



AMA
LEARNING

Equations: Notes

Intro to Equations:

Equation: The process of making one thing (numbers in math) equal to another

Example Structure: $3x + 3 = 10$

Equation

coefficient: number in front of variable

variable: letter representing an unknown number

- most common is x
- any letter can be used

* Equations usually perform one or several operations

↳ In algebra, you usually have an unknown number (variable) and have to find the value of that variable

One Step Equations:

* perform only one operation to find value of variable

Addition:

- subtract number being added on both sides to find value of the variable

Remember. you want to isolate the variable!

$$x + 5 = 7$$

$$x + 5 - 5 = 7 - 5$$

$$\boxed{x = 2}$$

Subtraction:

- add number being subtracted on both sides to find value of the variable

Remember to isolate the variable!

$$x - 2 = 9$$

$$x - 2 + 2 = 9 + 2$$

$$\boxed{x = 11}$$

Multiplication:

- divide coefficient of variable on both sides to find value of the variable

Make sure the variable is isolated!

$$\begin{aligned} 3x &= 9 \\ \cancel{3}x &= \cancel{9} \\ \cancel{3} &\quad \cancel{3} \\ \boxed{x = 3} \end{aligned}$$

OR

$$\begin{aligned} 3 \cdot x &= 9 \\ \cancel{3} \cdot \cancel{x} &= \cancel{9} \\ \cancel{3} &\quad \cancel{3} \\ \boxed{x = 3} \end{aligned}$$

Division

- multiply number being divided on both sides to find value of the variable

Isolate the variable

$$\frac{h}{3} = 2$$

$$\begin{aligned} \cancel{3} \left(\frac{h}{\cancel{3}} \right) &= 2(3) \\ \boxed{h = 6} \end{aligned}$$

TWO/MULTI STEP EQUATIONS:

*Equations with 2 or more operations performed

steps: - Always multiply first if the division operation is used (unless it is used only for the variable)
- then divide, add, or subtract
- isolate the variable to find the answer

*Make sure to solve the equation in a way that isolating the equation is the last step.

Examples:

$$4x + 2 = 10$$

$$4x + 2 - 2 = 10 - 2$$

$$4x = 8$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$\boxed{x = 2}$$

$$\frac{3x - 2}{4} = 4$$

$$4\left(\frac{3x - 2}{4}\right) = 4(4)$$

$$3x - 2 = 16$$

$$3x - 2 + 2 = 16 + 2$$

$$3x = 18$$

$$\frac{3x}{3} = \frac{18}{3}$$

$$\boxed{x = 6}$$

$$\frac{3x}{6} + 1 = 5$$

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

$$\frac{3x}{6} = 4$$

$$6\left(\frac{3x}{6}\right) = 4(6)$$

$$3x = 24$$

$$\frac{3x}{3} = \frac{24}{3}$$

$$\boxed{x = 8}$$

* Since it is dividing only the variable by 6, you would get rid of the 1 first

Exponents:

Exponents: number multiplied a certain number of times represented by a number in the corner ✓

$$\begin{array}{ccc}
 x^2 & x^3 & x^4 \\
 \downarrow & \downarrow & \downarrow \\
 x \cdot x & x \cdot x \cdot x & x \cdot x \cdot x \cdot x
 \end{array}$$

Examples: 4^2

$$\begin{array}{c}
 4^2 \\
 \downarrow \\
 4 \cdot 4 = \boxed{16}
 \end{array}$$

$$\begin{array}{c}
 2^3 \\
 \downarrow \\
 2 \cdot 2 \cdot 2 \\
 4 \cdot 2 \\
 \boxed{8}
 \end{array}$$

* with exponents with more than 2 numbers being multiplied with each other, multiply only 2 numbers at a time to avoid mistakes

Negative exponents:

$$x^{-2} = \frac{1}{x^2} = \frac{1}{x \cdot x}$$

Examples: 4^{-2}

$$\begin{array}{c}
 4^{-2} \\
 \frac{1}{4^2} \\
 \frac{1}{4 \cdot 4} \\
 \boxed{\frac{1}{16}}
 \end{array}$$

$$\begin{array}{c}
 2^3 \\
 \frac{1}{2^3} \\
 \frac{1}{2 \cdot 2 \cdot 2} \\
 \boxed{\frac{1}{8}}
 \end{array}$$

Square Roots & Cubic Roots:

Roots: numbers multiplied a certain number of times to get the number in the $\sqrt{\quad}$ (radical)

square root: $\sqrt{x} = y (y \cdot y)$
(2)

Example: $\sqrt{9} = 3$
b/c $3 \cdot 3 = 9$

More:

$$\sqrt{49} = 7$$

$(7 \cdot 7 = 49)$

$$\sqrt{36} = 6$$

$(6 \cdot 6 = 36)$

$$\sqrt{4} = 2$$

$(2 \cdot 2 = 4)$

cubic root: $\sqrt[3]{x} = y (y \cdot y \cdot y)$
(3)

Example: $\sqrt[3]{8} = 2$
b/c $2 \cdot 2 \cdot 2 = 8$

More:

$$\sqrt[3]{27} = 3$$

$(3 \cdot 3 \cdot 3 = 27)$

$$\sqrt[3]{64} = 4$$

$(4 \cdot 4 \cdot 4 = 64)$

$$\sqrt[3]{125} = 5$$

$(5 \cdot 5 \cdot 5 = 125)$