Basic Symbolic Manipulation Name _____

There will be a quiz on this content. You will be expected not only to write the answer, but demonstrate the steps to get to the answer!

Symbols, like X, Y, and Z, can be manipulated just like numbers can.

You can add, subtract, multiply, or divide both sides by a symbol.

To "solve an equation" for a symbol means that you will

For example, let's say I have the following equation:

$$Z = XY$$

I want to solve for Y. This means that I want to manipulate the terms until I have $Y =$ something.

In this specific case, I need to divide both sides by X, and I have

$$\frac{Z}{X} = Y$$

which is the answer!

One Step Equations:

1. Solve for B.

$A = BC$

2. Solve for E.

$D = E + F$

3. Solve for G.

$H = G - I$

4. Solve for N:

$M = \frac{N}{O}$

5. Solve for Q:

$P = 5Q$

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Two Step Equations

6. Solve for L

$J = K - L$

It is very important to be able to solve equations where your variable is in the denominator. There are two ways to do it:

Solve for Z:

$X = \frac{Y}{Z}$

Method 1: first, multiply both sides by Z. Then, it's just like one of the equations above:

$$X = \frac{Y}{Z} \quad \Rightarrow \quad ZX = Y \quad \Rightarrow \quad Z = \frac{Y}{X}$$

Method 2: Put the left side of the equation over 1. Then, cross multiply to solve the problem:

$$X = \frac{Y}{Z} \quad \Rightarrow \quad \frac{X}{1} = \frac{Y}{Z} \quad \Rightarrow \quad XZ = 1Y \quad \Rightarrow \quad XZ = Y \quad \Rightarrow \quad Z = \frac{Y}{X}$$

7. Solve for R:

$\frac{S}{R} = T$

8. Solve for m:

$E = mgh$

9. Solve for h:

$E = mgh$

10. Solve for m:

$E = \frac{1}{2}mv^2$

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11. Solve for v:
$E = \frac{1}{2}mv^2$

12. Solve for F_1
$F_1 - F_2 = ma$

13. Solve for a
$F_1 - F_2 = ma$

14. Solve for v_i
$v_f = v_i + at$

15. Solve for a
$v_f = v_i + at$

16. Solve for t
$v_f = v_i + at$

17. Solve for v
$a = \frac{v^2}{r}$

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18. Solve for r

$$a = \frac{v^2}{r}$$

19. Solve for m_1

$$F = \frac{Gm_1m_2}{r^2}$$

20. Solve for m_2

$$F = \frac{Gm_1m_2}{r^2}$$

21. Solve for r:

$$F = \frac{Gm_1m_2}{r^2}$$

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Answers:

1. $B = \frac{A}{C}$	**8.** $m = \frac{E}{gh}$	**15.** $a = \frac{v_f - v_i}{t}$
2. $E = D - F$	**9.** $h = \frac{E}{mg}$	**16.** $t = \frac{v_f - v_i}{a}$
3. $G = H + I$	**10.** $m = \frac{2E}{v^2}$	**17.** $v = \sqrt{ar}$
4. $N = MO$	**11.** $v = \sqrt{\frac{2E}{m}}$	**18.** $r = \frac{v^2}{a}$
5. $Q = \frac{P}{5}$	**12.** $F_1 = F_2 + ma$	**19.** $m_1 = \frac{Fr^2}{Gm_2}$
6. $L = K - J$	**13.** $a = \frac{F_1 - F_2}{m}$	**20.** $m_2 = \frac{Fr^2}{Gm_1}$
7. $R = \frac{T}{S}$	**14.** $v_i = v_f - at$	**21.** $r = \sqrt{\frac{Gm_1m_2}{F}}$