 to 10	8 to 0	After 1 hour of driving, there are 6 gallons of gas left in the tank.
The library received $15 for selling 3 books.	4 : 20	4 : 4	2 to 7
5 : 25		$\frac{0}{8}$	

Group 9 For a Science project, Eli decided to study colonies of mold. He observed a piece of bread that was molding for a number of days. The ratios represent the number of days passed to colonies of mold on the bread. Create a table, then graph and explain if the quantities are proportional to each other or not.		**Group 10** Frank purchased a pre-paid cell phone plan. The ratios represent Frank's cost to minutes used. Create a table then, graph and explain if the quantities are proportional to each other or not.	
1 to 1	2 to 4	0 : 0	\$1.50 for 3 minutes
3 : 9	$\frac{4}{16}$	3 to 6	6 : 12
Twenty-five colonies were found on the 5^{th} day.		\$10 for 20 minutes	

Gallery Walk Questions

Name: _____

7.RP.2a Decide whether two quantities are in a proportional relationships

Date: _____

Period: _____

As you walk around with your groups, carefully observe each poster, and write down any thoughts or comments on post-its and stick them to the poster (out of the way, if possible).

Answer the following questions below.

A) Which groups have graphs and tables that represent proportional relationships and which did not?

Proportional Relationship	**Nonproportional Relationship**

B) What are the characteristics of the problems that represent proportional relationships?

C) For the graphs representing proportional relationships, what does (0, 0) mean in the context of the given situation?

D) When you find the group that has the same problem as yours, do you notice any differences between their poster and yours?

E) As you observe other posters, do you notice any common mistakes? How might they be fixed?

F) Was there a group (or two) that stood out by representing their problems and findings in an exceptional clear and visually appealing way?