



Algebra 1 Workbook Solutions

Rules of equations

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MATH

EVALUATING EXPRESSIONS

- 1. Explain what went wrong in the following statement?

If $x^2 - x + 1$ when $x = -2$, then $-2^2 - -2 + 1 = -4 + 2 + 1 = -1$.

Solution:

There were no parentheses used when plugging in $x = -2$, so the expression -2^2 was evaluated incorrectly. It should be $(-2)^2 - (-2) + 1 = 4 + 2 + 1 = 7$.

- 2. In your own words, what does it mean to “evaluate an expression”?

Solution:

It means to replace (or plug in) a number for the given variable, and then simplify using PEMDAS until you’ve reached the simplest possible value.

- 3. Find the value of x in $x + 1 = y - 2z$, when $y = 4$ and $z = -3$.

Solution:



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

$$x + 1 = 4 + 6$$

$$x + 1 = 10$$

$$x = 9$$

- 4. Evaluate the expression when $a = 1$, $b = -3$, and $c = -4$.

$$\frac{\sqrt{b^2 - 4ac}}{2a}$$

Solution:

$$\frac{\sqrt{(-3)^2 - 4(1)(-4)}}{2(1)}$$

$$\frac{\sqrt{9 + 16}}{2}$$

$$\frac{5}{2}$$

- 5. Show that $x = -4$ by plugging it into the following expression.



$$x^2 - 4 = -3x$$

Solution:

$$(-4)^2 - 4 = -3(-4)$$

$$16 - 4 = 12$$

$$12 = 12$$



INVERSE OPERATIONS

- 1. Use inverse operations to solve for x in $3x = 5$.

Solution:

Divide both sides by 3 to get $x = 5/3$.

- 2. What is the inverse operation of division?

Solution:

Multiplication

- 3. Using division and multiplication, write two ways that we can solve for x .

$$\frac{1}{5}x = 10$$

Solution:

We can divide by $1/5$ or we can multiply by 5.



- 4. What value of the missing exponent would make the equation true?

$$(x^3)^? = x$$

Solution:

$$1/3$$

- 5. Put an expression in place of the question mark that would make the equation true.

$$\frac{1}{7} ? = 7$$

Solution:

$$\times 49$$

- 6. Using inverse operations, solve for x .

$$2x^2 = 8$$

Solution:



$$2x^2 = 8$$

$$x^2 = 4$$

$$x = \pm 2$$

■ 7. What went wrong in the following set of steps?

$$2 - \frac{1}{3}x = 1$$

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

$$x = -9$$

Solution:

The 2 was subtracted from the left side and added to the right side, instead of subtracted from both sides. The inverse operation of addition is subtraction, so it should be:

$$2 - \frac{1}{3}x = 1$$

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

$$x = 3$$



SIMPLE EQUATIONS

- 1. Solve for x .

$$2x - 5 = 11$$

Solution:

$$2x - 5 = 11$$

$$2x = 16$$

$$x = 8$$

- 2. If $x = 16$, what number would make the following equation true?

$$x - ?? = 11$$

Solution:

$$5$$

- 3. Solve for x .



$$\frac{x+1}{3} = 7$$

Solution:

$$\frac{x+1}{3} = 7$$

$$x+1 = 21$$

$$x = 20$$

■ 4. What went wrong in the following set of steps?

$$2x - 11 = -3$$

$$2x = 8$$

$$x = 16$$

Solution:

The 2 was multiplied on both sides instead of divided. It should be:

$$2x - 11 = -3$$

$$2x = 8$$

$$x = 4$$



BALANCING EQUATIONS

- 1. How would you solve for x in the following equation?

$$\frac{x}{4} = -5$$

Solution:

Multiply both sides by 4.

- 2. What is the next step in balancing the following equation? In words, explain why.

$$2x - 3 = 5x$$

Solution:

The next step is to subtract $2x$ from each side of the equation because we want to get all of the x 's to one side.

- 3. Solve for x in the following equation.

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



Solution:

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

$$-6x + 10 - 1 = 15x - 3$$

$$12 = 21x$$

$$\frac{12}{21} = x$$

■ 4. What went wrong in the following steps?

$$-2x + 3 = 3x$$

$$-2x + 3 - 2x = 3x - 2x$$

$$3 = x$$

Solution:

The inverse operation of subtraction is addition, so we should have added $2x$ to each side.

■ 5. What missing term makes sense in the following series of steps?

$$-3(4 - 10x) + 2 = 5x$$



$$-12 + 30x + 2 = 5x$$

$$-10 + ?? = 5x$$

Solution:

$$30x$$

■ 6. Solve for x in the following equation.

$$(x - 1) + 2(3x + 1) = -4(1 - x) + 9$$

Solution:

$$(x - 1) + 2(3x + 1) = -4(1 - x) + 9$$

$$x - 1 + 6x + 2 = -4 + 4x + 9$$

$$7x + 1 = 4x + 5$$

$$3x = 4$$

$$x = \frac{4}{3}$$

■ 7. What would be your next step in balancing the equation? Explain why.



$$2x - 6 + 5x + 10 = 11 - 3x + x + 4$$

Solution:

The next step is to simplify both sides by combining like terms so that we can then move all of the x 's to one side and constants to the other.

■ 8. Solve for x in the following equation.

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

Solution:

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

$$x - 2 + 2x + 5 = 6x + 12 - 6$$

$$3x + 3 = 6x + 6$$

$$-3 = 3x$$

$$-1 = x$$

■ 9. What missing equation would make the solution true?

$$-2(4 - x) = 5(-3x + 1) + 7$$



$$-8 + 2x = -15x + 12$$

$$????? = ????????$$

$$17x = 20$$

$$x = \frac{20}{17}$$

Solution:

$$-8 + 17x = 12 \text{ or } 2x = -15x + 20$$

- 10. Explain what's incorrect in the following set of steps.

$$2x - 1 = 4 - 3x$$

$$1 - 4 = -3x - 2x$$

Solution:

The negative sign with the 1 was ignored. It should be $-1 - 4 = -3x - 2x$.

- 11. What number would make the following true?

$$-7x + 4 = 3x - 11$$



$$??x = -15$$

Solution:

$$-10$$

■ 12. Solve for x in the given equation.

$$5 - x = 17 - 4x$$

Solution:

$$5 - x = 17 - 4x$$

$$-12 = -3x$$

$$4 = x$$

■ 13. What went wrong in the following set of steps?

$$-4 - x - 2x = 5x - 11$$

$$-4 - 3x = 5x - 11$$

$$-15 = 8x$$



Solution:

The -11 was subtracted from each side instead of added. It should be

$$-4 - 3x = 5x - 11$$

$$7 = 8x$$

■ 14. If $x = -2$, solve for y in the given equation.

$$3x + 2y - 7 = 1 - 5x - y$$

Solution:

$$3(-2) + 2y - 7 = 1 - 5(-2) - y$$

$$-6 + 2y - 7 = 1 + 10 - y$$

$$-13 + 2y = 11 - y$$

$$3y = 24$$

$$y = 8$$

■ 15. What missing equation would make the solution true?

$$6x - 13 + 5x = -x + 9$$

$$11x - 13 = -x + 9$$



$$12x - 13 = 9$$

$$?? = ??$$

$$x = \frac{22}{12}$$

Solution:

$$12x = 22$$

■ 16. What missing value would make the following true?

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

$$2y + 5 = ??x + 3$$

Solution:

$$-6$$

■ 17. If $y = -3$, solve for x in the given equation.

$$2x - (x + y) = 5y - x + 7$$



Solution:

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

$$2x - x + 3 = -15 - x + 7$$

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

$$2x = -11$$

$$x = -\frac{11}{2}$$

■ 18. Solve for y in the given equation.

$$3x - 2y + 5 = -5x + 7$$

Solution:

$$3x - 2y + 5 = -5x + 7$$

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

$$y = 4x - 1$$

■ 19. Solve for the variable by keeping the equation balanced.

$$-(6c - 5) = 4(7c - 8) + 3$$



Solution:

First, we'll use the distributive property.

$$-(6c - 5) = 4(7c - 8) + 3$$

$$-(6c) - (-5) = 4(7c) + 4(-8) + 3$$

$$-6c + 5 = 28c - 32 + 3$$

$$-6c + 5 = 28c - 29$$

Now we'll get the variable on one side, combining like terms after we do each addition or subtraction, and making sure that we keep the equation balanced by doing the same operations to both sides of the equation.

$$-6c - 28c + 5 = 28c - 28c - 29$$

$$-34c + 5 = -29$$

$$-34c + 5 - 5 = -29 - 5$$

$$-34c = -34$$

$$\frac{-34c}{-34} = \frac{-34}{-34}$$

$$c = 1$$

■ 20. Solve for the variable.



$$7(4a - 3) = -(6a - 5) + 8$$

Solution:

First, we'll use the distributive property.

$$7(4a - 3) = -(6a - 5) + 8$$

$$7(4a) + 7(-3) = -(6a) - (-5) + 8$$

$$28a - 21 = -6a + 5 + 8$$

$$28a - 21 = -6a + 13$$

Now we'll get the variable on one side, combining like terms after we do each addition or subtraction, and making sure that we keep the equation balanced by doing the same operations to both sides of the equation.

$$28a + 6a - 21 = -6a + 6a + 13$$

$$34a - 21 = 13$$

$$34a - 21 + 21 = 13 + 21$$

$$34a = 34$$

$$\frac{34a}{34} = \frac{34}{34}$$

$$a = 1$$



■ 21. Solve the equation.

$$4x - 3 = 17$$

Solution:

Add 3 to both sides.

$$4x - 3 + 3 = 17 + 3$$

$$4x = 20$$

Divide both sides by 4.

$$\frac{4x}{4} = \frac{20}{4}$$

$$x = 5$$

Check by substituting 5 for x in the original equation.

$$4(5) - 3 = 17$$

$$20 - 3 = 17$$

$$17 = 17$$



