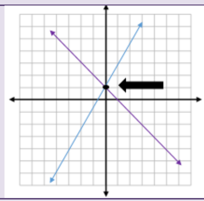
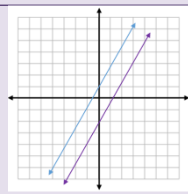
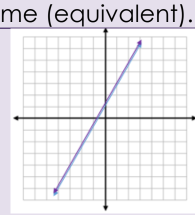
Packet 3: Systems of Linear Equations

Dear Parents/Guardians,

Functions: Packet 3 introduces systems of linear equations. Students solve systems using three typical methods; graphing, substitution and elimination. Students use systems of linear equations to solve real-life problems.

Solving Systems of Equations by Graphing

A system of linear equations is a set of two or more linear equations with the same variables. The solution set is the set of values that, when substituted in for the variables, makes all of the equations in the system true. First, students graph systems of linear equations to determine its solutions, if any.

One Solution When the lines intersect at only one point.	**No Solution** When the lines are parallel, they will never intersect.	**Infinitely Many Solutions** When the lines are the same (equivalent).
		
$\begin{cases} y = 2x+1 \\ y = -x+1 \end{cases}$	$\begin{cases} y = 2x+1 \\ y = 2x-1 \end{cases}$	$\begin{cases} y = 2x+1 \\ 2y - 4x = 2 \end{cases}$

Solving Systems of Equations by Substitution

Substitution is a good strategy to use when there is an isolated variable, or it is easy to isolate a variable.

$$\begin{cases} y + 3x = 1 \\ 2x - 4 = y \end{cases}$$

1. Since y is isolated in the second equation, replace the y in the first equation with $2x – 4$. Replace with 2x – 4

$$y + 3x = 1 \longrightarrow (2x-4) + 3x = 1$$

2. Solve for x.

$$\begin{aligned} (2x-4)+3x &= 1 \\ 5x-4 &= 1 \\ 5x &= 5 \\ x &= 1 \end{aligned}$$

3. Replace 1 for x in one of the original equations to solve for y.

$$\begin{aligned} 2x-4 &= y \\ 2(1)-4 &= y \\ -2 &= y \end{aligned}$$

4. The solution set for the system is (1, -2).

Solving Systems of Equations by Elimination

Elimination is a good strategy to use when there is a variable that could be eliminated easily by using properties of equality.

$$\begin{cases} 4x + y = -15 \\ -3x - 2y = 10 \end{cases}$$

Notice that the first (red) equation could be rewritten if both sides of the equation are multiplied by 2 (multiplication property of equality).	$2(4x+y) = 2(-15)$ $8x + 2y = -30$
Using the addition property of equality, add the expressions (from the blue and green equations) on both sides together. By doing this, we have eliminated the y's and can now solve for x.	$8x + 2y = -30$ $+(-3x) - 2y = +10$ $5x = -20$ $x = -4$
Substitute x = -4 into one of the original equations to solve for y. The solution set is (-4, -1).	$4x + y = -15$ $4(-4) + y = -15$ $-16 + y = -15$ $y = -1$

FUNCTIONS PACKET 3

By the end of the packet, your student should know…

- Why systems of equations may have zero, one, or infinitely many solutions Lesson 3.1
- How to solve systems of linear equations using a graphing method Lesson 3.1
- How to solve systems of linear equations using a substitution method Lesson 3.2
- How to solve systems of linear equations using properties of equality and the elimination method Lesson 3.3

Additional Resources

For additional notes and definitions please refer to section 3.5.