

Solving Linear Equations Study Guide

① ~~A~~ $\frac{1}{3}(6r+12) = 2r+12$

$$\frac{1}{3}(6r) + \frac{1}{3}(12) = 2r+12$$

$$2r+4 = 2r+12$$

$$2r+4-2r = 2r+12-2r$$

$$4 \neq 12$$

No solution

② ~~B~~ $\frac{1}{4}(8r+12) = 3+2r$

$$\frac{1}{4}(8r) + \frac{1}{4}(12) = 3r+2r$$

same equations $\rightarrow 2r+3 = 3+2r$

$$2r+3-2r = 3+2r-2r$$

$$3 = 3$$

Identity Equation

Infinitely many solutions

③ ~~e~~ $\frac{1}{2}(16+12r) = 12r+8$

$$\frac{1}{2}(16) + \frac{1}{2}(12r) = 12r+8$$

$$8+6r = 12r+8$$

$$8+6r-12r = 12r+8-12r$$

$$8-6r = 8$$

$$8-6r-8 = 8-8$$

$$-6r = 0$$

$$-6r = 0$$

$$-6 = -6$$

$$r = 0$$

One solution

④ ~~f~~ $\frac{1}{5}(10r+20) = 2r+10$

$$\frac{1}{5}(10r) + \frac{1}{5}(20) = 2r+10$$

$$2r+4 = 2r+10$$

$$2r+4-2r = 2r+10-2r$$

$$4 \neq 10$$

No solution

B has infinitely many solutions

② Perimeter = 28



3 ft

(2+x) ft

$$3 + 3 + (2+x) + (2+x) = 28$$

$$3+3+2+2+x+x = 28$$

$$10+2x = 28$$

$$10+2x-10 = 28-10$$

$$2x = 18$$

$$\frac{2x=18}{2} \rightarrow x=9$$

B. $x=9$

③ $3y + 5 = 7 + 3y - 9$ * Combine like terms on same side

$$3y + 5 = 3y - 2$$

$$3y + 5 - 3y = 3y - 2 - 3y$$

$$5 = -2$$

D **No Solutions**

④ 100 minutes + additional minutes over 100 = Total Cost
 \$24 + 0.07x = \$26.38

* x = additional minutes over 100

$$24 + 0.07x = 26.38$$

$$24 + 0.07x - 24 = 26.38 - 24$$

$$0.07x = 2.38$$

$$0.07x = 2.38$$

$$0.07 \cdot 0.07 = 0.07$$

$$x = 34$$

How many total minutes of long distance did Todd use in October?

$$100 + 34 = 134$$

Ⓒ

⑤ $-(5-x) = 5-x$
 $-1(5) - 1(-x) = 5-x$
 $-5 + x = 5-x$

Ⓑ

⑥ $8 - \frac{6}{5}x = 10$

$$8 - \frac{6}{5}x = 10 - 8$$

$$-\frac{6}{5}x = 2$$

$$\frac{-5}{6} \cdot \frac{-6}{5}x = 2 \cdot \frac{-5}{6}$$

$$x = \frac{-10 \div 2}{6 \div 2} = \frac{-5}{3}$$

Ⓑ

$$\textcircled{7} \quad 5(x+1) - 8 = x - 4(2x-1)$$

$$5(x) + 5(1) - 8 = x - 4(2x) - 4(-1)$$

$$5x + 5 - 8 = x - 8x + 4$$

$$5x - 3 = -7x + 4$$

$$5x - 3 + 7x = -7x + 4 + 7x$$

$$12x - 3 = 4$$

$$12x - 3 + 3 = 4 + 3$$

$$12x = 7$$

$$\frac{12x}{12} = \frac{7}{12}$$

$$x = \frac{7}{12} \quad \textcircled{B}$$

$$\textcircled{8} \quad 2m = 6m - 32$$

$$2m - 6m = 6m - 32 - 6m$$

$$-4m = -32$$

$$\frac{-4m}{-4} = \frac{-32}{-4}$$

$$m = 8$$

$$m = 8$$

\textcircled{D}

$$\textcircled{9} \quad 3(x-7) = 23 - (3x+2)$$

$$3(x) + 3(-7) = 23 - 1(3x) - 1(2)$$

$$3x - 21 = 23 - 3x - 2$$

$$3x - 21 + 3x = 21 - 3x + 3x$$

$$6x - 21 = 21$$

$$6x - 21 + 21 = 21 + 21$$

$$6x = 42$$

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

$$x = 7$$

$$x = 7$$

\textcircled{B}

⑩ $\frac{3}{5} - \frac{3}{5} \left(\frac{x}{2} - 3 \right) = \frac{3}{2} \left(\frac{x}{5} - 1 \right) - 3$

$\frac{3}{5} - \frac{3}{5} \left(\frac{x}{2} \right) - \frac{3}{5} \left(-\frac{3}{1} \right) = \frac{3}{2} \left(\frac{x}{5} \right) + \frac{3}{2} \left(-1 \right) - 3$

$\frac{3}{5} - \frac{3x}{10} + \frac{9}{5} = \frac{3x}{10} - \frac{3}{2} - 3$ * multiply by LCD to get rid of fractions

10 $\left(\frac{3}{5} - \frac{3x}{10} + \frac{9}{5} \right) = \left(\frac{3x}{10} - \frac{3}{2} - 3 \right) 10$

$10 \left(\frac{3}{5} \right) + 10 \left(-\frac{3x}{10} \right) + 10 \left(\frac{9}{5} \right) = 10 \left(\frac{3x}{10} \right) + 10 \left(-\frac{3}{2} \right) + 10 \left(-3 \right)$

$\frac{30}{5} - \frac{30x}{10} + \frac{90}{5} = \frac{30x}{10} - \frac{30}{2} - 30$

$6 - 3x + 18 = 3x - 15 - 30$

$-3x + 24 = 3x - 45$

$-3x + 24 - 3x = 3x - 45 - 3x$

$-6x + 24 = -45$

$-6x + 24 - 24 = -45 - 24$

$-6x = -69$

$-6x = -69$

$-6 = -6$

$x = \frac{-69 \div -3}{-6 \div -3} = \frac{23}{2}$

⑪ $(6+2x) - (3-4x) = 5$

$(6+2x) - 1(3-4x) = 5$

$6+2x - 1(3) - 1(-4x) = 5$

$6+2x - 3 + 4x = 5$ * Combine like terms on same side.

$6 - 3 + 2x + 4x = 5$

$3 + 6x = 5$

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

$6x = 2$

$\frac{6x}{6} = \frac{2}{6}$

$x = \frac{1}{3}$

Ⓒ

⑪ $(6+2x) - (3-4x) = 5$ * Distribute negative to regroup.
 $6+2x - 1(3) - 1(-4x) = 5$
 $6+2x-3+4x = 5$

Group like terms
 $(6-3) + (2x+4x) = 5$
 $3 + 6x = 5$
 $3 + 6x - 3 = 5 - 3$

ⓑ * Check to see if you get the same answer

$$6x = 2$$

$$\frac{6x}{6} = \frac{2}{6}$$

$$x = \frac{2 \div 2}{6 \div 2} = \frac{1}{3} \checkmark$$

⑫ $2(x+4) = 2x+8$

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

$$2x+8 = 2x+8$$

$$2x+8-2x = 2x+8-2x$$

$$8 = 8 \checkmark$$

← same equation means identity equation, which is infinitely many solutions

D Infinitely many solutions

⑬ $5(3x-4) = 2x+7+4x$

$$5(3x) + 5(-4) = 2x+7+4x$$

$$15x-20 = 2x+7+4x$$

$$15x-20 = 6x+7$$

$$15x-20-6x = 6x+7-6x$$

$$-20+9x = 7$$

$$-20+9x+20 = 7+20$$

$$9x = 27$$

$$\frac{9x}{9} = \frac{27}{9}$$

$$x = 3$$

ⓑ

$$\begin{aligned} \textcircled{14} \quad & \frac{x-4}{6} = \frac{3}{7} \\ & \cancel{6} \cdot \frac{x-4}{\cancel{6}} = \frac{3}{7} \cdot 6 \\ & x-4 = \frac{3}{7} \cdot 6 \\ & x-4 = \frac{18}{7} \\ & x-4+4 = \frac{18}{7} + 4 \\ & x = \frac{18}{7} + 4 \\ & x = 2\frac{4}{7} + 4 \\ & \boxed{x = 6\frac{4}{7}} \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad & 3(x+5) = 2x+35 \leftarrow \text{Original} \\ \text{Step 1:} & 3x+15 = 2x+35 \\ \text{Step 2:} & 5x+15 = 35 \leftarrow \text{Incorrect, should have} \\ \text{Step 3:} & 5x = 20 \quad \text{subtracted } 2x \text{ from} \\ \text{Step 4:} & x = 4 \quad \text{both sides.} \end{aligned}$$

B. Step 2

$$\begin{aligned} \textcircled{16} \quad \textcircled{A} \quad & 6r = 5r + r \\ & 6r = 6r \leftarrow \text{Infinitely many} \end{aligned}$$

$$\begin{aligned} \textcircled{B} \quad & 4m+5 = 25 \\ & 4m+5-5 = 25-5 \\ & 4m = 20 \\ & \frac{4m}{4} = \frac{20}{4} \\ & m = 5 \leftarrow \text{One solution... } m \\ & \text{can only equal 5.} \end{aligned}$$

⑥ $8v+11 \neq 8v+11 \leftarrow$ Same equation, so
$$\begin{array}{r|l} 8v+11-8v & 8v+11-8v \\ \hline 11 & \neq 11 \end{array}$$
 infinitely many solutions

⑦ $2-3p \neq -3p+5$
$$\begin{array}{r|l} 2-3p+3p & -3p+5+3p \\ \hline 2 & \neq 5 \end{array}$$

No Solution

- ⑩ One Solution Ex. $3=x$, $a=2$, $x=0$, $b=1$
No Solution Ex. $4 \neq 5$, $-2 \neq 2$, $0 \neq 1$
Infinitely Many Ex. $3=3$, $a=a$, $2x+1=2x+1$
Solutions

- ⑪ a) Distribute, if necessary
b) Get rid of all fractions.
c) Combine like terms on the same side, if necessary.
d) Move variables to the left.
e) Move constant to the right.
f) Solve for the variable.