Section 2-3, Mathematics 104

Solving Problems

We need to talk about problem solving in mathematics.

There are two good links on my website that address this issue and I encourage you to read them both.

There can be two distinct issues with solving a math problem.

The first is how to turn a word problem into mathematical language.

The can be more challenging if the word problem is not in your native language.

Also there time when the mathematical meaning of something is different than the usual meaning.

Example: OR

John has blue eyes or Mary has blue eyes.

In normal language we mean that John has blue eyes and Mary does not or Mary has blue eyes and John does not.

Mathematically we call this **exclusive or**.

But without the term exclusive added, in math we mean

John has blue eyes and Mary does not, or Mary has blue eyes and John does not or John has blue eyes and Mary has blue eyes.

These differences can be important.

Turning a word problem into a mathematical expression.

Fred is paid 5 cents for each aluminum cans he collects and 3 cents for each plastic bottle he collects.

Example:

Write an expression for the total amount of money he will get.

We need to give names to two values,

c - the number of cans he collects and
b - the number of bottles

The expression we want is 5c + 3b

Language has many ways to say the same thing.

Example:

3 less than m

or

m decreased by 3

Both of these are m - 3

Sometime as in our first example the operator is implied but not stated.

Turning a mathematical expression into words

Let's try the following:

x - 12

7(x+12)

5 + x/2

(5+x)/2

Guess and Check

Guess an check is the least efficient method to solve a problem, however it has the ability to get you started when you don't have any intuition about a problem.

Here's an example.

Let's say you are going to invest some money at 6% interest per year, compounded yearly and you want to know how long it will take to double your money.

The expression for how much you have after a year is

$$P + P \times \frac{6}{100} = P + .06P = P(1 + .06) = 1.06P$$

Where P is the starting principle.

The expression for how much you have after 2 years is

$$1.06 \times 1.06P = 1.06^2 P$$

Finally for any number of years, eg. n we have

$$1.06^n P$$

To answer our question we can choose a starting Principle that is easy to deal with, say $1.

n	1.06^n
1	1.06
2	1.12
4	1.26
8	1.59
16	2.54
13	2.13
12	2.01

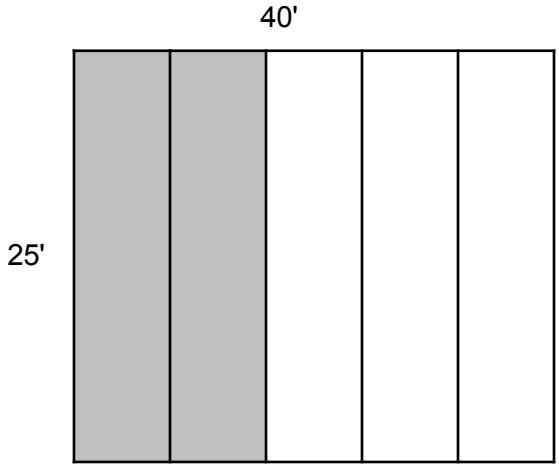
So we can see that the answer is a little less than 12 years.

A picture is worth a 1000 words

So draw a picture.

An apartment is 25 x 40 feet.
2/5ths of the apartment is taken up by the living room and kitchen.

What is the area of the rest of the apartment



You can see here that the total area is 40 x 25 = 1000 sq. feet.

2/5 of this is 400 sq. feet.

1000 - 400 = 600 sq. feet the answer