

Percentages

Introduction

The use of percentages is common place in many aspects of commercial life. Interest rates, discounts, pay rises and so on are all expressed using percentages. This leaflet revises the meaning of the term 'percentage' and shows how to calculate percentages, and how to convert expressions involving percentages into alternative forms.

Percentages

Any fraction which has a denominator of 100 can be written in a special way known as a **percentage**. The symbol for percentage is %.

For example, the fraction $\frac{20}{100}$ is written as 20%, and this is read as 'twenty per cent'.

To convert a decimal to a percentage:

The decimal should first be expressed as a fraction. Consider the following examples:

The decimal 0.06 can be written $\frac{6}{100}$ which now has a denominator of 100. Thus $0.06 = 6\%$.

The decimal 0.1 can be written as $\frac{1}{10}$, or equivalently $\frac{10}{100}$. Thus $0.1 = 10\%$.

The decimal 0.125 can be written as $\frac{125}{1000}$, or equivalently $\frac{12.5}{100}$. Thus $0.125 = 12\frac{1}{2}\%$.

Exercises

Convert the following decimals to percentages:

(a) 0.09, (b) 0.8, (c) 0.15, (d) 4.5, (e) 0.08, (f) 0.175.

Answers

(a) 9%, (b) 80%, (c) 15%, (d) 450%, (e) 8%, (f) $17\frac{1}{2}\%$.

To convert a percentage to a decimal:

This is straightforward. Simply note that $x\%$ means $\frac{x}{100}$. It may be appropriate to then re-write this fraction in its simplest form.

For example:

$25\% = \frac{25}{100}$. The simplest form of this fraction is obtained by cancelling down to $\frac{1}{4}$.

To convert a fraction to a percentage:

Simply multiply the fraction by 100 and relabel the result as a percentage:

For example:

The fraction $\frac{3}{4}$ is expressed as a percentage as follows:

$$\frac{3}{4} \times \frac{100}{1} = \frac{300}{4} = 75$$

Then, relabelling this as a percentage, $\frac{3}{4} = 75\%$.

Exercises

Convert the following fractions to percentages:

(a) $\frac{3}{8}$, (b) $\frac{4}{5}$, (c) $\frac{1}{8}$, (d) $\frac{22}{30}$, (e) $\frac{3}{5}$, (f) $\frac{3}{10}$, (g) $\frac{49}{50}$.

Answers

(a) 37.5%, (b) 80%, (c) 12.5%, (d) $73\frac{1}{3}\%$, (e) 60%, (f) 30%, (g) 98%.

Finding a percentage of a quantity

To find, say, 15% of 250, convert the percentage to a fraction, and remember that 'of' means multiply:

$$\frac{15}{100} \times \frac{250}{1} = \frac{3750}{100} = 37.5$$

To find, say $17\frac{1}{2}\%$ of 350,

$$\frac{17.5}{100} \times \frac{350}{1} = \frac{6125}{100} = 61.25$$

Exercises

Find (a) $17\frac{1}{2}\%$ of 275, (b) 25% of 3750, (c) $33\frac{1}{3}\%$ of 936, (d) 156% of 19.5.

Answers

(a) 48.125, (b) 937.5, (c) 312, (d) 30.42.

Some simple rules

Calculating 10% of a quantity is easy. Simply move the decimal point one place to the left. Thus 10% of 1275 is 127.5. Multiples of this are easily found. For example 20% of 1275 will be $2 \times 10\%$, that is $2 \times 127.5 = 255$.

Consider the following calculation of 17.5% of 650:

$$10\% \text{ of } 650 = 65.$$

So,

$$5\% \text{ of } 650 = 32.5. \quad 2\frac{1}{2}\% \text{ of } 650 = 16.25$$

Putting these results together: $17\frac{1}{2}\%$ of 650 is $65+32.5+16.25=113.75$.

Exercise

Use this method to find, without a calculator, (a) 17.5% of 2500, (b) 30% of 62.

Answers

(a) 437.5, (b) 18.6