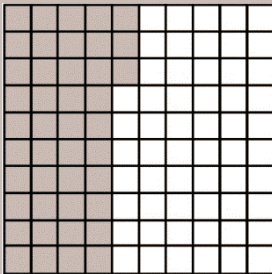


Unit 7: Percentages

7.1: Convert between fractions decimals and percentages

Concept corner

Per means 'out of' and cent means '100'. Therefore, percent means 'out of 100'.



The diagram shows a **hundred square** which is a large square divided into 100 equal smaller squares.

43 of the squares are shaded.

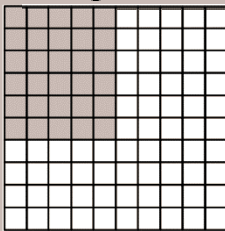
$\frac{43}{100}$ of the hundred square is shaded.

$$\frac{43}{100} = 0.43 = 43\%$$

So 43% of the hundred square is shaded.

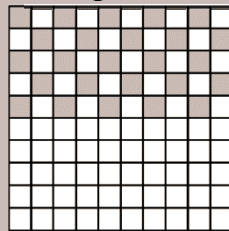
For each diagram, state what percentage of *one hundred square* is shaded.

Diagram 1



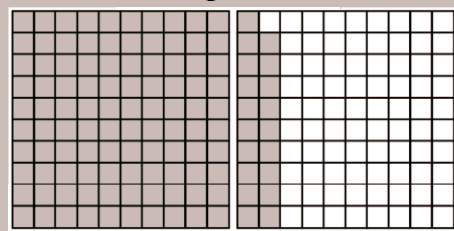
..... %

Diagram 2



..... %

Diagram 3



..... %

The shaded region of these 100-square could be represented as a vulgar fraction, a decimal fraction or a percentage.

$$20\% = 0.2 = \frac{1}{5}$$

Percentages over 100 can be represented as a mixed or improper fraction, a decimal fraction or a percentage.

$$150\% = 1.5 = 1\frac{1}{2}$$

1. Circle the odd one out.

a)	30%	$\frac{3}{100}$	0.3	$\frac{3}{10}$
b)	0.6	60%	$\frac{3}{5}$	$\frac{6}{100}$
c)	6%	$\frac{6}{100}$	0.6	0.06

2. Mary scored 84 out of 120 in a test.

a) Express this as a fraction.

b) Write this as a decimal

c) Write her score as a percentage?

3. Change each of these marks to a percentage.

a)

Science: $\frac{22}{25}$

Art: $\frac{24}{30}$

History: $\frac{54}{60}$

Maths: $\frac{34}{40}$

b) Put these marks in descending order.

4. Write in order of size, lowest first:

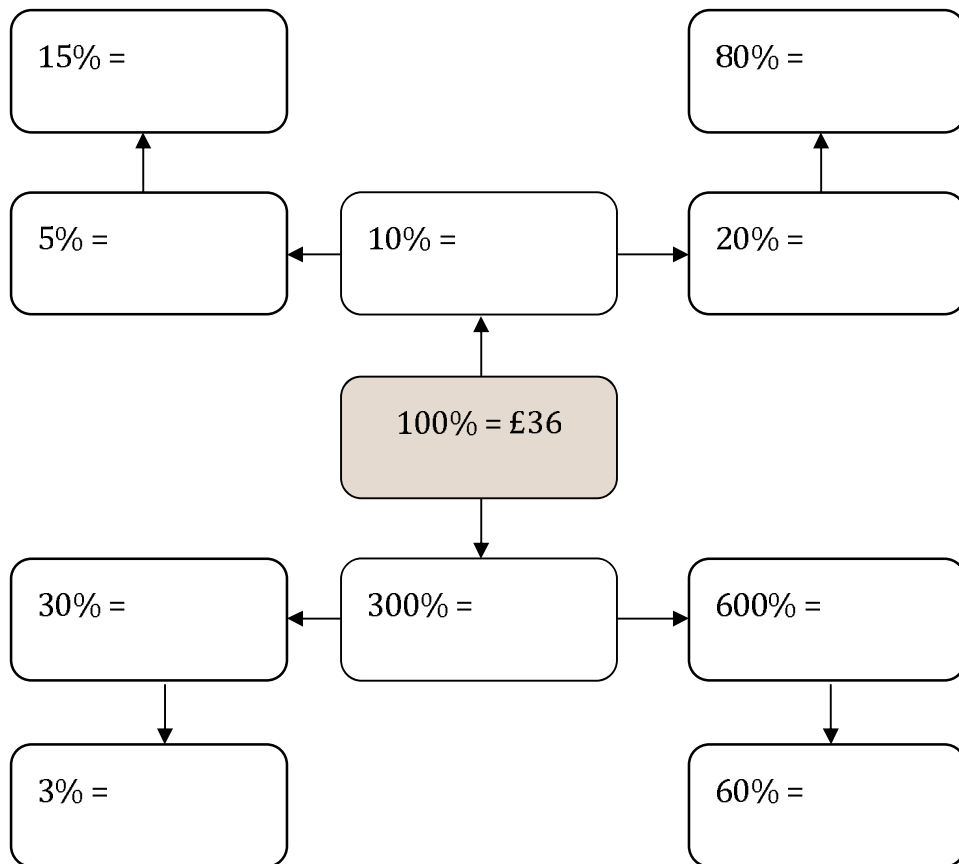
a) $\frac{2}{3}$, 0.6, $\frac{3}{4}$, 55%.....

b) 42%, $\frac{11}{25}$, 0.43, $\frac{9}{20}$

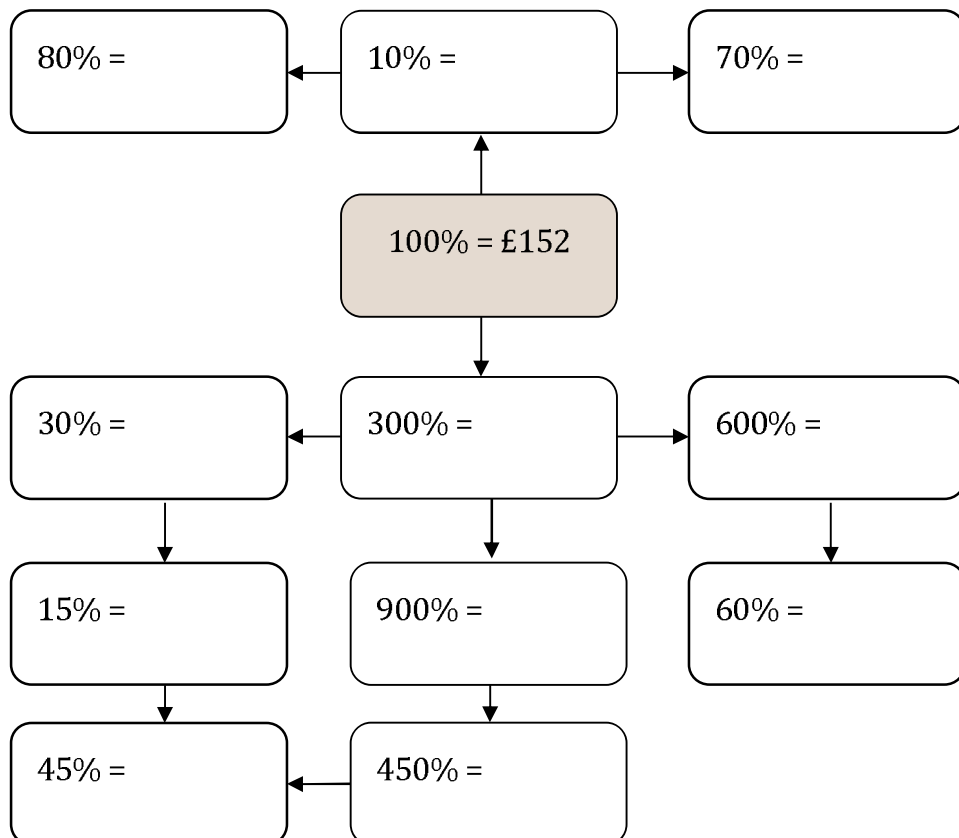


c) $\frac{21}{80}$, 27%, $\frac{57}{200}$, 0.280.....

7. Complete the diagram below, using the grey box as a starting point.



8. Complete the diagram below.



Concept corner

Work out 30% of £70

$$\frac{70}{100} \times 30 = \text{£}21$$

$$\frac{7}{10} \times 70 = \text{£}21$$

$$0.3 \times 70 = \text{£}21$$

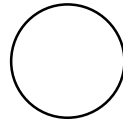
$$\frac{30}{100} \times 70 = \text{£}21$$

$$\frac{3}{10} \times 70 = \text{£}21$$

Why do all the calculations have the same answer?

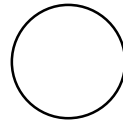
9. Put the correct symbol, either =, < or >, in the circle:

a) 20% of £80



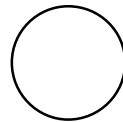
80% of £24

b) 30% of £60



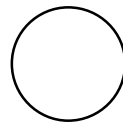
75% of £22

c) 45% of £25



5% of £200

d) 21% of £212



95% of £52

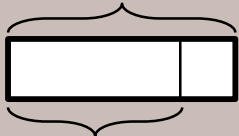
7.2: Express one quantity as a percentage of another

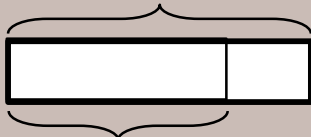
Concept corner

Express one quantity as a percentage of another.

Eric scored 24 out of 30 in a Science test and 29 out of 40 in a maths test.

In which subject did he achieve a higher percentage score?

Science  $\frac{24}{30} \times 100 = \dots\dots\dots \%$

maths  $\frac{29}{40} \times 100 = \dots\dots\dots \%$

Eric achieved a higher percentage score of $\dots\dots\dots \%$ in $\dots\dots\dots$



1. Circle the correct answer:

Work out in your head and then check your answers with a calculator.

- | | | | |
|--|-------------------------------------|--------------|-------------|
| a) What is 20 as a percentage of 50? | 20% | 40% | 80% |
| b) What is 48 as a percentage of 200? | 24% | 48% | 96% |
| c) What is 72 pence as a percentage of £2? | 36% | 72% | 144% |
| d) What is 150g as a percentage of 1 kg? | 1.5% | 15% | 150% |
| e) What is 60° as a percentage of 360° ? | 16.7% | 30% | 60% |
| f) What is 335 cm as a percentage of 5 m? | 3.35% | 33.5% | 67% |
| g) What is 4 months as a percentage of 1 year? | $33\frac{1}{3}\%$ | 40% | 300% |

2. A bar of chocolate has 32 squares. Laura eats 12 squares.
What percentage of the bar does she eat?

3. A new car costs £12 500. The car dealer gives a discount of £18 75.
Work out the percentage discount.

4. I can buy a scooter for one cash payment of £227, or pay a deposit of 20% and then six equal monthly payments of £32.
How much extra will I pay in the second option?

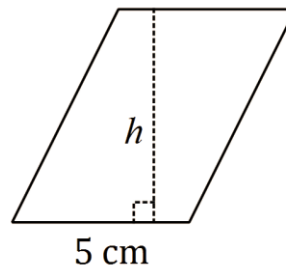
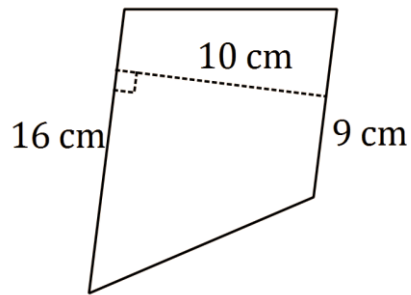
5. A lady buys a car for £2500 and sells it for £1800.
Work out her percentage loss.

6. An elastic band which is 72 cm long is stretched to 90 cm.
Work out the percentage increase in its length.

7. A stereo system has been reduced from £320 to £272. What is the percentage reduction?

8. The area of the parallelogram is 30% of the area of the trapezium.
Work out the missing height of the parallelogram.

Diagrams not
drawn
accurately



9. Nate earns £1750 each month.
In one month he spent 20% of his salary on rent, £580 on food and £850 on other expenses.

a) How much did he overspend by?

b) Express the amount he overspent as a percentage of his monthly salary, giving your answer correct to 1 decimal place.



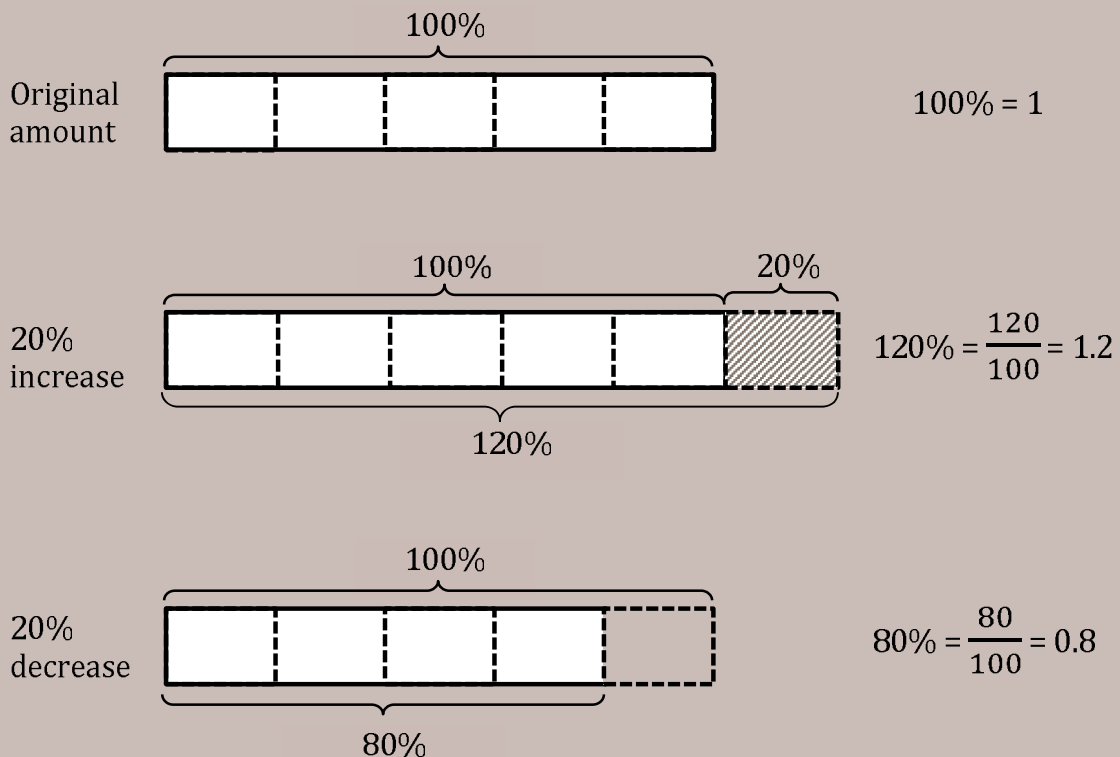
10. There are 800 pages in a book.

Jack reads 150 pages of the book on Monday and 40% of the remaining pages on a Tuesday.

Express the number of pages remaining on Wednesday as a percentage of the total number of pages in the book, giving your answer correct 1 decimal place.

7.3: Percentage change

Concept corner - Percentage change



So, 120% of 60 kg = $1.2 \times 60 = 72$ kg.

80% of 60 kg = $0.8 \times 60 = 48$ kg.

1. Complete the following sentences:

- a) If something increases by 100%, it
- b) If something increases by 500%, it increases by times itself,
and is then times its original size.
- c) I have left after my £10 decreased by 100%.

2. If a number is increased by 35%, what percentage is the new number of the original number?

3. If a number is decreased by 35%, what percentage is the new number of the original number?

4. Match each statement to the correct multiplier:

Increase by 70%

0.3

Decrease by 30%

1.3

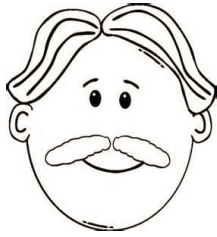
Increase by 30%

0.7

Decrease by 70%

1.7

5. Each of these people get a pay rise. Work out how much they earn now.



£200 per week
Pay rise of 7.5%



£1240 per month
Pay rise of 4.5%



£26 000 per annum
Pay rise of 6%

6. Match the calculations which are of equal value:

Increase £60 by 20%

Decrease £362.50 by 40%

Increase £110 by 25%

Decrease £115 by 20%

Increase £80 by 15%

Decrease £80 by 10%

Increase £150 by 45%

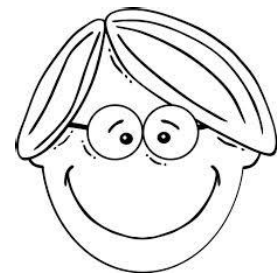
Decrease £275 by 50%

7. A shop has a sale, for each item in the sale work out the sale price.

Dress £68 SALE 20% off	Bed £350 SALE 40% off	Table £480 SALE 30% off
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8. Tim says:

I add 30% to a value.
I then take away 30% of this new value.
I should then get my original value.



Show calculations to explain whether Tim is correct.

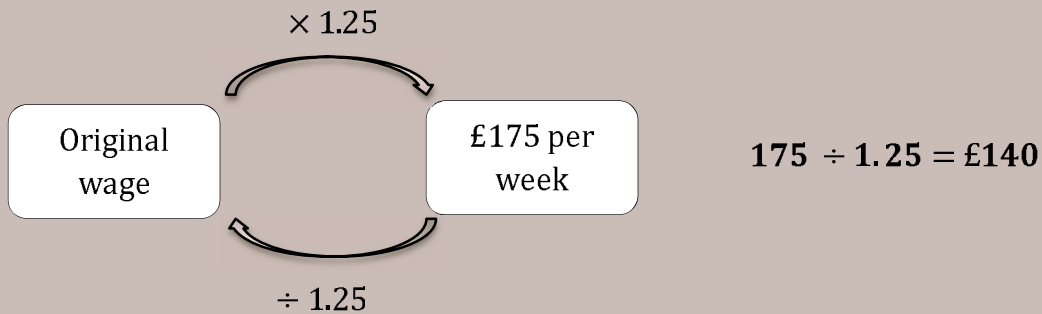
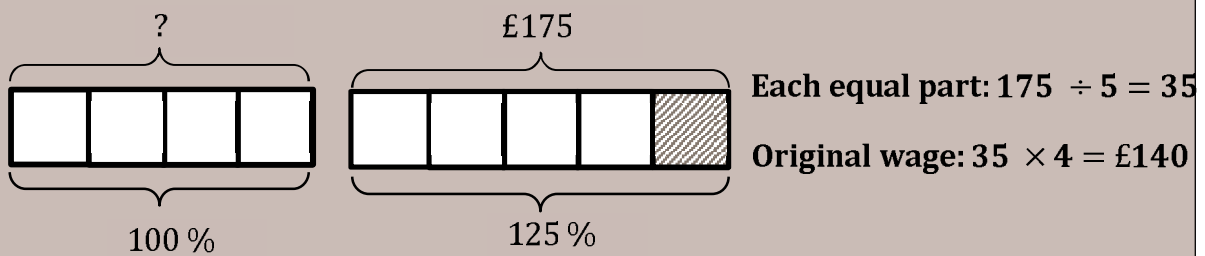
7.4: Finding the original value

Concept corner

Jay receives a 25% pay rise.

His new wage is £175 per week.

What was Jay's wage before his pay rise?




Compare the different calculation strategies. What do you notice?

on

1. A shop sells T-shirts with a 20% discount.
Jan buys a T-shirt and pays £10.
How much does the T-shirt normally cost?

2. A coat is on sale at £55.25, which is 85% of its original price.
What was its original price?

3. Larry gets a 5% wage rise.
His new wage is £252 per week.
What was Larry's wage before his wage rise?
4. If 10% is deducted from a restaurant bill, £40.95 remains to be paid.
How much is the original bill?
5. I bought a bicycle in a sale and saved £49. The label said that it was a '20% reduction'. What was the original price of the bicycle?
6. A football team plays one game each month.
12 500 people attended the game in June.
This was an increase of 25% on the previous month.
How many people attended the football match in May?
-  7. Neil sells his bike to Alex.
Alex sells it to John for £194.40.
Both Neil and Alex makes a 10% loss.
How much did Neil pay for the bike?



8. Dan sells his Smartphone to Katy and makes a 15% profit.

Katy then sells the Smartphone to Ben for £195.50.

Katy makes a 15% loss.

How much did Dan pay for the Smart phone?

Explain why it's not £195.50.

9. Circle the correct working out for each of the following:

- a) Jenny earns £88 a day. She has been told that she will receive a 15% pay rise.
How much will she earn now?

88×0.15

$88 \div 0.85$

88×1.15

88×0.85

- b) Clive earns £270 each week. He donates 12% of his wages to charity. How much money does Clive donate to charity each month?

270×1.12

$270 \div 0.88$

270×0.12

270×0.88

- c) A coat costs £90 in a shop. The shop has a sale and reduces the price of the coat by 10%. How much is the coat in the sale?

90×0.1

90×0.9

$90 \div 1.1$

$90 \div 0.1$

- d) After a 20% increase, Ian earns £72 a day. What was his original wage?

72×0.2

$72 \div 0.8$

$72 \div 1.2$

72×1.2

Reflections

This space is for you to write your reflections on percentages. You may wish to write about:

- Things you've learnt
- Things you found difficult
- Other areas of maths you used in this topic
- Topics you need to revisit/revise in the future