Name: _____

Isolating to Solve for *x*

When your goal is to plug in an *x*-value and simplify to determine a *y*-value, you use the order of operations:

Parenthesis Exponents Multiplication/Division Addition/Subtraction

When your goal is to isolate a variable (like when you're asked to solve for *x*), however, you have to do the **opposite** of each operation, which means you also have to follow the order of operations backwards.

Subtraction/Addition Division / Multiplication Exponents Parenthesis

For each problem below, do the opposite operation in order to isolate the *x*-value.

Example

$5 = -6x - 10$

SADMEP *(backwards PEMDAS):*

1. **Subtraction/Addition**

$5 = -6x\boxed{-10}$

Do the opposite of subtracting 10 to both sides!

$5 = -6x\boxed{-10}$

$\underline{+10} \qquad \underline{+10}$

$15 = -6x$

2. **Division/Multiplication**

$15 = \boxed{-6}x$

Do the opposite of multiplying by -6 to both sides!

$\frac{15}{-6} = \frac{\boxed{-6}x}{-6}$

Simplify the fraction

$\frac{15 \div 3}{6 \div 3} = x$

$\frac{5}{-2} = x$

$x = \frac{5}{-2}$

1. $8 = 2x - 6$

2. $5 = -3x + 4$

3. $7 = 5x - 1$

4. $-11 = -2x + 7$

Rule for inequalities $(\geq, \leq, >, <)$**:** If you **multiply or divide** by a **negative**, flip the inequality symbol.

Example

$5 \geq -6x - 10$

SADMEP *(backwards PEMDAS):*

1. **Subtraction/Addition**

$5 \geq -6x\boxed{-10}$

$\underline{+10} \qquad \underline{+10}$

$15 \geq -6x$

2. **Division/Multiplication**

When you divide by a negative, the inequality sign flips!

$\frac{15}{-6} \boxed{\leq} \frac{\boxed{-6}x}{-6}$

Simplify the fraction

$\frac{15 \div 3}{6 \div 3} \leq x$

$\frac{5}{-2} \leq x$

When you switch the sides, the inequality sign will also flip!

$x \geq \frac{5}{-2}$

5. $8 > 2x - 6$

6. $5 \geq -3x + 4$

7. $7 \leq 5x - 1$

8. $-11 < -2x + 7$

Rule for exponents: To remove the ^{2} from x^2, you must use a $\pm\sqrt{\ }$ on both sides.

Example

$15 = 5x^2$

SADMEP *(backwards PEMDAS):*

1. **Subtraction/Addition**

Nothing is subtracting or adding! Moving on…

2. **Division/Multiplication**

$15 = \boxed{5}x^2$

Do the opposite of multiplying by 5 to both sides!

$$\frac{15}{5} = \frac{\boxed{5}x^2}{5}$$

Simplify the fraction

$3 = x^2$

3. **Exponents**

$3 = x^{\boxed{2}}$

A square root $(\pm\sqrt{\ })$ cancels out ^{2}, so use that on both sides.

$\pm\sqrt{3} = \pm\sqrt{x^{\boxed{2}}}$

Cancel both the $\pm\sqrt{\ }$ and the ^{2} on the x only:

$\pm\sqrt{3} = x$

If the number can be square rooted, then simplify. If not, leave it as is.

$\boxed{x = \pm\sqrt{3}}$

9. $12 = 3x^2$

10. $-8 = -4x^2$

11. $-21 = -7x^2$

12. $18 = 2x^2$

Example

$15 < 5x^2$

SADMEP *(backwards PEMDAS):*

1. **Subtraction/Addition**
2. **Division/Multiplication**

We're not dividing by a negative, so leave the sign as it is!

$$\frac{15}{5} < \frac{\boxed{5}x^2}{5}$$

Simplify the fraction

$3 < x^2$

3. **Exponents**

$3 < x^{\boxed{2}}$

A square root $(\pm\sqrt{\ })$ cancels out ^{2}.

$\pm\sqrt{3} < \pm\sqrt{x^{\boxed{2}}}$

$\pm\sqrt{3} < x$

I When you switch the sides, the inequality sign will also flip!

$\boxed{x > \pm\sqrt{3}}$

13. $12 \leq 3x^2$

14. $-8 < -4x^2$

15. $-21 \geq -7x^2$

16. $18 \leq 2x^2$