

<p>Claim 1: Concepts and Procedures Students can explain and apply mathematical concepts, and carry out mathematical procedures with precision and fluency.</p>	
<p>Content Domain: Expressions and Equations</p>	
<p>Target C [m]: Understand the connections between proportional relationships, lines, and linear equations. (DOK Levels 1, 2)</p> <p>Tasks for this target will ask students to graph one or more proportional relationships and connect the unit rate(s) to the context of the problem.</p> <p>Other tasks will ask students to apply understanding of the relationship between similar triangles and slope.</p>	
<p>Standards: 8.EE.B, 8.EE.B.5, 8.EE.B.6</p>	<p>8.EE.B Understand the connections between proportional relationships, lines, and linear equations.</p> <p>8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p> <p>8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.</p>
<p>Related Below-Grade and Above-Grade Standards for Purposes of Planning for Vertical Scaling:</p> <p>7.EE.B, 7.EE.B.3, 7.RP.A, 7.RP.A.2</p> <p>F-IF.C, F-IF.C.7, F-IF.C.8, F-IF.C.9</p>	<p>Related Grade 7 Standards</p> <p>7.EE.B Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</p> <p>7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. <i>For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</i></p> <p>7.RP.A Analyze proportional relationships and use them to solve real-world and mathematical problems.</p> <p>7.RP.A.2 Recognize and represent proportional relationships between quantities.</p> <ol style="list-style-type: none"> 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. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions. Represent proportional relationships by equations. <i>For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship</i>

	<p><i>between the total cost and the number of items can be expressed as $t = pn$.</i></p> <p>d. 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.</p> <p>Related High School Standards</p> <p>F-IF.C Analyze functions using different representations.</p> <p>F-IF.C.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.</p> <ol style="list-style-type: none"> Graph linear and quadratic functions and show intercepts, maxima, and minima. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. <p>F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <ol style="list-style-type: none"> Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. Use the properties of exponents to interpret expressions for exponential functions. <i>For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay.</i> <p>F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.</i></p>
DOK Level:	1, 2
Achievement Level Descriptors:	
<p>RANGE Achievement Level Descriptor (Range ALD) Target C: Understand the connections between proportional relationships, lines,</p>	<p>Level 1 Students should be able to graph a proportional relationship on a coordinate plane.</p> <p>Level 2 Students should be able to compare two different proportional relationships represented in different ways. They should also be able to calculate the slope of a line and identify the y-intercept of a line.</p> <p>Level 3 Students should understand that slope is a unit rate of change in a proportional relationship, and convert proportional relationships to linear equations in slope-intercept form while also</p>

and linear equations.	<p>understanding when and why the y-intercept is zero. They should also be able to use repeated reasoning to observe that they can use any right triangle to find the slope of a line.</p> <p>Level 4 Students should be able to use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in a coordinate plane.</p>
Evidence Required:	<ol style="list-style-type: none"> 1. The student graphs proportional relationships. 2. The student interprets the unit rate as the slope of the graph of a proportional relationship. 3. The student compares two different proportional relationships represented in different formats. 4. [Retired this Evidence Required statement] 5. The student finds the equation $y = mx$ or $y = mx + b$ for a line.
Allowable Response Types:	Multiple Choice, single correct response; Equation/Numeric; Graphing
Allowable Stimulus Materials:	graphs, tables, equations, verbal descriptions
Construct-Relevant Vocabulary:	proportional relationship, unit rate, slope, y -intercept, similar triangles, origin, coordinate plane, ordered pairs
Allowable Tools:	None
Accessibility Guidance:	<p>Item writers should consider the following Language and Visual Element/Design guidelines¹ when developing items.</p> <p>Language Key Considerations:</p> <ul style="list-style-type: none"> • Use simple, clear, and easy-to-understand language needed to assess the construct or aid in the understanding of the context • Avoid sentences with multiple clauses • Use vocabulary that is at or below grade level • Avoid ambiguous or obscure words, idioms, jargon, unusual names and references <p>Visual Elements/Design Key Considerations:</p> <ul style="list-style-type: none"> • Include visual elements only if the graphic is needed to assess the construct or it aids in the understanding of the context • Use the simplest graphic possible with the greatest degree of contrast, and include clear, concise labels where necessary • Avoid crowding of details and graphics <p>Items are selected for a student's test according to the blueprint, which selects items based on Claims and targets, not task models. As such, careful consideration is given to making sure fully accessible items are available to cover the content of every Claim</p>

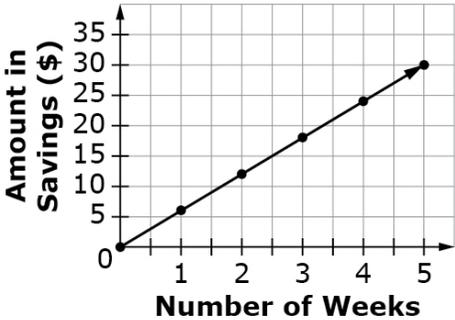
¹ For more information, refer to the General Accessibility Guidelines at:

<http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/Guidelines/AccessibilityandAccommodations/GeneralAccessibilityGuidelines.pdf>

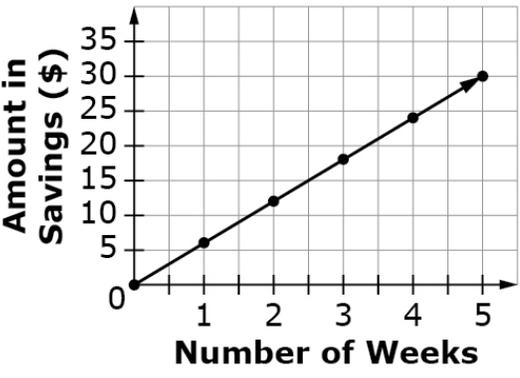
	and target, even if some item formats are not fully accessible using current technology. ²
Development Notes:	Tasks for this target will ask students to compare two different proportional relationships presented in different formats. Many of these tasks will contribute evidence to Claims 2 and 4.

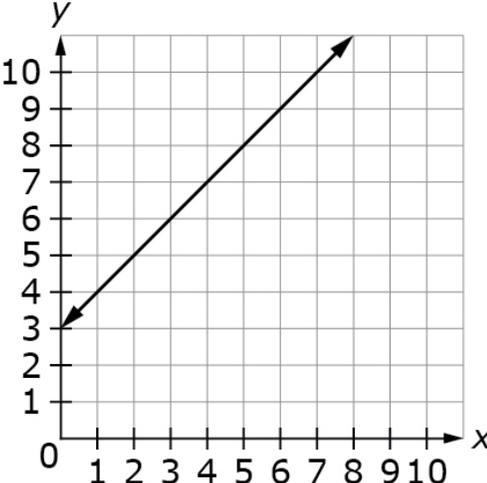
² For more information about student accessibility resources and policies, refer to http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced_Guidelines.pdf

<p>Task Model 1</p> <p>Response Type: Graphing</p> <p>DOK Level 1</p> <p>8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p> <p>Evidence Required:</p> <ol style="list-style-type: none"> The student graphs proportional relationships. The student interprets the unit rate as the slope of the graph of a proportional relationship. <p>Tools: None</p> <p>Accessibility Note: Graphing items are not currently able to be Brailled. Minimize the number of items developed to this TM.</p>	<p>Prompt Features: The student is prompted to create a graph of a proportional relationship.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> Unit rates can be positive rational numbers in whole numbers, fraction, or decimal form. Tables should have four to six rows of data. If used, context must be realistic and familiar to students 13 to 15 years old. Coordinate graphs for real-world contexts will be limited to Quadrant I. x- and y-axes of graphs should be labeled with an appropriate scale and units. Equations should be in the form $y = mx$. Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> Students graph a proportional relationship from values in a table or an equation. Students graph a proportional relationship from a verbal statement. Unit rate is a whole number, fraction, or decimal. <p>TM1</p> <p>Stimulus: The student is presented with a proportional relationship that may be represented as a verbal statement, table, or equation.</p> <p>Example Stem 1: The cost c, in dollars, for p pounds of meat is shown in the table.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>p</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>5</td> <td>25</td> </tr> <tr> <td>7</td> <td>35</td> </tr> <tr> <td>9</td> <td>45</td> </tr> <tr> <td>10</td> <td>50</td> </tr> </tbody> </table> <p>Use the Add Arrow tool to graph the proportional relationship between the number of pounds of meat and the total cost.</p> <p>Example Stem 2: Meat costs \$5.00 per pound at a store.</p> <p>Use the Add Arrow tool to graph the proportional relationship between the number of pounds of meat and the total cost.</p> <p>Example Stem 3: The cost c, in dollars, for p pounds of meat can be represented by the equation $c = 5p$.</p> <p>Use the Add Arrow tool to graph the proportional relationship between the number of pounds of meat and the total cost.</p> <p>Interaction: Student is given a coordinate plane with axes labeled. The Add Point, Add Arrow, and Delete tools are provided.</p> <p>Rubric: (1 point) Student creates a line with the correct slope passing through the origin.</p> <p>Response Type: Graphing</p>	p	c	3	15	5	25	7	35	9	45	10	50
p	c												
3	15												
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<p>Task Model 2</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 2</p> <p>8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p> <p>Evidence Required: 2. The student interprets the unit rate as the slope of the graph of a proportional relationship.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to identify and interpret the unit rate in a proportional relationship from a graph of the relationship.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> Context must be realistic and familiar to students 13 to 15 years old. Graphs should contain a line through the origin. Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> Unit rates can be whole numbers, fractions, or decimals. Scale on graph can be in different increments. <p>TM2</p> <p>Stimulus: The student is presented with a graph of a proportional relationship.</p> <p>Example Stem: This graph shows a proportional relationship between the amount of money in Jack’s savings account and the number of weeks Jack has been saving money.</p> <div style="text-align: center;"> <p>Jack’s Savings Account</p>  </div> <p>Which statement identifies the correct slope, and the correct interpretation of the slope for this situation?</p> <p>A. The slope of the line is $\frac{6}{1}$, so Jack’s savings rate is \$6 dollars every week.</p> <p>B. The slope of the line is $\frac{6}{1}$, so Jack’s savings rate is \$1 dollar every 6 weeks.</p> <p>C. The slope of the line is $\frac{1}{6}$, so Jack’s savings rate is \$6 dollars every week.</p> <p>D. The slope of the line is $\frac{1}{6}$, so Jack’s savings rate is \$1 dollars every 6 weeks.</p> <p>Rubric: (1 point) Student identifies the correct statement of the slope of the graph (e.g., A).</p> <p>Response Type: Multiple Choice, single correct response</p>
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<p>Task Model 3</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 2</p> <p>8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p> <p>Evidence Required: 3. The student will compare two different proportional relationships presented in different formats.</p> <p>Tools: None</p> <p>Version 3 Update: Retired TM4</p>	<p>Prompt Features: The student is prompted to compare two proportional relationships given in different formats.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> • Equations should be in the form $y = mx$. • Tables should have three to five rows of data. • If used, context must be realistic and familiar to students 13 to 15 years old. • Graphs in preamble should contain a line through the origin. • Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> ○ Unit rates can be whole numbers, fractions, or decimals ○ Students make a comparison between proportional relationships presented in a table and a graph (unit rate is a whole number). ○ Students make a comparison between proportional relationships presented in an equation and a table (unit rate is a fraction/decimal). ○ Students make a comparison between proportional relationships presented in a graph and an equation (unit rate is a fraction/decimal). <p>TM3a</p> <p>Stimulus: The student is presented with a proportional relationship that may be represented as a graph, equation, or table.</p> <p>Example Stem: The table shows the proportional relationship between the cost in dollars (c) of meat and the weight in pounds (p) at Lane Grocery Store.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>p</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>15</td> </tr> <tr> <td>5</td> <td>25</td> </tr> <tr> <td>7</td> <td>35</td> </tr> <tr> <td>9</td> <td>45</td> </tr> <tr> <td>10</td> <td>50</td> </tr> </tbody> </table> <p>Select the equation that shows a cost of meat per pound which is twice the cost of meat per pound at Lane Grocery Store.</p> <ul style="list-style-type: none"> A. $c = 5p$ B. $c = 6p$ C. $c = 10p$ D. $c = 30p$ <p>Rubric: (1 point) Student correctly identifies the equation (e.g., C).</p> <p>Response Type: Multiple Choice, single correct response</p>	p	c	3	15	5	25	7	35	9	45	10	50
p	c												
3	15												
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7	35												
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<p>Task Model 5</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 2</p> <p>8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.</p> <p>Evidence Required: 5. The student finds the equation $y = mx$ or $y = mx + b$ for a line.</p> <p>Tools: None</p>	<p>Prompt Features: The student is prompted to give the equation of a line.</p> <p>Stimulus Guidelines:</p> <ul style="list-style-type: none"> Coordinate graphs for real-world contexts will be limited to Quadrant I. x- and y-axes should be labeled with an appropriate scale and units. Lines should be in the form $y = mx$ or $y = mx + b$ (where $b \neq 0$). Context must be realistic and familiar to students 13 to 15 years old. Item difficulty can be adjusted via these example methods: <ul style="list-style-type: none"> y-intercept is zero. y-intercept is not zero. Slope should be an integer, fraction, or decimal. Students select the equation for a given line. Students enter the equation for a given line. <p>TM5 Stimulus: The student is presented with a graph of a line.</p> <p>Example Stem 1: This graph shows the amount of money s, in dollars, in Jack's account after w weeks.</p> <p style="text-align: center;">Jack's Savings Account</p>  <p style="text-align: center;">Enter an equation to represent the amount of money s, in dollars, in Jack's account after w weeks.</p>
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<p>Task Model 5</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 2</p> <p>8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.</p> <p>Evidence Required: 5. The student finds the equation $y = mx$ or $y = mx + b$ for a line.</p> <p>Tools: None</p>	<p>Example Stem 2:</p> <p>Consider the line shown on the graph.</p>  <p>Enter the equation of the line in the form $y = mx + b$ where m is the slope and b is the y-intercept.</p> <p>Rubric: (1 point) The student gives the correct equation (e.g., $s = 6w$; $y = x + 3$). Slope may be written as an integer, fraction, or decimal.</p> <p>Response Type: Equation/Numeric</p>
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