# 7-5: Moving Straight Ahead
Unit Goals, Focus Questions, and Mathematical Reflections

## Unit Goals

**Linear Relationships** Recognize problem situations in which two variables have a linear relationship
- Identify and describe the patterns of change between the independent and dependent variables for linear relationships represented by tables, graphs, equations, or contextual settings
- Construct tables, graphs, and symbolic equations that represent linear relationships
- Identify the rate of change between two variables and the $x$- and $y$-intercepts from graphs, tables, and equations that represent linear relationships
- Translate information about linear relationships given in a contextual setting, a table, a graph, or an equation to one of the other forms
- Write equations that represent linear relationships given specific pieces of information, and describe what information the variables and numbers represent
- Make a connection between slope as a ratio of vertical distance to horizontal distance between two points on a line and the rate of change between two variables that have a linear relationship
- Recognize that $y=mx$ represents a proportional relationship
- Solve problems and make decisions about linear relationships using information given in tables, graphs, and equations

**Equivalence** Understand that the equality sign indicates that two expressions are equivalent
- Recognize that the equation $y=mx+b$ represents a linear relationship and means that $mx+b$ is an expression equivalent to $y$
- Recognize that linear equations in one unknown, $k=mx+b$ or $y=m(t)+b$, where $k, t, m$, and $b$ are constant numbers, are special cases of the equation $y=mx+b$
- Recognize that finding the missing value of one of the variables in a linear relationship, $y=mx+b$, is the same as finding a missing coordinate of a point $(x,y)$ that lies on the graph of the relationship
- Solve linear equations in one variable using symbolic methods, tables, and graphs
- Recognize that a linear inequality in one unknown is associated with a linear equation
- Solve linear inequalities using graphs or symbolic reasoning
- Show that two expressions are equivalent
- Write and interpret equivalent expressions

# 7-5 Moving Straight Ahead: Focus Questions (FQ) and Mathematical Reflections

| Investigation 1<br>Walking Rates | Investigation 2<br>Exploring Linear Relationships with Graphs and Tables | Investigation 3<br>Solving Equations | Investigation 4<br>Exploring Slope: Connecting Rates and Ratios |
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| **Problem 1.1**<br>**Walking Marathons: Finding and Using Rates**<br>FQ: What equation represents the relationship between the time and the distance you walk at a constant rate? What are the dependent and independent variables?<br><br>**Problem 1.2**<br>**Walking Rates and Linear Relationships: Tables, Graphs, and Equations**<br>FQ: How can you predict whether a relationship is linear from a table, a graph, or an equation that represents the relationship?<br><br>**Problem 1.3**<br>**Raising Money: Using Linear Relationships**<br>FQ: What is the pattern of change in a linear relationship?<br><br>**Problem 1.4**<br>**Using the Walkathon Money: Recognizing Linear Relationships**<br>FQ: How can you determine if a linear relationship is increasing or decreasing? | **Problem 2.1**<br>**Henri and Emile's Race: Finding the Point of Intersection**<br>FQ: When is it helpful to use a graph or table to solve a problem?<br><br>**Problem 2.2**<br>**Crossing the Line: Using Tables, Graphs, and Equations**<br>FQ: How does the pattern of change for a linear relationship appear in a table, a graph, or an equation?<br><br>**Problem 2.3**<br>**Comparing Costs: Comparing Relationships**<br>FQ: How can you decide if a table or an equation represents a linear relationship?<br><br>**Problem 2.4**<br>**Connecting Tables, Graphs, and Equations**<br>FQ: How are solutions of an equation of the form y = b + mx related to the graph and the table for the same relationship? | **Problem 3.1**<br>**Solving Equations Using Tables and Graphs**<br>FQ: How are the coordinates of a point on a line or in a table related to the equation of the line?<br><br>**Problem 3.2**<br>**Mystery Pouches in the Kingdom of Montarek: Exploring Equality**<br>FQ: What does equality mean?<br><br>**Problem 3.3**<br>**From Pouches to Variables: Writing Equations**<br>FQ: How can the properties of equality be used to solve linear equations?<br><br>**Problem 3.4**<br>**Solving Linear Equations**<br>FQ: What are some strategies for solving linear equations?<br><br>**Problem 3.5**<br>**Finding the Point of Intersection: Equations and Inequalities**<br>FQ: How can you find when two expressions are equal, or when one expression is greater or less than the other? | **Problem 4.1**<br>**Climbing Stairs: Using Rise and Run**<br>FQ: How is the steepness of a set of stairs related to a straight-line graph?<br><br>**Problem 4.2**<br>**Finding the Slope of a Line**<br>FQ: How can you find the y-intercept and the slope of a line from data in a table, graph, or equation?<br><br>**Problem 4.3**<br>**Exploring Patterns with Lines**<br>FQ: How can you predict if two lines are parallel or perpendicular from their equations?<br><br>**Problem 4.4**<br>**Pulling it All Together: Writing Equations for Linear Relationships**<br>FQ: What information do you need to write an equation for a linear relationship? Is the expression for the dependent variable always the same? |
| **Mathematical Reflections**<br><br>1. Describe how the dependent variable changes as the independent variable changes in a linear relationship. Give examples.<br><br>2. How does the pattern of change between two variables in a linear relationship show up in<br>2a. a contextual situation?<br>2b. a table?<br>2c. a graph?<br>2d. an equation? | **Mathematical Reflections**<br><br>1a. Explain how the information about a linear relationship is represented in a table, a graph, or an equation.<br>1b. Describe several real-world situations that can be modeled by equations of the form y = mx + b and y = mx. Explain how the latter equation represents a proportional relationship.<br><br>2a. Explain how a table or graph that represent a linear relationship can be used to solve a problem.<br>2b. Explain how you have used an equation that represents a linear relationship to solve a problem. | **Mathematical Reflections**<br><br>1a. Suppose that, in an equation with two variables, you know the value of one of the variables. Describe a method for finding the value of the other variable using the properties of equality. Give an example to illustrate your method.<br>1b. Compare the method you described in part (a) to the methods of using a table or a graph to solve linear equations.<br><br>2a. Explain how an inequality can be solved by methods similar to those used to solve linear equations.<br>2b. Describe a method for finding the solution to an inequality using graphs.<br><br>3. Give an example of two equivalent expressions that were used in this investigation. Explain why they are equivalent. | **Mathematical Reflections**<br><br>1. Explain what the slope of a line is. How does finding the slope compare to finding the rate of change between two variables in a linear relationship?<br><br>2. How can you find the slope of a line from<br>2a. an equation?<br>2b. a graph?<br>2c. a table of values of the line?<br>2d. the coordinates of two points on the line?<br><br>3. For parts (a) and (b), explain how you can write an equation of a line from the information. Use examples to illustrate your thinking.<br>3a. the slope and the y-intercept of the line<br>3b. two points on the line |