

1.4: Percentages

Learning Outcomes

- Calculate percentages and use in calculations.

In chemistry and healthcare, values are reported with a variety of units. Percentages are often used in the concentration of IV solutions and medications. There are multiple ways to report percentages so it is important to understand the basic meaning of a percent, which will be the focus here, as well as the type of percentage, such as mass or volume percent.

Percent

Percents are used to report many different values, such as a grade on an assignment as 85%, the shoes are 20% off their original price, or the concentration of the IV solution is 5.5% NaCl by mass. While all of these numbers use percent very differently, the values are all found the same way. For now, we will focus on some basic calculations using percents. Percents are all calculated with the same basic formula using the amount of the "part" and the amount of the "whole". Note that the percent will always be less than or equal to 100% because the "part" must be less than or equal to the "whole". The basic percent equation is shown here.

$$\% = \frac{\text{part}}{\text{whole}} \times 100 \quad (1.4.1)$$

Example 1.4.1

What percent of 70 is 14?

Solution

Since this is a percent problem, first look at the equation for percent and see which values are given in the problem. In this case, we know the part (14) and the whole (70). With this information and the formula, we can solve for the percent by inserting the known values into the equation and solving for the unknown.

$$\% = \frac{\text{part}}{\text{whole}} \times 100$$

$$\% = \frac{14}{70} \times 100$$

$$\% = 0.20 \times 100$$

$$\% = 20$$

Therefore, 14 is 20% of 70.

Example 1.4.2

What is 35% of 80?

Solution

This problem also involves percent so we will use the same equation as the previous example. However, in this example, we know the percentage (35) and the whole (80) and we are trying to find the value of the part. As before, we will insert the known values into the equation and solve for our unknown.

$$\% = \frac{\text{part}}{\text{whole}} \times 100$$

$$35 = \frac{\text{part}}{80} \times 100$$

$$0.35 = \frac{\text{part}}{80}$$

$$\text{part} = 28$$

So 28 is 35% of 80.

If you need to review how to rearrange equations and solve for an unknown, check out the worked examples and practice problems at <https://www.mathisfun.com/algebra/in...-multiply.html>.

Example 1.4.3

A patient has a fasting blood sugar level of 150 mg/dL. The doctor has recommended some dietary changes and is hoping to see at least a 20% reduction in the patient's blood sugar level at their next appointment. If the patient meets this goal, what will their blood sugar level be?

Solution

We can start this problem like we do other percent problems. The problem gives us the percent (20) and the whole (150) and we need to calculate the part which will be the amount of decrease in the patient's blood sugar.

$$\% = \frac{\text{part}}{\text{whole}} \times 100$$

$$20 = \frac{\text{part}}{150} \times 100$$

$$0.20 = \frac{\text{part}}{150}$$

$$\text{part} = 30$$

The part that was calculated is the *decrease* that should be seen in the patient's blood sugar level. However, it's not the actual blood sugar level that the doctor wants to see at the next visit. To find that, we need to subtract from the original value.

$$\text{original} - \text{loss} = \text{final} \quad (1.4.2)$$

$$150 \frac{\text{mg}}{\text{dL}} - 30 \frac{\text{mg}}{\text{dL}} = 120 \frac{\text{mg}}{\text{dL}} \quad (1.4.3)$$

At the next visit, the patient's blood sugar level should be 120 mg/dL (or less!) if they are making sufficient progress towards improving their health and reducing their risk of diabetes.

Supplemental Resources

- Percents: <http://www.mathisfun.com/percentage.html>

Contributors and Attributions

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