

With your partner, sort the following equations into at least two groups. Be sure to justify your grouping and be ready to share your justification.



Equations grouped in a blue circle:

- $5x - 2 = 3x + 4$
- $10 = 5x$
- $6x + 2 = 8x$
- $2x + 1 = 5$

Equations grouped in a blue circle:

- $3x + 6 = 3(x + 2)$
- $9x - 4 = -4 + 8x + x$
- $x + 1 = x - 6$
- $7x - 1 = 5x + 2x - 10$

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### Solving Equations with Special Solutions

**Don't FORGET!**

**Solving Steps:**

1. Remove parentheses using the distributive property
2. Combine like terms
3. Get variable terms to one side by adding the additive inverse (opposite)
4. Get constant terms to the other side by adding the additive inverse (opposite)
5. Get the variable alone by multiplying by the multiplicative inverse (reciprocal)

Solutions for algebraic equations can be broken down into 3 categories

**Sometimes True** – the equation is true only for set of possible values

Example 1)

$$3(2x - 1) - 10 = 8 + 5x$$

$$6x - 3 - 10 = 8 + 5x$$

$$6x - 13 = 8 + 5x$$

$$\begin{array}{r} 6x - 13 = 8 + 5x \\ -5x \quad -5x \\ \hline x - 13 = 8 \\ +13 \quad +13 \\ \hline x = 21 \end{array}$$

Example 2)

$$4(x + 5) = 3(x - 2) - 2(x + 2)$$

$$4x + 20 = 3x - 6 - 2x - 4$$

$$4x + 20 = x - 10$$

$$\begin{array}{r} 4x + 20 = x - 10 \\ -x \quad -x \\ \hline 3x + 20 = -10 \\ -20 \quad -20 \\ \hline 3x = -30 \\ \frac{3x}{3} = \frac{-30}{3} \quad x = -10 \end{array}$$

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**Always True** – the equation is true only for all possible values (you would write *Infinite Solutions* or *Identity*)

Example 3)

$$3(x+2) + 5 = 9 + 8x + 2 - 5x$$

$$3x + 6 + 5 = 11 + 3x$$

$$3x + 11 = 11 + 3x$$

$$\begin{array}{r} -3x \\ \hline \end{array}$$

$$11 = 11$$

$$\begin{array}{r} -11 \\ \hline \end{array}$$

$$0 = 0$$

Infinite Solutions

Example 4)

$$8x + 9 - 3x = 8 + 5x + 1$$

$$\begin{array}{r} 5x + 9 = 9 + 5x \\ -5x \\ \hline \end{array}$$

$$9 = 9$$

Infinite Solutions

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**Never True** – the equation is never true for any possible values (you would write *No Solution*)

Example 5)

$$5(x+2) - 11 = 2x - 8 + 3x - 7$$

$$5x + 10 - 11 = 2x - 8 + 3x - 7$$

$$5x - 1 = 5x - 15$$

$$\begin{array}{r} -5x \\ \hline \end{array}$$

$$-1 \neq -15$$

No Solution

Example 6)

$$6x - [2x + 3(x+1)] = x + 20$$

$$6x - [2x + 3x + 3] = x + 20$$

$$6x - [5x + 3] = x + 20$$

$$6x - 5x - 3 = x + 20$$

$$x - 3 = x + 20$$

$$\begin{array}{r} -x \\ \hline \end{array}$$

$$-3 \neq 20$$

No Solution



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