Math Help Sheet: Proportions

A proportion is defined as: "A statement that 2 ratios are equal."
Proportions are a great problem-solving tool. Proportions can be used to solve everyday household problems like how much of an ingredient to use when baking cookies or how much water to mix with cleaner to mop the floor.
Examples of proportions are:

$$\frac{4}{12}=\frac{1}{3} \qquad \frac{2\,quarts}{6\,gallons}=\frac{4\,quarts}{12\,gallons} \qquad \frac{30\,dollars}{2\,CD's}=\frac{15\,dollars}{1\,CD's}$$

The method for solving proportions is called "The Cross Multiplication Rule", which states:

If $\frac{a}{b}=\frac{c}{d}$ then $ad=bc$. Note that we set the cross products equal to each other: $\frac{a}{b}\times\frac{c}{d}$

-- Here are two examples of how to cross multiply:

1. $\frac{2}{5}=\frac{c}{25}$ → (2)(25) = (5)(c) → 50 = 5c → c = 5
2. $\frac{a}{7}=\frac{4}{14}$ → (a)(14) = (7)(4) → 14a = 28 → a = 2

The following examples illustrate how to use proportions to solve problems.

1. If 5 pints of cleaner requite 10 gallons of water in order to clean a kitchen floor, how many gallons of water will 4 pints of cleaner require?

Step 1: Draw a table containing your knowns

Pints of Cleaner	Gallons of water
5	10
3	unknown

Step 2: Set up your proportion. Let N be the label for the unknown quantity and solve.

$$\frac{Cleaner}{Water}=\frac{5}{3}=\frac{10}{N} \xrightarrow{Cross\ multiply} 5N=30 \xrightarrow{Solve} N=6\,Gallons\ of\ water$$

2. You need to mix 2-cycle oil into 1 gallon of gasoline in a 1 to 40 ratio. How many ounces of oil to you add? 1 gallon = 128 oz. so we have the following:

$$\frac{Oil}{Gas} = \frac{N}{128} = \frac{1}{40} \xrightarrow{Cross\ multiply} 40N = 128 \xrightarrow{Solve} N = 3.2\ ounces\ of\ oil$$

3. Solve the following proportion: $\frac{N}{3} = \frac{27}{N}$ $N^2 = (3)(27) = 81 \xrightarrow{Solve} N = 9$