1) put everything away except a pen and your homework
2) we will grade, answer questions, and make corrections
3) We will do the 1.3 lesson
4) correct anything that needs it and put it in your folder GRADED
5) Your vocab is due in your folder today too

Algebra 1.3: Solving Equations with Variables on Both Sides

WARM-UP Review:

Use the Distributive Property to simplify the expression.

1. $5(u - 5)$ $5u - 25$

2. $17(2 + n)$ $34 + 17n$

3. $-5(e - 4)$ $-5e + 20$

4. $-3(t + 7)$ $\boxed{-3t - 21}$

5. $4(v - 6)$ $\boxed{4v - 24}$

6. $4(a + 5)$ $\boxed{4a + 20}$

Warm Up

Simplify the expression.

1. $-1 + (-1) + (-1) = -3$

2. $(10)(-10)(-10)(10) = 1{,}000$

3. $-6 - (-6) = 0$

4. $\dfrac{300}{-3} \div \dfrac{300}{3}$ KCF $\dfrac{300}{-3} \cdot \dfrac{3}{300} = \dfrac{900}{-900} = -1$

5. $4 + \cancel{4 - 4} + \cancel{4 - 4} + 4 = 8$

6. $2(10 - 2)(2 - 8)(6 - 2)(2 - 4)(2 - 2)$
$2(8)(-6)(4)(-2)(0) = 0$

Cumulative Warm Up 1-3

Learning Outcomes:

I can solve linear equations that have variables on both sides.

I can identify **special solutions** of linear equations.

I can use linear equations to solve real-life problems.

1.3 Solving Equations with Variables on Both Sides with work

Core Concept

Solving Equations with Variables on Both Sides

To solve an equation with variables on both sides, simplify one or both sides of the equation, if necessary. Then use inverse operations to collect the variable terms on one side, collect the constant terms on the other side, and isolate the variable.

Steps:
1.
2.
3.

SADMEP

Example 1: Solve. Check your solution.

a) $10 - 4x = -9x$.

$+4x \quad +4x$

$10 = -5x$

$\frac{10}{-5} = \frac{-5x}{-5}$

$\boxed{-2 = x}$

$10 - 4(-2) = 18$

$-9(-2) = 18$

```
10-4(-2)
                18
-9(-2)
                18
```

b) $3(3x-4) = \frac{1}{4}(32x+56)$

$9x - 12 = \cancel{8x} + 14$

$-8x \qquad -8x$

$x - \cancel{12} = 14$

$+12 \quad +12$

$x = 26$

Core Concept

Practice 1:

Solve the equation. Check your solution.

1. $-2x = 3x + 10$

$-3x \quad -3x$

$\frac{-5x}{-5} = \frac{10}{-5}$

$x = -2$

$x = -2$

2. $\frac{1}{2}(6h-4) = -5h+1$

$3h - 2 = -5h + 1$

$+5h \qquad +5h$

$8h - 2 = 1$

$+2 \quad +2$

$\frac{8h}{8} = \frac{3}{8}$

$h = \frac{3}{8}$

3. $-\frac{3}{4}(8n+12) = 3(n-3)$

$\frac{-24}{4}n + \frac{(-36)}{4} = 3n - 9$

$-6n - \cancel{9} = 3n - \cancel{9}$

$+9 \qquad +9$

$0 = n$

$n = 0$

$-6n = 3n$

$+6n \quad +6n$

$\frac{0}{9} = \frac{9n}{9}$

$0 = n$

$0 = \frac{0}{K}$

$\frac{N}{0} = \emptyset$

Monitoring Progress 1-3

Core Concept

Special Solutions of Linear Equations

Equations do not always have one solution. An equation that is true for all values of the variable is an **identity** and has *infinitely many solutions*. An equation that is not true for any value of the variable has *no solution*.

Example 2:

Solve each equation.

a. 3(5x + 2) = 15x

$\cancel{15x} + 6 = \cancel{15x}$

$-\cancel{15x} \qquad -\cancel{15x}$

$6 \neq 0$

false

$\boxed{\text{no sol.}}$

b. −2(4y + 1) = −8y − 2

$-8y \cancel{-2} = -8y \cancel{-2}$

$+2 \qquad +2$

$\cancel{-8}y = \cancel{-8}y$

$\cancel{-8} \qquad \cancel{-8}$

true $y = y$

$\boxed{\text{inf. many sol.}}$

Core Concept

Practice 2:

Solve the equation.

4. 4(1 − p) = − 4p + 4

5. $6m - m = \frac{5}{6}(6m - 10)$

6. 10k + 7 = − 3 − 10k

7. 3(2a − 2) = 2(3a − 3)

Monitoring Progress 4-7

Concept Summary

Steps for Solving Linear Equations

Here are several steps you can use to solve a linear equation. Depending on the equation, you may not need to use some steps.

Step 1 Use the Distributive Property to remove any grouping symbols.

Step 2 Simplify the expression on each side of the equation.

Step 3 Collect the variable terms on one side of the equation and the constant terms on the other side.

Step 4 Isolate the variable. (Get the variable by itself)

Step 5 Check your solution.

Concept Summary

Example 3:

A boat leaves New Orleans and travels upstream on the MississippiRiver for 4 hours. The return trip takes only 2.8 hours because the boat travels 3 miles per hour faster downstream due to the current. How far does the boat travel upstream?

$D = r \cdot t$

rate up = x

rate down = x + 3

↑ = __ mph

↓ = __ mph

distance ↑ = distance ↓

$r_u \cdot t_u = r_d \cdot t_d$

$x \cdot 4 = (x+3)\,2.8$

$4x = 2.8x + 8.4$

Example 4

Practice 3:

8. A boat travels upstream on the Mississippi River for 3.5 hours. The return trip only takes 2.5 hours because the boat travels 2 miles per hour faster downstream due to the current. How far does the boat travel upstream?

Monitoring Progress 8

Grab a slip of paper from me and put both of these on your slip and give it to me before starting your homework assignment.

Reflect on your current understanding of solving equations.

- I Used to Think …

  But Now I Know ....

- Exit Ticket: Solve $6 - 2x = 4x - 9$.

Closure

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A: 5 - 25 (eoo), 27, 29, 38, 42, 44

B: 1 - 25(o), 40 - 44(e)

(eoo) every other odd

(e) evens

(o) odds