



## Using fractions and percentages

- Expressing one number as a percentage of another
- Increasing and decreasing an amount by a percentage
- Using multiplicative methods to solve percentage change problems

Keywords

You should know

explanation 1a

explanation 1b

explanation 1c

- 1** Convert each of these percentages into a decimal and a fraction in its lowest terms.

- a** 60%      **b** 25%      **c** 20%      **d** 75%      **e** 65%  
**f** 15%      **g** 82%      **h**  $33\frac{1}{3}\%$       **i** 72%      **j** 175%

- 2** Convert these fractions into percentages.

Round your answers to two decimal places (2 d.p.).

- a**  $\frac{19}{50}$       **b**  $\frac{2}{5}$       **c**  $\frac{16}{20}$       **d**  $\frac{11}{15}$       **e**  $\frac{2}{3}$   
**f**  $\frac{11}{12}$       **g**  $\frac{4}{7}$       **h**  $\frac{1}{8}$       **i**  $\frac{4}{21}$       **j**  $\frac{14}{27}$

- 3** Convert these decimals into percentages.

- a** 0.26      **b** 0.79      **c** 0.15      **d** 0.04      **e** 1.56  
**f** 2.05      **g** 0.135      **h** 0.458      **i** 0.245      **j** 1.305

- 4** Damian got these marks in his end-of-unit tests.

His report card gave the results as percentages.

What were the percentages?

Maths  $\frac{18}{25}$

English  $\frac{11}{15}$

Science  $\frac{13}{20}$

Geography  $\frac{12}{16}$

- 5** In a 100-year period, a water molecule spends 98 years in the ocean, 20 months as ice,  $\frac{1}{2}$  of a month in lakes and rivers and less than  $\frac{1}{4}$  of a month in the atmosphere. What percentage of its time does a water molecule spend in these forms?

Start by finding the number of months in 100 years.

**a** in the ocean **b** as ice

Round your answers sensibly.

explanation 2a

explanation 2b

- 6** Which number in each pair is larger?

**a**  $\frac{3}{5}$  and  $\frac{3}{4}$

**b**  $\frac{5}{8}$  and  $\frac{2}{3}$

**c**  $\frac{5}{12}$  and  $\frac{3}{8}$

**d**  $\frac{7}{10}$  and  $\frac{3}{4}$

**e** 0.9 and  $\frac{7}{8}$

**f**  $\frac{7}{9}$  and 0.76

**g**  $\frac{11}{15}$  and 0.75

**h**  $\frac{7}{10}$  and  $\frac{15}{21}$

- 7** Does < or > go in the box to make each of these true?

**a**  $\frac{1}{4} \square \frac{1}{3}$

**b**  $\frac{5}{6} \square \frac{3}{4}$

**c**  $\frac{2}{3} \square \frac{5}{8}$

**d**  $\frac{15}{20} \square 80\%$

**e**  $0.625 \square \frac{17}{25}$

**f**  $\frac{2}{3} \square 66\%$

**g**  $\frac{5}{9} \square 55\%$

**h**  $0.15 \square \frac{1}{6}$

- 8** In four games of football James scored these numbers of goals out of the total goals scored.

**Game 1**  $\frac{1}{3}$

**Game 2**  $\frac{3}{7}$

**Game 3**  $\frac{2}{5}$

**Game 4**  $\frac{4}{9}$

- a** In which game did he score the highest proportion of goals?

- b** In which game did he score the lowest proportion of goals?



- 9** Put each set in order from smallest to largest.

**a** 0.25,  $\frac{2}{5}$ , 35%,  $\frac{1}{3}$

**b** 0.66,  $\frac{2}{3}$ , 65%,  $\frac{7}{9}$

**c**  $\frac{19}{24}$ , 0.78, 81%,  $\frac{28}{36}$

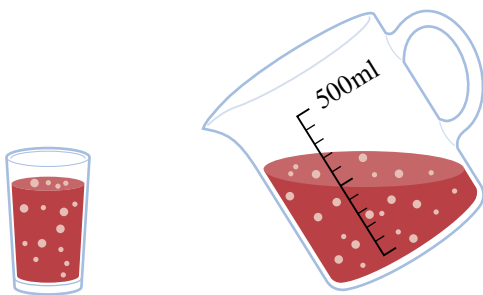
- 10**  $\frac{7}{12} > \frac{x}{5}$ . What is the largest whole number  $x$  can be?

explanation 3a

explanation 3b

explanation 3c

- 11 a** What fraction of 30 is 27?  
**c** What fraction of 75 is 130?
- 12 a** What fraction of 1 m is 35 mm?  
**c** What fraction is 300 g of 10 kg?  
**e** What fraction of 1 day is 6 hours?
- 13 a** What percentage is 9 of 45?  
**c** What percentage is 45 of 225?  
**e** What percentage is 158 of 474?
- b** What fraction is 180 of 100?  
**d** What fraction is 2000 of 1750?
- b** What fraction of 1 kg is 250 g?  
**d** What fraction is 2500 m of 7 km?  
**f** What fraction is £125 of £5000?
- b** What percentage is 27 of 108?  
**d** What percentage is 36 of 120?  
**f** What percentage is 15 of 90?
- 14** Bryony is downloading a 120 MB file to her computer.  
 When 75 MB have been downloaded, what fraction of the file has been downloaded?
- 15 a** James had a 500 ml jug of fruit punch. He poured 375 ml into a glass.  
 What fraction of the punch did he pour into the glass?



- b** A small ball bounces 1 m on its first bounce and 68 cm on its second bounce.  
 What fraction of the first bounce height did it reach on its second bounce?
- 16** Anna scored 18 out of 25 points in a fashion design competition and Joe scored 25 out of 36 points in a boat design competition.  
 To compare their competition marks Anna converted them to percentages.  
 What percentage scores did they get and who got the higher score?

- 17** In his last two basketball games Jason got 42 points of the total 126 points.  
In her two games Ruth got 65 out of a total 169 points.  
Who was better at scoring points in the two games? Explain your answer.

- 18** It takes Tom three hours to drive to his grandmother's house.  
He sets off at 10:30 a.m. and stops for lunch at 12:40 p.m.  
What percentage, to the nearest whole number, of the travel time has he completed?

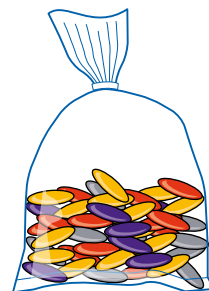
**explanation 4**

- 19** Work these out without using a calculator.

- |                         |                                      |                        |
|-------------------------|--------------------------------------|------------------------|
| <b>a</b> 30% of £150    | <b>b</b> 45% of 120 m                | <b>c</b> 11% of 200 kg |
| <b>d</b> 45% of 2000 cm | <b>e</b> 35% of £140                 | <b>f</b> 25% of 500 ml |
| <b>g</b> 52% of £5000   | <b>h</b> $12\frac{1}{2}\%$ of 300 mm |                        |

- 20** Which is greater, 75% of 1800 or 65% of 2000?

- 21** In a bag of 96 beans, 25% are red,  
12.5% are grey,  $33\frac{1}{3}\%$  are blue,  
16 are yellow and the rest are purple.  
What percentage of the beans are purple?



- 22** Use your calculator to work these out. Give your answers to the nearest penny.

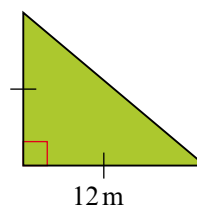
- |                                   |                                       |                         |
|-----------------------------------|---------------------------------------|-------------------------|
| <b>a</b> 8% of £27.50             | <b>b</b> 7% of £105                   | <b>c</b> 33% of £45.80  |
| <b>d</b> 6% of £56.30             | <b>e</b> 92% of £34.50                | <b>f</b> 23% of £132.80 |
| <b>g</b> $12\frac{1}{2}\%$ of £50 | <b>h</b> $66\frac{2}{3}\%$ of £124.60 |                         |

- 23** 42% of people have blood type O and 44% have blood type A.

- a** Out of 1850 patients in St Mary's Hospital how many of each blood type would you expect to have?
- b** In a class of 26 pupils how many of blood type O would you expect to have? Round your answer sensibly.

- 24** The diagram shows Nyssa's triangular garden. 23% of the garden is planted with flowers.

- a** What area is planted with flowers?  
**b** 45% of the flower garden needs weeding.  
 What area needs weeding?

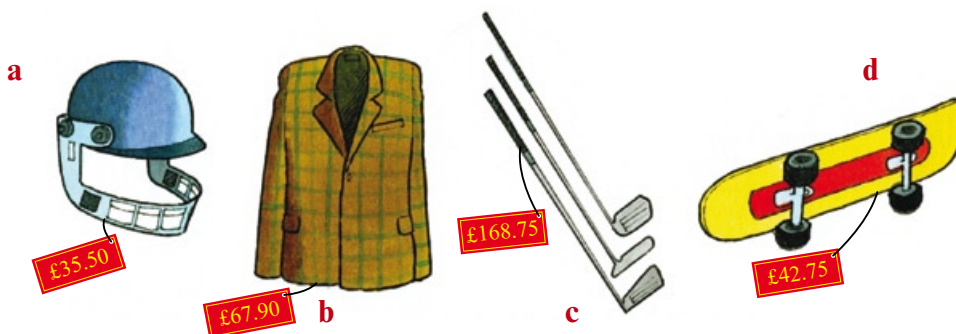


- 25** 33% of the total export earnings of a region come from manufacturing.
- a** If the total export earnings are £132 345 000, how much is earned from manufacturing?
- b** 42% of the manufacturing earnings come from heavy machine production.  
 How much comes from this type of production?

explanation 5a

explanation 5b

- 26** **a** Increase 80 g by 20%.  
**c** Increase 90 kg by 28%.
- b** Increase 250 ml by 64%.  
**d** Increase 244 m by 72%.
- 27** **a** Decrease 48 litres by 75%.  
**c** Decrease £35 by 8%.
- b** Decrease 125 ml by 30%.  
**d** Decrease 230 g by 38%.
- 28** How much would you pay for these in a closing-down sale with 30% off everything?



- 29** The table shows the number of visitors to a theme park during four months last year.

June	July	August	September
6250	9600	14 500	10 300

This year, each of the monthly figures had increased by 18%.

How many people visited the park during each of the months this year?

- 30** Chandra makes dresses for a local shop.  
The materials for each dress cost her £42.

Round all your answers to these questions to the nearest 10 pence.

- a** She adds 60% to the cost price when she sells dresses to Dress4Less.  
How much does she get for each dress?
- b** The shop makes 48% profit on the dresses.  
What does the shop sell them for?
- c** Dress4Less had a 40% sale on all clothing.  
How much would one of Chandra's dresses cost in the sale?
- d** After two weeks the prices dropped by 20% on the sale price.  
How much would the dress cost now?



- 31** The cost price of stereos from a wholesale company is £120.  
The shop sells them at a 27.5% increase on the cost price.
- a** What price do the stereos sell for?
  - b** In an end-of-line sale the shop reduces its prices by 15%.  
What price would you pay for the stereo in the sale?

explanation 6a

explanation 6b

- 32 a** How much would you pay in the sale for a laptop computer that originally cost £429?
- b** How much would you have to pay if you bought it on the last day of the sale?
- c** To get the sale price the shop owner multiplied all the prices by 0.85.

She then multiplied the sales price by 0.85 to get the last day price.

What single number could she have multiplied by to get the last day price?

- d** By what percentage have the original prices been reduced on the last day?
- e** How could you check your answer to part **b** using your answers to parts **c** and **d**?



**Last day** a further **15%** off the sale price

- 33** Pravin thought that an increase of 20% followed by a decrease of 20% is greater than an increase of 10% followed by a decrease of 10%. Is he correct? Explain your answer.

- 34** A puppy, Emma, increases her mass in her first week by 8% each day. She began life with a mass of 240 g.

Round all your answers to these questions to one decimal place.

- a** How much will Emma weigh after **i** a day? **ii** 3 days? **iii** a week?
- b** Another puppy, Milo, also began life with a mass of 240 g but his mass increased by 9% a day for the first week.

How much heavier is Milo than Emma after a week?

- 35** Andy deposited £500 in a bank at an annual compound interest rate of 4%.
- a** How much will he have in total after three years?

- b** Andy decides to leave his money in the bank until he has at least £650. How many years will he need to invest his money for?

- c** Andy's friend deposited £1100 at an annual compound interest rate of 3.5%. How much will she have after five years?

**explanation 7**

**36** Find these increases or decreases as percentages.

- a** an increase from £25 to £30
- b** a decrease from 96 kg to 24 kg
- c** an increase from 150 g to 250 g
- d** a decrease from £320 to £280
- e** an increase from 325 cm to 455 cm
- f** a decrease from 748 litres to 561 litres
- g** an increase from £2480 to £3348
- h** a decrease from £5600 to £4816

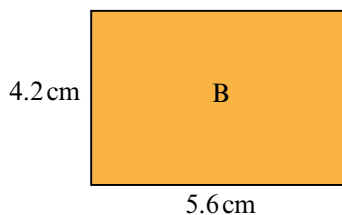
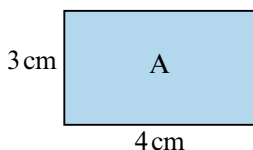
**37** A car depreciated in value from £18 900 to £11 340.

What percentage depreciation is this?



**38** Rectangle B is an enlargement of rectangle A.

- a** By what percentage have the lengths of the sides of rectangle B been increased?



- b** What is the percentage increase in area between the two rectangles?

**explanation 8a**

**explanation 8b**

**39** Find the original amounts deposited in these bank accounts.

- a** 10% more than originally and currently £66 in the account
- b** 12% more than originally and currently £515.20 in the account
- c** 24% more than originally and currently £1 103.60 in the account



- 40** Find the original amounts deposited in these bank accounts.
- a** 20% less than originally and currently £144 in the account
  - b** 17% less than originally and currently £323.70 in the account
  - d** 32% less than originally and currently £1407.60 in the account

- 41** Yarumba Zoo had 108 pelicans in their enclosure, an increase of 20% from their last count.

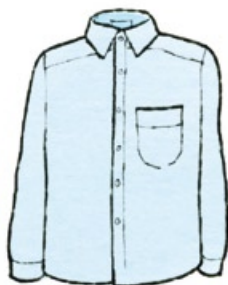
How many pelicans were there when they were last counted?



- 42** All prices were reduced by 15% in a sale.

What was the original price of each of these items bought in the sale?

- |                          |                  |                |                             |
|--------------------------|------------------|----------------|-----------------------------|
| <b>a</b> A pair of shoes | <b>b</b> A shirt | <b>c</b> A tie | <b>d</b> A pair of trousers |
| £38.25                   | £30.60           | £10.20         | £79.90                      |



- 43** Mrs Wheeler received a 3% pay rise. She now gets £37 801 a year.

What was her salary before the rise?

- 44** A delivery company charges 10% of the original price to carry goods and then the supplier adds an extra 5% administration charge to the new price.

What was the original price of a desk that cost £288.75 delivered?