**Unit Abstract:**

This unit will focus on finding solutions to equations in one variable using the properties of equality.

In this unit students will use words, tables, equations, and graphs to represent and analyze linear and non-linear functions with emphasis on the slope-intercept form.

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| **Overarching Question:**  How do linear functions help us analyze real-life situations and solve practical problems? | | | | | | |
|  | | **This Unit:** Equations in one variable, slope, graphing and creating linear equations in slope-intercept form, linear functions, graphing functions. | | | |  |
| **Questions to Focus Assessment and Instruction:**  How can we use the working backwards problem-solving strategy to solve equations in one variable?  EE7  How do you determine whether a relationship is a function? F1  What does the slope of a line indicate about a line? EE.5  How are equations and graphs related? EE.5  How can we use similarity to show proportional triangles have the same slope? EE.6  What information does the equation of a line give you? F4  How can we translate tables and graphs into linear equations? F4  How can we compare properties of functions represented in different ways? F.2 F.4  How can we determine if a function is linear or non-linear using multiple representations? F.5 | | | | **Standards for Mathematical Practice**  1.Make sense of problems and persevere in solving them.  2.Reason abstractly and quantitatively.  3.Construct viable arguments and critique the reasoning of others.  **4.Model with mathematics.**  5.Use appropriate tools strategically.  6.Attend to precision.  **7.Look for and make use of structure.**  **8.Look for and express regularity in repeated reasoning.** | | |
| **Academic Vocabulary**  *(5-8 most important content specific vocabulary words)* | Unit rate  Slope  Slope intercept form  Constant of proportionalitiy  Constant rate of change  Proportional relationships  Linear relationships  Function  Input/Output | |  | |  | |

| **Standards** | **Learning Targets** *(including relevant practice standards)* | **Explanations and Examples\*** | **Assured Experiences**  *(common assessments and learning activities)* |
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| List number and text of the content standard; priority standards are bold-faced  **8.EE.7. Solve linear equations in one variable.**   1. **Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x* = *a*, *a* = *a*, or *a* = *b* results (where *a* and *b* are different numbers).** 2. **Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive** **property and collecting like terms.**   **MP 8**. Look for and express regularity in repeated reasoning  8.F.1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.  **8.EE.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.** *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*  **MP 4** Model with mathematics.  8.EE.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*.  **MP7** Look for and make use of structure.  **MP8** Look for and express regularity in repeated reasoning  **8.F.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.**  MP4  **8.F.2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.***  MP8  8.F.3.Interpret the equation *y* = *mx* + *b* as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s² giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*  MP 4  MP 7  8.F.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. | Students will….  Identify if there is one solutions, no solution, or an infinite number of solutions to an equation.  Use the properties of equality to solve equations with in variable.  Identify if a relation is a function.  Graph and interperate linear relationships.  Explain slope using the proportionality between two similar triangles given any two points.  Write an equation in slope-intercept given a graph, table, or a written scenario.  Compare slopes given a variety of models.  Identify and explain if a function is linear or non-linear.  Create and interpret graphs of functions. | From state document  **8.EE.7.** As students transform linear equations in one variable into simpler forms, they discover the equations can have one solution, infinitely many solutions, or no solutions.  When the equation has one solution, the variable has one value that makes the equation true as in  12 - 4*y* =16. The only value for y that makes this equation true is -1.  When the equation has infinitely many solutions, the equation is true for all real numbers as in  7*x* + 14 = 7(*x*+2). As this equation is simplified, the variable terms cancel leaving 14 = 14 or 0 = 0. Since the expressions are equivalent, the value for the two sides of the equation will be the same regardless which real number is used for the substitution.  When an equation has no solutions it is also called an inconsistent equation. This is the case when the two expressions are not equivalent as in 5*x* - 2 = 5(*x*+1). When simplifying this equation, students will find that the solution appears to be two numbers that are not equal or -2 = 1. In this case, regardless which real number is used for the substitution, the equation is not true and therefore has no solution.  Examples:    8.F.1. For example, the rule that takes *x* as input and gives *x*2+5*x*+4 as output is a function. Using y to stand for the output we can represent this function with the equation *y* = *x*2+5x+4, and the graph of the equation is the graph of the function. Students are not yet expected use function notation such as f(*x*) = *x*2+5*x*+4.  **8.EE.5.**Using graphs of experiences that are familiar to students increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs.  Example:  • Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation.    8.EE.6. Example:    **8.F.4.** Examples:  • The table below shows the cost of renting a car. The company charges $45 a day for the car as well as charging a one-time $25 fee for the car’s navigation system (GPS).Write an expression for the cost in dollars, *c,* as a function of the number of days, *d*.  Students might write the equation *c* = 45*d* + 25 using the verbal description or by first making a table.      Students should recognize that the rate of change is 45 (the cost of renting the car) and that initial cost (the first day charge) also includes paying for the navigation system. Classroom discussion about one time fees vs. recurrent fees will help students model contextual situations.  • When scuba divers come back to the surface of the water, they need to be careful not to ascend too quickly. Divers should not come to the surface more quickly than a rate of 0.75 ft per second. If the divers start at a depth of 100 feet, the equation *d* = 0.75*t* – 100 shows the relationship between the time of the ascent in seconds (*t)* and the distance from the surface in feet (*d*).  o Will they be at the surface in 5 minutes? How long will it take the divers to surface from their dive?  • Make a table of values showing several times and the corresponding distance of the divers from the surface. Explain what your table shows. How do the values in the table relate to your equation?  **8.F.2.** Examples:   * Compare the two linear functions listed below and determine which equation represents a greater rate of change.      * Compare the two linear functions listed below and determine which has a negative slope.   Function 1: Gift Card  Samantha starts with $20 on a gift card for the book store. She spends $3.50 per week to buy a magazine. Let y be the amount remaining as a function of the number of weeks.    Function 2:  The school bookstore rents graphing calculators for $5 per month. It also collects a non-refundable fee of $10.00 for the school year. Write the rule for the total cost (c) of renting a calculator as a function of the number of months (*m*).  Solution:  Function 1 is an example of a function whose graph has negative slope. Samantha starts with $20 and spends money each week. The amount of money left on the gift card decreases each week. The graph has a negative slope of -3.5, which is the amount the gift card balance decreases with Samantha’s weekly magazine purchase. Function 2 is an example of a function whose graph has positive slope. Students pay a yearly nonrefundable fee for renting the calculator and pay $5 for each month they rent the calculator. This function has a positive slope of 5 which is the amount of the monthly rental fee. An equation for Example 2 could be *c* = 5*m* + 10.  8.F.3. Example:  • Determine which of the functions listed below are linear and which are not linear and explain your reasoning.  o *y* = -2*x2* + 3 non linear  o *y* = 2*x* linear  o *A* = πr2 non linear  o *y* = 0.25 + 0.5(*x* – 2) linear  8.F.5. Example:  • The graph below shows a student’s trip to school. This student walks to his friend’s house and, together, they ride a bus to school. The bus stops once before arriving at school.  Describe how each part A-E of the graph relates to the story. | * Unit # 4 common summative assessment * Learning activity:   [hyper link to video streaming](resources/Video%20Streaming_247%20-%208f4.pdf)  [hyper link to who has the best job](resources/Who%20Has%20the%20Best%20Job_184%20-%20ee5.pdf)  [hyper link to chips and candy](resources) |

| **Standards** | **Learning Targets** *(including relevant practice standards)* | **Explanations and Examples\*** | **Assured Experiences**  *(common assessments and learning activities)* |
| --- | --- | --- | --- |
| List number and text of the content standard; priority standards are bold-faced | Students will…. | From state document | * Unit # common summative assessment * Learning activity: |

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|  | Students will…. | From state document | * Unit # common summative assessment * Learning activity: |

**Instructional resources** (including manipulatives, literature connections, professional resources)

Standard #1

Standard #2

Standard #3

Standard #4

Standard #5