Bellwork: Algebra

1. Write down your homework for the night.
2. You need your Algebra Nation book today and composition book
3. Go back to your yellow divider and fill in your updated score. Then, glue in this new divider and fill in the initial score.
4. Take our your assingment from yesterday and be ready to check.
5. Solve the following questions on your bellwork in the THURSDAY box:

$$-7 + x = -6$$

X - 7

+7 +7

$X = 1$

$$\frac{x+6}{10} = -3$$

$\cdot 10$ $\cdot 10$

$X + 6 = -30$

-6 -6

$X = -36$

One-Step Equations

1. $m + 12 = 10$

$-12 \quad -12$

$\boxed{m = -2}$

2. $-2 = g - 9$

$+9 \quad +9$

$\boxed{7 = 9}$

$g = 7$

3. $\frac{-7y}{-7} = \frac{-91}{-7}$

$\boxed{y = 13}$

4. $\frac{a}{9} = -4 \cdot 9$

$\boxed{a = -36}$

Fractions

To "get rid" of a fraction, multiply by the reciprocal!

5. $\frac{3}{2} \cdot \frac{2}{3}x = 10 \cdot \frac{3}{2}$

$\boxed{x = 15}$

6. $\frac{9}{4} \cdot \frac{4}{9}w = -8 \cdot \frac{9}{4}$

$\boxed{w = -18}$

7. $\frac{-6}{6} \cdot -\frac{6}{5}k = 12 \cdot \frac{-5}{6}$

$\boxed{k = -10}$

8. $-2 \cdot -\frac{1}{2}m = -9 \cdot -2$

$\boxed{m = 18}$

Two-Step Equations

To Solve a Two-Step Equation:

1. Undo the **Addition/Subtraction** (to remove constant term)
2. Undo the **Multiplication/Division** (to remove coefficient)

9. $6x + 8 = 50$

$-8 \quad -8$

$\frac{6x}{6} = \frac{42}{6}$

$\boxed{x = 7}$

10. $2n - 5 = 11$

$+5 \quad +5$

$\frac{2n}{2} = \frac{16}{2}$

$\boxed{n = 8}$

11. $13 = -4k + 9$

$-9 \quad -9$

$\frac{4}{-4} = \frac{-4k}{-4}$

$\boxed{k = -1}$

12. $7 - 3y = 34$

$-7 \quad -7$

$\frac{-3y}{-3} = \frac{27}{-3}$

$\boxed{y = -9}$

13. $\frac{x}{2} - 7 = 9$

$+7 \quad +7$

$2 \cdot \frac{x}{2} = 16 \cdot 2$

$\boxed{x = 32}$

14. $11 = \frac{c}{-5} + 8$

$-8 \quad -8$

$-5 \cdot 3 = \frac{c}{-5} \cdot -5$

$\boxed{-15 = c}$

15. $\frac{3}{5}x + 22 = 28$

$-22 \quad -22$

$\frac{5}{3} \cdot \frac{3}{5} x = 6 \cdot \frac{5}{3}$

$\boxed{x = 10}$

16. $-\frac{1}{3}m + 1 = -7$

$-1 \quad -1$

$-3 \cdot -\frac{1}{3}m = -8 \cdot -3$

$\boxed{m = 24}$

17. $-10 + \frac{7}{4}p = -38$

$+10 \quad +10$

$\frac{4}{7} \cdot \frac{7}{4} p = -28 \cdot \frac{4}{7}$

$\boxed{p = -16}$

18. $15 = 9 - \frac{1}{2}x$

$-9 \quad -9$

$-2 \cdot 6 = -\frac{1}{2}x \cdot -2$

$\boxed{-12 = x}$

Watch Out!

The examples below are different in that the multiplication/division is done FIRST, followed by the addition/subtraction.

19. $\frac{x+11}{8} = -3 \cdot 8$

$x + 11 = -24$

$-11 \quad -11$

$x = -35$

20. $\frac{n-5}{-2} = -7 \cdot -2$

$n - 5 = 14$

$+5 \quad +5$

$n = 19$

21. $1 = \frac{a-13}{-6} \cdot -6$

$-6 = a - 13$

$+13 \quad +13$

$7 = a$

22. $4 = \frac{w+8}{9} \cdot 9$

$36 = w + 8$

$-8 \quad -8$

$28 = w$

Section 2: Equations and Inequalities

Section 2 – Topic 1

Equations: True or False?

Consider the statement $4 + 5 = 2 + 7$. This is a grammatically correct sentence.

Is the sentence true or false?

True; $4+5=9$, $2+7=9$

Consider the statement $1 + 3 = 8 + 6$. This statement is also a grammatically correct sentence.

Is the sentence true or false?

False; $1+3=4$, $8+6=14$

The previous statements are examples of ***number sentences***.

- A number sentence is a statement of equality between two numerical expressions.
- A number sentence is said to be true if both numerical expressions are equal.
- If both numerical expressions don't equal the same number, we say the number sentence is false.
- True and false statements are called ***truth values***.

Let's Practice!

1. Determine whether the following number sentences are true or false. Justify your answer.

   a. $13 + 4 = 7 + 11$

   $17 \neq 18$; False

   b. $\frac{1}{2} + \frac{5}{8} = 1.4 - 0.275$

   $1\frac{1}{8} = 1.125$

   $1.125 = 1.125$ True

Try It!

2. Determine whether the following number sentences are true or false. Justify your answer.

   a. $(83 \cdot 401) \cdot 638 = 401 \cdot (638 \cdot 83)$

   True; commutative property

   b. $(6 + 4)^2 = 6^2 + 4^2$

   $100 = 36 + 16$

   52 False

A number sentence is an example of an ***algebraic equation***.

- An algebraic equation is a statement of equality between two expressions
- Algebraic equations can be number sentences (when both expressions contain only numbers), but often they contain variables whose values have not been determined.

Consider the algebraic equation $4(x + 2) = 4x + 8$.

Are the expressions on each side of the equal sign equivalent? Justify your answer.

Yes; distributive property

What does this tell you about the numbers we can substitute for x?

Anything

Let's Practice!

3. Consider the algebraic equation $x + 3 = 9$.

   a. What value can we substitute for x to make it a true number sentence?

   6

   b. How many values could we substitute for x and have a true number sentence?

   1 $4(x+2)=4x+8$

4. Consider the algebraic equation $x + 6 = x + 9$. What values could we substitute for x to make it a true number sentence?

   No value!

Try It!

5. Complete the following sentences.

   a. $d^2 = 4$ is true for 2 and -2.

   $2m = 2m$

   b. $2m = m + m$ is true for Anything.

   c. $d + 67 = d + 68$ is true for Nothing.

BEAT THE TEST!

1. Which of the following equations have the correct solution? Select all that apply.

- [x] $2x + 5 = 19;\ x = 7$
- [ ] $3 + x + 2 - x = 16;\ x = 3$
- [x] $\frac{x+2}{5} = 2;\ x = 8$
- [x] $6 = 2x - 8;\ x = 7$
- [ ] $14 = \frac{1}{3}x + 5;\ x = 18$

Section 2 – Topic 2
Identifying Properties When Solving Equations

The following equations are equivalent. Describe the operation that occurred in the second equation.

$3 + 5 = 8$ and $3 + 5 - 5 = 8 - 5$

$x - 3 = 7$ and $x - 3 + 3 = 7 + 3$

$2(4) = 8$ and $\frac{2(4)}{2} = \frac{8}{2}$

$\frac{x}{2} = 3$ and $2 \cdot \frac{x}{2} = 2 \cdot 3$

This brings us to some more properties that we can use to write equivalent equations.

Properties of Equality

If x is a solution to an equation, then x will also be a solution to the new equation formed when the same number is added to each side of the original equation.

These are the ***addition and subtraction properties of equality***.

- If $a = b$, then $a + c = b + c$ and $a - c = b - c$.
- Give examples of this property.

$x - 2 = 11$ Addition property of equality

$x + 7 = 10$ subtraction property of equality

If x is a solution to an equation, x will also be a solution to the new equation formed when each side of the original equation is multiplied by the same number.

These are the ***multiplication and division properties of equality***.

- If $a = b$, then $a \cdot c = b \cdot c$ and $\frac{a}{c} = \frac{b}{c}$.
- Give examples of this property.

$2x = 14$ Divison property of equality

$\frac{x}{6} = 15$ Multiplication property of equality

Let's Practice!

1. The following equations are equivalent. Determine the property that was used to write the second equation.

   a. $x - 5 = 3x + 7$ and $x - 5 + 5 = 3x + 7 + 5$

   b. $x = 3x + 12$ and $x - 3x = 3x - 3x + 12$

   c. $-2x = 12$ and $\frac{-2x}{-2} = \frac{12}{-2}$

Try It!

2. The following pairs of equations are equivalent. Determine the property that was used to write the second equation.

   a. $2(x + 4) = 14 - 6x$ and $2x + 8 = 14 - 6x$

   b. $2x + 8 = 14 - 6x$ and $2x + 8 + 6x = 14 - 6x + 6x$

   c. $2x + 8 + 6x = 14$ and $2x + 6x + 8 = 14$

   d. $8x + 8 = 14$ and $8x + 8 - 8 = 14 - 8$

   e. $8x = 6$ and $\frac{1}{8} \cdot 8x = \frac{1}{8} \cdot 6$

BEAT THE TEST!

1. For each algebraic equation, select the property or properties that could be used to solve it.

Algebraic Equation	Addition or Subtraction Property of Equality	Multiplication or Division Property of Equality	Distributive Property	Commutative Property
$\frac{x}{2} = 5$	☐	☑	☐	☐
$2x + 7 = 13$	☑	☑	☐	☐
$4x = 23$	☐	☐	☐	☐
$x - 3 = -4$	☐	☐	☐	☐
$4(x + 5) = 40$	☑	☑	☑	☐
$10 + x = 79$	☐	☐	☐	☐
$-8 - x = 19$	☐	☐	☐	☐
$2(x - 8) + 7x = 9$	☐	☐	☐	☐