Math 9 – Unit 3: Solving Equations

Name: Mr. Hagen

Lesson #7: Working with Formulas

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Learning Goal: We are learning to rearrange formulas to solve for a given variable.

Now that we know how to solve equations, we can use those skills to solve word problems (our next unit!). However, before we start tackling word problems, we will first focus on how to manipulate formulas. Often, a word problem requires us to use a formula, but sometimes that formula is not solving exactly what we want. We can first rearrange/manipulate the formula, then solve!

a) Given the formula for the area of a rectangle, $A = lw$, solve it for the width (w). Then, determine the width if the area is $450m^2$ and the length is $15m$.

(1)

$\frac{A}{l} = \frac{lw}{l}$

$\frac{A}{l} = w$

(2)

$w = \frac{A}{l}$

$w = \frac{450m^2}{15m}$

$w = 30m$

b) Given the formula for the perimeter of a rectangle, $P = 2(l + w)$, solve it for the length (l). Then, determine the length if the perimeter is $348cm$ and the width is $47cm$.

$P = 2(l + w)$

$P = 2l + 2w$

$-2w \quad -2w$

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

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

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

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

$-w \quad -w$

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

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

$l = \frac{348cm - 2(47cm)}{2}$

$l = \frac{348cm - 94cm}{2}$

$l = \frac{254cm}{2}$

$l = 127cm$

c) Given the formula for the circumference of a circle, $C = 2\pi r$, solve it for the radius, *r*. Then, determine the radius if the circumference is $628cm$.

$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$

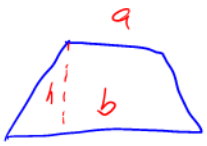
$$\frac{C}{2\pi} = r$$

$$r = \frac{C}{2\pi}$$

$$r = \frac{628}{2(3.14)}$$

$$r = \frac{628}{6.28}$$

$$r = 100cm$$



d) Given the formula for the area of a trapezoid, $A = \frac{h(a+b)}{2}$, solve it for the base (*b*). Then, determine the base *b* if the height is $54mm$, the top is $34mm$, and the area is $2862mm^2$.

$$(2)A = \frac{h(a+b)}{2}(2)$$

$$2A = h(a+b)$$

$$\frac{2A}{h} = \frac{h(a+b)}{h}$$

$$\frac{2A}{h} - a = a + b - a$$

$$\frac{2A}{h} - a = b$$

$$b = \frac{2A}{h} - a$$

$$b = \frac{2(2862)}{54} - 34$$

$$b = 106 - 34$$

$$b = 72mm$$

e) Given the formula for simple interest, $I = Prt$, solve it for time, *t*. Then, determine the time in years if the interest is $1000, the principal is $5000 and the rate is 4% (or 0.04). Hint: Just match the variable with the names.

$$\frac{I}{Pr} = \frac{Prt}{Pr}$$

$$\frac{I}{Pr} = t$$

$$t = \frac{I}{Pr}$$

$$t = \frac{1000}{(5000)(0.04)}$$

$$t = \frac{1000}{200}$$

$$t = 5 \text{ years}$$

f) Given the formula for the Pythagorean Theorem, $a^2 + b^2 = c^2$, solve it for *b*. Then, determine *b* if the *a* is 5cm and the hypotenuse, *c*, is 13cm.

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

$$-a^2 \quad -a^2$$

$$\sqrt{b^2} = \sqrt{c^2 - a^2}$$

$$b = \sqrt{c^2 - a^2}$$

$$b = \sqrt{13^2 - 5^2}$$

$$b = \sqrt{169 - 25}$$

$$b = \sqrt{144}$$

$$b = 12 \text{ cm}$$

Success Criteria:

- I can identify the variable that I am trying to solve
- I can rearrange a formula by using inverse operations
- I can use the rearranged formula to answer the question