Solving Percent Problems

There are three types of percent problems that you are going to have to solve: finding the part, finding the whole, and finding the percent. There are two ways to do this, so pick the one that you understand the best.

Method #1 The Proportion Method.

In this method, we write a proportion like this: $\frac{\%}{100} = \frac{\text{part}}{\text{whole}}$. The percent is always over 100 because that's what percent means. The "part over the whole" is the definition of a fraction. In this case the number following "of" is the whole.

A variation of this proportion is $\frac{\%}{100} = \frac{\text{IS}}{\text{OF}}$

The advantage of the proportion method is that we never have to worry about moving decimal points to get a percent as an answer. The division by 100 takes care of that for us.

Method #2 The Percent Equation Method.

This method is a word-for-word translation method. In this case "of" means "multiply" and "is" means "equals". The advantage of this method is that it's sometimes easier; the disadvantage is that percents have to be converted to their decimal form and if the answer you're trying to find is a percent you have to change the decimal answer you get to its percent form.

Example A: Finding the part. Find 15% of 80

Method #1 The number following "of" is 80, so that's the whole. The percent is 15, therefore, we are trying to find the part. ("IS" = x, "OF" = 80,and % = 15)

$\frac{15}{100} = \frac{x}{80}$. Now cross multiply to find x.

Method #2 Translate the question into an equation:

Find 15% of 80

becomes $(0.15) \cdot (80) = x$ Solve for x.

Remember to change the % to a decimal

Example B: Finding the whole. 25 is 40% of what number

Method #1 There is no number following "of", so this will be x. That means 25 is the part or the IS number, and, of course, 40 is the percent. ("IS" = 25, "OF" = x, % = 40)

$\frac{40}{100} = \frac{25}{x}$. Now cross multiply to find x.

Method #2 Translate the question into an equation:

25 is 40% of what number

becomes $25 = (0.40) \cdot (x)$ Solve for x.

Remember to change the % to a decimal

yes, there is a back.

Example C: Finding the percent. 9 is what percent of 15

Method #1 The whole is 15 (it follows "of"), we're trying to find the percent so it is x, and so the part is 9. ("IS" = 9, "OF" = 15, % = x)

$\frac{x}{100} = \frac{9}{15}$. Now cross multiply to find x.

Method #2 Translate the question into an equation:

9 is what percent of 15

becomes $9 = (x) \cdot (15)$ Solve for x.

Since x is a decimal you must change it into a percent.

Find the missing part in each problem.

1. 15 is what percent of 50?

2. What number is 65.3% of 60?

3. Find 69% of 72.5.

4. 63 is what percent of 84?

5. 15% of what number is 12?

6. 13 is 6.5% of what number?

7. What percent of 105 is 88.2?

8. What number is 30% of 17?

9. 60 is 15% of what number?

10. What percent of 160 is 336?

Percentages and Proportions

One of the methods discussed earlier for solving percentage problems is by using a proportion in the following format: $\frac{\%}{100} = \frac{\text{part}}{\text{whole}}$. The left side is the definition of percent as "per hundred" and the right side is the definition of a fraction. We can be a little more specific with this format when it comes to solving percentage story problems, or "real-life" percentage problems.

The idea here is that, like with a proportion, we must keep the two numerators "alike terms" and the two denominators "alike terms". Here's the specific set-up:

$$\frac{\%\text{ we're interested in}}{\%\text{ of the whole (100)}} = \frac{\text{the amount we're interested in}}{\text{original amount that makes the whole}}$$

Do you see how both numerators are the parts we're interested in and how both denominators are both wholes?

Do you see how the fraction on the left deals exclusively with the percents and the fraction on the right deals with the other numeric quantities?

Example 1: A $50 pair of jeans is on sale for $35. What is the percent discount on the jeans?

We're looking for the percent, so this is x. Here's the set-up

$$\frac{\%}{100} = \frac{\text{amount of discount}}{\text{orignal price}}$$

Find the amount of discount: Original Price – Sale Price $= 50 - 35 = 15$

$\frac{x}{100} = \frac{15}{50}$ Now, cross multiply.

Example 2: The number of students that attended a school in Fall 2014 was 4,527. The number of students that atttended the same school in Fall 2015 was 5,071. What was the percent increase in the school population from Fall 2014 to Fall 2015?

We're looking for the percent, so this is x. Here's the set-up

$$\frac{\%}{100} = \frac{\text{amount of increase}}{\text{orignal amount}}$$

Find the amount of increase: Final Amount – Original Amount $= 5,071 - 4,527 = 544$

$\frac{x}{100} = \frac{544}{4,527}$ Now, cross multiply.

Example 3: Over the next five years, tuition is expected to increase 5%, or $100 per semester, over what it the cost is now. What is the tuition now?

This time we know the percent of increase (5%) and the amount of increase ($100). What we want to know is the original tuition, so this will be x.

$\frac{\%}{100} = \frac{\text{amount of increase}}{\text{orignal amount}}$ This becomes: $\frac{5}{100} = \frac{\$100}{x}$ Now, cross multiply.

Example 4: A new bottle of stain remover claims it contains 25% more product free compared to the original bottle. The new bottle has 10 ounces of stain remover. How much did the original bottle have in it?

This time we don't know the original amount so this will be x.

$$\frac{\%}{100} = \frac{\text{amount of increase}}{\text{orignal amount}}$$

Find the amount of increase = Final amount – Original amount $= 10 - x$

$\frac{25}{100} = \frac{10-x}{x}$ Set the cross products equal: $25x = 100(10-x)$ Now, solve for x

DO THE PROBLEMS ON THE BACK

Percent of Increase and Decrease

1. A new bridge reduced the normal 45-minute travel time between two cities by 18 minutes. What percent decrease does this represent?

2. By installing energy-saving equipment, the Pala Rey Youth Camp reduced its normal $800-per-month utility bill by $320. What percent decrease does this amount represent?

3. Because of an improved traffic pattern pattern at a sports stadium, the average amount of time a fan waits to park decreased from 3.5 minutes to 2.8 minutes. What percent decrease does this amount represent?

4. One configuration of the Boeing 777-300 has a seating capacity of 394. This is 26 more than that of the corresponding 777-200 jet. What is the percent decrease in capacity from the 777-300 to the 777-200 model?

5. The price of a new model camera dropped from $450 to $396 in 10 months. What percent decrease does this represent?

6. Because of a decrease in demand for super-8 video cameras, Kit-s Cameras reduced the orders for these models from 20 per month to 8 per month. What percent decrease does this amount represent?

7. An automobile manufacturer increased the average mileage on a car from 17.5 miles per gallon to 18.2 miles per gallon. Find the percent increase in mileage.

8. In the 1990s, the number of Target stores increased from 420 stores to 914 stores. What was the percent increase in the number of Target stores in the 1990s?

9. In 1924, the number of events in the Winter Olympics was 14. The 2002 Winter Olympics in Salt Lake City included 78 medal events. Find the percent increase in the number of events in the Winter Olympics from 1924 to 2002.

10. The value of a $3000 investment increased $750. What percent increase does this represent?