Chocolate Chip Cookies (IT)

Overview

This instructional task requires students to use ratio and rate reasoning and division of fractions by fractions to solve word problems.

Standards

Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning with use of tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

c. Find a percentage of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percentage.
d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.RP.A.3c 6.RP.A.3d	• 6.RP.A.2	1. You have 30 baseball cards left after selling most of your collection. You have 15% of your collection left. How many baseball cards did you have originally? a. 200 2. How many ¼ cups are in 8 cups? a. $8 \div \frac{1}{4} = 32\ cups$ 3. http://www.illustrativemathematics.org/illustrations/54 4. http://www.illustrativemathematics.org/illustrations/899	• http://www.illustrativemathematics.org/illustrations/77 • http://www.illustrativemathematics.org/illustrations/549 • http://www.illustrativemathematics.org/illustrations/1611 • http://learnzillion.com/lessonsets/181-use-ratios-to-solve-percent-problems • http://learnzillion.com/lessonsets/87-use-ratios-to-convert-unit-measures
6.NS.A.1	• 3.OA.B.6 • 5.NF.B.7	1. $\frac{3}{4} \div \frac{2}{3}$ a. $\frac{9}{8}$ 2. http://www.illustrativemathematics.or	• http://www.illustrativemathematics.org/illustrations/12 • http://www.illustrativemathematics.org/illustrations/829

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
		g/illustrations/692 3. http://www.illustrativemathematics.org/illustrations/50 4. http://www.illustrativemathematics.org/illustrations/267	• http://www.illustrativemathematics.org/illustrations/1196 • http://learnzillion.com/lessonsets/701-interpret-and-compute-quotients-of-fractions • http://learnzillion.com/lessonsets/13-divide-fractions-by-fractions

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

What is a recipe? This question is designed to make sure that students understand the purpose of this task. A recipe tells you how to make something to eat. A recipe is a list of ingredients along with instructions on how to prepare the dish.

Why would you need to alter a recipe? A recipe is designed with a certain number of servings in mind. If a recipe will only make 5 servings but you are serving 10 people, you would need to double the recipe.

During the Task

Students may struggle with creating the shopping list. Encourage them to think about the size of the containers they are purchasing. They don't want to buy a container so big that they have lots of leftover food, but they shouldn't buy too little of an amount either.

For example, if they need 60 eggs, it makes more sense to purchase by 12-count or 18-count instead of by the half-dozen.

After the Task

This task shows students how math is useful in their own lives. Encourage students to find a recipe for their favorite food and alter it to feed their own families or the class.

Student Instructional Task

Your school is having a celebration, and you have to bring homemade chocolate chip cookies. You Googled and found a recipe that you'd like to try; this recipe yields 30 cookies.

Chocolate Chip Cookies

Ingredients

1/2 cup (1 stick) unsalted butter

3/4 cup packed dark brown sugar

3/4 cup sugar

2 large eggs

1 teaspoon pure vanilla extract

1 (12-ounce) bag semisweet chocolate chips, or chunks

2 1/4 cups all-purpose flour

3/4 teaspoon baking soda

1 teaspoon fine salt

Recipe source: http://www.foodnetwork.com/recipes/food-network-kitchens/chocolate-chip-cookies-recipe4.html?oc=linkback

1. To practice the recipe, you decide to follow the recipe as given.
    a. The eggs you used were 20% of the total number of eggs you had when you started. How many eggs did you have before you made this batch of cookies? Justify your answer.

    b. You are ready to add baking soda to the bowl, but you only have a $\frac{1}{8}$ teaspoon measuring spoon. How many $\frac{1}{8}$ teaspoons of baking soda will you need to add to your bowl? Show your work.

    c. How many $\frac{1}{4}$ cup measuring containers can you fill with sugar based on the ingredients listed? Show your work.

2. You are going to make a batch of cookies for every class at your school.

    a. Rewrite this recipe to show how much of each of these ingredients you will need.

    b. Research the ingredients in your recipe, and write a shopping list. For each ingredient, write how many of each item you will need to purchase. Also, determine the percentage of the item that will be left in the container after you make your batter.

    c. You are going to bake the cookies on three different afternoons, so you store your batter in three containers. Rewrite your recipe to show how much of each ingredient will be stored in each container.

Instructional Task Exemplar Response

Your school is having a celebration, and you have to bring homemade chocolate chip cookies. You Googled and found a recipe that you'd like to try on the Food Network website; this recipe yields 30 cookies.

Recipe source: http://www.foodnetwork.com/recipes/food-network-kitchens/chocolate-chip-cookies-recipe4.html?oc=linkback

1. To practice the recipe, you decide to follow the recipe as given.
    a. The eggs you used were 20% of the total numbers of eggs you had when you started. How many eggs did you have before you made this batch of cookies? Justify your answer.

$$\cdot \frac{20}{100} x = 2$$
$$x = 2 \div \frac{20}{100}$$
$$x = 10\ eggs$$

or

20% = 2 eggs
40% = 4 eggs
60% = 6 eggs
80% = 8 eggs
100% = 10 eggs

Students may draw a tape diagram to show this reasoning.

20%	*20%*	*20%*	*20%*	*20%*
2 eggs	*2 eggs*	*2 eggs*	*2 eggs*	*2 eggs*

2. You are ready to add your baking soda to the bowl, but you only have a $\frac{1}{8}$ teaspoon measuring spoon. How many $\frac{1}{8}$ teaspoons of baking soda will you need to add to your bowl? Show your work.

$$\frac{3}{4} \div \frac{1}{8} = \frac{3 \times 8}{4 \times 1} = 6\ of\ the\ \frac{1}{8}\ teaspoons$$

    1. How many $\frac{1}{4}$ cup measuring containers can you fill with sugar based on the ingredients listed? Show your work.

$$\frac{3}{4} \div \frac{1}{4} = 3\ containers$$

3. You are going to make a batch of cookies for every class at your school.
    a. Rewrite this recipe to show how much of each of these ingredients you will need.

Students will have to research how many classes are at your school and how many students are in each class. An example response based on 30 classes is completed below.

Original Recipe:

Ingredients

1/2 cup (1 stick) unsalted butter

3/4 cup packed dark brown sugar

3/4 cup sugar

2 large eggs

1 teaspoon pure vanilla extract

1 (12-ounce) bag semisweet chocolate chips, or chunks

2 1/4 cups all-purpose flour

3/4 teaspoon baking soda

1 teaspoon fine salt

Recipe for 30 batches:

Ingredients

15 cups (30 sticks) unsalted butter

$\frac{45}{2}$ *or 22.5 or* $22\frac{1}{2}$ *cups packed dark brown sugar*

$\frac{45}{2}$ *or 22.5 or* $22\frac{1}{2}$ *cups sugar*

60 large eggs

30 teaspoons pure vanilla extract

30 (12-ounce) bags semisweet chocolate chips, or chunks

$\frac{135}{2}$ *or 67.5 or* $67\frac{1}{2}$ *cups all-purpose flour*

$\frac{45}{2}$ *or 22.5 or* $22\frac{1}{2}$ *teaspoons baking soda*

30 teaspoons fine salt

b. Research the ingredients in your recipe, and write a shopping list. For each ingredient, write how many of each item you will need to purchase. Also, determine the percentage of the item that will be left in the container after you make your batter.

This will vary depending on the recipe in part 2a and the size package bought by each student. For example, in the sample above, the recipe calls for 60 eggs. The student might do the following:

Buy eggs by the dozen:

$$\frac{60}{12} = 5 \text{ dozen}$$

The recipe will use 5 complete packages of a dozen eggs and 0% will remain.

Buy eggs by the 18 count:

$$\frac{60}{18} = 3\frac{1}{3} \text{ packages}$$

You need to purchase 4 packages of 18-count eggs. You will have 66.67% of an 18-count package left.

c. You are going to bake the cookies on three different afternoons, so you store your batter in three containers. Rewrite your recipe to show how much of each ingredient will be stored in each container.

This will vary based on the answer in part a. The following is based on the example in part 2a:

Batter in each container:

Ingredients

5 *cups (10 sticks) unsalted butter*

$\frac{15}{2}$ *or 7.5 or* $7\frac{1}{2}$ *cups packed dark brown sugar*

$\frac{15}{2}$ *or 7.5 or* $7\frac{1}{2}$ *cups sugar*

20 large eggs

10 teaspoons pure vanilla extract

10 (12-ounce) bags semisweet chocolate chips, or chunks

$\frac{45}{2}$ *or 22.5 or* $22\frac{1}{2}$ *cups all-purpose flour*

$\frac{15}{2}$ *or 7.5 or* $7\frac{1}{2}$ *teaspoons baking soda*

10 teaspoons fine salt

Word of Mouth (IT)

Overview

Based on a given number of workers students will decide how to use word-of-mouth advertising to share the news of a new sandwich. They will express their findings using exponents.

Standards

Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.A.1: Write and evaluate numerical expressions involving whole-number exponents.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.EE.1	• 4.0A.B.4 • 5.NBT.A2	1. How can you write 4 x 3 x 3 x 3 using exponents? a. 4×3^3 2. Write the expanded form of 2×6^4. a. 2 x 6 x 6 x 6 x 6 3. What is $2 \times 3^2 + 2 \times 3^3$? a. 90 4. http://www.illustrativemathematics.org/illustrations/532 5. http://www.illustrativemathematics.org/illustrations/891	• http://www.illustrativemathematics.org/illustrations/938 • http://www.illustrativemathematics.org/illustrations/1524 • http://www.illustrativemathematics.org/illustrations/1620 • http://learnzillion.com/lessonsets/196-write-and-evaluate-expressions-involving-whole-number-exponents

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

What is word-of-mouth advertising? Word-of-mouth advertising is when people share information by telling someone directly instead of putting the information on the radio or on television.

During the Task

1. Students need to understand the task means that each person will only tell two people. After they have shared with two people, they will not share the information again.
2. Students may have a hard determining the final answer. They may want to simply use the final expression in the table.
3. Students may struggle with finding the total when a person from week 5 becomes sick. They may want to reduce the 5 x 2 to 4 x 2. Teachers may need to assist with understanding why taking this person out from the whole group would change the entire answer. The person is simply unable to reach two people on the sixth day, and those two people are unable to reach people on the last day.

After the Task

Relate this task to the rising cost of advertisement. Discuss the impact on profit if advertisement costs are high.

Student Instructional Task

Dave owns a sandwich shop. He has 4 employees. Next week he will be introducing a new sandwich. In order to save money, he has decided to ask his employees, Rhonda, Lisa, Benny, and Jena, to spread the word about the new sandwich rather than spending money on advertisements. Dave and his employees will each tell two of their friends about the new sandwich. Dave assumes that each friend will tell two new people. Then each of these people will tell two new people and so on.

1. How many people will they reach by the end of seven days?
   In your answer include:

   - A table showing the number of people reached at the end of each day.
   - The expression for the number of people reached at the end of each day written in expanded form and exponential form (i.e., $2 \times 4 \times 4$, 2×4^2).
   - The expression in exponential form you will use to determine the total number of people reached at the end of seven days.
   - The total number of people reached at the end of seven days, which will help Dave plan for the first day of sales.
2. How would your answer be affected if one person becomes sick on day 5 and is unable to share the news with two people? Explain your reasoning using an expression with exponents.
3. Develop an advertising plan that would reach more people per day. Show/explain how your plan would be more effective. Using expressions with exponents, share the total number of people reached for each of the seven days and the final number of people reached.

Instructional Task Exemplar Response

Dave owns a sandwich shop. He has 4 employees. Next week he will be introducing a new sandwich. In order to save money, he has decided to ask his employees, Rhonda, Lisa, Benny, and Jena, to spread the word about the new sandwich rather than spending money on advertisements. Dave and his employees will each tell two of their friends about the new sandwich. Dave assumes that each friend will tell two new people. Then each of these people will tell two new people and so on.

1. How many people will they reach by the end of seven days?
   In your answer include:

   - A table showing the number of people reached at the end of each day.
   - The expression written in expanded form and exponential form for each day (i.e., 2 x 4 x 4, 2 x 4^2).
   - The expression in exponential form you will use to determine the total number reached.
   - The total number reached, which will help Dave plan for the first day of sales.

   Students' table should look similar to this.

Day	*Number of people reached at the end of the day in expanded form*	*Number of people reached at the end of the day in exponential form*
1	*5 x 2*	*5 x 2^1*
2	*5 x 2 x 2*	*5 x 2^2*
3	*5 x 2 x 2 x 2*	*5 x 2^3*
4	*5 x 2 x 2 x 2 x 2*	*5 x 2^4*
5	*5 x 2 x 2 x 2 x 2 x 2*	*5 x 2^5*
6	*5 x 2 x 2 x 2 x 2 x 2 x 2*	*5 x 2^6*
7	*5 x 2 x 2 x 2 x 2 x 2 x 2 x 2*	*5 x 2^7*

   Total number reached: 5 x 2^1 + 5 x 2^2 + 5 x 2^3 + 5 x 2^4 + 5 x 2^5 + 5 x 2^6 + 5 x 2^7 = 1,270

2. How would your answer be affected if one person becomes sick on day 5 and is unable to share the news with two people? Explain your reasoning using an expression with exponents.
   The total number of people reached will be decreased by 1 person x 2 people not shared with on the sixth day. On the seventh day, 2 people will not be sharing with 2 people. This will give the expression: 1,270 – (2^1 + 2^2) = 1,264 people.

3. Develop an advertising plan that would reach more people per day. Illustrate how your plan would be more effective. Using expressions with exponents, share your totals for each of the seven days and the final number reached.

Student responses will have different total answers. Key items to look for in their responses include:

- *An alternate advertising plan (i.e., sharing on Facebook, Twitter, etc.,), which includes more than 2 people shared with each day*
- *A description, whether written or drawn, that explains how this plan is better at reaching people*
- *Expressions to show how many people are reached each day*
- *Expression showing the total number*
- *Total number of people reached*

Sample Response:

Our plan uses email to help share the news. Instead of sharing the news with only two people we suggest that the employees and Dave send an email to four people on the first day and ask each of those people to send the email to four people. The email would ask everyone who receives it to send it to at least four people. Here's what the email might say:

> *Hi everyone! I wanted to let you know about a new sandwich that we will start serving at Dave's sandwich shop next week. We're excited about the sandwich, and we're asking you to help us spread the word. Please forward this email to at least four people who are not already listed on this email.*

We think this plan is better because people can still send an email when they are sick and it's easier to forward the email when you get it than it may be to find two new people who may not know about the sandwich already. Also, because we plan to share with four new people each day, more people will be reached.

Day	*Number of people reached at the end of the day in expanded form*	*Number of people reached at the end of the day in exponential form*
1	*5 x 4*	5×4^1
2	*5 x 4 x 4*	5×4^2
3	*5 x 4 x 4 x 4*	5×4^3
4	*5 x 4 x 4 x 4 x 4*	5×4^4
5	*5 x 4 x 4 x 4 x 4 x 4*	5×4^5
6	*5 x 4 x 4 x 4 x 4 x 4 x 4*	5×4^6
7	*5 x 4 x 4 x 4 x 4 x 4 x 4 x 4*	5×4^7

The total number reached would be Total number reached: $5 \times 4^1 + 5 \times 4^2 + 5 \times 4^3 + 5 \times 4^4 + 5 \times 4^5 + 5 \times 4^6 + 5 \times 4^7 =$ *109,220 people!*

The Elevator Limit (IT)

Overview

In this instructional task students are given two inequalities, one in words and one as a formula, and a set of possible solutions. Students must decide which of the possible solutions actually solves the inequalities.

Standards

Reason about and solve one-variable equations and inequalities.

6.EE.B.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.B.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.EE.B.5	• 6.EE.A.2	1. If 3x > 6, which value of x would make the inequality true: A. 1 B. 2 C. 3 a. The answer is C. 2. http://www.illustrativemathematics.org/illustrations/673	• http://www.illustrativemathematics.org/illustrations/540 • http://learnzillion.com/lessonsets/734-understand-solving-an-equation-or-inequality-as-the-process-of-finding-the-values-that-make-it-true
6.EE.B.8	• 6.NS.C.6a • 6.NS.C.6c • 6.NS.C.7a • 6.NS.C.7b	1. Write an inequality for the following situation: *There can be no more than 65 people on the bus.* a. $x \leq 65$; $x =$ the number of people on the bus 2. http://www.illustrativemathematics.org/illustrations/642	• http://www.illustrativemathematics.org/illustrations/283 • http://www.illustrativemathematics.org/illustrations/284 • http://www.illustrativemathematics.org/illustrations/285 • http://learnzillion.com/lessonsets/578-understand-write-and-represent-inequalities-of-the-form-x-c-or-x-c-and-recognize-that-they-have-infinitely-many-solutions • http://learnzillion.com/lessonsets/310-writing-using-and-understanding-inequalities

Real-World Preparation:

Teachers may need to have a discussion about field trips, and how student/teacher/chaperone ratios affect groupings of students.

During the Task

- Discuss with students what the inequality for part *a* means in the context of a real-world situation. Students will need to understand that there cannot be a half or fourth of a person.
- When graphing the solution set, discuss with students that the set will not include values less than zero, and have them explain why based on the context of the situation.
- Students will use the number of 6^{th} graders and 6^{th} grade teachers at their school to help make groups. A discussion of district policy on the number of chaperones (not including the teachers) may need to be held, so students can determine if they need to add more adults to their groups.
- Some students may decide that only one adult and one student would be in a group—discuss with students why that may not be a good plan.
- As you circulate, probe further by asking what would happen if the chaperone number increased or decreased.
- A discussion may also need to be held about whether the total for the benches is included or not included in the weight limit of 1,800 pounds.

After the Task

This task shows students how math is useful in their own lives. Using inequalities can help us determine how many of an item we need or the constraints we have on certain tasks. Extensions of the task can be done by including discussion of what would happen to the groups if the chaperone or student number changed. What would happen if four students were absent that day? Would you decide to change your groups? Why or why not?

Student Instructional Task

All of the 6th graders and all of the 6th grade teachers at your school are visiting the Kilgore Oil Museum in Kilgore, Texas. During the visit, the students have the opportunity to get on an elevator that brings them below the surface of the earth to see different layers of soil and rock. The elevator can hold at most 15 people and has a weight limit of no more than 1,800 pounds. The elevator contains five rows of benches, and the five benches weigh 175 pounds together. The average adult weighs 180 pounds and the average 6th grader weighs 100 pounds.

1. Write an inequality that shows approximately how many people can ride the elevator. Be sure to define your variable. Model the solution on a number line.

2. The students and adults will be split into groups so that everyone attending can see the exhibit. The groups must be created to ensure that everyone can ride the elevator safely. Using the average weights listed above, determine the number of students and the number of adults that each group could contain. Explain how you decided how many adults and how many students should be in each group.

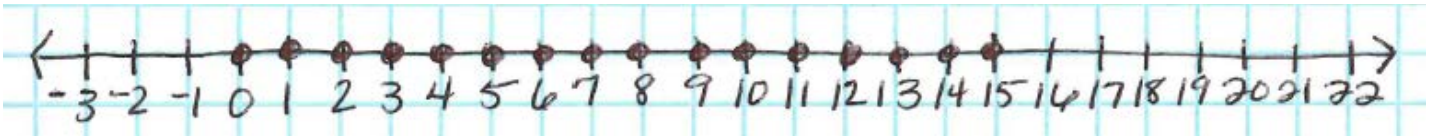
3. Write an inequality that represents the number students in each of your groups. Define the variable.

Instructional Task Exemplar Response

All of the 6th graders and all of the 6th grade teachers at your school are visiting the Kilgore Oil Museum in Kilgore, Texas. During the visit, the students have the opportunity to get on an elevator that brings them below the surface of the earth to see different layers of soil and rock. The elevator can hold at most 15 people and has a weight limit of no more than 1,800 pounds. The elevator contains five rows of benches, and the five benches weigh 175 pounds together. The average adult weighs 180 pounds and the average 6th grader weighs 100 pounds.

1. Write an inequality that shows how many people can ride the elevator. Be sure to define your variable. Model the solution on a number line.
   P = the number of people that can ride the elevator

   $p \leq 15$



2. The students and adults will be split into groups so that everyone attending can see the exhibit. The groups must be created so that everyone can ride the elevator safely. Using the average weights listed above, determine the number of students and the number of adults that each group could contain. Explain how you decided how many adults and how many students should be in each group.
   Sample answer based on 72 6th graders, 3 teachers, 3 adult chaperones, and the weight of the benches must be subtracted from the 1,800-pound limit.

   1,800 lbs – 175 lbs = 1,625 lbs, so the people on the elevator can total no more than 1,625 pounds.

   If 1 adult rides with each group, then 1,625 – 180 = 1,445 lbs. The 72 students can be split into 6 groups of 12 kids each. 12 kids will weigh approximately 1,200 pounds.

   1 adult and 12 kids makes 13 people riding the elevator, which is less than the 15-person limit.

   1(180) + 12(100) = 1,380 pounds

   1,380 lbs ≤ 1,625 lbs

   That weight does not exceed the total allowable weight of 1,625 pounds.

   Split the 6th graders into 6 groups with 1 adult and 12 kids in each group.

3. Write an inequality that represents the number of students in each of your groups. Define the variable.
   This answer will be dependent upon the answer the students get for question 2.

Sample Answer: $s \leq 12$; s represents the number of students who would be able to ride the elevator if only one adult rode with the group.

Crawfish Boil (IT)

Overview

Students will use their understandings of ratios and proportional reasoning to recommend how many pounds of crawfish and how many other items would need to be purchased for a party.

Standards

Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the birdhouse at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standard	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.RP.A.1	• 4.OA.A.2 • 5.NF.B.5 • 5.OA.B.3	1. The ratio of boys to girls in a classroom is 2:3. Describe the relationship between the number of boys and girls in the classroom based on the given ratio. a. *There are 2 boys in the classroom for every 3 girls in the classroom.* 2. http://www.illustrativemathematics.org/illustrations/76	• http://www.illustrativemathematics.org/illustrations/263 • http://www.illustrativemathematics.org/illustrations/22 • http://www.illustrativemathematics.org/illustrations/150 • http://www.illustrativemathematics.org/illustrations/143 • http://learnzillion.com/lessonsets/133-understand-ratios-and-using-ratio-language-to-describe-a-ratio-relationship-1 • http://learnzillion.com/lessonsets/114-understand-ratios-and-using-ratio-language-to-describe-a-ratio-relationship-2

<table>
<tr><th>Grade-Level Standard</th><th>The Following Standards Will Prepare Them:</th><th>Items to Check for Task Readiness:</th><th>Sample Remediation Items:</th></tr>
<tr><td>6.RP.A.2</td><td>• 4.MD.A.1
• 5.NF.B.3
• 5.NF.B.7
• 6.RP.A.1</td><td>1. Collin paid $56 for 7 boxes of cookies. What is the unit rate?
a. This is a rate of $8 per box of cookies.
2. http://www.illustrativemathematics.org/illustrations/549
3. http://www.illustrativemathematics.org/illustrations/1175</td><td>• http://www.illustrativemathematics.org/illustrations/1508
• http://www.illustrativemathematics.org/illustrations/858
• http://www.illustrativemathematics.org/illustrations/292
• http://www.illustrativemathematics.org/illustrations/12
• http://www.illustrativemathematics.org/illustrations/829
• http://www.illustrativemathematics.org/illustrations/1196
• http://learnzillion.com/lessonsets/152-understand-unit-rate-and-use-rate-language-in-the-context-of-a-ratio-relationship</td></tr>
<tr><td>6.RP.A.3a</td><td>• 5.G.A.2
• 6.RP.A.1</td><td>1. Matthew can walk at a rate of 4 miles per hour. Complete the table below based on this rate.
<table><tr><th>Hours Walked</th><th>Miles Walked</th></tr><tr><td>1</td><td>4</td></tr><tr><td>2</td><td></td></tr><tr><td>3</td><td></td></tr><tr><td>4</td><td>16</td></tr><tr><td>5</td><td></td></tr></table>a.
<table><tr><th>Hours Walked</th><th>Miles Walked</th></tr><tr><td>1</td><td>4</td></tr><tr><td>2</td><td>8</td></tr><tr><td>3</td><td>12</td></tr><tr><td>4</td><td>16</td></tr><tr><td>5</td><td>20</td></tr></table>2. http://www.illustrativemathematics.org/illustrations/711</td><td>• http://learnzillion.com/lessonsets/164-solve-ratio-problems-using-tables-and-the-coordinate-plane-1
• http://learnzillion.com/lessonsets/156-solve-ratio-problems-using-tables-and-the-coordinate-plane-2
• http://learnzillion.com/lessonsets/86-find-ratio-values-and-compare</td></tr>
<tr><td>6.RP.A.3b</td><td>• 6.RP.A.2
• 6.RP.A.3a</td><td>1. If it costs $3 per person to go to the volleyball game, how many people could A'vial pay for if she has $35?
a. She could pay for 11 people.
2. http://www.illustrativemathematics.org/illustrations/193</td><td>• http://learnzillion.com/lessonsets/157-solve-unitrate-problems</td></tr>
</table>

Real-World Preparation: The following questions will prepare students for some of the real world components of this task:

- What is a crawfish boil? Typically it is a get-together where people boil crawfish for everyone to share and enjoy.
- Why would someone need more than one pound of crawfish? One pound of crawfish includes the weight of the shells and other inedible parts of the crawfish. Once peeled to be eaten, one pound of crawfish produces only about 2 ounces of meat.
- What is catering? Catering is when a restaurant prepares food and/or drink for a person, organization, or an event.

During the Task

- Students may create two separate number lines rather than one number line that shows the relationship between the pounds of crawfish and the number of people. It may help to provide students with the number line already drawn and they would only have to fill in the numbers.
- Students may be tempted to multiply 3 by 150 for part c in the first section. Ask students to verify that work by plotting the point on the graph and make the connection to the proportional relationship.
- Students will need to make some decisions about the types and quantities of beverages as well as other items in the menu of options.
- Attention will need to be given to students who use an incorrect answer from question 1 with a correct procedure or correct reasoning to answer this portion of the task.

After the Task

Students can connect this task to planning for a party at their house to celebrate their birthday or some other event. Have students plan for the number of people they would like to invite and determine how much food and drink they would need to purchase to make sure everyone they would invite would be able to eat and drink.

Student Instructional Task

Your group has been selected to represent the 6th grade class at meetings to help prepare for an end-of-year celebration. The school has decided to have a crawfish boil to celebrate the end of the school year for the 6th grade students. They would like your group to help them plan the event and determine how much food and drink they will need to order.

1. A local restaurant uses the chart below to recommend the number of pounds of crawfish for takeout and catering orders based on the number of people to be served.

Number of People	Pounds of Crawfish
10	30
20	60
30	90
40	120
50	150
60	
70	
80	
90	
100	

a. Using the table above, create a double number line diagram to represent the number of pounds of crawfish needed for groups up to 100 people, then fill in the missing quantities on the table in the Pounds of Crawfish column.

b. Based on your work in part a, describe the relationship between the number of pounds of crawfish and the number of people to be served as a unit rate. How can this unit rate be used to find out how many pounds of crawfish to order if there are 45 people to be served?

c. Plot the values from the table in part a on a coordinate plane, and draw a straight line through the points. Label the axes. Then use the graph to find the quantity of crawfish that would be needed for 150 people.

2. The same restaurant uses the price list below to charge for other menu items.

Menu Item	Price
Boiled Crawfish	$2.75 per lb.
Corn and Potatoes	$1.50 per lb.
Sweet and Unsweet Tea	$10.00 per gallon
Water (16 oz. bottles)	$6.00 per case of 24
Coke products (12 oz. cans)	$4.50 per case of 12

Use the chart from question 1 and the price list above to help answer the following. Also, consider the following:

- 3 pounds of corn and potatoes will feed four people.
- One gallon of tea (sweet or unsweet) will provide 10 drinks.
- Each person will drink at least 2 beverages.

The school has told your group that they want to spend no more than $12.00 per person. What can be purchased to be prepared for a group of 100 people that stays within the per person budget? Your choices should include an appropriate amount of crawfish, corn and potatoes, and beverages. Your final product should include a narrative explaining your choices with justifications for those decisions. Be prepared to share your narrative with the class.

Instructional Task Exemplar Response

Your group has been selected to represent the 6th grade class at meetings to help prepare for an end-of-year celebration. The school has decided to have a crawfish boil to celebrate the end of the school year for the 6th grade students. They would like your group to help them plan the event and determine how much food and drink they will need to order.

1. A local restaurant uses the chart below to recommend the number of pounds of crawfish for takeout and catering orders based on the number of people to be served.

Number of People	Pounds of Crawfish
10	30
20	60
30	90
40	120
50	150
60	*180*
70	*210*
80	*240*
90	*270*
100	*300*

a. Using the table above, create a double number line diagram to represent the number of pounds of crawfish needed for groups up to 100 people, then fill in the missing quantities on the table in the Pounds of Crawfish column.

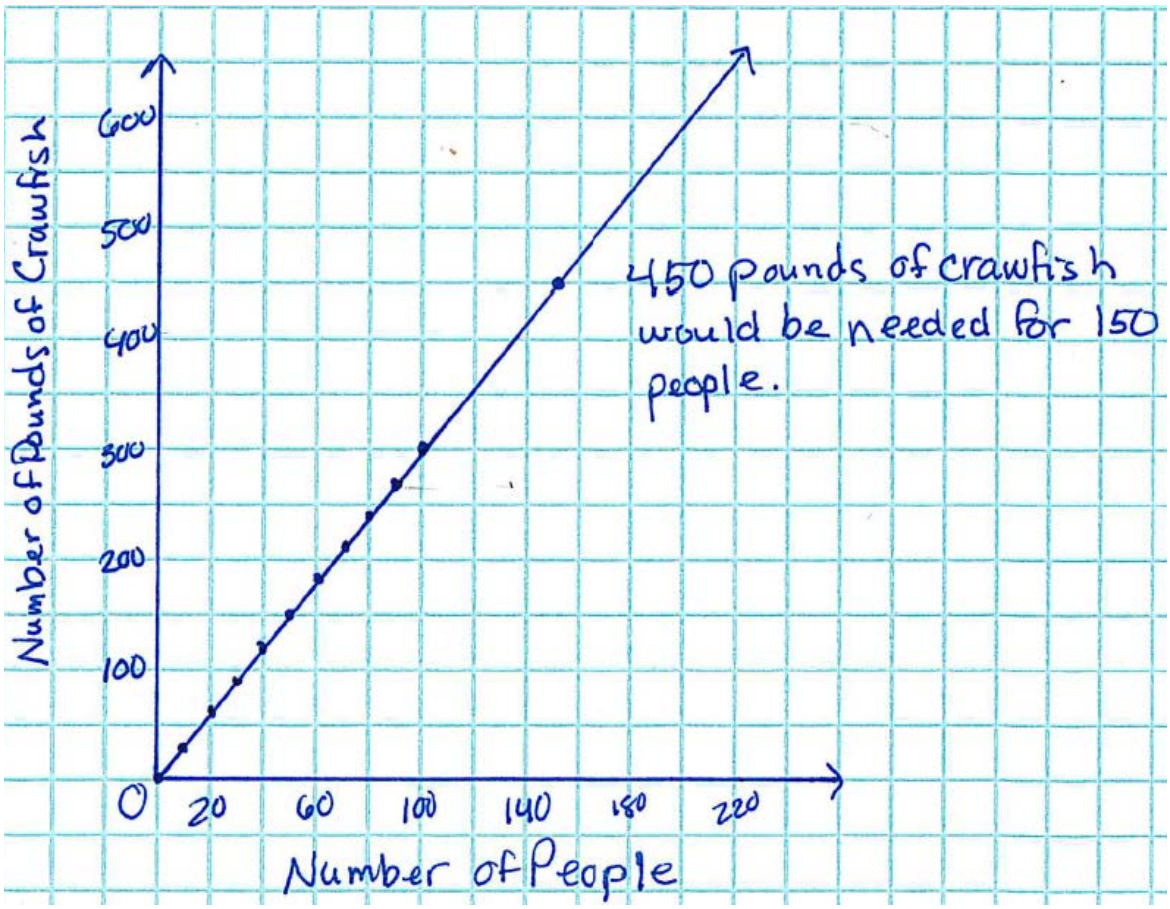
Crawfish

0 30 60 90 120 150 180 210 240 270 300

b. Based on your work in part a, describe the relationship between the number of pounds of crawfish and the number of people to be served as a unit rate. How can this unit rate be used to find out how many pounds of crawfish to order if there are 45 people to be served?

The unit rate of number of pounds of crawfish per person is 3 pounds of crawfish per person. To find the number of pounds of crawfish needed to feed 45 people, multiply 45 by 3. To serve 45 people, 135 pounds of crawfish would be needed.

c. Plot the values from the table on a coordinate plane, and draw a straight line through the points. Label the axes. Then use the graph to find the quantity of crawfish that would be needed for 150 people.



2. The same restaurant uses the price list below to charge for other menu items.

Menu Item	Price
Boiled Crawfish	$2.75 per lb.
Corn and Potatoes	$1.50 per lb.
Sweet and Unsweet Tea	$10.00 per gallon
Water (16 oz. bottles)	$6.00 per case of 24
Coke products (12 oz. cans)	$4.50 per case of 12

Use the chart from question 1 and the price list above to help answer the following. Also, consider the following:

- 3 pounds of corn and potatoes will feed four people.
- One gallon of tea (sweet or unsweet) will serve 10 drinks.
- Each person will drink at least 2 beverages.

The school has told your group that they want to spend no more than $12.00 per person. What can be purchased to be prepared for a group of 100 people that still stays within the per person budget? Your choices should include an appropriate amount of crawfish, corn and potatoes, and beverages. Include a narrative explaining your choices with justifications for those decisions in your final product. Be prepared to share your narrative with the class.

Sample Response:

We recommend the following be purchased for the end-of-year crawfish boil based on 150 people:

- *At a rate of 3 pounds of crawfish per person, we need to buy 3 x 100 = 300 pounds of crawfish. At $2.75 per pound, the cost of the crawfish would be 300 x $2.75 = $825.*
- *If 3 pounds of corn and potatoes feeds 4 people, then 1 person will eat 0.75 pounds of corn and potatoes. For 100 people, this would mean 100 x 0.75 = 75 pounds of corn and potatoes. The cost for the corn and potatoes will be 75 x $1.50 per pound = $112.50.*
- *Based on our group preferences, we decided that we would order enough water for 50 people, Coke products for 30 people, and tea for 20 people. If each person drinks at least two beverages, then we will need to buy at least 100 waters, at least 60 coke products, and enough tea for 40 drinks.*
    - *Waters come 24 to a case, so 100/24 is about 4.2 cases, but since we can't buy a part of a case, we will need to buy 5 cases. 5 cases of water at $6.00 per case will cost $30.*
    - *Coke products are packaged 12 per case, so to get 60 Coke products we will need 5 cases because 60/12 = 5.5 cases of Coke products at $4.50 per case. The total will be $22.50 (5 x 4.50 = 22.50).*
    - *To have enough tea for 40 drinks, we will need to have 4 gallons of tea (40/10 = 4). We suggest buying 2 gallons of sweet tea and 2 gallons of unsweet tea. The cost of 4 gallons of tea can be found by multiplying 4 x $10, which gives a cost of $40.*
    - *The total cost for the end-of-year celebration is found by adding the total costs of each of the menu options: $825 + $112.50 + $30 + $22.50 + $40 = $1,030.00. To find the total cost per person, divide $1,030 by 100 people, and the cost per person is $10.30.*

Teacher note: This portion of the task will take on many different looks. Students have multiple options to fulfill the requirements listed above. They will need to make some decisions about the types and quantities of beverages. Attention will need to be given to students who use an incorrect answer from question 1 with a correct procedure or correct reasoning to answer this portion of the task.

Marathon Prep (IT)

Overview

This instructional task requires students to use an equation in the form of *px = q* to represent and solve word problems.

Standards

Reason about and solve one-variable equations and inequalities.

6.EE.B.7 Solve real-world and mathematical problems by writing and solving equations of the form *x + p = q* and *px = q* for cases in which *p*, *q,* and *x* are all nonnegative rational numbers.

Represent and analyze quantitative relationships between dependent and independent variables.

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*

Prior to the Task

Standards Preparation: The material in the chart below illustrates the standards and sample tasks that are pre-requisites for student success with this task's standards.

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
6.EE.B.7	• 5.NF.B.4	1. Solve the following equation: $23.7 = 2x$ a. $x = 11.85$ 2. http://www.illustrativemathematics.org/illustrations/1107	• http://www.illustrativemathematics.org/illustrations/321 • http://www.illustrativemathematics.org/illustrations/965 • http://learnzillion.com/lessonsets/577-solve-problems-by-writing-and-solving-equations-of-the-form-x-p-q-and-px-q • http://learnzillion.com/lessonsets/269-solve-problems-with-equations-xpq-and-pxq
6.EE.C.9	• 5.OA.B.3	1. Complete the following table: X | Y 1 | 2 2 | 4 3 | 4 | 8 5 | a.	• http://learnzillion.com/lessonsets/675-use-variables-to-relate-two-quantities-in-a-real-world-problem • http://learnzillion.com/lessonsets/346-use-variables-to-represent-quantities-that-change-in-relationship-to-one-another

Grade-Level Standards	The Following Standards Will Prepare Them:	Items to Check for Task Readiness:	Sample Remediation Items:
		<table><tr><td>X</td><td>Y</td></tr><tr><td>1</td><td>2</td></tr><tr><td>2</td><td>4</td></tr><tr><td>3</td><td>6</td></tr><tr><td>4</td><td>8</td></tr><tr><td>5</td><td>10</td></tr></table> 2. Write an equation to represent the information in the table in question 1. a. $y = 2x$ 3. http://www.illustrativemathematics.org/illustrations/806	

Real-World Preparation: The following questions will prepare students for some of the real-world components of this task:

What is a marathon? This question is designed to make sure that students understand the purpose of this task. A marathon is a 26.21875-mile race. For many running and/or fitness enthusiasts, completing a marathon is an important milestone.
Why do you have to train for a marathon? Since a marathon is such a long race, you must prepare your body.

During the Task

Students may struggle with creating their own race preparation schedule. To help interest them in the task, you may want to mention specific races in specific towns. If students have trouble creating a realistic plan, you could work with the physical education teacher to help students get an idea of their current fitness levels and how that would affect any preparation plan they would create.

After the Task

This task shows students how math is useful in their own lives. Encourage students to follow through with their plans. The class could follow through with a plan together. The class could vote on one plan and complete the training and race together.

Student Instructional Task

Lee is training for a marathon. A marathon is 26.21875 miles. She is going to run four days a week to prepare for the marathon. Lee will run the same distance for four days, and then each week she is going to increase her total distance for the week by 1.5 miles. Below is a partial table to represent her training schedule.

Training Week *(w)*	Weekly Distance (*d)*
1	1.5 miles
2	
3	
4	
5	
6	9 miles
7	

1. Use the table to answer the questions below.

    a. Complete the table above for values of *d*.

    b. Graph the ordered pairs from the table above.

    c. Write an equation to find the weekly distance, *d*, that will be run if she is on week *w* of training. Which variable is the independent variable and which is the dependent variable?

    d. During which week of training will the total distance Lee runs for the week be equivalent to a marathon?

2. Lee decides that she wants to shorten her training schedule. Write an equation that would allow Lee to prepare for her race in less time. Explain how your equation would get Lee ready sooner, and provide support for your explanation.

3. In a group, research local races in your area. Pick one and plan your group's race preparation schedule. Keep the following points in mind:

    - What is the date of the race?
    - What is the length of the race?
    - How many days will the group have to train?
    - Has anyone in the group ever run a race before? Does anyone in the group run on a regular basis?

Your group's plan should include a table, an equation, and a graph. Be sure to include the start date and end date of your training. Your group's plan should also include a short narrative. In the narrative, be sure to explain how your group chose the race and planned the training. Your group will present the plan to the class when it is finished.

Instructional Task Exemplar Response

Lee is training for a marathon. A marathon is 26.21875 miles. She is going to run four days a week to prepare for the marathon. Lee will run the same distance for four days, and then each week she is going to increase her total distance for the week by 1.5 miles. Below is a partial table to represent her training schedule.

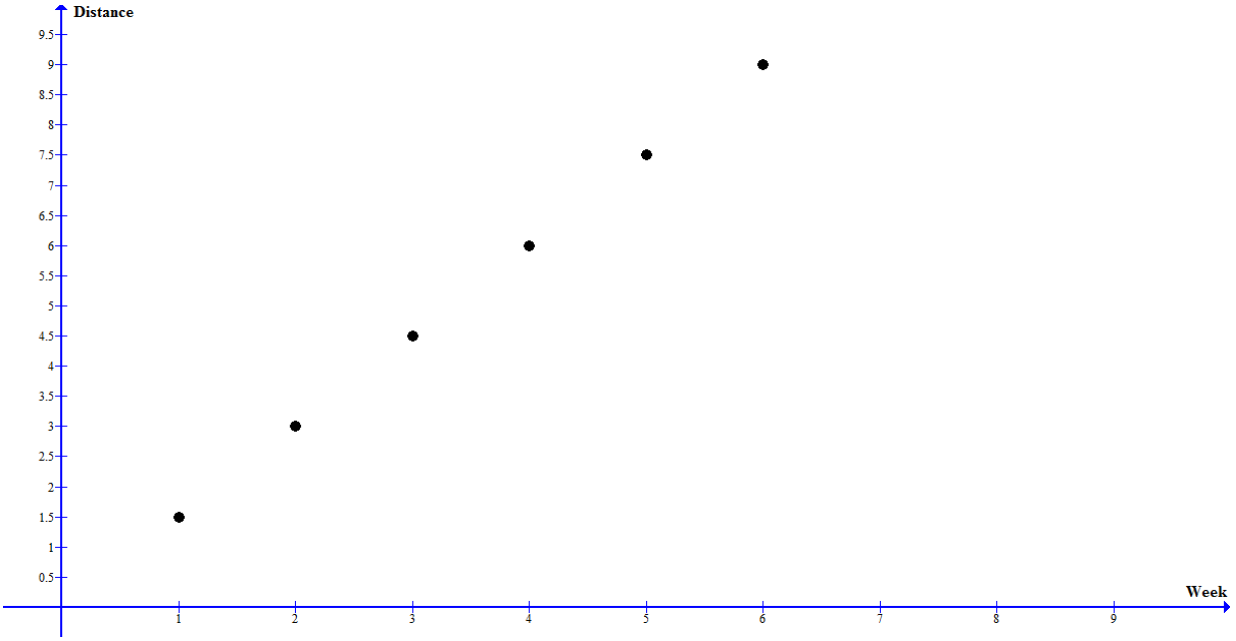
Training Week *(w)*	Weekly Distance *(d)*
1	1.5 miles
2	
3	
4	
5	
6	9 miles
7	

1. Use the table to answer the questions below.

   a. Complete the table above for values of *d*.

Training Week (w)	*Distance Run (d)*
1	*1.5 miles*
2	*3 miles*
3	*4.5 miles*
4	*6 miles*
5	*7.5 miles*
6	*9 miles*
7	*10.5 miles*

b. Graph the ordered pairs from the table above.



c. Write an equation to find the weekly distance, *d*, that will be run if she is on week *w* of training. Which variable is the independent variable and which is the dependent variable?

$$d = 1.5w; \text{independent variable} = w \text{ and dependent variable} = d$$

d. During which week of training will the total distance Lee runs for the week be equivalent to a marathon?

$$26.21875 = 1.5t$$

$$t = \frac{26.21875}{1.5}$$

$$t = 17.479167$$

Lee would run a total distance equivalent to a marathon during week 18.

2. Lee decides that she wants to shorten her training schedule. Write an equation that would allow Lee to prepare for her race in less time. Explain how your equation would get Lee ready sooner, and provide support for your explanation.
Sample Answer:

$$d = 2w; independent\ varirable = w\ and\ dependent\ variable = d$$

This equation models a training schedule that would prepare her more quickly. The slope of this equation is 2 instead of the 1.5 in the original equation. The 2 would make the line rise more quickly, so she would be prepared sooner. The slope of 2 would mean that Lee would need to increase the total number of miles for each week by 2 miles per week. The table below shows that the distance Lee would run each week is longer than the distance she would run each week in the table for the original equation.

Training Week (w)	*Weekly Distance (d)*
1	*2 miles*
2	*4 miles*
3	*6 miles*
4	*8 miles*
5	*10 miles*
6	*12 miles*
7	*14 miles*

We can solve the equation to see how long it would take Lee to finish her training.

$$26.21875 = 2t$$

$$t = \frac{26.21875}{2}$$

$$t = 13.109375$$

We see that it would take her 14 weeks. The original plan required 18 weeks of training.

3. In a group, research local races in your area. Pick one and plan your group's race preparation schedule. Keep the following points in mind:

- What is the date of the race?
- What is the length of the race?
- How many days will the group have to train?
- Has anyone in the group ever run a race before? Does anyone in the group run on a regular basis?

Your group's plan should include a table, an equation, and a graph. Be sure to include the start date and end date of your training. Your group's plan should also include a short narrative. In the narrative, be sure to explain how your group chose the race and planned the training. Your group will present the plan to the class when it is finished.

This portion of the task will take on many different looks. Students have multiple options to fulfill the requirements listed above. They will need to make choices about lengths of races and dates of races.

Sample Response:

Race: Crowley Rice Festival Run

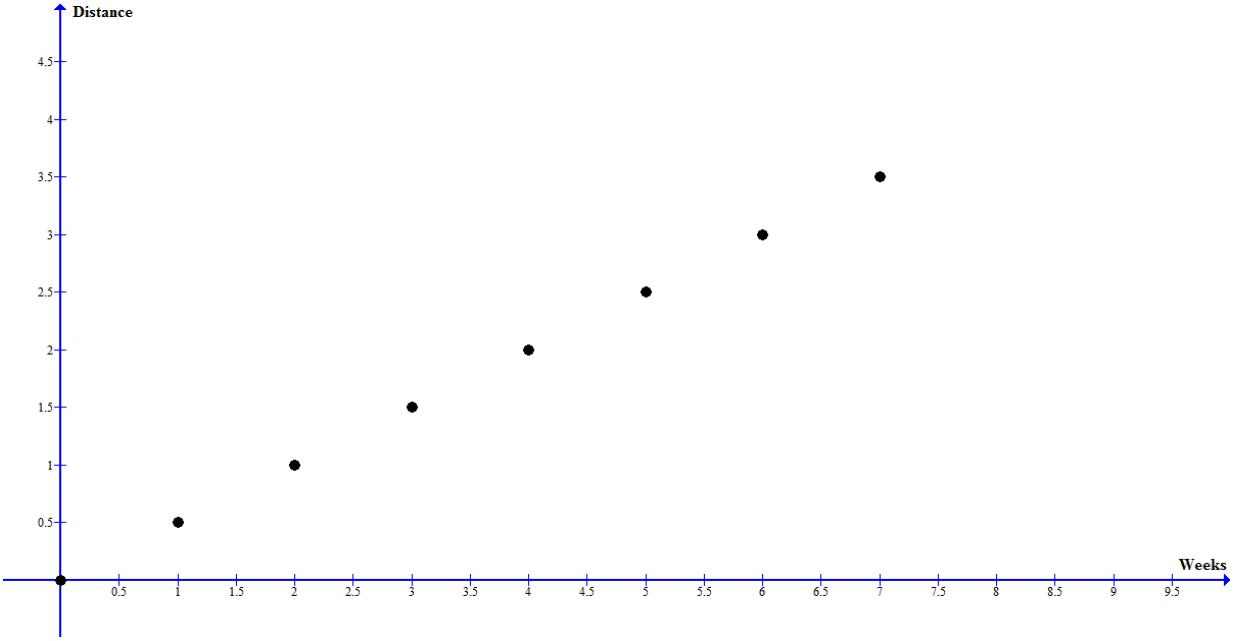
Distance: 5k or 3.1 miles

Date of Race: Saturday, October 18, 2014

We will train for 7 weeks.

Training Week (w)	*Weekly Distance (d)*
1	*.5 miles*
2	*1 miles*
3	*1.5 miles*
4	*2 miles*
5	*2.5 miles*
6	*3 miles*
7	*3.5 miles*

$$d = 0.5; independent\ varirable = w\ and\ dependent\ variable = d$$



We decided to prepare for the Rice Festival Run because we attend this festival each year. None of the group members had running experience, so we picked a shorter race. We decided to start off running short distances, so we added on .5 miles to our distance each week. In 7 weeks we would be prepared for our race. In order to be prepared, we will start training August 17, 2014. This will allow us to rest the week before the race.