

Mastery Checkpoint 4: Systems of Equations Toolkit

A system of equations is a set of equations with the same variables. Solving a system of equations means finding one or more solutions that make each of the equations in the system true. A solution to a system of equations gives a **point of intersection** (x, y) of the graphs of the equations in the system. There are many methods for solving a system of linear equations such as tables, graphing Equal Values and Substitution method, Elimination method. Furthermore, there are 3 types of solutions.

Tables

Sam and Hector are earning money for football season. Sam has \$20 and is earning two dollars per week. Hector has \$15, but is earning three dollars per week. In how many weeks will they both have the same amount?

Sam	Week (x)								rule
	Money (y)								

Hector	Week (x)								rule
	Money (y)								

Graphing

One Solution (x,y) "Intersecting Lines"	No Solutions "Parallel Lines"	Many Solutions "Coinciding Lines"
Sam $y =$ Hector $y =$	$y = 3x - 4$ $y = 3x + 1$	$y = x - 2$ $2y = 2x - 4$
Solution: _____	Why?	Why?

Equal Values Method

Algebraic method solving for both x and y. Also known as substitution.

Sam $y = 2x + 20$

Hector $y = 3x + 15$

$2x + y = 5$ Put both equations into $y = mx + b$ form.

$y = x - 1$

$2x + y = 5 \quad | \quad y = x - 1$

$y = -2x + 5$

$-2x + 5 = x - 1$

$-3x = -6$

$x = 2$

now find y by checking in both equations

$x = 8 - 2y$

$y - 4 = x$

now find x by checking in both equations

now find y by checking in both equations

Substitution Method

Substitute the expression of x in second equation. This will create an equation with just one variable, y . Solve for y , then substitute the answer back into both equations to find x .

Substitute the expression of y in second equation. Then repeat the substitution method in equation to solve for x . Finally substitute x back into both equations to find y .

$$x = -3y + 1$$

$$4x - 3y = -11$$

$$x = (-3y + 1)$$

$$4(-3y + 1) - 3y = -11$$

$$-12y + 4 - 3y = -11$$

$$-15y + 4 = -11$$

$$-15y = -15$$

$$y = 1$$

now find x by checking in both equations

$$y = 10 - 2x$$

$$3x - 2y = 1$$

now find y by checking in both equations

Elimination Method

By adding or subtracting the two linear equations in a way that eliminates one of the variables, a single variable equation remains. Solve for it, then substitute the variable back into **both** equations to solve for the other variable.

Variables ready to eliminate	Multiply either by -1 , then eliminate	Multiply top by 3 , then eliminate
$3x + 2y = 14$ $-3x + 5y = 14$	$5x + 2y = 18$ $3x + 2y = 10$	$5x + 3y = -6$ $2x - 9y = 18$
Check in both	Check in both	Check in both