

## WORD PROBLEMS

The ONLY formula we need to solve this kind of problems is:

$$\text{Base} \times \text{Rate} = \text{Percentage}$$

where:

**Percent (Rate):** A fraction whose denominator is 100.

**Percentage:** The product of a rate (percent) and another number called the base.

Percentages have the unit of the base and the description of the rate.

**Example 1:** ITT graduated 120 students from a math class after having "washed out" 40 of them. What percent of the class graduated?

120 = number of students graduated  
40 = number of students not graduated  
percent of students graduated = ???

The total number of students in the class is  $120 + 40 = 160$   
If 120 graduated out of 160, then the percent is  $120/160 = 0.75 = 75\%$

**Example 2:** A company produced 800 good shafts and 30 defective shafts. What percent of their production was defective?

800 = number of good shafts  
30 = number of defective shafts  
percent of defective shafts = ???

The percent is  $30/830 = 0.0361 = 3.61\%$  ( $830=800+30$ )

**Example 3:** Mary received \$90 for her weekly allowance. Then she received two 15% increases. How much is her weekly allowance after the second increase?

**NOTE: you cannot add percents.**

90 = old allowance  
15% = first increase  
15% = second increase  
allowance after the second increase = ???

After the first increase, her allowance was:  $90 + 90(.15) = \$103.5$

After the second increase, her allowance is:  $103.5 + 103.5(.15) = \$119.03$

**Example 4:** John just received a 10% raise on his salary. If he now receives \$170 per week, what was his salary before the raise?

170 = current salary  
10% = raise  
salary before the raise = ??? = x5

Looking at the previous example we know that:  $x + x(.1) = 170$  (Why?)

Solve for x:  $1.1x = 170$

$$x = \$154.54$$

Does the answer make sense?

Well, if he is getting \$170 now, and we know that he got a raise; then, he used to get less than \$170 or \$154.54. So, yes, the answer makes sense.

**Example 5:** Tim got a 22.5% discount for a TV. He bought the TV for \$345. What was the marked price of the TV?

22.5% = percent of discount  
 345 = selling price  
 marked price = ??? = x

Like the previous example:  $x - x(.225) = 345$  (Why "-")?

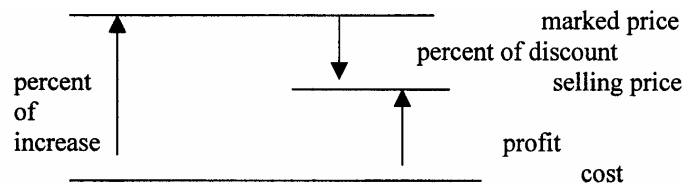
Solve for x:  $.755x = 345$   
 $x = \$445.16$

Does the answer make sense?

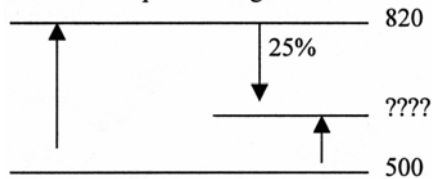
**Example 6:** A merchant paid \$500 for a table. He then marked it \$820. If he then allowed the buyer a 25% discount, how much was the selling price?

500 = cost  
 820 = marked price  
 25% = percent of discount  
 selling price = ???

For the complicated problems, we will use the following diagram:



For our example the diagram looks like:



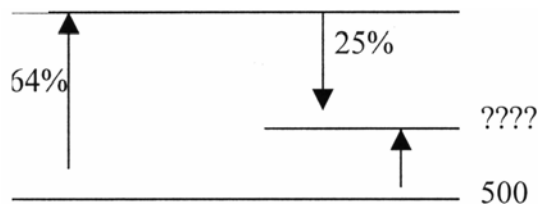
To find the selling price, we simply take 25% off the marked price:

$$820 \times .25 = 205$$

$$820 - 205 = \$615$$

**Example 7:** A merchant paid \$500 for a table. He then marked the table 64% above the cost. If he then allowed the buyer a 25% discount, how much was the selling price?

500 = cost  
 64% = rate of mark up  
 25% = percent of discount  
 selling price = ???



To find the selling price, we first need to find the marked price; then, we take 25% off.

To find the marked price:  $500 \times .64 = 320$

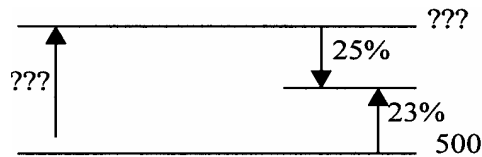
$$500 + 320 = \$820 \text{ (marked price)}$$

The selling price = \$615 (why?)

**Example 8:** A sofa cost a merchant \$500. He priced the sofa so that he could allow a customer a 25% reduction from the marked price and still make a 23% profit.

- Find: a. The marked price.  
b. The rate of mark up.

500 = cost  
25% = rate of discount  
23% = rate of profit  
marked price = ???  
rate of mark up = ???



First, find the selling price, and then the marked price.

To find the selling price:

$$500 \times .23 = \$115 \text{ (profit)}$$
$$500 + 115 = \$615 \text{ (selling price)}$$

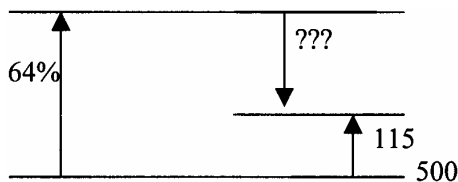
To find the marked price (let's call it "x"), we take 25% off "x" and get 615:

$$x - .25x = 615$$
$$.75x = 615$$
$$x = \$820$$

The rate of mark up:  $(820 - 500) / 500 = 64\%$

**Example 9:** An item cost a merchant \$500. If it was marked 64% above the cost and later sold for a \$115 profit, what was the rate of reproduction?

500 = cost  
64% = rate of mark up  
115 = profit  
rate of discount = ???



To find the rate of discount, we need the marked price and the selling price.

The marked price:  $500 \times .64 = 320$

$$500 + 320 = \$820 \text{ (marked price)}$$

The selling price:  $500 + 115 = \$615$  (selling price)

Rate of discount:  $(820 - 615) / 820 = 25\%$