

Solving 2-Step Equations and Algebraic Properties

Write an equivalent expression using the property stated.

1. Identity Property of Addition:  $c + 0 = \underline{c}$
2. Identity Property of Multiplication:  $22b \cdot 1 = \underline{22b}$
3. Multiplicative Property of Zero:  $40,286 \cdot 0 = \underline{0}$
4. Commutative Property of Addition:  $x + z = \underline{z + x}$
5. Commutative Property of Multiplication:  $k \cdot 6 = \underline{6k}$
6. Associative Property of Addition:  $(1 + 3) + 9 = \underline{1 + (3 + 9)}$
7. Associative Property of Multiplication:  $(w \cdot h) \cdot l = \underline{w \cdot (h \cdot l)}$
8. Symmetric Property:  $x > 3 = \underline{3 < x}$
9. Exponential Property of Equality:  $3^3 = 3^x$  therefore  $\underline{3 = x}$
10. Multiplication Property of Equality: if  $x = 4$ , then  $2 \cdot x = \underline{2 \cdot 4}$
11. Addition Property of Equality: if  $x = 4$ , then  $x + 3 = \underline{4 + 3}$
12. Additive Inverse:  $a + (-a) = \underline{0}$
13. Multiplicative Inverse:  $4/5 \cdot 5/4 = \underline{1}$

Solving 2-step equations. Solve the following equations for x.

$$1. \quad 7x - 4 = 23$$

$$\begin{array}{r} +4 \quad +4 \\ \hline 7x = 27 \\ \hline \frac{7x}{7} = \frac{27}{7} \end{array}$$

$$x = \frac{27}{7}$$

$$2. \quad 5(x + 9) = -45$$

$$\begin{array}{r} \frac{5}{5} \quad \frac{5}{5} \\ \hline x + 9 = -9 \\ -9 \quad -9 \\ \hline x = -18 \end{array}$$

$$x = -18$$

$$3. \quad 17 = 5 - 3p$$

$$\begin{array}{r} -5 \quad -5 \\ \hline 12 = -3p \\ -3 \quad -3 \\ \hline -4 = p \end{array}$$

$$p = -4$$

$$3. \quad 4. \quad \frac{x+6}{3} = 2$$

$$\begin{array}{r} \frac{x+6}{3} = 2 \\ \frac{x+6}{3} \cdot 3 = 2 \cdot 3 \\ \hline x + 6 = 6 \\ -6 \quad -6 \\ \hline x = 0 \end{array}$$

$$x = 0$$

$$5. \quad \frac{x}{6} - 3 = -1$$

$$\begin{array}{r} +3 \quad +3 \\ \hline \frac{x}{6} = 2 \\ 6 \cdot \frac{x}{6} = 2 \cdot 6 \\ \hline x = 12 \end{array}$$

$$x = 12$$

$$6. \quad \frac{2(x-7)}{4} = 7$$

$$\begin{array}{r} \frac{2(x-7)}{4} = 7 \\ \frac{2(x-7)}{4} \cdot 2 = 7 \cdot 2 \\ \hline 2(x-7) = 28 \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline x - 7 = 14 \\ +7 \quad +7 \\ \hline x = 21 \end{array}$$

$$x = 21$$

$$7. \quad x + k = j$$

$$\begin{array}{r} -k \quad -k \\ \hline x = j - k \end{array}$$

$$x = j - k$$

$$8. \quad \frac{x}{2} - b = a$$

$$\begin{array}{r} +b \quad +b \\ \hline \frac{x}{2} = a + b \\ 2 \cdot \frac{x}{2} = (a+b) \cdot 2 \\ \hline x = 2(a+b) \end{array}$$

$$x = 2(a+b)$$

or

$$x = 2a + 2b$$

Name the property demonstrated by each statement

1.	$9 \cdot 7 = 7 \cdot 9$	Comm. Prop. of Mult.
2.	$2 \cdot (3 \cdot 4) = (2 \cdot 3) \cdot 4$	Assoc. Prop. of Mult.
3.	$37 \cdot 0 = 0$	Mult. Prop. of zero
4.	$1 \cdot 87 = 87$	Identity prop. of mult.
5.	$14 + 6 = 6 + 14$	Comm. Prop. of Add.
6.	$3(6a) = (3 \cdot 6)a$	Assoc. Prop. of Mult.
7.	$2b + 0 = 2b$	Identity Prop. of Add.
8.	$55 + 6 = 6 + 55$	Comm. Prop. of Add.
9.	If $2^4 = 2^x$ then $4 = x$	Exponential Prop. of Equality
10.	$(x + 3) + y = x + (3 + y)$	Assoc. Prop. of Add.
11.	$1 \cdot mp = mp$	Identity prop. of mult.
12.	$9 + (5 + 35) = (9 + 5) + 35$	Assoc. Prop. of Add.
13.	$6b + 0 = 6b$	Identity Prop. of Add.
14.	$7x \cdot 0 = 0$	Mult. Prop. of zero
15.	$4(3 \cdot z) = (4 \cdot 3)z$	Assoc. Prop. of Mult.
16.	$14 \cdot 1 = 14$	Identity Prop. of Mult.
17.	$6 + (5 + m) = (6 + 5) + m$	Assoc. Prop. of Add.
18.	If $4 < x$ , then $x > 4$	Symmetric Prop.
19.	$3/4 \cdot 4/3 = 1$	Mult. Inverse
20.	$-14 + 14 = 0$	Add. Inverse
21.	If $x = 10$ then $x + 13 = 10 + 13$	Add. Prop. of Equality
22.	If $x = 5$ , then $3x = 3(5)$	Mult. Prop. of Equality
23.	If $x = 12$ then $x - 7 = 12 - 7$	Subt. Prop. of Equality
24.	If $x = 30$ then $x/5 = 30/5$	Division Prop. of Equality
25.	If $x = 6$ then $6 = x$	Symmetric Prop.

Solve the 2-step problems below. Justify each step as using an Algebraic Property.

1.  $5x + 2 = 12$

$$\begin{array}{l} \underline{-2 \quad -2} \quad \text{Subt. Prop. of Equality} \\ 5x + 0 = 10 \quad \text{Add. Inverse} \\ \underline{5x = 10} \quad \text{Identity Prop. of Add.} \\ \underline{\quad 5 \quad 5} \quad \text{Division Prop. of Equality} \\ 1x = 2 \quad \text{Mult. Inverse} \\ x = 2 \quad \text{Identity Prop. of Mult.} \end{array}$$

2.  $4 - 2x = 8$

$$\begin{array}{l} \underline{-4 \quad -4} \quad \text{Subt. Prop. of Equality} \\ 0 - 2x = 4 \quad \text{Add. Inverse} \\ \underline{-2x = 4} \quad \text{Identity Prop. of Add.} \\ \underline{\quad -2 \quad -2} \quad \text{Division Prop. of Equal.} \\ 1x = -2 \quad \text{Mult. Inverse} \\ x = -2 \quad \text{Identity Prop. of Mult.} \end{array}$$