**COLLEGE PREP**

**SECTION 1.3 - USING FORMULAS TO SOLVE PROBLEMS**

**Objectives:**

* Solve for a variable in a formula.
* Use formulas to solve problems.

**DEFINITION:** A ***FORMULA*** is an equation that describes a relationship between two or more variables.

***SOLVING FOR VARIABLES IN FORMULAS:*** Since formulas describe relationships between variables, (the Area of a rectangle is related to its base and height), we often end up looking for different variables. For instance, we may want the Area, or we may have the area and the height, but we want to find the value for the base. Because of this, we sometimes need to rearrange formulas to answer for a specific variable.

TIPS: Solving for a variable in a formula is just like solving an equation with one unknown. Treat everything else like a constant. Circling or underlining what you’re solving for may help keep things straight.

**EXAMPLE:** The area A of a trapezoid is $A=\frac{1}{2}h\left(B+b\right)$, where h is the height, B and b are the lengths of the two bases.

 A) Solve the formula for B.

 $2A=h\left(B+b\right)$ Multiply both sides by 2.

 $\frac{2A}{h}=B+b$ divide both side by h

 $\frac{2A}{h}-b=B$ subtract b from both sides.

 B) Use the result to find B is A= 90 sq. in, h=12 in., and b=4 in.

 $B=\frac{2\left(90\right)}{\left(12\right)}-4 = \frac{180}{12}-4 = 15-4 = 11 inches$

**EXAMPLE:** Your History teacher uses the formula G= a + b + 2c to determine your final grade, where a and b are your 2 tests, and c is your final exam (which counts as two tests). Solve the formula for c, your final exam grade.

 $G=a+b+2c$ Subtract a and b from both sides

 $G-a-b=2c$ Divide by 2

 $c=\frac{G-a-b}{2}$

**EXAMPLE:** Solve *2xh - 4x = 3h - 3* for h.

 $2xh-3h-4x=-3$ Get all the terms with h on one side of the equation

 $2xh-3h=4x-3$ move everything else to the opposite side

 $\left(2x-3\right)h=4x-3$ Use “reverse distribution” to isolate h

 $h=\frac{4x-3}{2x-3}$ divide by the coefficient of h. Remember!!!! You cannot cancel out or reduce the x’s or 3’s because they are expressions, not factors!

***USING FORMULAS TO SOLVE PROBLEMS:*** Substitute the values you know into the formulas and solve for the remaining variable.

**EXAMPLE:** The perimeter of a rectangular garden in 17 feet. The length of the garden is 1.5 feet longer than the width. Find the dimensions of the garden.

 First, figure out how the length and the width relate. If w= width, then L = w + 1.5

 The formula for Perimeter is: P = 2w + 2L, so substitute.

 $17=2w+2\left(w+1.5\right)$

 $17=2w+2w+3$ combine like terms, and subtract 3 from both sides

 $14=4w$ divide by 4

 $w=\frac{14}{4}=3.5$

 SO: w = 3.5 feet, L= 3.5+1.5 = 5 feet

**EXAMPLE:** A can of paint has a surface area of 565.8 square inches. Find the height of the paint can if its radius is 6.375 inches. Round the answer to the nearest hundredth.

 The formula for the surface area of a cylinder is: $A=2πr^{2}+2πrh$ where r is the radius, and h is the height.

 $565.8=2π\left(6.375\right)^{2}+2π\left(6.375\right)h$ Solve for h. Note: don’t do any computations yet!

 $565.8-2π\left(6.375\right)^{2}=2π\left(6.375\right)h$

 $\frac{565.8-2π\left(6.375\right)^{2}}{2π\left(6.375\right)}=h$ NOTE: DON’T CANCEL ANYTHING!!!! Use a calculator.

 $h=7.75 inches$

Homework: Pg. 86-89: #7-10 all, 11, 14, 19, 27-31 all, 33, 43, 45, 47-50 all