

Name: KEY

FOUNDATIONS OF ALGEBRA – UNIT 4 STUDY GUIDE

Distribute
Combine Like Terms
Move variable
Add/subtract
Multiply / Divide

Learning Target #1: Creating and Solving Linear Equations:

1. What is the value of x in the following equation: $5x + 15 = 7x - 13$

$$\begin{array}{r|l} 5x + 15 & = 7x - 13 \\ -5x & -5x \\ \hline 15 & = 2x - 13 \\ +13 & +13 \\ \hline 28 & = 2x \\ \frac{28}{2} & = \frac{2x}{2} \end{array} \quad \boxed{14 = x}$$

2. Solve $\frac{8-2x}{12} = 2$ for x.

$$\begin{array}{l} 12 \cdot \frac{8-2x}{12} = 2 \cdot 12 \\ 8-2x = 24 \\ -8 \quad -8 \\ \hline -2x = 16 \\ \frac{-2x}{-2} = \frac{16}{-2} \end{array} \quad \boxed{x = -8}$$

3. What is the value of x in the equation $3(3x - 5) = 3$?

$$\begin{array}{l} 3(3x-5) = 3 \\ 9x-15 = 3 \\ +15 \quad +15 \\ \hline 9x = 18 \\ \frac{9x}{9} = \frac{18}{9} \end{array} \quad \boxed{x = 2}$$

4. Solve $\frac{10x+22}{4} = -2$

$$\begin{array}{l} 4 \cdot \frac{10x+22}{4} = -2 \cdot 4 \\ 10x+22 = -8 \\ -22 \quad -22 \\ \hline 10x = -30 \\ \frac{10x}{10} = \frac{-30}{10} \end{array} \quad \boxed{x = -3}$$

5. What is the value of x in the following equation? $5x - 13 = 15 + 7x$

$$\begin{array}{r|l} 5x - 13 & = 15 + 7x \\ -5x & -5x \\ \hline -13 & = 15 + 2x \\ -15 \quad -15 \\ \hline -28 & = 2x \\ \frac{-28}{2} & = \frac{2x}{2} \\ \hline \boxed{-14 = x} \end{array}$$

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6. What is the value of x in the equation $3x - 4(2x - 5) = 5$?

$$\begin{aligned}
 3x - 4(2x - 5) &= 5 \\
 3x - 8x + 20 &= 5 \\
 -5x + 20 &= 5 \\
 \underline{-20 \quad -20} & \\
 -5x &= -15 \\
 \underline{-5} & \\
 x &= 3
 \end{aligned}$$

$x = 3$

7. What value of y makes the equation $12 - (y + 1) = 3 + y$ true?

- A. 6
- B. 0
- C. 12
- D. 8

$$\begin{aligned}
 12 - (y + 1) &= 3 + y \\
 12 - y - 1 &= 3 + y \\
 11 - y &= 3 + y \\
 8 &= 2y \quad y = 4
 \end{aligned}$$

8. If 21 more than 3 times a number is -15, what is the number?

$$\begin{aligned}
 3n + 21 &= -15 \\
 \underline{-21 \quad -21} & \\
 3n &= -36 \\
 \underline{3} & \\
 n &= -12
 \end{aligned}$$

9. The following formula can be used to convert a temperature in degrees Fahrenheit, F , to a temperature in degrees Celsius, C .

$$C = \frac{5}{9}(F - 32)$$

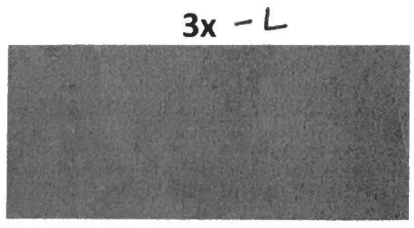
What temperature in degrees Fahrenheit is equal to 30 degrees Celsius? (Hint: Solve for F when $C=30$)

$$\begin{aligned}
 \frac{9}{5} \cdot 30 &= \frac{5}{9}(F - 32) \cdot \frac{9}{5} \\
 54 &= F - 32 \\
 \underline{+32} & \quad \underline{+32} \\
 86 &= F
 \end{aligned}$$

10. The length of a rectangle is 3 times its width, as shown below. The perimeter of the rectangle is 72 inches. If the value of x is increased by 2, what is the perimeter of the new rectangle, in inches?

original perimeter:

$$\begin{aligned}
 P &= L + L + W + W \\
 72 &= 3x + 3x + x + x \\
 \frac{72}{8} &= \frac{8x}{8}
 \end{aligned}$$



new perimeter:

$$\begin{aligned}
 P &= 3(11) + 3(11) + 11 + 11 \\
 P &= 33 + 33 + 11 + 11 \\
 P &= 88
 \end{aligned}$$

$9 = x$ $\xrightarrow{\text{increased by 2}}$ $x = 9 + 2 = 11$

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11. Consider the procedure used below to solve the given equation.

Given: $4(2x + 5) - (3x - 4) = 15$

$$4(2x + 5) - (3x - 4) = 15$$

Step 1: $8x + 5 - 3x + 4 = 24$ X

$$8x + 20 - 3x + 4 = 15 \checkmark$$

Step 2: $5x + 9 = 24$

Step 3: $5x = 24 - 9$

Step 4: $-5x = 15$

Step 5: $\frac{-5x}{-5} = \frac{15}{-5}$

Step 6: $x = -3$

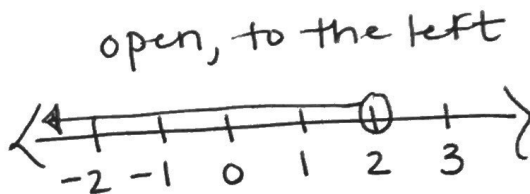
Which statement about the solution of the given equation is true?

- A. The first mistake was made in Step 1.
- B. The first mistake was made in Step 2.
- C. The first mistake was made in Step 3.
- D. The answer is correct.

Learning Target #2: Solving Linear Inequalities:

12. Solve and graph on a number line: $x + 3x < 7$

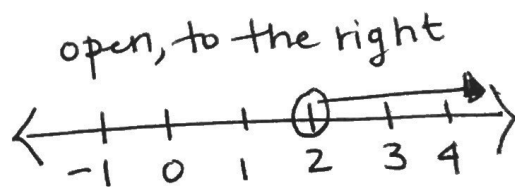
$$\begin{array}{r} x + 3x < 7 \\ -x \quad -1 \\ \hline 3x < 6 \\ \frac{3}{3} \quad \frac{6}{3} \\ \hline x < 2 \end{array}$$



13. Solve and graph on a number line: $4 > -3x + 10$

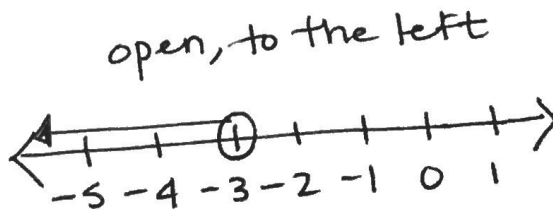
* Flip sign because you divide by -3

$$\begin{array}{r} 4 > -3x + 10 \\ -10 \quad -10 \\ \hline -6 > -3x \\ \frac{-6}{-3} > \frac{-3x}{-3} \\ \hline 2 < x \quad \text{OR} \quad x > 2 \end{array}$$



14. Solve and graph on a number line: $3(x + 2) < -3$

$$\begin{array}{r} 3(x + 2) < -3 \\ 3x + 6 < -3 \\ -6 \quad -6 \\ \hline 3x < -9 \\ \frac{3x}{3} < \frac{-9}{3} \\ \hline x < -3 \end{array}$$



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15. For which values of x is the inequality $5x - 11 \leq 3x - 11$ true?

- A. $x \leq 0$
- B. $x \geq 0$
- C. $x \leq -11$
- D. $x \geq -11$

$$\begin{array}{r} 5x - 11 \leq 3x - 11 \\ -3x \quad -3x \\ \hline 2x - 11 \leq -11 \\ +11 \quad +11 \\ \hline 2x \leq 0 \\ \frac{2x}{2} \leq \frac{0}{2} \\ \boxed{x \leq 0} \end{array}$$

16. What is the solution to the inequality $-31 > 6x + 11$?

$$\begin{array}{r} -11 \quad -11 \\ \hline -42 > 6x \\ \frac{-42}{6} > \frac{6x}{6} \\ \boxed{-7 > x} \text{ OR } \boxed{x < -7} \end{array}$$

17. What is the solution to the inequality $-x < 4$?

$$\begin{array}{r} +x < 4 \\ -x \quad -1 \\ \hline \boxed{x > -4} \end{array}$$

* flip sign because you divide by -1

18. Which inequality is equivalent to $\frac{x}{2} + 2 < 10$?

- ~~A. $x + 3 < 5$ $x < 2$~~
- ~~B. $x + 3 < 6$ $x < 3$~~
- ~~C. $x + 3 < 7$ $x < 4$~~
- ~~D. $x + 3 < 10$ $x < 7$~~

$$\begin{array}{r} \frac{x}{2} + 2 < 10 \\ -2 \quad -2 \\ \hline \frac{x}{2} < 8 \cdot 2 \\ \boxed{x < 16} \end{array}$$

Learning Target #3: Isolating a Variable

19. Solve for y : $8x - 4y = 16$

$$\begin{array}{r} -8x \quad -8x \\ \hline -4y = 16 - 8x \\ -4 \quad -4 \\ \hline \boxed{y = -4 + 2x} \end{array}$$

20. Solve for x : $y = mx + b$

$$\begin{array}{r} y = mx + b \\ -b \quad -b \\ \hline y - b = mx \\ \frac{y - b}{m} = \frac{mx}{m} \\ \boxed{\frac{y - b}{m} = x} \end{array}$$