

Percentages

In mathematics, a **percentage** is a way of expressing a number as a fraction of 100 (per cent meaning 'per hundred'). For example, 5% means $\frac{5}{100}$.

Converting a fraction to a percentage

When converting to a percentage, form a fraction and multiply by 100%:

$$\frac{a}{b} \xrightarrow{\times 100} \%$$

Example

A student receives 15 marks out of a total of 20 for an assignment. As a percentage, he receives:

$$\frac{15}{20} \times 100\% = 75\%$$

Converting from a percentage to a fraction or decimal

Divide the percentage amount by 100:

$$\frac{a}{b} \xleftarrow{\div 100} \%$$

Example

Convert 65% to

1. a fraction

2. a decimal

Answer:

$$1. \quad 65\% = \frac{65}{100} = \frac{13}{20}$$

$$2. \quad 65\% = \frac{65}{100} = 65 \div 100 = 0.65,$$

note the shift the decimal place two places to the left.

Calculating the value of a given percentage of a number

Example

Text books receive a 10% discount if purchased for cash. What will a book priced at \$198 cost?

Method 1: Firstly calculate the amount of discount:

$$\text{discount} = 10\% \text{ of } \$198 = \frac{10}{100} \times \$198 = \$19.80.$$

Therefore, the cost = $\$198 - \$19.80 = \$178.20$.

Method 2:

$$\text{Percentage to pay} = 100\% - 10\%.$$

Therefore, the cost will be:

$$\text{cost} = 90\% \text{ of } \$198 = \frac{90}{100} \times \$198 = \$178.20.$$

To calculate a percentage increase or decrease

1. Calculate the actual increase or decrease.
2. Divide the increase or decrease by the original amount.
3. Multiply by 100 to convert to a percentage.

Example

The value of a car decreased from \$20 000 to \$16 000. Find the percentage decrease.

$$\begin{aligned} \text{The percentage decrease} &= \frac{\text{amount of decrease}}{\text{original amount}} \times 100\% \\ &= \frac{\$20\,000 - \$16\,000}{\$20\,000} \times 100\% \\ &= \frac{\$4\,000}{\$20\,000} \times 100\% \\ &= 20\%. \end{aligned}$$

Example

An item of jewellery increased in value from \$16 000 to \$20 000.

$$\begin{aligned} \text{The percentage increase} &= \frac{\text{amount of increase}}{\text{original amount}} \times 100\% \\ &= \frac{\$20\,000 - \$16\,000}{\$16\,000} \times 100\% \\ &= \frac{\$4\,000}{\$16\,000} \times 100\% \\ &= 25\%. \end{aligned}$$

Resources

- Other [QuickTips](#) flyers;
 - Online resources at [Study Support](#), USQ Library;
 - Make a consultation with a Mathematics Learning Advisor.
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