Unit 4: Linear Equations & Linear Systems **Name:**

Lesson 1 - Number Puzzles

Think about the expression x+5.

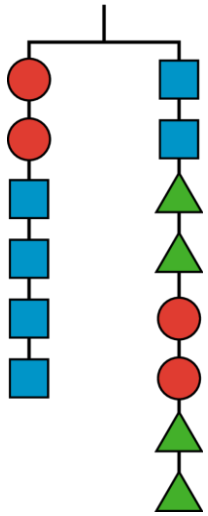
What could this mean in terms of two numbers being related to each other?

What could this represent as an action?

Lesson 2 - Keeping the Equations Balanced

What is an equation? What does the equal sign in an equation tell you?

What features do balanced hangers and equations have in common?



Here is a hanger that is in balance. We don't know how much any of its shapes weigh. How could you change the number of shapes on it, but keep it in balance? What does this tell you about the weight of the shapes in the balance? Describe in words or draw a new diagram.

Lesson 3 - Balanced Moves

Here is an equation: 6x+12=10x−4. Think of three different things you could do to each side of the question but still maintain equality.

If you made a mistake when solving this equation and thought that x=2, how would you be able to tell?

Lesson 4 - More Balanced Moves

Does the move described maintain the equality of an equation?

- subtract a number from each side
- Add 4 to one side and add 5 to the other
- subtract 4x from each side
- dividing each side of the equation by 7
- adding 5x to one side and 10 to the other

Lesson 5 - Solving Any Linear Equation

Solve the following equations and check your solution.

Ex 1: $2x - 8 = 7 + 5x$ Check:

Ex 2: $2(3x - 4) = 2(2x - 4)$ Check:

Lesson 6 - Strategic Solving

Solve the following equations.

$3(2-x) = 2x + 7 - 7x + 3$

$\frac{3}{5}(2x-1) = \frac{1}{3}(x+3)$

What are some things these equations might have that could be considered difficult to solve? What strategies do we know for solving equations that have each of these things?

Lesson 7 - All, Some, or No Solutions

Complete each equation so that it is true for all values of x.	Complete each equation so that it is true for no values of x.
a. $3x + 6 = 3(x + \_\_)$	a. $3x + 6 = 3(x + \_\_)$
b. $x - 2 = -(\_\_ - x)$	b. $x - 2 = -(\_\_ - x)$
c. $\frac{15x-10}{5} = \_\_ - 2$	c. $\frac{15x-10}{5} = \_\_ - 2$

Describe how you know whether an equation will be true for all values of x or true for no values of x.

Lesson 8 - How Many Solutions?

Identify which of the equations has one solution, no solutions, or infinitely many solutions. Explain how you know with or without solving the equations.

12x + 7 = 3(4x + 4)

12x + 7 = ½(20x + 14) + 2x

12x + 7 = 3(4x + 1) + 2x

Lesson 9 - When Are They the Same?

Imagine a full 1,500 liter water tank that springs a leak, losing 2 liters per minute. Write an expression for this tank.

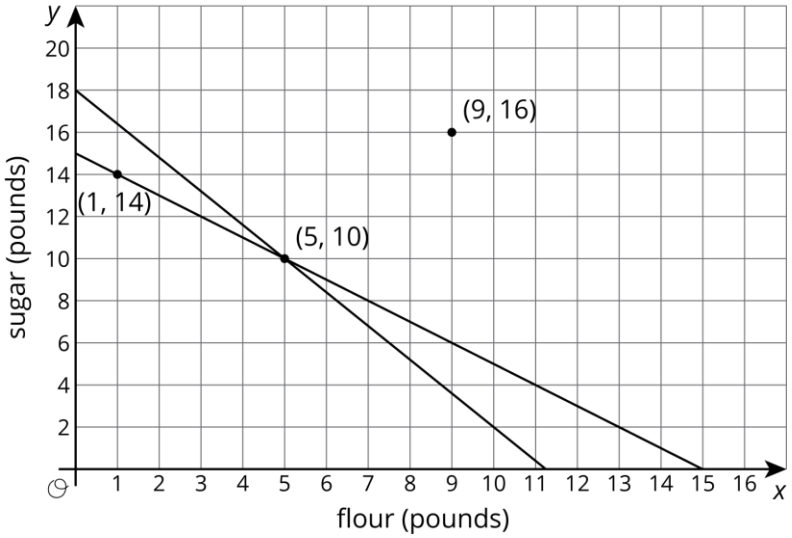
Now imagine that a second tank has 300 liters and is being filled at a rate of 6 liters per minute. Write an expression for the second tank.

What can we find by setting the two expressions equal to each other?

The solution is x=150. What does the solution mean in the context of the problem?

Lesson 10 - On or Off the Line?

Two equations are graphed below.
One equation is 0.8x + 0.5y = 9.
Label the line the equation corresponds to.



The other equation is x + y = 15.
Label the line the equation corresponds to.

Why is (5, 10) on both lines?

Why is (1, 14) on only one line?

Why is (9, 16) on neither of the lines?

Lesson 11 - On Both of the Lines

What is a system of equations?

What does the solution to a system of equations represent?

Sketch an example of a system with one solution at (1, 2).

Sketch an example of a system with no solution.

Lesson 12 - Systems of Equations

Identify which system has one solution, no solutions, or infinitely many solutions, without solving.

$y = 2x + 1$
$y = 2x - 5$

$y = 2(x + 1) - 3x$
$y = 2 - x$

$y = 2x + 3$
$y = 3x + 2$

Lesson 13 & 14 - Solving Systems of Equations

Solve each of the following systems:

$9x + y = 16$ $y = 7x$	$3x + y = 24$ $x = 2y - 20$
$2x - y = 3$ $2x - y = -3$	$\begin{cases} y = \frac{3}{4}x \\ \frac{5}{2}x + 2y = 5 \end{cases}$

Lesson 15 - Writing Systems of Equations

When writing systems, look for:

- Two situations that can be written as expressions in terms of x
- One statement that relates the total amount of two items, and one statement that the total value of the two items

Write a system of equations for each of the following situations. You do not need to solve it.

The activities director of the Community Center is planning a skating event for all the students at the local middle school. There are several skating rinks in the area, but the director does not know which one to use. Skate Fest charges a fee of $200 plus $3 per skater, while Rollerama charges $5 per skater. When is the cost of each skating rink the same?

One day each month the Family and Consumer Science classes offer a deli lunch for the faculty and staff of the school to purchase. The staff has a choice of either a chef salad for $5.75 or a sandwich for $5. Today the Family and Consumer Science classes sold 85 lunches for a total of $464. Determine how many chef salads and hoagies were sold.