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Mr. Rogove Date: _____

Learning Objective: We will rearrange formulas and solve for variables. (Lesson 84)

Activating Prior Knowledge:

We know how to use formulas to find unknown quantities.

The side of one leg of a right triangle is 24 inches, and the hypotenuse is 25 inches. What is the length of the other leg?	The average of 3 numbers is 67. One number is 45, and another is 71. What is the third number?

Concept Development:

We can use properties of equality and inverse operations to rearrange formulas, and solve for specific variables.

Example: $A = \pi r^2$ Let's solve for r.

MANIPULATE

$$\frac{A}{\pi} = \frac{\pi r^2}{\pi}$$

$$\sqrt{\frac{A}{\pi}} = \sqrt{r^2}$$

$$r = \sqrt{\frac{A}{\pi}}$$

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Guided Practice:

Steps for Solving For Variables

1. Study the particular formula and identify the variable you are trying to solve for.
2. Perform inverse operations and use properties of equality to isolate the appropriate variable.

The formula for the perimeter of a rectangle is $P = 2(l + w)$. Solve for w.

$P=2(l+w)$ $P=2(l+w)$

$P=2l+2w$ $\frac{P}{2}=l+w$

$-2l \quad -2l$ $-l \quad -l$

$P-2l=2w$ $\frac{P}{2}-l=w$

$\frac{P-2l}{2}=\frac{2w}{2}$

$\frac{P}{2}-l=w$

The formula for volume of a sphere is $V = \frac{4}{3}\pi r^3$. Solve for the ~~radius~~.

$V(\frac{3}{4})=\frac{4}{3}\pi r^3\frac{3}{4}$

$\frac{3V}{4}=\frac{\pi r^3}{\pi}$

$\frac{3V}{4\pi}=r^3$

$\sqrt[3]{\frac{3V}{4\pi}}=r$

$\sqrt[3]{\frac{\frac{3}{4}V}{\pi}}$

$\sqrt[3]{V-\frac{4}{3}\pi}$

The surface area of a cone is $S = \pi r^2 + \pi rl$. Solve for l.

$\frac{S}{\pi r}=\frac{\pi r^2+\pi rl}{\pi r}$

$\pi r^2+\pi rl$ $-\pi r^2 \quad \pi r\cdot r$

$\frac{S}{\pi r}=r+l$ $\pi r(r+l)$

$-r \quad -r$ $S=\pi r^2+\pi rl$

$\frac{S}{\pi r}-r=l$ $S-\pi r^2=\pi rl$

$\frac{S-\pi r^2}{\pi r}=\frac{\pi rl}{\pi r}$

$\frac{S}{\pi r}-r=l$

The formula $E = \frac{1}{2}kx^2$ is used to find the potential energy E of a spring with spring constant k that has been stretched by length x. Solve the formula for x.

$2(E=\frac{1}{2}Kx^2)2$

$\frac{2E}{K}=\frac{Kx^2}{K}$

$\sqrt{\frac{2E}{K}}=\sqrt{x^2}$

$x=\sqrt{\frac{2E}{K}}$

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The formula for the average of three numbers is $A = \frac{x+y+z}{3}$. Solve for z.

The formula for Fahrenheit is $F = 32 + \frac{9}{5}C$. Solve for Celsius.

$$\frac{y-b}{m} = x.$$

Solve for y.

$$\frac{y-b}{m} = x(m)$$
$$y - b = mx$$
$$+b \quad +b$$
$$\boxed{y = mx + b}$$

$$\frac{m}{n} = \frac{p}{q}.$$

Solve for q.

$$\frac{mq}{m} = \frac{np}{m}$$
$$\boxed{q = \frac{np}{m}}$$

$$km = \frac{m}{2} + p.$$

Solve for m.

$$2(km) = \left(\frac{m}{2} + p\right)2$$
$$\frac{2km}{m} = \frac{m + 2p}{m}$$
$$2k = 1 + \frac{2p}{m}$$
$$\frac{1}{2p}(2k-1) = \frac{2p}{m}\left(\frac{1}{2p}\right)$$
$$\frac{2k-1}{2p} = \frac{1}{m}$$
$$\boxed{m = \frac{2p}{2k-1}}$$

$$km = \frac{m}{2} + p$$
$$-\frac{m}{2} \quad -\frac{m}{2}$$
$$2\left(km - \frac{m}{2}\right) = (p)2$$
$$2km - m = 2p$$
$$\frac{m(2k-1)}{2k-1} = \frac{2p}{2k-1}$$
$$\boxed{m = \frac{2p}{2k-1}}$$

$\frac{6}{2} = \frac{3}{1}$

Solve for s.

$$rs - t = us + v$$
$$+t \quad +t$$
$$rs = us + t + v$$
$$-us \quad -us$$
$$rs - us = t + v \quad \text{Collects on one side}$$
$$\frac{s(r-u)}{r-u} = \frac{t+v}{r-u}$$
$$\boxed{s = \frac{t+v}{r-u}}$$

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Independent Practice:

Solve for the variable.

Simple Interest is calculated as $I = Prt$. Solve for t.

The standard form for the equation of a line is $Ax + By = C$. Solve for y.

Solve for h. $g\left(h + \frac{2}{3}\right) = 1.$

$h + \frac{2}{3} = \frac{1}{g}$

$-\frac{2}{3} \quad -\frac{2}{3}$

$h = \frac{1}{g} - \frac{2}{3}$

$a(n-3) + 8 = bn.$

Solve for n.

$an - 3a + 8 = bn$

$-an \qquad -an$

$-3a + 8 = bn - an$

$\frac{-3a+8}{b-a} = \frac{n(b-a)}{b-a}$

$\frac{-3a+8}{b-a} = n \qquad n = \frac{3a-8}{a-b}$

$(1-a)x = \frac{1+a}{1-a}(1-a)$

Solve for a.

$x - ax = 1 + a$

$-a \qquad -a$

$x - ax - a = 1$

$-x \qquad -x$

$-ax - a = 1 - x$

$\frac{a(-x-1)}{-x-1} = \frac{1-x}{-x-1}$

$a = \frac{1-x}{-x-1} \quad \frac{-1}{-1}$

$a = \frac{x-1}{x+1}$

$a^2 + b^2 = c^2.$

Solve for b.

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Closure:

$$T = 4\sqrt{m}$$

Solve for m.

Notes:

Maps to lesson 4-3 of Algebra 1 (GO MATH) and lesson 19 in Alg 1 Mod 1 of ENY