PROBLEM 3 Other Ways to Write Familiar Formulas

Convert each literal equation to solve for the given variable.

1. Think Inside the Box is manufacturing new boxes for You Pack 'Em, We Ship 'Em (YPEWSE). YPEWSE told Think Inside the Box that the boxes must have a specific volume and area. However, YPEWSE did not specify a height for the boxes.

   a. Write a literal equation to calculate the volume of a box.

   $V = lwh$

   b. Convert the volume formula to solve for height. Get "h" by itself!

   $V = lwh$

   $\frac{V}{lw} = \frac{lwh}{lw}$ Divide both sides by lw

   $\frac{V}{lw} = h$ Simplify

   c. YPEWSE specified the volume of the box must be 450 in^3 and the area of the base must be 75 in^2. Use your formula to determine the height of the new boxes.

   Given: $V = 450\ in^3$ and Area or $lw = 75\ in^2$

   You have to find "h".

   $h = \frac{V}{lw}$

   $h = \frac{450}{75}$ Let $V = 450$ and $lw = 75$

   $h = 6$ Simplify

2. The volume of an ice cream cone is the measure of how much ice cream a cone can hold. An ice cream cone company wants to make an ice cream cone with a larger radius that still holds the same amount of ice cream.

a. Write an equation to calculate the volume of a cone.

$$V = \frac{1}{3}\pi r^2 h$$

b. Convert the equation to solve for the radius.

Get "r" by itself!

$$V = \frac{1}{3}\pi r^2 h$$

$$(3)V = 3\left(\frac{1}{3}\pi r^2 h\right)$$ Multiply both sides by 3

$$\frac{3V}{\pi h} = \frac{\pi r^2 h}{\pi h}$$ Divide both sides by πh

$$\frac{3V}{\pi h} = r^2$$ Simplify

$$\sqrt{\frac{3V}{\pi h}} = r$$ Take the square root of both sides

3. Future value is the value of a sum of money at a specific date due to interest. The formula $A = P(1 + rt)$ is used to determine future value. The variable A is the future value, P is the principal, r is the interest rate, and t is the time.

A bank wants to know the interest rate of a customer's account who earned a certain amount of future value.

a. Convert the equation to solve for rate.

Get "r" by itself!

$$A = P(1+rt)$$

$$A = P + Prt$$ Distribute P

$$A - P = P + Prt - P$$ Subtract P from both sides

$$A - P = Prt$$ Simplify

$$\frac{A-P}{Pt} = \frac{Prt}{Pt}$$ Divide both sides by Pt

$$\frac{A-P}{Pt} = r$$ Simplify

b. Jillian deposited $5000 in an account 10 years ago after her college graduation. The money she deposited now has a value of $15,000. Determine the interest rate of Jillian's account.

Given: P = \$5000, t = 10 years, and A = \$15000

You have to find "r".

$$\frac{A-P}{Pt} = r \quad \text{or} \quad r = \frac{A-P}{Pt}$$

$$r = \frac{15000-5000}{5000 \cdot 10}$$

$$r = \frac{10000}{50000}$$

$$r = 0.2 \text{ or } 20\%$$