

KEYSKILLS

PERCENTAGES

PLEASE READ THE TEXT AND ATTEMPT THE EXERCISES BEFORE YOU ASK FOR ANY HELP.

Percentages are a type of a fraction and represent part of a whole.

Percent means out of one hundred, so fifty percent represents fifty out of a hundred, which is equal to a half. This can be demonstrated by cancelling the numbers down.

$$50/100 \text{ (divide by 10)} = 5/10 \text{ (divide by 5)} = 1/2$$

EXERCISE 1

Work out what the following common, simple percentages are as fractions.

- | | | |
|--------|--------|-----------|
| 1. 25% | 4. 70% | 7. 37.5% |
| 2. 75% | 5. 15% | 8. 33.33% |
| 3. 20% | 6. 85% | 9. 66.67% |

REPRESENTING NUMBERS AS PERCENTAGES.

It is easy to represent numbers as percentages. There are two steps to this:

1. Change the numbers to a decimal fraction.
2. Multiply the decimal fraction by a hundred to change it to a percentage.

Examples

1. In a survey of five-year-old PCs it was found that 315 out of 1050 computers were no longer working. The company wants this represented as a percentage.

315 divided by 1050 equals 0.3. 0.3 multiplied by 100 equals 30%.

2. A survey of peoples favourite holiday destinations obtained the following results.

Destination	Number	Destination	Number
Spain	72	Greece	40
USA	68	Portugal	28
France	59	Australia	25
Italy	47	Holland	20
Jamaica	42	Ireland	19

There were a total of 420 replies, (the numbers for the countries added up).

So Spain is	$72/420 = 0.1714 \times 100 = 17\%$	Greece is	$40/420 = 0.0952 \times 100 = 10\%$
USA is	$68/420 = 0.1619 \times 100 = 16\%$	Portugal is	$28/420 = 0.0666 \times 100 = 7\%$
France is	$59/420 = 0.1405 \times 100 = 14\%$	Australia is	$25/420 = 0.0595 \times 100 = 6\%$
Italy is	$47/420 = 0.1119 \times 100 = 11\%$	Holland is	$20/420 = 0.0476 \times 100 = 5\%$
Jamaica is	$42/420 = 0.0999 \times 100 = 10\%$	Ireland is	$19/420 = 0.0452 \times 100 = 4\%$

NOTE: THE PERCENTAGES HAVE BEEN ROUNDED TO THE NEAREST WHOLE NUMBER, AND WHEN ADDED UP THEY TOTAL 100%

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It is possible to have percentages of over 100%. For example if the average wage in a firm is £250pw and I get £350 pw, then my wage as a percentage of the average is:

$$350/250 = 1.4 \quad 1.4 \times 100 = 140\% \text{ of the average wage.}$$

SHORT CUT WHEN USING A CALCULATOR

Most calculators will allow you to use a short cut when calculating numbers as percentages. You can follow the process as shown above, divide the numbers and then multiply by one hundred. A short cut is to divide the numbers and then press the % button; this will automatically multiply the answer by one hundred.

EXAMPLE. What is 45 as a percentage of 50?

Long method: Enter 45, press the divide button, enter 50, answer is 0.9, press the multiply button, enter 100, press = button. The answer is 90%

Short cut: Enter 45, press the divide button, enter 50, press the % button. The answer is 90%.

EXERCISE 2.

1. What is $13/50$ as a percentage?
2. What is $17/88$ as a percentage?
3. What is $25/144$ as a percentage?
4. What are $22/80$ as a percentage?
5. What is $19/76000$ as a percentage?
6. What is $135/90$ as a percentage?

FINDING A PERCENTAGE OF A NUMBER.

This is in some ways the reverse operation to the previous section. There are a number of different ways of working this out, so choose a method that you understand and are happy with.

A percentage is a fraction over a hundred. So to multiply by a percentage you can act as if it is a fraction. To do this you multiply by the figure and divide your answer by 100.

Example: What is 32% of £55.

$$55 \times 32 = 1760 / 100 = 17.6$$

Another way of calculating percentages is to change the percent into a decimal fraction, and then to multiply the value by the decimal fraction.

Example: What is 32% of £55.

$$32/100 = 0.32 \times 55 = 17.6$$

SHORT CUT WHEN USING A CALCULATOR

Most calculators will allow you to use a short cut when calculating percentages of numbers. You can follow the processes as shown above, but this takes longer. A short cut is to use the % button; this will automatically divide the answer by one hundred.

EXAMPLE: What is 90% of 50?

Enter 50, press the x button, enter 90, press the % button. The answer is 45.

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EXERCISE 3

1. What is 15% of £120?
2. What is 28% of 2500?
3. What is 4% of 35,000?
4. What is 120% of 1000?
5. What is 17.5% of 0.8?
6. What is 0.5% of 20.

CALCULATING PERCENTAGE CHANGE

This is similar to the section above, but it involves calculating the difference between the original value and the new value, turning this into a fraction and then converting this to a percentage.

It is represented by the formula:

$$\frac{\text{New Value} - \text{Original Value}}{\text{Original Value}} \times 100 = \text{percentage change}$$

EXAMPLE

1. What is the percentage increase if wages increase from £300 to £375 per week?
 $375 - 300 = 75$ $75/300 = 0.25$ $0.25 \times 100 = 25\%$
2. What is the percentage change if the price of a CD drops from £12 to £10?
 $10 - 12 = -2$ $-2/12 = -0.1667$ $-0.1667 \times 100 = -16.67\%$

SHORT CUT WHEN USING A CALCULATOR

The short cut with this is similar to the first example from representing numbers as percentages. When you have obtained the fraction by dividing the change in value by the original value, you can press the % button instead of multiplying by 100.

EXAMPLE: What is the percentage wage increase from £45 to £50 per day?
Enter 50, press -, enter 45, press =, press divide, enter 45, press %. The answer is 11.11%

EXERCISE 4

1. What is the % change of an increase from 160 to 240?
2. What is the % change of an increase from 27 to 81?
3. What is the % change of an increase from 0.8 to 0.9?
4. What is the % change of a decrease from 240 to 180?
5. What is the % change of a decrease from 81 to 27?
6. What is the % change of a decrease from 0.9 to 0.8?

VALUE ADDED TAX (VAT) AND DISCOUNTS

VAT is a tax on all products and services sold in Britain except for food, children's clothing, books and newspapers. It is generally at 17.5%, although some services such as electricity and gas have a lower VAT rate.

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An article for sale at £10 will have an extra 17.5%, (which is £1.75), added to the price before it is sold. So the selling price would be $£10 + £1.75 = £11.75$.

Discounts are reductions on the prices of goods and services. If a shop offers a 10% discount on goods sold, then an article on sale for £10 will have 10%, (which is £1), taken from the price before it is sold. So the selling price is $£10 - £1 = £9$.

SHORT CUT WHEN USING A CALCULATOR

The shortcut when working out VAT, or adding or subtracting any percentage, is to use the + and - keys to automatically add or subtract the percentage from the original value.

EXAMPLES:

What is the selling price of a CD costing £11 before VAT is added?

Enter 11, press x, enter 17.5, press %, (it now shows that the VAT is £1.925), press +, press =.

The calculator adds the VAT to the original price, giving a selling price of £12.925, which would be rounded to £12.93.

What is the selling price of a computer costing £1,520 if it is sold at a 15% discount?

Enter 1520, press x, enter 15, press %, (it now shows that the discount is £228), press -, press =.

The calculator subtracts the discount from the original price, giving a selling price of £1292.

EXERCISE 5

Calculate the VAT to be added, and the total selling price of the following.

1. A camera at £120 before VAT.
2. A TV at £75 before VAT.
3. A meal at £14.50 before VAT.
4. A car at £12,750 before VAT.

Calculate the discount to be subtracted, and the total selling price of the following.

5. A CD-ROM costing £35 with a 25% discount.
6. A train ticket costing £75 with a 33.3% discount.
7. A pair of jeans costing £62 with a 12.5% discount.
8. A holiday costing £1200 with a 6.4% discount.