

## 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

**Rule:** 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

**Rule:** Divide the percentage amount by 100

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

*Example*

Convert 65% to

(a) a fraction

(b) a decimal

Answer:

$$(a) \quad 65\% = \frac{65}{100} = \frac{13}{20}$$

$$(b) \quad 60\% = \frac{60}{100} = 60 \div 100 = 0.6$$

Note: shift the decimal place 2 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:

$$\text{Discount} = \frac{10}{100} \text{ of } \$198 = \$19.80$$

$$\therefore \text{Cost} = \$198 - \$19.80 = \$178.20$$

Method 2:

$$\text{Percentage to pay} = 100\% - 10\% = 90\%$$

$$\therefore \text{Cost} = 90\% \text{ of } \$198 = \frac{90}{100} \times \$198 = \$178.20$$

## To calculate a percentage increase / decrease

### Rule:

- Calculate the actual increase/decrease
- Divide the increase/decrease by the original amount
- 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.

$$\begin{aligned}\text{The percentage decrease} &= \frac{\text{amount of decrease}}{\text{original amount}} \times 100\% \\ &= \frac{(\$20000 - \$16000)}{\$20000} \times 100\% \\ &= \frac{\$4000}{\$20000} \times 100\% \\ &= 20\%\end{aligned}$$

### Example

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

$$\begin{aligned}\text{The percentage increase} &= \frac{\text{amount of increase}}{\text{original amount}} \times 100\% \\ &= \frac{(\$20000 - \$16000)}{\$16000} \times 100\% \\ &= \frac{\$4000}{\$16000} \times 100\% \\ &= 25\%\end{aligned}$$

## RESOURCES

- Other Quick Tips Flyers: <http://www.usq.edu.au/learningcentre/tips.htm>
- Online resources: <http://www.usq.edu.au/learningcentre/alsoonline/mathsci/mathstop/arith.htm>
- Talk with a tutor at The Learning Centre ([tlc@usq.edu.au](mailto:tlc@usq.edu.au))