5: Percentages and Ratios

EN1106 - Introductory Mathematics

Level I - Semester 1

5.1 Percentage

Percentage

- A percentage is a fraction whose denominator is 100.
- We use the symbol % to represent a percentage.

  e.g. $\frac{30}{100}$ → 30%

- To convert a fraction whose denominator is not 100, to a percentage, divide the numerator by the denominator, multiply by 100 and then label the result as a percentage.

Example

- Express $\frac{1}{2}$ as a percentage.

  $\frac{1}{2} \times 100 = 50$

Therefore, the percentage is 50%

- Express $\frac{4}{25}$ as a percentage.

  $\frac{4}{25} \times 100 = 16 \rightarrow 16\%$

Percentage cont..

- To convert a decimal fraction to a percentage, multiply by 100 and then label the result as a percentage.

e.g. (1) Express 0.25 as a percentage

$0.25 \times 100 = 25$ Therefore the percentage of 0.25 is 25%

e.g. (2) Express 0.165 as a percentage

$0.165 \times 100 = 16.5$ Therefore the percentage of 0.165 is 16.5%

Exercises

Convert the following fractions and decimals into percentages

1. 0.75
2. 1.25
3. $\frac{6}{20}$
4. $\frac{2}{5}$

Calculate a Percentage of a Quantity

e.g. Find 12.5% of 160.

$$\frac{12.5}{100} \times 160 = 20$$

Therefore, 12.5% of 160 is 20

Percentage Change

$$\text{Percentage change} = \frac{\text{change}}{\text{original value}} \times 100$$

$$= \frac{\text{new value} - \text{original value}}{\text{original value}} \times 100$$

- If the change is positive, then there has been an increase in the measured quantity. If the change is negative, then there has been a decrease in the quantity.

Example

The price of a chocolate has increased from Rs. 80 to 105. Calculate the percentage change in price.

$$\text{Percentage change} = \frac{\text{change}}{\text{original value}} \times 100$$

$$= \frac{105-80}{80} \times 100 = 31.25$$

Increase in price is 31.25%

Exercise

1. A man gives 5% of his salary to his child. If the man earns Rs. 35,000, how much money does he give to his child?

2. The price of a washing machine is Rs. 60,000. During a sale, the price was reduced by 25%. What is the new sale price of the washing machine.

5.2 Ratios

Ratios

- Ratios are simply an alternative way of expressing fractions.

Example: divide 100 in the ratio 2:8.

- A ratio of 2 : 8 means that every 10 parts are split as 2 and 8. That is, the first number is $\frac{2}{10}$ of the total; the second number is $\frac{8}{10}$ of the total.

Therefore 100 is divided into 20 and 80.

Ratios cont..

- If the ratio is given as x : y, the total number of parts is x + y. Then these x + y parts are split into two with the first number being $\frac{x}{x+y}$ of the total, and the second number being $\frac{y}{x+y}$.

- In the above example, the total number of parts is 10 (2+8).

Equivalent Ratios

- Ratios can be written in different ways.
- Generally, any ratio can be expressed as an equivalent ratio by multiplying or dividing each term in the ratio by the same number.
  - E.g. The ratio 2 : 8 is equivalent to 4 : 16, because 4 is 2 × 2 and 16 is 8 × 2.

Exercises

1. Divide a length of 250m in the ratio 7:10:8

2. Divide a mass 4400kg into $\frac{3}{8}$ and $\frac{5}{8}$

3. Express 72 : 36 in its simplest form

4. The ratio of white chocolate to milk chocolate in a box of chocolates is 4:8. If the total number of chocolates is 54, calculate the number of each type of chocolate.