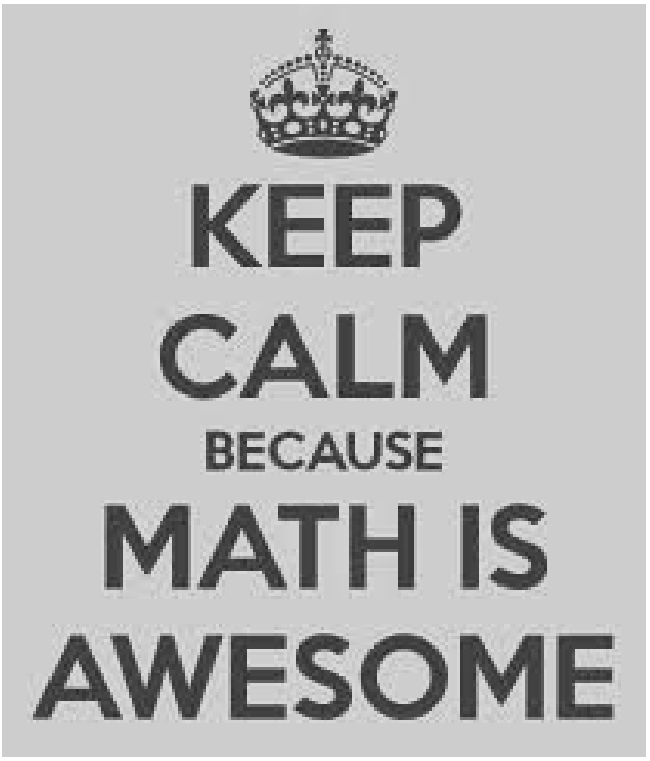
Incoming 8th Grade Math
Summer Learning Packet



Name: _____

Be sure to use the example problems to help you!

Part one: Two step equations

When **solving** an **equation** (a math sentence with an equals sign), our goal is to figure out the value of **variable** (a letter that represents an unknown amount) that makes the equation true.

Example:
$2x + 5 = 13$

The **solution** to this equation is $x = 4$ because if we **substitute** (replace) 4 in for x, we get:

$2 * 4 + 5 = 13$
$8 + 5 = 13$
$13 = 13$

Since 13 truly does equal 13, this is true and our solution of $x = 4$ is correct.

To solve an equation, we have to use **inverse** (opposite) operations.

Addition and subtraction are inverses of each other.
Division and multiplication are inverses of each other.

Examples:

$-4x + 8 = 16$

$\downarrow -8 \quad -8$

$-4x + 0 = 8$

$-4x = 8$

$\frac{-4}{-4} \quad \frac{8}{-4}$

$x = -2$

Step (1): Subtract 8 from both sides since subtraction is the inverse of addition. Then, simplify.

Step (2): Divide both sides by -4 since division is the inverse of multiplication. Then, simplify.

Step (3): Check solution →

$-4x+8 = 16$

$-4(-2)+8 = 16$

$8+8 = 16$

$16 = 16$ ✓

$7x - 15 = -1$

$\downarrow +15 \quad +15$

$7x + 0 = 14$

$\frac{7x}{7} = \frac{14}{7}$

$x = 2$

Step (1): Add 15 to both sides since addition is the inverse of subtraction. Then, simplify.

Step (2): Divide both sides by 7 since division is the inverse of multiplication. Then, simplify.

Step (3): Check solution

$7x - 15 = -1$

$7(2) - 15 = -1$

$14 - 15 = -1$

$-1 = -1$ ✓

Solve each of the following equations using inverse operations. Be sure to show your work. See the examples on the previous page for help!

$3x - 11 = 16$

$-5x + 2 = -8$

$6x + 9 = 39$

$10x - 18 = 32$

$-7x - 4 = 3$

$2x + 12 = -18$

Part two: Rational number operations

Rational numbers are just numbers that can be written as a fraction of two **integers** (positive and negative whole numbers).

Operations are just addition, subtraction, multiplication, and division.

Examples:

$\frac{1}{2} - \frac{2}{3}$ Before we can subtract, we need a common denominator: $\frac{1}{2} \cdot \frac{3}{3} = \frac{3}{6}$ $\frac{2}{3} \cdot \frac{2}{2} = \frac{4}{6}$

$\frac{3}{6} - \frac{4}{6}$ ← To evaluate, simply subtract across the top. The bottom does not change.

$\frac{3}{6} - \frac{4}{6} = \boxed{\frac{-1}{6}}$

$\frac{-3}{5} \cdot 20$ To multiply a fraction and a whole number, just multiply the numerator by the whole number. The denominator doesn't change.

$-\frac{3}{5} \cdot 20 = \frac{-60}{5}$

↳ $\frac{-60}{5}$ simplifies to $\boxed{-12}$.

$\frac{4}{9} \div \frac{1}{3}$ Instead of dividing by $\frac{1}{3}$, we can multiply by the reciprocal of $\frac{1}{3}$ which is $\frac{3}{1}$. Keep the first fraction the same, change $\div$ to multiplication, and flip the second fraction: $\frac{4}{9} \cdot \frac{3}{1} = \frac{12}{9} = \boxed{\frac{4}{3}}$

$-3 + \frac{7}{10}$ Before we can add, we need a common denominator: $-3 = \frac{-3}{1} \rightarrow \frac{-3}{1} \cdot \frac{10}{10} = \frac{-30}{10}$

$\frac{-30}{10} + \frac{7}{10}$ → simply add the numerators, and keep the denominator the same. $\frac{-30}{10} + \frac{7}{10} = \boxed{\frac{-23}{10}}$

Evaluate each expression, and simplify if necessary:

$\frac{2}{5} - \frac{1}{2}$

$\frac{1}{3} \cdot -9$

$\frac{1}{4} \div \frac{3}{2}$

$-1 + \frac{7}{8}$

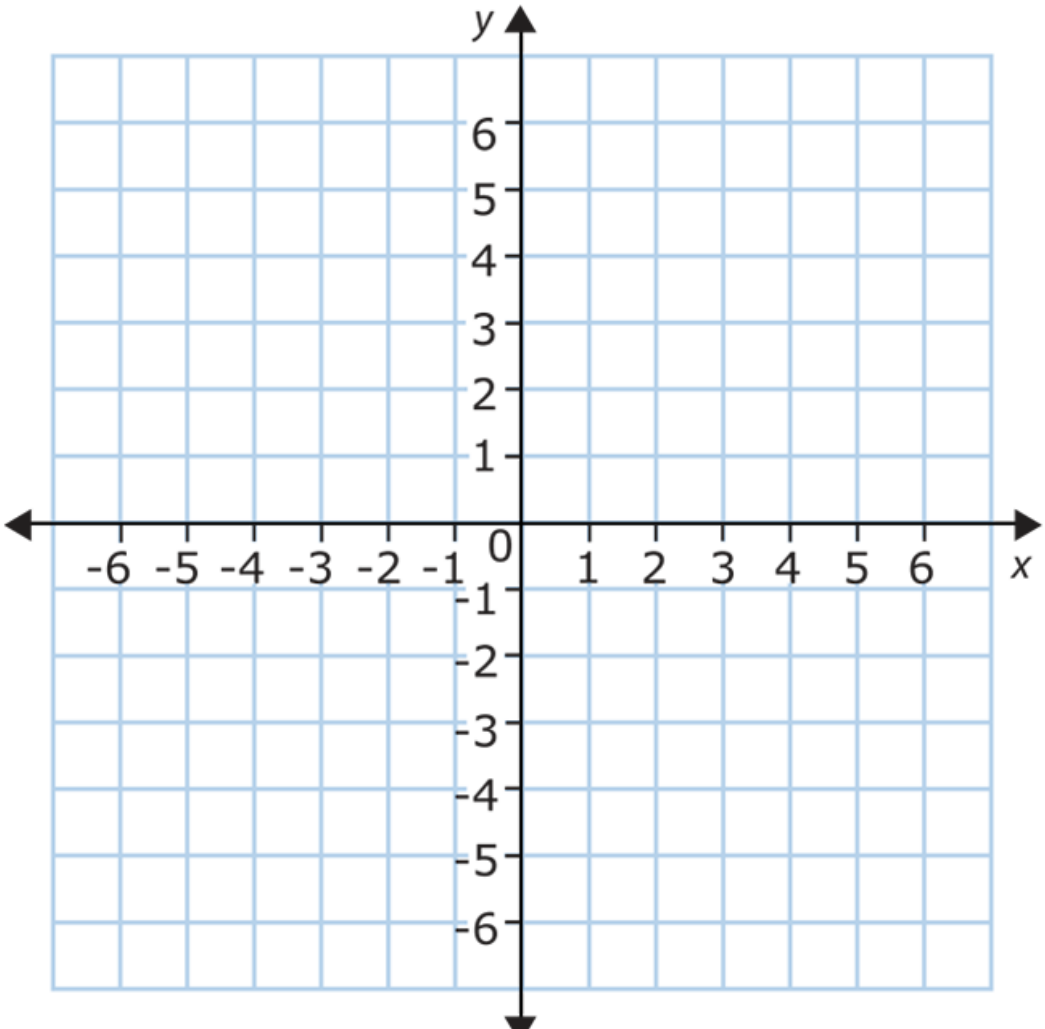
$\frac{3}{5} \cdot \frac{5}{3}$

$\frac{4}{9} + \frac{2}{3}$

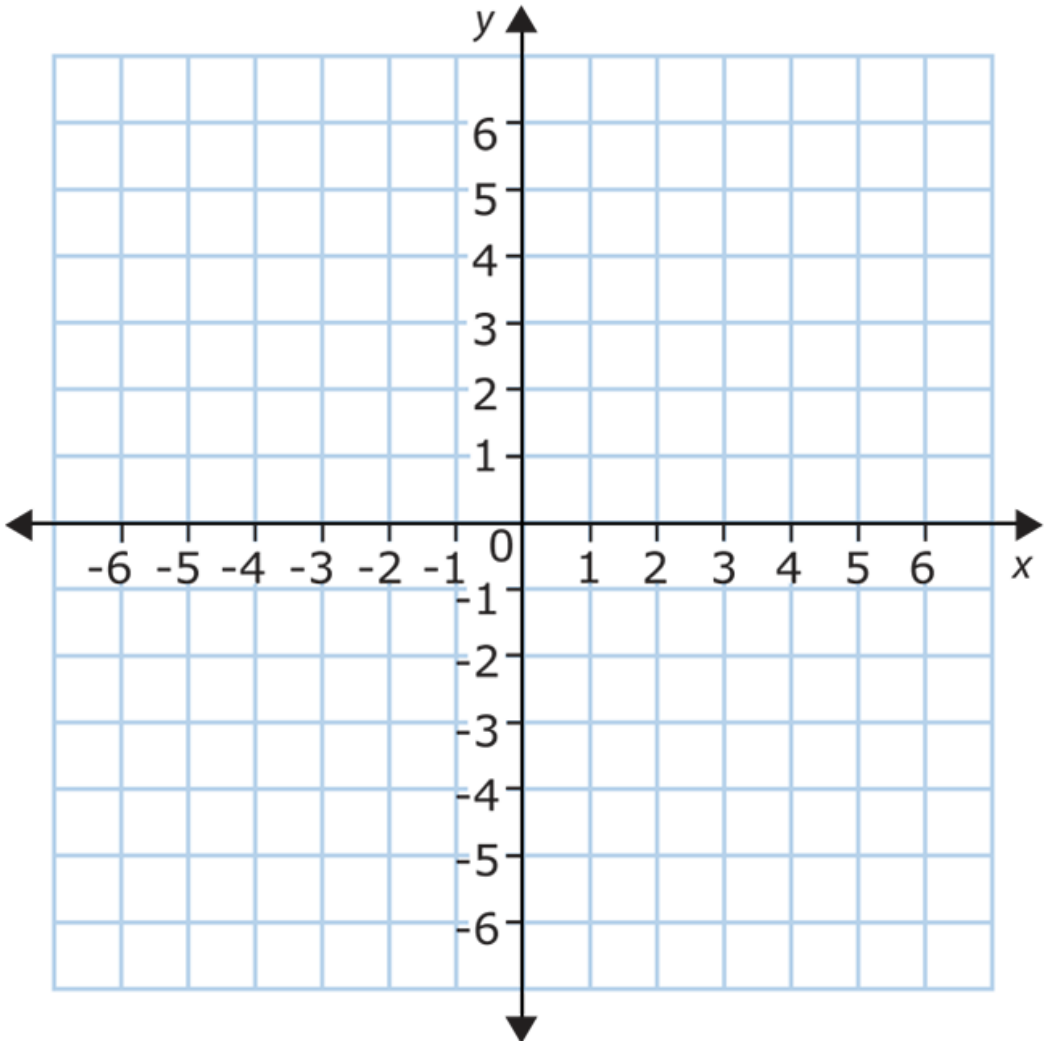
Part three: Graphing

If a relationship is **proportional**, its graph creates a **straight line** through **the origin** [the point 0,0)]. Use each table to graph each relationship. State if the relationship is proportional or not, and how you know.

x	y
-4	-3
-2	0
0	3
2	6



x	y
-5	5
-3	3
0	0
1	-1
4	4



x	y
-4	6
-2	3
0	0
2	5
3	4