

The Distributive Property

The Distributive Property states for any number a , b , and c :

$$1. a(b+c) = ab+ac \text{ or } (b+c)a = ba+ca$$

$$2. a(b-c) = ab-ac \text{ or } (b-c)a = ba-ca$$

Practice: Rewrite each expression using the distributive property.

$$1. 7(h - 3)$$

$$2. -3(2x + 5)$$

Combining Like Terms

Terms in algebra are numbers, variables or the product of numbers and variables. In algebraic expressions terms are separated by addition (+) or subtraction (-) symbols. Terms can be combined using addition and subtraction if they are **like-terms**.

Like-terms have the same variables to the same power.

Example of like-terms: $5x^2$ and $-6x^2$

Example of terms that are **NOT** like-terms: $9x^2$ and $15x$

Although both terms have the variable x , they are not being raised to the same power

To combine like-terms using addition and subtraction, add or subtract the numerical factor

Example: Simplify the expression by combining like-terms

$$\begin{aligned} 8x^2 + 9x - 12x + 7x^2 &= (8+7)x^2 + (9-12)x \\ &= 15x^2 + -3x \\ &= 15x^2 - 3x \end{aligned}$$

$$3. c^2 + 4d^2 - 7d^2$$

$$4. 5x^2 + 6x - 12x^2 - 9x + 2$$

$$5. 2(3x - 4y) + 5(x + 3y)$$

$$6. 10xy - 4(xy + 2x^2y)$$

Solving Equations with Variables on One Side

To solve an equation means to **find the value** of the variable. We solve equations by isolating the variable using opposite operations.

Example:

Solve.

$$\begin{array}{r} 3x - 2 = 10 \\ + 2 \quad + 2 \end{array}$$

Isolate $3x$ by adding 2 to each side.

$$\frac{3x}{3} = \frac{12}{3}$$

Simplify
Isolate x by dividing each side by 3.

$$x = 4$$

Simplify

Check your answer.

$$\begin{array}{r} 3(4) - 2 = 10 \\ 12 - 2 = 10 \\ 10 = 10 \end{array}$$

Substitute the value in for the variable.

Simplify

Is the equation true? If yes, you solved it correctly!

Opposite Operations:

Addition (+) & Subtraction (-)
Multiplication (x) & Division (÷)

Please remember...

to do the same step on
each side of the equation.

**Always check your
work by substitution!**

7. $-14 + y = -2$

8. $14n - 8 = 34$

9. $8k = -64$

10. $\frac{2}{5}x = 6$

Solving Equations with Variables on Both Sides

To solve an equation with the same variable on each side, write an equivalent equation that has the variable on just one side of the equation. Then solve.

Example Solve $4(2a - 1) = -10(a - 5)$.

$$4(2a - 1) = -10(a - 5) \quad \text{Original equation}$$

$$8a - 4 = -10a + 50 \quad \text{Distributive Property}$$

$$8a - 4 + 10a = -10a + 50 + 10a \quad \text{Add } 10a \text{ to each side.}$$

$$18a - 4 = 50 \quad \text{Simplify.}$$

$$18a - 4 + 4 = 50 + 4 \quad \text{Add 4 to each side.}$$

$$18a = 54 \quad \text{Simplify.}$$

$$\frac{18a}{18} = \frac{54}{18} \quad \text{Divide each side by 18.}$$

$$a = 3 \quad \text{Simplify.}$$

The solution is 3.

11. $5 + 3r = 5r - 19$

12. $8x + 12 = 4(3 + 2x)$

13. $-5x - 10 = 2 - (x + 4)$

14. $6(-3m + 1) = 5(-2m - 2)$

Rate of Change and Slope

Example 1 Find the slope of the line that passes through $(-3, 5)$ and $(4, -2)$.

Let $(-3, 5) = (x_1, y_1)$ and $(4, -2) = (x_2, y_2)$.

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Slope formula} \\ &= \frac{-2 - 5}{4 - (-3)} && y_2 = -2, y_1 = 5, x_2 = 4, x_1 = -3 \\ &= \frac{-7}{7} && \text{Simplify.} \\ &= -1 \end{aligned}$$

Find the slope of the line that passes through each pair of points.

15. $(4, 9), (1, 6)$

16. $(1, -2), (-2, -5)$

Linear Equations in Slope Intercept Form

Slope-Intercept Form

Slope-Intercept Form $y = mx + b$, where m is the given slope and b is the y -intercept

Example 1 Write an equation of the line whose slope is -4 and whose y -intercept is 3 .

$$y = mx + b \quad \text{Slope-intercept form}$$

$$y = -4x + 3 \quad \text{Replace } m \text{ with } -4 \text{ and } b \text{ with } 3.$$

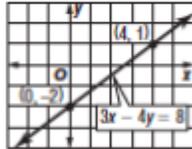
Example 2 Graph $3x - 4y = 8$.

$$3x - 4y = 8 \quad \text{Original equation}$$

$$-4y = -3x + 8 \quad \text{Subtract } 3x \text{ from each side.}$$

$$\frac{-4y}{-4} = \frac{-3x + 8}{-4} \quad \text{Divide each side by } -4.$$

$$y = \frac{3}{4}x - 2 \quad \text{Simplify.}$$



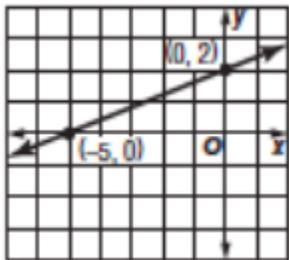
The y -intercept of $y = \frac{3}{4}x - 2$ is -2 and the slope is $\frac{3}{4}$. So graph the point $(0, -2)$. From this point, move up 3 units and right 4 units. Draw a line passing through both points.

Write an equation of the line with the given slope and y -intercept.

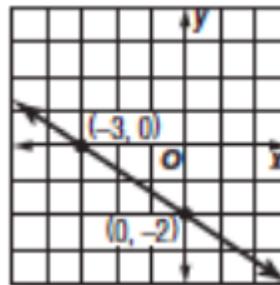
17. slope: $\frac{1}{4}$, y -intercept: 3

18. slope: -2.5 , y -intercept: 3.5

Write an equation of the line shown in each graph.



19.

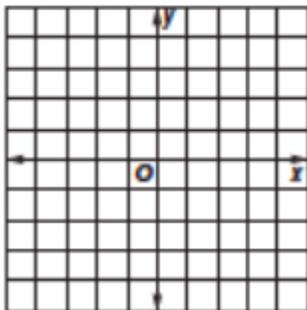


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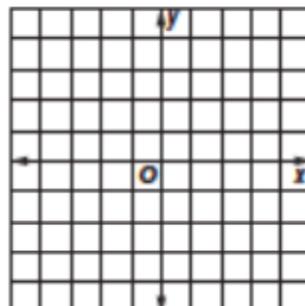
Graph each equation.

$$y = -\frac{1}{2}x + 2$$

$$6x + 3y = 6$$



21.



22.

Solving Word Problems

Translate each word problem into an algebraic expression, using x for the unknown, and solve. Write a "let $x=$ " for each unknown; write an equation; solve the equation; substitute the value for x into the let statement(s) to answer the question.

For Example:

Kara is going to Maui on vacation. She paid \$325 for her plane ticket and is spending \$125 each night for the hotel. How many nights can she stay in Maui if she has \$1200?

Step 1: What are you asked to find? Let variables represent what you are asked to find.

How many nights can Kara stay in Maui?

Let $x=$ The number of nights Kara can stay in Maui

Step 2: Write an equation to represent the relationship in the problem.

$$325+125x=1200$$

Step 3: Solve the equation for the unknown.

$$325+125x=1200$$

$$\underline{-325} \quad \underline{-325}$$

$$125x=875$$

$$x=7$$

Practice: Write an algebraic equation to model each situation. Then solve the equation and answer the question.

23. A video streaming company charges a one-time membership fee of \$11.75 plus \$1.50 per video rental. How many videos did Stewart rent if he spends \$72.00?

24. Sarah drove 3 hours more than Michael on their trip to Texas. If the trip took 37 hours, how long did Sarah and Michael each drive?

25. Darel went to the mall and spent \$41. He bought several t-shirts that each cost \$12, and he bought 1 pair of socks for \$5. How many t-shirts did Darel buy?