Percent Problems: The Proportion Method

A percent is a ratio of the number to 100. You may wish to review ratios in your text. The second number of the ratio form of a percent is always 100.

EXAMPLES:

$$5\% \text{ is } \frac{5}{100} \quad \text{or} \quad 5{:}100 \ \text{ or } \ 5 \text{ to } 100$$

$$33\frac{1}{3}\% \text{ is } \frac{33\frac{1}{3}}{100} \quad \text{or} \quad 33\frac{1}{3}{:}100 \ \text{ or } \ 33\frac{1}{3} \text{ to } 100$$

A percent equation can be solved using proportions. You may wish to review proportions in your text. The proportion must have two equal ratios. One of the ratios will be determined by the percent. The other ratio will be the <u>Amount </u>to the <u>Base</u>, written $\dfrac{\text{Amount}}{\text{Base}}$. If you review from your text, you will recall the form of the basic percent equation

$$\text{Percent} \times \text{Base} = \text{Amount}$$
or
$$\text{Amount} = \text{Percent} \times \text{Base}$$

If you choose the proportion method to solve percent problems, you <u>must</u> be able to identify the base and the amount, but you will not have to find fraction, decimal and percent equivalents, since the percent number itself is written over 100 for one ratio. You will use a letter such as *n* for the unknown number.

The following examples will each be done two ways:

 I. using a proportion, the method illustrated in worksheet #35.
II. using the percent equation shown on worksheet #39.

Most students prefer mastering only one method at first. If you choose the proportion method, you may have a little trouble with interest problems later. Therefore, method II is preferred.

EXAMPLES: Each problem has been worked two ways. In part 1, proportions were used and in part 2, the percent equation was used.

I. Using Proportions:

$$\frac{\text{Percent}}{100} = \frac{\text{Amount}}{\text{Base}}$$

II. Translating percent to fraction or decimal; "of" to × and "is" to =.

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1. Find 3.7% of 24.

      24 is the Base.

      The amount is not known.

$$\frac{3.7}{100} = \frac{n}{24}$$

      Find the cross products:

$$100 \times n = 3.7 \times 24$$
$$100 \times n = 88.8$$
$$n = 88.8 \div 100$$
$$n = 0.888$$

1. Find 3.7% of 24

      THINK: What is 3.7% of 24?

$$n = .037 \times 24$$
$$n = 0.888$$

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2. What percent of 180 is 54?

The percent number is not known. The base is 180. The amount is 54.

$$\frac{n}{100} = \frac{54}{180}$$

$$180 \times n = 54 \times 100$$
$$180 \times n = 5400$$
$$\frac{180 \times n}{180} = \frac{5400}{180}$$

$$n = 30$$

The percent is 30%. (Notice n is the percent number. The decimal point is not moved in this method)!

2.   What percent of 180 is 54?

$$n \times 180 = 54$$
$$n = 54 \div 180$$
$$n = 0.3$$

(or use algebra, dividing each side by 180)

This is the <u>decimal value</u>. Now write it as a percent.

$$0.3 \times 100\% = 30\%$$

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3. 52% of what is 26?

      26 is the amount.

      The base is not known.

$$\frac{52}{100} = \frac{26}{n}$$

$$52 \times n = 100 \times 26$$
$$52 \times n = 2600$$
$$\frac{52 \times n}{52} = \frac{2600}{52}$$
$$n = 50$$

3. 52% of what is 26?

$$.52 \times n = 26$$
$$n = 26 \div 0.52$$
$$n = 50$$

(Use the rule for division or use your calculator).

Notice: $2600 \div 52$ and $26 \div 0.52$ have the same quotient. Why?

4. Find $33\frac{1}{3}\%$ of 612.

The amount is not known.

$$\frac{33\frac{1}{3}}{100} = \frac{n}{612}$$

$$100 \times n = 33\frac{1}{3} \times 612$$

$$100 \times n = \frac{100}{3} \times \frac{612}{1}$$

$$\frac{100 \times n}{100} = \frac{20400}{100}$$

$$n = 204$$

HINT: If you have memorized that

$33\frac{1}{3}\% = \frac{1}{3}$, you may use $\frac{1}{3}$ instead of $\dfrac{33\frac{1}{3}}{100}$

$$\frac{1}{3} = \frac{n}{612}$$

$$\frac{3 \times n}{3} = \frac{612}{3}$$

4. Find $33\frac{1}{3}\%$ of 612.

$$n = \frac{1}{3} \times \frac{612}{1}$$

$$n = 204$$

5. 28 is what percent of 14?
   28 is the amount.
   14 is the base.

$$\frac{n}{100} = \frac{28}{14}$$

$14 \times n = 100 \times 28$
$14 \times n = 2800$
$n = 2800 \div 14$
$n = 200$

n is the percent number.
The answer is 200%

5. 28 is what percent of 14?

$$28 = n \times 14$$
$$\frac{28}{14} = \frac{n \times 14}{14}$$
$$2 = n$$

This is not the percent number. (Multiply this answer by 100% to get the percent equivalent. $2 \times 100\%$ is 200%. Use your number sense. 28 is 2% of 14 can't be right. 28 is 200% of 14 is reasonable.

6. 30 is 120% of what?
   30 is the amount.
   The base is unknown.

$$\frac{120}{100} = \frac{30}{n}$$
$100 \times 30 = 120 \times n$
$3000 = 120 \times n$
$25 = n$

6. 30 is 120% of what?

$$30 = 1.2 \times n$$
$$\frac{30}{1.2} = \frac{1.2 \times n}{1.2}$$
$$25 = n$$

7. $\dfrac{1}{4}$ % of 8000 is what?

The base is 8000.
The amount is unknown.

$$\frac{\frac{1}{4}}{100} = \frac{n}{8000}$$

$$100 \times n = \frac{1}{4} \times 8000$$

$$100 \times n = 2000$$

$$\frac{100 \times n}{100} = \frac{2000}{100}$$

$$n = 20$$

7. $\dfrac{1}{4}$% of 8000 = what?

Be careful!

$$\frac{1}{4}\% \text{ is } \frac{1}{4} \times \frac{1}{100} = \frac{1}{400}$$

$$\frac{1}{400} \times \frac{8000}{1} = n$$

$$20 = n$$

Practice using whichever method you prefer. You may want to learn both methods; but if you're having trouble, its better to learn one way really well!

1. Find $87\dfrac{1}{2}$ % of 640.

2. What percent of 12 is 15?

3. $16\dfrac{2}{3}$ % of what is 84?

4. 45.92 is what percent of 574?

5. Find $\dfrac{1}{2}$ % of 600.

6. 300 is what percent of 180?

To solve the following applications, first write the percent equation. Then use either method to solve it!

7. Thirty seven wells in Tallahassee were tested in July, 1989. Thirteen of these wells were contaminated. What percent of the wells were contaminated? (Answer to the nearest tenth of a percent.)

8. 115 members of high school band marched in the parade. This was $83\frac{1}{3}$% of the band. How many total members were there in the band?

9. Laura got 84% of the 150 test questions right. How many correct answers did she have?

10. Twelve thousand people played a lottery game. Eighteen people won some money on the game. What percent of the players won money on this game?

Answers: Get help if you miss <u>any</u> of these!

1. 560   2. 125%   3. 504   4. 8%   5. 3   6. $166\frac{2}{3}$%

7. 13 is what percent of 37?

    35.1%

8. 115 is $83\frac{1}{3}$% of what

    138 members are in the band.

9. What is 84% of 150?
    126 questions were answered correctly.

10. What percent of 12000 is 18?

    0.15% or $\frac{3}{20}$%   Notice this is less than 1%!

    It might be interesting to find the answer to a similar question before you play any lottery!

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