

KEY CONCEPT OVERVIEW

In Topic D, students continue their work with linear equations by exploring **simultaneous equations (systems of equations)** using graphs, as well as multiple algebraic methods. Students discover that, as with linear equations in one variable, a system can have a unique solution, no solution, or infinitely many solutions. Topic E extends systems of equations to an application of the **Pythagorean theorem**.

You can expect to see homework that asks your child to do the following:

- Write a system of equations for situations involving constant rate.
- Graph a system of equations and interpret the point where the lines intersect as the solution to the system.
- Substitute numbers for specific variables to verify the solution for simultaneous equations.
- Determine whether a system has a unique solution, no solution, or infinitely many solutions.
- Solve simultaneous equations by using the computational methods of elimination and substitution. (See Sample Problem.)
- Apply techniques for solving systems of equations to real-life situations, including finding **Pythagorean triples**.

SAMPLE PROBLEM (From Lesson 28)

Determine the solution to the system of equations by eliminating one of the variables. Verify the solution using the graph of the system.

$$\begin{cases} x - 4y = 7 \\ 5x + 9y = 6 \end{cases}$$

Transform one of the equations to create inverses that will cancel or eliminate one of the variables.

$$\begin{aligned} -5(x - 4y) &= -5(7) \\ -5x + 20y &= -35 \end{aligned}$$

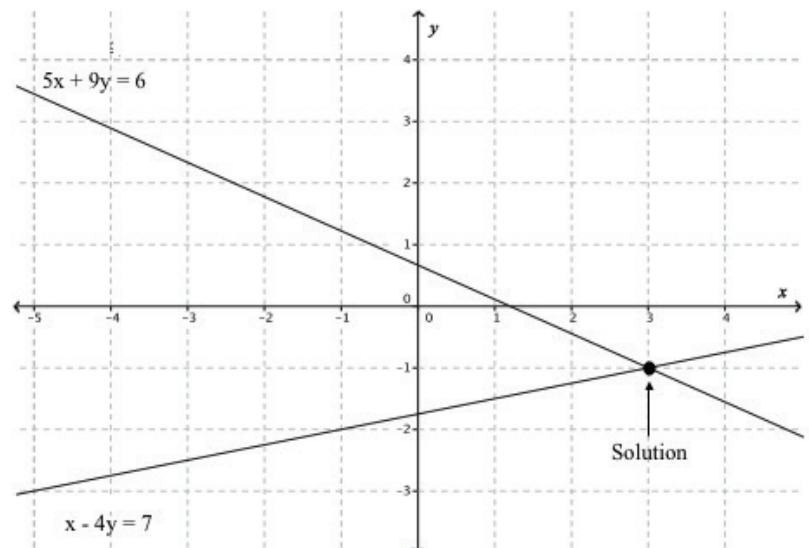
Now there is a new system where one of the variables will eliminate.

$$\begin{cases} -5x + 20y = -35 \\ 5x + 9y = 6 \end{cases}$$

$$\begin{aligned} -5x + 20y + 5x + 9y &= -35 + 6 \\ 29y &= -29 \\ y &= -1 \end{aligned}$$

$$\begin{aligned} x - 4y &= 7 \\ x - 4(-1) &= 7 \\ x + 4 &= 7 \\ x &= 3 \end{aligned}$$

The solution is (3, -1).



Additional sample problems with detailed answer steps are found in the *Eureka Math Homework Helpers* books. Learn more at GreatMinds.org.

HOW YOU CAN HELP AT HOME

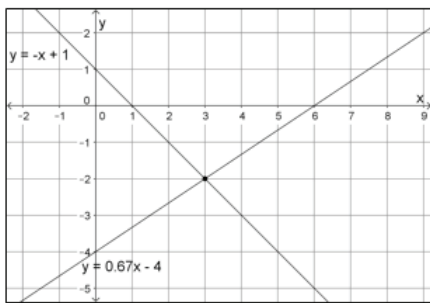
You can help at home in many ways. Here are some tips to help you get started.

- Help your child practice identifying additive inverses so she becomes more comfortable using them in the elimination method for solving systems of equations. For example, the additive inverse of $3x$ is $-3x$, and the additive inverse of $-\frac{1}{4}y$ is $\frac{1}{4}y$.
- Continue to work with your child on transforming equations from standard form to slope-intercept form. Give your child any equation written as $ax + by = c$, and have him rewrite that equation in the form “ $y =$.” For example, give your child the equation $3x - 2y = 10$. After your child transforms the equation to $y = \frac{3}{2}x - 5$, ask him to identify the slope, $\frac{3}{2}$, and the y -intercept point, $(0, -5)$.

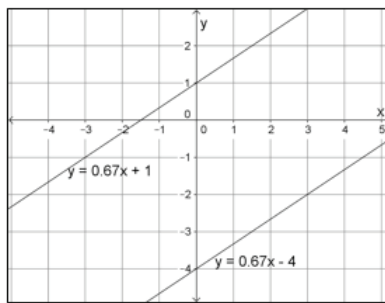
TERMS

Ordered pair: Two numbers written in a fixed order, usually as (x, y) .

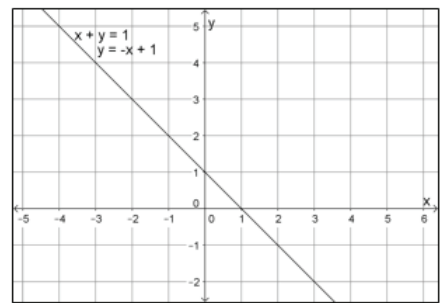
Simultaneous equations/Systems of equations: Two or more two-variable equations that have one common solution, graphically represented by where the graphs intersect. There are also systems of equations with no solution, which would graph as parallel lines, and some with infinitely many solutions, which would graph as the same line. (See images below.)



One Solution



No Solution



Infinite Solutions

Hypotenuse of a right triangle: The longest side of the right triangle. The hypotenuse is opposite the right angle.

Leg of a right triangle: One of the two shorter sides of the right triangle. Together, the legs form the right angle.

Pythagorean theorem: If the triangle is a right triangle, then $leg_1^2 + leg_2^2 = hypotenuse^2$, or $a^2 + b^2 = c^2$.

Pythagorean triple: Three positive integers that represent the lengths of the sides of a right triangle and that successfully fulfill the Pythagorean theorem.

