



# Percentages

## Learning Skills

### Introduction:

When working with solution strengths percentages are involved. Working with percentages requires a sound knowledge of fractions so you may like to review the fractions document before proceeding.

### This sheet will teach you to:

- Change from a percentage
- Change to a percentage
- Find a percentage of an amount

### 1. Converting percentages to fractions

*The % sign simply means over 100 so express in fraction form and simplify if possible*

#### Examples:

a) 13%       $13\% = \frac{13}{100}$       (cannot be simplified further)

b) 30%       $30\% = \frac{30}{100} = \frac{30^{\div 10}}{100^{\div 10}} = \frac{3}{10}$

c)  $8\frac{1}{2}\%$        $8\frac{1}{2}\% = \frac{8\frac{1}{2}}{100} = \frac{17}{200}$       (double the top and bottom to remove the  $\frac{1}{2}$ )

d) 4.5%       $4.5\% = \frac{4.5}{100} = \frac{9}{200}$   
(again double the top and bottom to remove the decimal)

## 2. Finding a percentage of an amount

**Rule:** To find a percentage of an amount express the percentage in fraction form and multiply by the amount

### Examples:

- a) How much dextrose would be in 1 litre of a 5% solution?

Amount = 1L, convert to 1000 mL to make the calculation more manageable

$$\text{Percentage} = 5\% = \frac{5}{100}$$

$$\frac{5}{100} \times 1000\text{mL} = \frac{5}{100} \times \frac{1000}{1} \text{mL} = \frac{5000}{100} \text{mL} = \frac{50}{1} = 50\text{mL}$$

- b) A sick infant is to have a 200mL bottle of cow's milk diluted to 80%. How much milk and water will the bottle require?

Amount = 200mL

$$\text{Percentage} = 80\% = \frac{80}{100}$$

$$\frac{80}{100} \times 200\text{mL} = \frac{80}{100} \times \frac{200}{1} \text{mL} = \frac{16000}{100} = 160\text{mL}$$

The 200mL bottle requires 160mL of cow's milk and 40mL of water

## 3. Converting a fraction into a percentage

**Rule:** To make any fraction into a percentage multiply by 100%

### Examples:

a)  $\frac{2}{5}$

$$\frac{2}{5} \times 100\% = \frac{2}{5} \times \frac{100}{1} \% = \frac{200}{5} \% = 5 \overline{)200.0} = 40\%$$

b)  $\frac{7}{40}$

$$\frac{7}{40} \times 100\% = \frac{7}{40} \times \frac{100}{1} \% = \frac{700}{40} \% = \frac{70}{4} \% = 4 \overline{)70.0} = 17.5\%$$

- c) Calculate the percentage strength when 4mL of disinfectant concentrate is made up to 1000 mL with water

Volume of disinfectant = 4mL  
Total volume = 1000mL

$$\text{So ratio strength} = \frac{4mL}{1000mL}$$

$$\text{Percentage strength} = \frac{4mL}{1000mL} \times 100\% = \frac{4}{1000} \times \frac{100}{1} = \frac{400}{1000} = \frac{4}{10} = 0.4\%$$

#### Notes

If you compare a small amount with a large amount then the percentage strength will be very small as calculated here.

- d) 5 mL of medication is mixed with 15 mL of distilled water. Calculate the percentage strength of the medication.

Volume of medication = 5 mL

Total volume = 20 mL

$$\text{So ratio strength} = \frac{5mL}{20mL}$$

$$\text{Percentage strength} = \frac{5mL}{20mL} \times 100\% = \frac{5}{20} \times \frac{100\%}{1} = \frac{500}{20} = \frac{50}{2} = 25\%$$

#### 4. Some exercises to try

##### Convert to a fraction in simplest form

1. 67%
2. 15%
3. 44%
4.  $3\frac{1}{2}\%$
5. 0.5%

##### Convert to a percentage

6.  $\frac{3}{10}$
7.  $\frac{9}{20}$
8.  $\frac{22}{25}$
9.  $\frac{1}{8}$

##### Calculate the following

10. Nurse Jones needs to make up 1.2 litres of disinfectant solution of 15% strength. How much disinfectant and water is required for the solution?
11. Anna's drama class of 40 students is 65% female. How many females are in the class?
12. Find the percentage strength of the solution when 4mL of disinfectant is made up to 500mL with water.
13. Find the percentage strength of a solution when 10mL of a medication is mixed with 190mL of distilled water.
14. In a lecture theatre there are 24 males and 136 females. What percentage of the group is male?

## 5. Solutions

$$1. \frac{67}{100}$$

$$2. \frac{15}{100} = \frac{3}{20}$$

$$3. \frac{44}{100} = \frac{11}{25}$$

$$4. \frac{3\frac{1}{2}}{100} = \frac{7}{100}$$

$$5. \frac{0.5}{100} = \frac{1}{200}$$

$$6. 30\%$$

$$7. 45\%$$

$$8. 88\%$$

$$9. 12.5\%$$

$$10. \frac{15}{100} \times \frac{1200mL}{1} = \frac{18000}{100} mL = 180mL : 180mL \text{ disinfectant and } 1020mL \text{ water}$$

$$11. \frac{65}{100} \times \frac{40}{1} \text{ females} = \frac{2600}{100} \text{ females} = 26 \text{ females}$$

$$12. \frac{4}{500} \times \frac{100\%}{1} = \frac{400}{500} \% = \frac{4}{5} \% = 0.8\%$$

$$13. 10mL + 190mL = 200mL: \frac{10}{200} \times \frac{100\%}{1} = \frac{1000}{200} \% = 5\%$$

$$14. 24 + 136 = 160 \text{ students: } \frac{24}{160} \times \frac{100\%}{1} = \frac{2400}{160} \% = 15\%$$

## 6. For more information

Visit our Learning Skills website at <http://www.csu.edu.au/division/studserv/maths/index.htm>

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