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

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

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

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

The percentage increase

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

RESOURCES

- Other Quick Tips Flyers http://www.usq.edu.au/learningcentre/tips.htm
- Online resources
  http://www.usq.edu.au/learningcentre/alsonline/mathsci/mathsscitopic/arith.htm
- Talk with a tutor at The Learning Centre (tlc@usq.edu.au)