

PERCENTS AS PROPORTIONS

Every percent problem must be one of the following:

- 1) What is 35% of 400?, or
- 2) 45 is what percent of 360?, or
- 3) 200 is 16% of what number?

These problems can be expressed as proportions:

$$\frac{\text{percent}}{100} = \frac{\text{amount}}{\text{base}}$$

or more simply

$$\frac{p}{100} = \frac{a}{b}$$

where **p** is the percent, **a** is the amount and **b** is the base.

How do we figure out what **p, a, & b** are?

a is p% of b

The easiest to figure out is **p**. The value of p is always followed by the % symbol or the word **percent**. So in problem 1:

EXAMPLE: 1) What is **35%** of 400?

a is p% of b

Now we know that **p** is 35, **b** is 400 and **a** is the unknown. Substituting these values into our proportion:

$$\frac{p}{100} = \frac{a}{b}$$

it becomes,

$$\frac{35}{100} = \frac{a}{400}$$

Then we solve the proportion by cross-multiplying and dividing. **The answer is 140.**

EXAMPLE: 2) 45 is what **percent of** 360?

$$\frac{p}{100} = \frac{a}{b}$$

we replace the **a** with 45, the **b** with 360 and solve for **p**. So we get:

$$\frac{p}{100} = \frac{45}{360}$$

Then we solve the proportion by cross-multiplying and dividing.
p = 12.5% or 12 ½%

EXAMPLE: 3) 200 is 16% of what number?

This time **p** is 16, **b** is the unknown and **a** is 200. Again, using our favorite proportion:

$$\frac{a}{b} = \frac{p}{100}$$

then making the proper substitutions we have

$$\frac{200}{b} = \frac{16}{100}$$

Then we solve the proportion by cross-multiplying and dividing. Yes, **b** = 1250

Practice Percent application problems

- 1) What is the sales tax on a purchase of \$87 if the rate is 5%?
- 2) A store advertises a 20% discount on all TV's in stock. What is the amount of the discount on a TV which sells for \$350 before the discount?
- 3) If you invest \$250 at 7% interest, what is the amount earned at the end of one year?
- 4) The cookie jar contained 40 cookies. If you ate 6 of the cookies, what percent of the cookies did you eat?
- 5) Zelda Mae wishes to earn \$5,480 in commissions this month. If her commission is 4% of what she sells, how much merchandise must she sell?
- 6) The number of students taking math in the spring semester is 75. If the enrollment for the fall semester is expected to increase by 27 students, what is the percent of increase?

They can all be put in the form of: ***a is p% of b***

So the problems become:

- 1) What is the sales tax on a purchase of \$87 if the rate is 5%?
What is 5% of \$87? or **a** is 5% of \$87?
- 2) A store advertises a 20% discount on all TV's in stock. What is the amount of the discount on a TV which sells for \$350 before the discount?
What is 20% of \$350? or **a** is 20% of \$350?
- 3) If you invest \$250 at 7% interest, what is the amount earned at the end of one year?
What is 7% of \$250? or **a** is 7% of \$250?
- 4) The cookie jar contained 40 cookies. If you ate 6 of the cookies, what percent of the cookies did you eat?
6 is what percent of 40? or 6 is **p**% of 40?

- 5) Zelda Mae wishes to earn \$5,480 in commissions this month. If her commission is 4% of what she sells, how much merchandise must she sell?

\$5,480 is 4% of what number? or \$5,480 is 4% of **b**?

- 6) The number of students taking Basic College Math in the spring semester is 75. If the enrollment for the fall semester is expected to increase by 27 students, what is the percent of increase?

27 is what percent of 75? or 27 is **p**% of 75?

Now we can use the proportion:

$$\frac{a}{b} = \frac{p}{100}$$

After substituting for **a**, **p** and **b** we have one unknown.

Solve by "cross multiplying and dividing."

So we have found that those nasty math teachers have tried to scam us again.

By the way, the answers to the above problems are as follows:

1) $a = \$4.35$

2) $a = \$70$

3) $a = \$17.50$

4) $p = 15\%$

5) $b = \$137,000$

6) $p = 36\%$