Lesson 1.3.1: Creating and Graphing Linear Equations in Two Variables

Warm-Up 1.3.1

Read the information that follows and use it to complete the problems.

A cell phone company charges a $20 flat fee plus $0.05 for every minute used for calls.

1. Make a table of values from 0 to 60 minutes in 10-minute intervals that represent the total amount charged.

2. Write an algebraic equation that could be used to represent the situation.

3. What do the unknown values in your equation represent?

Standards: MCC9–12.A.CED.2⋆

MCC9–12.N.Q.1⋆

Introduction

Many relationships can be represented by linear equations. Linear equations in two variables can be written in the form $y = mx + b$, where m is the slope and b is the y-intercept. The slope of a linear graph is a measure of the rate of change of one variable with respect to another variable. The y-intercept of the equation is the point at which the graph crosses the y-axis and the value of x is zero.

Creating a linear equation in two variables from context follows the same procedure at first for creating an equation in one variable. Start by reading the problem carefully. Once you have created the equation, the equation can be graphed on the coordinate plane. The **coordinate plane** is a set of two number lines, called the axes, that intersect at right angles.

Key Concepts

Reviewing Linear Equations:

- The slope of a linear equation is also defined by the ratio of the rise of the graph compared to the run. Given two points on a line, (x_1, y_1) and (x_2, y_2), the slope is the ratio of the change in the y-values of the points (rise) to the change in the corresponding x-values of the points (run).

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

- The slope-intercept form of an equation of a line is often used to easily identify the slope and ***y*-intercept**, which then can be used to graph the line. The slope-intercept form of an equation is shown below, where m represents the slope of the line and b represents the y-value of the point where the line intersects the y-axis at point $(0, y)$.

$$y = mx + b$$

- Horizontal lines have a slope of 0. They have a run but no rise. Vertical lines have no slope.
- The ***x*-intercept** of a line is the point where the line intersects the x-axis at $(x, 0)$.
- If a point lies on a line, its coordinates make the equation true.

- The independent variable will be labeled on the x-axis. The **independent variable** is the quantity that changes based on values you choose.
- The dependent variable will be labeled on the y-axis. The **dependent variable** is the quantity that is based on the input values of the independent variable.

Example 1

A local convenience store owner spent $10 on pencils to resell at the store. What is the equation of the store's revenue if each pencil sells for $0.50? Graph the equation.

Example 2

A taxi company in Atlanta charges $2.50 per ride plus $2 for every mile driven. Write and graph the equation that models this scenario.

Example 3

Miranda gets paid $300 a week to deliver groceries. She also earns 5% commission on any orders she collects while out on her delivery run. Write an equation that represents her weekly pay and then graph the equation.

Example 4

The velocity (or speed) of a ball thrown directly upward can be modeled with the following equation: $v = -gt + v_0$, where v is the speed, g is the force of gravity, t is the elapsed time, and v_0 is the initial velocity at time 0. If the force of gravity is equal to 32 feet per second, and the initial velocity of the ball is 96 feet per second, what is the equation that represents the velocity of the ball? Graph the equation.

Practice 1.3.1: Creating and Graphing Linear Equations in Two Variables

Graph each equation on graph paper.

1. $y = x + 2$

2. $y = \frac{1}{3}x + 2$

3. A gear on a machine turns at a rate of 2 revolutions per second. Let x = time in seconds and y = number of revolutions. What is the equation that models the number of revolutions over time? Graph this equation.

4. A company started with 3 employees and after 8 months grew to 19. The growth was steady. What is the equation that models the growth of the company's employees? Graph this equation.

5. You and some friends are hiking the Appalachian Trail. You started out with 70 pounds of food for the group, and eat about 8 pounds each day. What is the equation that models the food you have left? Graph this equation.

Linear Equations Game