

Solving Linear Equations with Variables on Both Sides Algebra 1 Homework

Skills

1. Which of the following values of x is a solution to the equation $18 - 4x = 6 - 16x$?

- (1) $x = 1$
- (3) $x = -3$
- (2) $x = -1$
- (4) $x = 7$

$$\begin{array}{r}
 18 - 4x = 6 - 16x \\
 +16x \quad +16x \\
 \hline
 18 + 12x = 6 \\
 -18 \quad -18 \\
 \hline
 12x = -12 \\
 \frac{12x}{12} = \frac{-12}{12} \\
 x = -1
 \end{array}$$

2. Which of the following values of x is a solution to the equation $5x - 11 = 2x - 3$?

- (1) $x = 5$
- (3) $x = \frac{8}{3}$
- (2) $x = \frac{2}{3}$
- (4) $x = \frac{11}{2}$

$$\begin{array}{r}
 5x - 11 = 2x - 3 \\
 -2x \quad -2x \\
 \hline
 3x - 11 = -3 \\
 +11 \quad +11 \\
 \hline
 3x = 8 \\
 \frac{3x}{3} = \frac{8}{3} \\
 x = \frac{8}{3}
 \end{array}$$

3. Which of the following values of x is a solution to the equation $\frac{2}{3}x + 13 = \frac{7}{3}x - 22$?

- (1) $x = \frac{5}{3}$
- (3) $x = 21$
- (2) $x = -\frac{10}{3}$
- (4) $x = -15$

$$\begin{array}{r}
 \frac{2}{3}x + 13 = \frac{7}{3}x - 22 \\
 -\frac{2}{3}x \quad -\frac{2}{3}x \\
 \hline
 13 = \frac{5}{3}x - 22 \\
 +22 \quad +22 \\
 \hline
 35 = \frac{5}{3}x \\
 \frac{35 \cdot 3}{5} = \frac{5x \cdot 3}{5} \\
 105 = 3x \\
 \frac{105}{3} = \frac{3x}{3} \\
 x = 35
 \end{array}$$

4. Solve each of the following linear equations. Check your answers using **STORE** on your calculator. + list the properties

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

$$\begin{array}{r}
 3x + 5 = 2x - 7 \\
 -2x \quad -2x \quad \text{Sub. Prop. of } = \\
 \hline
 x + 5 = -7 \\
 -5 \quad -5 \quad \text{Sub. Prop. of } = \\
 \hline
 x = -12
 \end{array}$$

(b) $x - 2 = 3x - 1$

$$\begin{array}{r}
 x - 2 = 3x - 1 \\
 -x \quad -x \quad \text{Sub. Prop. of } = \\
 \hline
 -2 = 2x - 1 \\
 +1 \quad +1 \quad \text{Add Prop. of } = \\
 \hline
 -1 = 2x \\
 \frac{-1}{2} = \frac{2x}{2} \quad \text{Div. Prop. of } = \\
 x = -\frac{1}{2}
 \end{array}$$

(c) $3x + 4x - 7 = 8 - 3x + 11$

$$\begin{array}{r}
 3x + 4x - 7 = 8 - 3x + 11 \\
 7x - 7 = 19 - 3x \quad \text{Combine} \\
 +3x \quad +3x \quad \text{Add Prop. of } = \\
 \hline
 10x - 7 = 19 \\
 +7 \quad +7 \quad \text{Add Prop. of } = \\
 \hline
 10x = 26 \\
 \frac{10x}{10} = \frac{26}{10} \quad \text{Div. Prop. of } = \\
 x = 2 \frac{3}{5} \text{ or } 2.6
 \end{array}$$

chk by hand

(d) $5x + 6 + 2x - 1 = 10x + 3$

$$\begin{array}{r}
 5x + 6 + 2x - 1 = 10x + 3 \\
 7x + 5 = 10x + 3 \quad \text{C.L.T.} \\
 -7x \quad -7x \quad \text{S.P.O.E.} \\
 \hline
 5 = 3x + 3 \\
 -3 \quad -3 \quad \text{S.P.O.E.} \\
 \hline
 2 = 3x \\
 \frac{2}{3} = \frac{3x}{3} \quad \text{D.P.O.E.} \\
 x = \frac{2}{3}
 \end{array}$$

(e) $2 + 7x + 8 = x - 14$

$$\begin{array}{r}
 2 + 7x + 8 = x - 14 \\
 10 + 7x = x - 14 \quad \text{C.L.T.} \\
 -x \quad -x \quad \text{S.P.O.E.} \\
 \hline
 10 + 6x = -14 \\
 -10 \quad -10 \quad \text{S.P.O.E.} \\
 \hline
 6x = -24 \\
 \frac{6x}{6} = \frac{-24}{6} \quad \text{D.P.O.E.} \\
 x = -4
 \end{array}$$

(f) $6x - 10 - x - 2 = 9x + 2$

$$\begin{array}{r}
 6x - 10 - x - 2 = 9x + 2 \\
 5x - 12 = 9x + 2 \quad \text{C.L.T.} \\
 -5x \quad -5x \quad \text{S.P.O.E.} \\
 \hline
 -12 = 4x + 2 \\
 -2 \quad -2 \quad \text{S.P.O.E.} \\
 \hline
 -14 = 4x \\
 \frac{-14}{4} = \frac{4x}{4} \quad \text{D.P.O.E.} \\
 x = -3.5 \text{ or } -3 \frac{1}{2}
 \end{array}$$

5. Translate each of the following sentences into an equation and then solve for the number described.

(a) Ten times a number increased by six is four times the same number increased by 24.

let $x =$
the #

$$10x + 6 = 4x + 24$$

$$\begin{array}{r} -4x \\ \hline 6x + 6 = 24 \\ -6 \quad -6 \\ \hline 6x = 18 \\ \frac{6x}{6} = \frac{18}{6} \\ \hline x = 3 \end{array}$$

the #
is 3.

(b) Eight times a number increased by 12 is eight less than three times the same number.

let $x =$
the #

$$8x + 12 = 3x - 8$$

$$\begin{array}{r} -3x \\ \hline 5x + 12 = -8 \\ -12 \quad -12 \\ \hline 5x = -20 \\ \frac{5x}{5} = \frac{-20}{5} \\ \hline x = -4 \end{array}$$

the #
is -4.

(c) Nine more than two-thirds of a number is one more than the same number.

let $x =$
the #

$$\frac{2}{3}x + 9 = x + 1$$

$$\begin{array}{r} -\frac{2}{3}x \\ \hline 9 = \frac{1}{3}x + 1 \\ -1 \quad -1 \\ \hline 8 = \frac{1}{3}x \left(\frac{3}{1}\right) \\ \hline x = 24 \end{array}$$

the #
is 24.

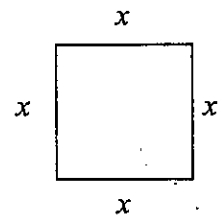
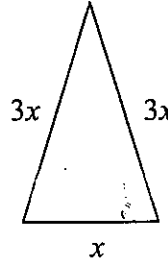
Applications

6. An isosceles triangle and a square are shown below with their side lengths given in terms of x . If the perimeter of the triangle is 27 more than the perimeter of the square, find the value of x .

$$3x + x + 3x = x + x + x + x + 27$$

$$7x = 4x + 27$$

$$\begin{array}{r} -4x \quad -4x \\ \hline 3x = 27 \\ \frac{3x}{3} = \frac{27}{3} \\ \hline x = 9 \end{array}$$



Reasoning

7. Consider the linear equation $5x + 11 - 2x + 6 = 3x + 17$.

(a) For each of the following, determine whether the given value of x satisfies the equation. Use ~~STORE~~ on your calculator. ~~check~~ using your calculator

$x = 5$

yes

$x = -3$

yes

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

yes

$x = -\frac{3}{2}$

yes

$3x + 17 = 3x + 17$

(b) Simplify the left hand side of the equation by combining like terms.

(c) What can you say about the solution set of this equation considering both parts (a) and (b)?

all #'s will work B/c
the two sides are =
there are an infinite #
of solutions.