TOPIC 2 Analyze and Solve Linear Equations

In this topic, students extend their understanding of equations to solving two-step and multistep equations. They then move on to solving two-step inequalities. Students also graph and analyze linear equations.

CONNECT THE MATH

Many real-world situations that involve something that varies or is unknown can be modeled by linear equations. *Linear equations* are equations with graphs that are lines. The *slope* of the line tells its steepness and represents the rate of change from one point to another. The *y*-intercept, also called the *initial value*, is the point at which the line crosses the *y*-axis.

When something is moving at a constant speed the linear equation $distance = rate \bullet time$ represents how far it has moved. This equation represents a proportional relationship, the distance is proportional to the amount of time in motion. The speed the object is moving is the rate, or the constant of proportionality. When you travel, the GPS in your car or on your phone uses the average speed and the distance to a destination to calculate an estimated arrival time.





Not all linear equations represent proportional relationships. For example, the amount of money spent at a carnival can be represented by the equation: total money spent = admission fee + price of ride ticket • number of ride tickets purchased. The relationship is not proportional because the admission fee is a fixed cost.

LESSON 2-1 Combine Like Terms to Solve Equations

Combining like terms that are on one side of an equation makes it easier to solve for the variable by using inverse operations.

LESSON OBJECTIVES

- Combine like terms.
- Solve equations with like terms on one side of the equation.
- Make sense of scenarios and represent them with equations.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share this video tutorial with your student:

• How Do You Solve a Two-Step Equation by Combining Like Terms?

You can use these search terms and phrases to help your student find additional help online:

- combining like terms with positive coefficients
- combining like terms with negative coefficients
- combining like terms to solve an addition equation
- combining like terms to solve a subtraction equation

LESSON 2-2

Solve Equations with Variables on Both Sides

To solve a linear equation that has variable terms on both sides of the equation, first use inverse operations to move all variable terms to one side of the equation and all constant terms to the other. Then, combine like terms and use inverse operations to isolate the variable.

LESSON OBJECTIVES

- Solve equations with variables on both sides of the equation.
- Make sense of scenarios and represent them with equations.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share these video tutorials with your student:

- How Do You Solve an Equation with Variables on Both Sides?
- <u>How Do You Solve a Word Problem Using an Equation with Variables on</u> <u>Both Sides?</u>

You can use these search terms and phrases to help your student find additional help online:

- solving equations with variables on both sides
- combining like terms to solve equations

LESSON 2-3 Solve Multistep Equations

The Distributive Property is an important tool for simplifying expressions and combining like terms. In order to combine like terms, it might be necessary to expand expressions that include parentheses.

LESSON OBJECTIVES

• Plan multiple solution pathways and choose one to find the solution to multistep equations.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share these video tutorials with your student:

- How Do You Solve an Equation with Variables on Both Sides and Grouping Symbols?
- How Do You Solve an Equation with Variables on Both Sides and Fractions?

You can use these search terms and phrases to help your student find additional help online:

- using the Distributive Property to solve a multistep equation
- using the Distributive Property on both sides of an equation
- distributing a negative coefficient

LESSON 2-4

Equations with No Solutions or Infinitely Many Solutions

Equations with one variable can have no solution, one solution, or infinitely many solutions. An equation with one solution is true for only a single value of the variable. An equation with infinitely many solutions is true for any value of the variable. An equation with no solutions is not true for any value of the variable.

LESSON OBJECTIVES

• Determine the number of solutions to an equation.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share this video tutorial with your student:

• How Do You Solve an Equation with No Solution?

You can use these search terms and phrases to help your student find additional help online:

- solving a multistep equation with infinitely many solutions
- solving a multistep equation with one solution
- solving a multistep equation with no solution
- determine the number of solutions by inspection

LESSON 2-5 Compare Proportional Relationships

Proportional relationships can be represented using different models, including graphs, tables, and equations. The models can be used to compare the rate of change among different relationships.

LESSON OBJECTIVES

• Analyze equations, linear graphs, and tables to find unit rates and compare proportional relationships.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share this video tutorial with your student:

• Determine Whether Values in a Table are Proportional

You can use these search terms and phrases to help your student find additional help online:

- finding unit rate
- comparing proportional relationships represented by graphs, tables,

equations and verbal descriptions

LESSON 2-6

Connect Proportional Relationships and Slope

Slope is a measure of the steepness of a line and is equal to the rate of change between quantities. In a proportional relationship, the slope is the same as the unit rate and the constant of proportionality.

LESSON OBJECTIVES

- Find the slope of a line using different strategies.
- Interpret slope in context and relate it to steepness on a graph.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share these video tutorials with your student:

- How Do You Find the Slope of a Line from Two Points?
- What Does the Slope of a Line Mean?

Review Key Vocabulary

Review key vocabulary from this lesson in your student's glossary:

• <u>slope</u>

You can use these search terms and phrases to help your student find additional help

online:

- understand slope
- find the slope from two points
- interpret slope

LESSON 2-7 Analyze Linear Equations: y = mx

The slope, constant of proportionality, and unit rate are equal for proportional relationships.

LESSON OBJECTIVES

- Understand how the constant of proportionality and slope relate in a linear equation.
- Write a linear equation in the form y = mx when the slope is given.
- Graph a linear equation in the form y = mx.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share these video tutorials with your student:

- What's the Formula for Slope?
- What Does Negative Slope Mean?

You can use these search terms and phrases to help your student find additional help online:

• relate constant of proportionality to slope

- writing an equation from two points
- graphing an equation in the form y = mx

LESSON 2-8

Understand the *y*-Intercept of a Line

The *y*-intercept of a line is the *y*-coordinate of the point where the graph of the line crosses the *y*-axis. Its meaning depends on the context of the graph.

LESSON OBJECTIVES

- Interpret and extend the table or graph of a linear relationship to find the *y*-intercept.
- Analyze graphs in context to determine and explain the meaning of the *y*-intercept.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share these video tutorials with your student:

- What's the y-Intercept?
- What Does Direct Variation Look Like on a Graph?

Review Key Vocabulary

Review key vocabulary from this lesson in your student's glossary:

• <u>y-intercept</u>

You can use these search terms and phrases to help your student find additional help online:

- determine the *y*-intercept of a relationship
- the y-intercept of a proportional relationships
- identifying the *y*-intercept

LESSON 2-9 Analyze Linear Equations: y = mx + b

The slope-intercept form of a linear equation, y = mx + b, gives information to sketch a graph of the line. It indicates the point (0, b) is on the graph of the line and shows that the slope of the line is m. The slope and y-intercept can be found by interpreting a given graph of a line. This information can be used to write an equation for that line in slope-intercept form.

LESSON OBJECTIVES

- Graph a line from an equation in the form y = mx + b.
- Write an equation that represents a given graph of a line.

HOW CAN YOU HELP WITH HOMEWORK

Review Lesson Content

Watch and share these video tutorials with your student:

- How Do You Write an Equation of a Line in Slope-Intercept Form if You Have Two Points?
- How Do You Write an Equation of a Line in Slope-Intercept if You Have a Graph?

Review Key Vocabulary

Review key vocabulary from this lesson in your student's glossary:

• <u>slope-intercept form</u>

You can use these search terms and phrases to help your student find additional help online:

- writing the equation of a line
- graphing an equation in y = mx + b form
- graphing a line from a table of values
- writing an equation in slope-intercept form from a table of values