Eureka Remediation Tool: Grade 8
Module 6, Topic A

o become mathematically proficient, students **must** access on-grade-level content. This document aims to help teachers who use the Eureka curriculum to target remediation for students needing extra support before and **during** approaching on-grade-level work, creating opportunities for on-time remediation directly connected to the new learning.

About this Topic

Focus Standards:

8.F.B.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.F.B.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Topic Overview per the Eureka Curriculum

In Topic A, students build on their study of functions by recognizing a linear relationship between two variables (**8.F.B.4**). Students use the context of a problem to construct a function to model a linear relationship (**8.F.B.4**). In Lesson 1, students are given a verbal description of a linear relationship between two variables and then must describe a linear model. Students graph linear functions using a table of values and by plotting points. They recognize a linear function given in terms of the slope and initial value, or y-intercept. In Lesson 2, students interpret the rate of change and the y-intercept, or initial value, in the context of the problem. They interpret the sign of the rate of change as indicating that a linear function is increasing or decreasing (**8.F.B.5**) and as indicating the steepness of a line. In Lesson 3, students graph the line of a given linear function. They express the equation of a linear function as $y = mx + b$, or an equivalent form, when given the initial value and slope. In Lessons 4 and 5, students describe and interpret a linear function given two points or its graph.

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Overview

Eureka Remediation Tools include:

1. a diagnostic assessment to help teachers determine the misunderstandings or gaps in mathematical knowledge related to a specific Topic in the Eureka curriculum
2. guidance for teachers to analyze student work on the diagnostic assessment
3. suggested materials for targeted remedial instruction

> Note: The use of this guidance is not intended to delay students' engagement with on-grade-level learning. On-grade-level learning should be the focus of instructional time and be treated as an opportunity for students to "finish" learning previous skills and deepen conceptual understanding.

Diagnostic Assessment

The diagnostic assessment is designed to be administered to targeted students prior to beginning instruction on the given Topic. When appropriate, it is broken into parts (Part A, Part B, and so on); each part addresses a different prerequisite standard and contains three problems. If a student correctly answers at least 2 out of the 3 problems, it can be assumed that he/she is ready to engage with the new content of the Topic with little to no support needed prior to engaging with the Topic. The diagnostic assessment is designed in this way so that teachers can determine the "entry point" to remedial instruction and/or opportunities for unfinished learning within the context of the new learning. The entry points and opportunities for unfinished learning will vary between students.

Guidance for Remediation

The Remediation Guidance is designed for teacher use. It is also broken into parts (Part A, Part B, and so on) and correlates to the parts on the diagnostic assessment. Each part contains the following:

1. **The focus standard**: The focus standards are strategically chosen to address prerequisite skills and are purposefully arranged in the order that students typically master the skills and knowledge.
2. **Why this is important for current grade level work**: This section describes how the work of the prerequisite standard relates to the standard(s) addressed in the Topic of instruction.
3. **Using the diagnostic assessment to identify gaps**: This section identifies common errors students make on the diagnostic assessment items.
4. **Remediation Resources for Targeted Instruction**: The resources pinpoint specific Eureka lessons and parts of lessons for teachers to use to address gaps in mathematical knowledge. Using Eureka materials to address remediation ensures alignment to the standards, consistency in approach to learning, and similarities in strategies for solving problems.

Part A: 7.RP.A.2a

1. Mrs. Cassard wants to reward her students for earning Accelerated Reader (AR) points. Mrs. Cassard has created a table to help encourage her students to read for bonus points. Based on the table, is the number of bonus points proportional to the number of AR points? Explain your reasoning.

AR points	bonus points
10	2
20	4
30	8
40	16

2. Kiley has decided to buy new shoes for the upcoming school year. He found a store where each pair of shoes is on sale for $24. Create a table to show the amount of money he will spend if he purchases 1, 2, 3, and 4 pairs of shoes. Use the table to determine whether or not the relationship between the numbers of pairs of shoes and the cost is proportional. Explain your reasoning.

3. Monica wants to buy tickets to the upcoming middle school dance for herself and her three friends. The first ticket costs $4. Each additional ticket costs $2. Use the grid below to graph the cost of the initial ticket and each additional ticket that Monica will purchase. Is the relationship between the cost and number of tickets proportional? Use your graph to support your claim.
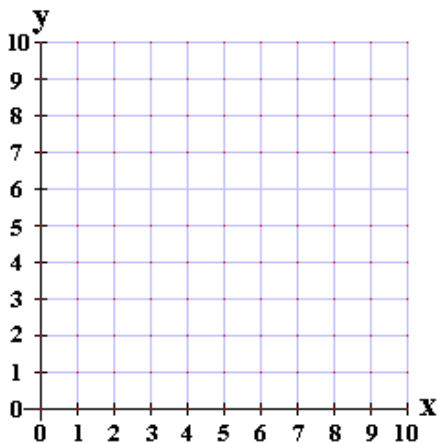
Part B: 7.RP.A.2b

4. Leah got a job delivering pizzas. A portion of her pay is determined by the number of miles she drives to deliver each pizza. Based on the table, how much money does Leah earn per mile driven? Show your work and/or explain your answer.

Miles Driven	8	12	24	16
Money Earned (in dollars)	2	3	6	4

5. Kynetra participated in the St. Jude Walkathon to help earn money for cancer research. Below is a graph that shows her earnings. How much money did Kynetra earn per mile walked? Explain how you determined your answer.

Earnings for St. Jude Walkathon
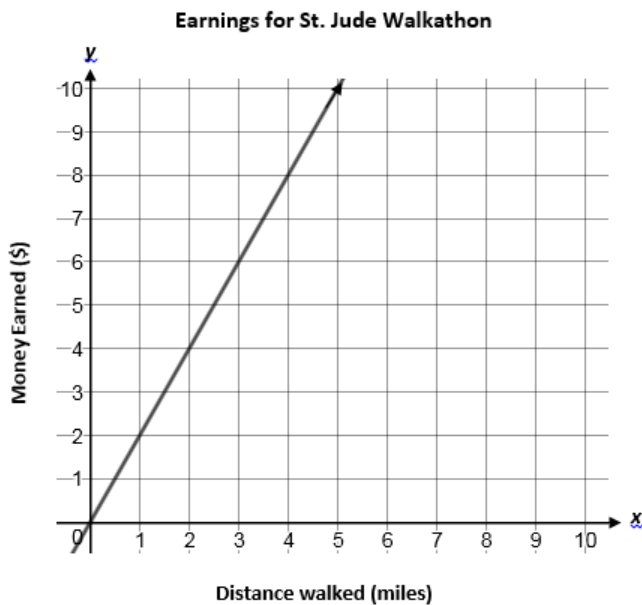
6. Dwayne got a summer job mowing lawns. He created the equation below to help him determine how much money he will make mowing lawns. In the equation, m represents the total amount of money earned and l represents the number of lawns mowed.

$$m = 30l$$

How much money will Dwayne make per lawn he mows? Explain how you determined your answer.

Part C: 7.RP.A.2c

7. Carly is training to try-out for the fitness team at her school. She has decided to do sit-ups and push-ups to train. Each time she does 4 push-ups, she does 8 sit-ups. Use the table below to write an equation that Carly can use to figure out how many sit-ups she should do for each push-up. Be sure to define any variables used in your equation.

Push-ups	Sit-ups
4	8
8	16
10	20
20	40

(Use the below information for problems 8 and 9)

Jeremy is a flight attendant for Delta airlines. Halfway through each flight, he provides complimentary peanuts and drinks to the passengers. The table below shows the relationship between the number of packages of peanuts served and the number of drinks served.

| Number of Passengers	20	36	50	80
Packages of Peanuts	60	108	150	240
Drinks	30	54	75	120

8. Create an equation that Jeremy can use to determine how many packages of peanuts he should stock his cart with based on the number of passengers. Be sure to define any variables used in your equation.

9. Create an equation that Jeremy can use to determine how many drinks he should stock his cart with based on the number of passengers. Be sure to define any variables used in your equation.

Part D: 7.RP.A.2d

(Use the information below for problems 10-12.)

Geoffrey volunteers at an animal shelter where he is responsible for feeding the dogs. He created the following graph to show the relationship between the number of dogs in the shelter and the amount of food that must be purchased.
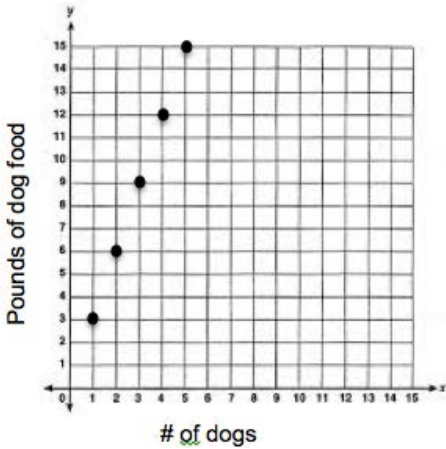
10. What does the ordered pair (6,18) mean in the context of this situation?

11. Which ordered pair represents the amount of dog food that should be purchased per dog?

12. Explain what the point (0, 0) means in the context of this situation.

Solutions:

1. (sample) No, the relationship is not proportional since there is no common ratio between bonus points and AR points.
2. (sample) The relationship is proportional due to a common ratio of $24 per pair of shoes.

Pairs of Shoes	Cost
1	24
2	48
3	72
4	96

3. (sample) No, the relationship is not proportional, because the graph does not go through the origin as there is a not a common price per ticket.
4. $0.25
5. $2.00, explanations will vary.
6. $30
7. $s = 2p$ where s is the number of sit-ups and p is the number of push-ups
8. $p = 3n$ where p is the number of packages of peanuts and n is the number of passengers
9. $d = \frac{3}{2}n$ where d is the number of drinks and n is the number of passengers
10. If there are 6 dogs, 18 pounds of dog food is needed.
11. (1,3)
12. If there are no dogs to be fed, then no food is required.

Part A Focus: 7.RP.A.2a: 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.

Why this is important for current grade level work: **In** grade 8, students will extend their understanding of testing proportional relationships within a table and graph, to using a table to find constant rate of change with an initial value. In other words, students will use tables and graphs to determine that when a relationship is not proportional, it may still grow at a constant rate; thereby resulting in a linear function. This connection will be used to introduce students to slope and y-intercept. Furthermore, students will compare two or more linear functions to determine which has the greater rate of change and/or steeper slope. This item set will help teachers determine which students can identify a constant rate of change from a table and graph, which will serve students well as they engage with the new learning of the target Topic.	**Remediation Resources for Targeted Instruction:** 7th Grade, Module 1, Topic A, Lesson(s) 2 – 5 Use the Classwork portion of each Lesson and a sampling of problems from the Problem Set focused on conceptual understanding.
Using the Diagnostic Assessment to identify gaps: **Problem 1:** Look or students who think the multiplicative pattern in successive outputs suffices for a constant rate of change, not recognizing that a multiplicative will not produce points that fall on a line. This shows a gap in understanding that will likely lead to misconceptions around linear functions. **Problem 2:** Look for students who neglect to answer the question of proportionality, simply making a table. Also, look for students who put the price in the left column and number of pairs in the right. While this is not necessarily wrong, it may be a sign of a misconception around input and output which will prove problematic while engaging with the new learning of the target Topic. **Problem 3:** Look for students who think the relationship has a constant rate of change, neglecting the difference in price from the first ticket to the rest of the tickets, as this shows a gap in understanding of constant rate of change.	

Part B Focus: 7.RP.A.2b: Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

Why this is important for current grade level work:
In grade 6 students were introduced to the concept of unit rate for ratio relationships. In grade 7 this was extended to introduce the constant of proportionality for proportional relationships. These ideas get extended again in grade 8 to the slope of a linear function. Since these ideas are fundamentally connected, it is essential that students have mastered constant of proportionality before trying to master the concept of slope. This item set will help teachers determine which students have the skill of identifying the constant of proportionality, which serves as the foundational skill set for identifying slope.

Using the Diagnostic Assessment to identify gaps:

Problem 4:
Look for students who reverse the relationship and actually report the number of miles per dollar. The context should help students determine the constant of proportionality. Students who reverse the relationship likely are missing the conceptual understanding needed to interpret their answer in the context of the problem, which will greatly hinder them in the target Topic.

Problem 5:
Look for students who neglect the point (1,2) and instead use two ordered pairs to find the rate of change. While this shows understanding and skill that will be used in the target Topic, it might be a sign that the student just knows how to determine rate of change but may understand it to the depth needed.

Problem 6:
Look for students who use the equation to calculate the constant of proportionality, not recognizing that it is given in the equation, as this likely shows a gap in understanding that will hinder students while engaging with the new learning of the target Topic.

Remediation Resources for Targeted Instruction:

7th Grade, Module 1, Topic B, Lesson 7

Use the Classwork portion of the Lesson and a sampling of problems from the Problem Set focused on conceptual understanding and/or procedural skill and fluency.

Part C Focus: 7.RP.A.2c: Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.*

Why this is important for current grade level work: Multiple lessons within the target Topic require students to create equations to model linear relationships, most of which are in a real-world context. The item set requires students to find the constant f proportionality in order to create their equation. This is still a critical component of creating an equation to model a linear relationship. Students who have mastered this understanding and skill will be able to focus on the new learning of an initial value that is not zero. Students who struggle with these items are not ready to engage with the target Topic.	**Remediation Resources for Targeted Instruction:** 7th Grade, Module 1, Topic B, Lesson(s) 8 – 9
Using the Diagnostic Assessment to identify gaps: **Problems 7 – 9:** Look for students who reverse the intended relationship and/or neglect to define their variables. As much, if not most, of the target Topic is within context, it is essential that students master this standard prior to engaging with the target Topic.	Use the Classwork portion of each Lesson and a sampling of problems from the Problem Set focused on conceptual understanding and/or procedural skill and fluency.

Part D Focus: 7.RP.A.2d: Explain what a point (*x,y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where *r* is the unit rate.

Why this is important for current grade level work: Lesson 2 in the target Topic focuses on interpreting the rate of change and initial value, both of which are assessed in this item set. While this foundational standard is limited to proportional relationships, the new learning will extend this to all linear relationships. In grade 7 the interpretation of the origin is always similar (i.e., none of something results in none of something else); however, in the target Topic, the output will rarely be zero, requiring the students connect extend their understanding of what it means for both the input and output to be zero. While students will not be able to use the point (1,*r*) to determine the slope in most linear relationships, being able to interpret any and all points associated with a given relationship is an invaluable skill that is essential for success in the target Topic.	**Remediation Resources for Targeted Instruction:** 7th Grade, Module 1, Topic B, Lesson 10 Use the Classwork portion of the Lesson and a sampling of problems from the Problem Set focused on conceptual understanding and/or procedural skill and fluency.

Using the Diagnostic Assessment to identify gaps:

Problem 10:	**Problem 11:**	**Problem 12:**
Look for students who either reverse their interpretation of the given ordered pair or who neglect to mention the context in their response, simply stating that 6 is the input and 18 the output, as both show a gap in understanding.	Look for students who understand the problem is referencing the rate of change but neglect to connect that to the ordered pair (1,3) as this shows a gap in understanding of proportional relationships, which serve as the foundation for linear relationships.	Similar to problem 10, look for students who neglect to mention the context in their response, simply stating that 0 is the input and 0 the output, as this shows a gap in understanding that will prove problematic when studying the initial value of a linear relationship.