DNEP EDUCATION

Half Term 2 Topics Book

Year 10 · Set 5 · Mathematics

Helper book: explanations, worked examples and practice for every topic in the second half of Autumn Term 1.

Name: _____

Class: _____

How to use this book

This book goes with your lessons. Each topic is split into short **skills**. Every skill has the same parts, so you always know what to do next.

1 Key ideas

Read the key ideas. Say them in your own words.

2 Worked examples

Example 1 is done. Finish 2 and 3. After each one do **Your turn** and **say the rule**.

3 Practice

15 questions, from Bronze to Platinum. Work in the box.

4 Check

Mark with the answers at the back. Colour the dot in the topic list.

Remember it. At the end of each topic there are four questions from earlier topics. Doing old questions again helps you remember them for the exam.

✎ **Maths book.** Most questions have a box for your working. If it says ✎, write your working in your maths book. Write the topic and question number first.

Draw on the diagrams. When a question says plot, draw or mark, do it on the picture in this book with a sharp pencil and a ruler.

KEEP GOING WHEN IT FEELS HARD

If you get stuck, look back at the yellow boxes in the worked examples, then try again. Wrong answers are useful: they show what to fix.

8 Percentages

Out of 100, decimals, amounts and money

WHAT YOU WILL LEARN

		Not yet	Nearly	Got it
8.1	**Per Cent Means Out of 100** I can read a percentage from a hundred grid and say what per cent means.	○	○	○
8.2	**Fractions as Percentages** I can change a fraction into a percentage.	○	○	○
8.3	**Percentages and Decimals** I can change between percentages and decimals.	○	○	○
8.4	**Percentages of an Amount (No Calculator)** I can find a percentage of an amount without a calculator.	○	○	○
8.5	**Percentages of an Amount (Calculator)** I can find a percentage of an amount with a calculator.	○	○	○
8.6	**Increase and Decrease by a Percentage** I can increase or decrease an amount by a percentage.	○	○	○
8.7	**VAT, Profit and Loss** I can work out VAT, profit and loss.	○	○	○
8.8	**Simple Interest and Income Tax** I can work out simple interest and income tax.	○	○	○

KEY WORDS

Per cent (%)	'Out of 100'. 36% means 36 out of every 100.
Multiplier	The number you multiply by. To increase by 20% multiply by 1.2.
VAT	A tax added to the price of many things. It is 20%.
Profit and loss	Profit: sell for MORE than you paid. Loss: sell for LESS.
Simple interest	Money a bank pays you. It is the SAME amount every year.
Income tax	Money you pay out of your pay. The first part of your pay is tax-free.

8.1 Per Cent Means Out of 100

I can read a percentage from a hundred grid and say what per cent means.

KEY IDEAS

Per cent means "out of 100"

Say it slowly: per cent = for every hundred.

The grid has 100 equal squares.
27 of the squares are shaded.

27 out of 100 = 27%

The number in front of the % sign is the number of squares out of 100.
Say it: "twenty-seven per cent".

How to read a hundred grid

Count in tens first, then count the extra squares.

Step 1. Count the full rows of 10.
2 full rows → 2 × 10 = 20
Step 2. Count the extra squares.
4 extra squares → 20 + 4 = 24
Step 3. Write it out of 100.

24 out of 100 = 24%

Check: the % number is never more than 100.

Finding the rest of 100

The whole is always 100%. Take away the part you know.

The whole bar is 100%.
33% of a cake is eaten. What percentage is left?

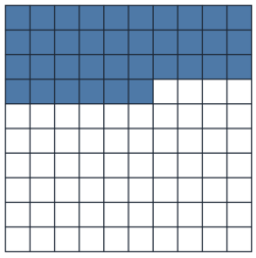
100 − 33 = 67

67% of the cake is left. Check: 33% + 67% = 100%.

WORKED EXAMPLES

Example 1 · done for you

What percentage of the grid is shaded?

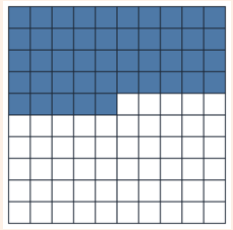


1. The grid has 100 equal squares. 'Per cent' means 'out of 100'. — 100 squares
2. Count the shaded squares. 3 full rows of 10 make 30, and 6 more squares make 36. — 30 + 6 = 36
3. 36 out of 100 is written 36%. We say 'thirty-six per cent'. — 36 out of 100 = 36%

Answer 36%

Say the rule: Per cent means out of 100.

Your turn What percentage of the grid is shaded?



Answer

Example 2 · finish it

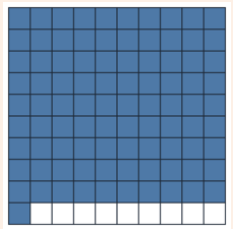
A box has 100 pencils. 41 are blue. What percentage are blue?

1. There are 100 pencils, so the amount is already 'out of 100'. — 100 pencils
2. 41 of the 100 pencils are blue. — _____
3. 41 out of 100 is 41 per cent. The number in front of the % sign is the number out of 100. — _____

Answer

Say the rule: fill the gap. Per cent means out of _____.

Your turn What percentage of the grid is shaded?



Answer

Example 3 · finish it on your own

A game has 100 levels. Ravi has done 37. What percentage is NOT done?

1. The levels not done are the rest of the 100. Take 37 away from 100. — 100 − 37 = _____
2. So 63 levels out of 100 are not done. — _____
3. Check: 37% + 63% = 100%, which is the whole game. — _____

Answer

Say the rule in your own words: _____

Your turn A bag has 100 beads. 29 are red. What percentage are red?

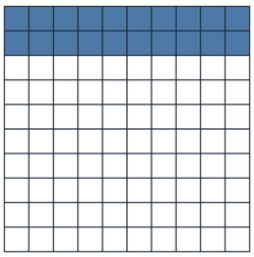
Answer

PRACTICE · 15 QUESTIONS

Work in the space in each box. ✎ means write your working in your maths book. If it says plot, draw or mark, do it on the diagram.

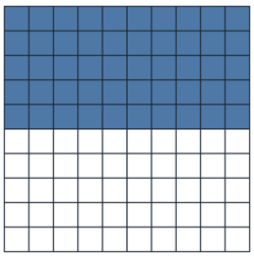
Bronze · Read a percentage from a hundred grid

1 What percentage of the grid is shaded?



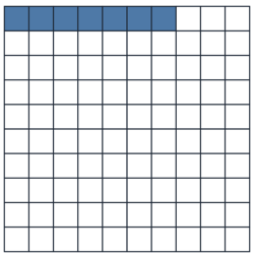
Answer _____

2 What percentage of the grid is shaded?



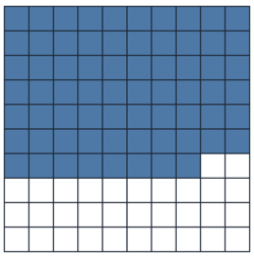
Answer _____

3 What percentage of the grid is shaded?



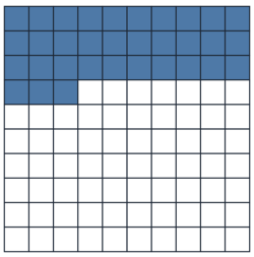
Answer _____

4 What percentage of the grid is shaded?



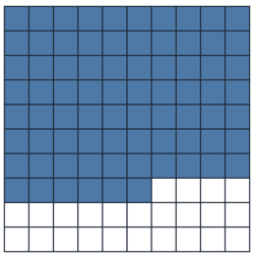
Answer _____

5 What percentage of the grid is shaded?



Answer _____

6 What percentage of the grid is shaded?



Answer _____

Silver · Write 'out of 100' as a percentage

7 A test is out of 100. Ali scores 73. What percentage is this?

Answer _____

8 A jar has 100 coins. 55 are silver. What percentage are silver?

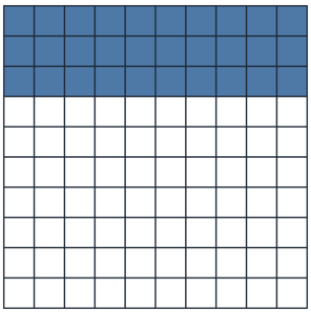
Answer _____

9 3 out of 100

Answer _____

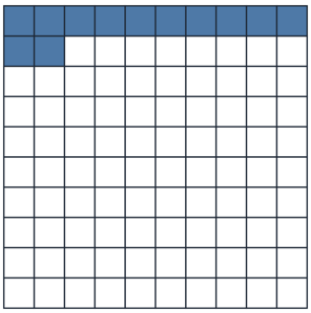
Gold · Find the rest of 100; spot the mistake

10 What percentage of the grid is NOT shaded?



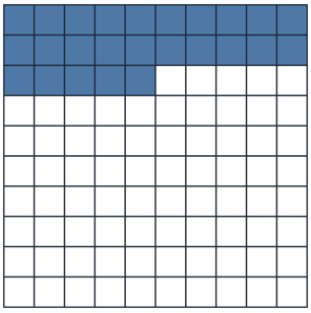
Answer _____

11 What percentage of the grid is NOT shaded?



Answer _____

12 Dan says 'the grid is 25% not shaded'. Spot his mistake. What is the correct percentage?



Answer _____

13 45% walk and 30% bus. The rest come by car. What percentage come by car?

Answer _____

Platinum · Non-examples, explain and solve

14 Lena says 'per cent means out of 10'. Explain why Lena is wrong.

Answer _____

15 Cara scores 62 out of 100. Ben scores 4 more than Cara. What is Ben's percentage?

Answer _____

8.2 Fractions as Percentages

I can change a fraction into a percentage.

KEY IDEAS

Make the bottom number 100

Do the same to the top and the bottom.

$\frac{4}{25}$ **× 4** $\frac{16}{100}$

Step 1. What times 25 makes 100? 25 × 4 = 100.

Step 2. Do the SAME to the top: 4 × 4 = 16.

Step 3. Out of 100 means per cent: 16 out of 100 = 16%.

Whatever you do to the bottom, you must do to the top.

The fractions to learn by heart

These three families come up on every exam paper.

Fraction Decimal Percentage

$\frac{1}{2}$

$\frac{1}{4}$

$\frac{3}{4}$

$\frac{1}{10}$

A quarter is 25%. So three quarters is 3 × 25% = 75%.

When the bottom number is NOT a factor of 100

8 does not go into 100 exactly. Divide instead.

$\frac{7}{8}$ Short division of 7 ÷ 8

8 into 7 does not go: 0.

Step 1. Divide the top by the bottom. 8 into 70 goes 8 times (64), left 6

7 ÷ 8 = 0.875 8 into 60 goes 7 times (56), left 4

8 into 40 goes 5 times (40), left 0

Step 2. Multiply by 100.

0.875 × 100 = 87.5% 7 ÷ 8 = 0.875

WORKED EXAMPLES

Example 1 · done for you

What percentage of the bar is shaded?



1. The bar has 10 equal parts and 3 are shaded. That is the fraction $\frac{3}{10}$. — 3 out of 10 parts
2. Make the bottom number 100. Times the bottom by 10, so times the top by 10 as well: $\frac{3}{10} = \frac{30}{100}$. — 10 × 10 = 100
3. 30 out of 100 is 30 per cent. — 30 out of 100 = 30%

Answer 30%

Say the rule: Make the bottom number 100. Whatever you times the bottom by, times the top by too.

Your turn What percentage of the bar is shaded?



Answer

Example 2 · finish it

Write this fraction as a percentage.

$$\frac{7}{20}$$

1. Find the number that makes the bottom 100. Twenty times 5 is 100. → $20 \times 5 = 100$
2. Do the SAME to the top: 7 times 5 is 35. So $\frac{7}{20}$ is the same as $\frac{35}{100}$. → $7 \times 5 =$ _____
3. 35 out of 100 is 35 per cent. → _____

Answer

Say the rule: fill the gap. Make the bottom number 100. Whatever you times the bottom by, times the _____ by too.

Your turn Write this fraction as a percentage.

$$\frac{8}{100}$$

Answer

Example 3 · finish it on your own

Write this fraction as a percentage.

$$\frac{13}{25}$$

1. What do you times 25 by to get 100? Four quarters of 25 make 100, so times by 4. → $25 \times 4 =$ _____
2. Times the top by 4 as well: 13 times 4 is 52. → $13 \times 4 =$ _____
3. 52 out of 100 is 52 per cent. → _____

Answer

Say the rule in your own words: _____

Your turn Write this fraction as a percentage.

$\frac{1}{5}$

Answer

PRACTICE · 15 QUESTIONS

Work in the space in each box. ✎ means write your working in your maths book. If it says plot, draw or mark, do it on the diagram.

Bronze · Key fractions: halves, quarters, tenths, 100

1 What percentage of the bar is shaded?



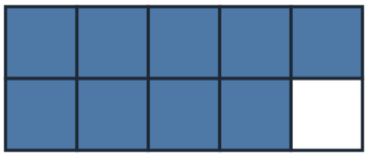
Answer _____

2 What percentage of the bar is shaded?



Answer _____

3 What percentage of the bar is shaded?



Answer _____

4

$\frac{47}{100}$

Answer _____

5

$\frac{3}{4}$

Answer _____

6

$\frac{1}{10}$

Answer _____

Silver · Fractions with 5, 20, 25 or 50 on the bottom

7

$\frac{3}{5}$

Answer _____

8

$\frac{17}{20}$

Answer _____

9

$\frac{11}{50}$

Answer _____

Gold · Mixed fractions; spot the mistake

10

$$\frac{7}{25}$$

Answer _____

11

$$\frac{33}{50}$$

Answer _____

12 Mia says that $\frac{3}{4}$ is 34%. Spot her mistake. Write $\frac{3}{4}$ as a percentage.

Answer _____

13 60%

Answer _____

Platinum · Bottom number is not a factor of 100

14

$$\frac{3}{8}$$

Answer _____

15 Jo says '$\frac{1}{8}$ cannot be a percentage because 8 does not go into 100'. Is Jo right? Explain.

Answer _____

8.3 Percentages and Decimals

I can change between percentages and decimals.

KEY IDEAS

Percentage to decimal

Divide by 100. The decimal point moves 2 places to the left.

Tens Ones Tenths Hundredths

46% means 46 out of 100.

46 ÷ 100 = 0.46

Percentage → decimal: ÷ 100 Each digit moves 2 places.

Decimal to percentage

Multiply by 100. The decimal point moves 2 places to the right. 1 whole is 100%.

0.6 is here

Decimal

Percentage

0.6 × 100 = 60 So 0.6 = 60%

Careful: 0.06 is 6%. 0.6 is 60%. They are not the same.

Percentages can be more than 100%

100% is one whole. More than one whole is more than 100%.

1.75 is here

Decimal

Percentage

1.75 × 100 = 175 So 1.75 = 175%

175% is bigger than 100%. 175% = 1.75 is more than one whole.

WORKED EXAMPLES

Example 1 · done for you

Write this percentage as a decimal.

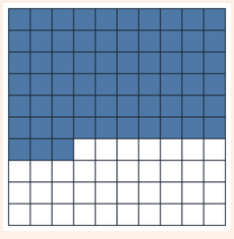
37%

1	Per cent means out of 100, so 37% is 37 hundredths.	37% = 37 out of 100
2	Divide by 100. The decimal point moves 2 places to the left.	37 ÷ 100 = 0.37
3	Write the answer with the decimal point.	37% = 0.37

Answer 0.37

Say the rule: To change a percentage to a decimal, divide by 100. The point moves 2 places to the left.

Your turn Write the shaded part as a decimal.



Answer ____

Example 2 · finish it

Write this decimal as a percentage.

0.6

1. Write 0.6 with 2 decimal places: it is 60 hundredths. → 0.6 = 0.60
2. Multiply by 100. The decimal point moves 2 places to the right. → 0.60 × 100 = _____
3. 60 out of 100 is 60 per cent. → 0.6 = _____

Answer

Say the rule: fill the gap. To change a percentage to a decimal, divide by _____. The point moves 2 places to the left.

Your turn Write this percentage as a decimal. 10%

Answer

Example 3 · finish it on your own

Write this percentage as a decimal.

8%

1. Per cent means out of 100. → 8% = _____
2. Divide by 100. The decimal point moves 2 places to the left. Put a zero in the gap. → 8 ÷ 100 = _____
3. Check: 8% is small, so 0.08 is right. It is NOT 0.8. → 8% = _____

Answer

Say the rule in your own words: _____

Your turn The calculator shows this decimal. Write it as a percentage.



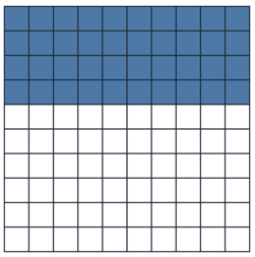
Answer

PRACTICE · 15 QUESTIONS

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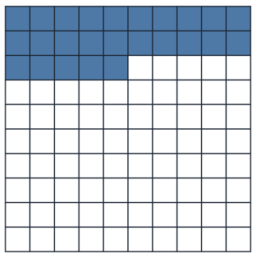
Bronze · Write a percentage as a decimal

1 Write the shaded part as a decimal.



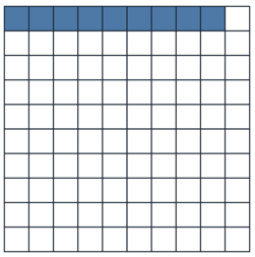
Answer _____

2 Write the shaded part as a decimal.



Answer _____

3 Write the shaded part as a decimal.



Answer _____

4 50%

Answer _____

5 24%

Answer _____

6 71%

Answer _____

Silver · Write a decimal as a percentage

7 The calculator shows this decimal. Write it as a percentage.



Answer _____

8 0.9

Answer _____

9 0.5

Answer _____

Gold · Percentages over 100%; spot the mistake

10 120%

Answer _____

11 105%

Answer _____

12 Sam says 6% = 0.6. Spot his mistake. Write 6% as a decimal.

Answer _____

13 Ben says 'a percentage can never be more than 100%'. Is Ben right?

Answer _____

Platinum · Decimals with 3 places; explain and compare

14 12.5%

Answer _____

15 Which one is NOT equal to 35%?

$$0.35, \quad \frac{35}{100}, \quad 3.5$$

Answer _____

8.4 Percentages of an Amount (No Calculator)

I can find a percentage of an amount without a calculator.

KEY IDEAS

The easy ones: 50%, 25% and 10%

Start with £160. Cut it into equal parts.

50% = one half £80

Divide by 2

25% = one quarter £40

Divide by 4

10% = one tenth £16

Divide by 10

The shaded part is the percentage.

Build any percentage from 10%

Find 10%, then add parts. Amount: £240.

10% of £240 = £240 ÷ 10 = £24

30% = 3 × 10% = 3 × £24 = £72

5% = half of 10% = £24 ÷ 2 = £12

35% = 30% + 5% = £72 + £12 = £84

35% of £240 = £84

Halve to get smaller percentages

Amount: £280.

17.5% = 10% + 5% + 2.5%

£28 + £14 + £7 = £49

17.5% of £280 = £49

WORKED EXAMPLES

Example 1 · done for you

Work out 10% of £70.



1	10% is one tenth of the amount. Cut the amount into 10 equal parts.	10% = 1 out of 10 equal parts
2	Divide by 10 to find the size of ONE part.	£70 ÷ 10 = £7
3	The answer is the size of one part.	10% of £70 = £7

Answer £7

Say the rule: 10% means divide by 10. Build the other percentages from 10%, 5% and 1%.

Your turn Work out 25% of £48.



Answer

Example 2 · finish it

Work out 30% of £60.

30% of £60

1. Find 10% first. Divide by 10. → 10% of £60 = £6
2. 30% is 3 lots of 10%. → 30% = _____
3. Multiply the 10% amount by 3. → 3 × £6 = _____

Answer

Say the rule: fill the gap. 10% means divide by _____. Build the other percentages from 10%, 5% and 1%.

Your turn Work out: 50% of 84 cm

Answer

Example 3 · finish it on your own

Work out 15% of £80.

15% of £80

1. Find 10% first. Divide by 10. → 10% of £80 = _____
2. 5% is half of 10%. Halve the 10% amount. → 5% = half of 10% = _____
3. Add the parts: 10% + 5% = 15%. → 15% = £8 + £4 = _____

Answer

Say the rule in your own words: _____

Your turn Work out 30% of £50.



Answer

PRACTICE · 15 QUESTIONS

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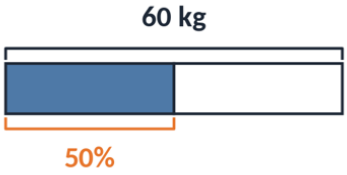
Bronze · Find 10%, 50% and 25% of an amount

1 Work out 10% of £90.



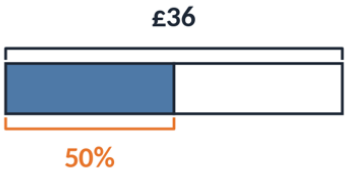
Answer _____

2 Work out 50% of 60 kg.



Answer _____

3 Work out 50% of £36.



Answer _____

4 10% of £350

Answer _____

5 25% of 36 pupils

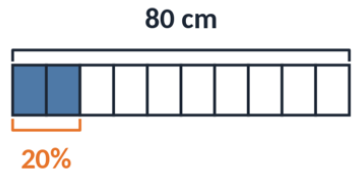
Answer _____

6 10% of 1200 people

Answer _____

Silver · Find 20%, 30%, 40% and so on of an amount

7 Work out 20% of 80 cm.



Answer _____

8 70% of 130

Answer _____

9 30% of 250 grams

Answer _____

Gold · Build 5%, 15%, 35% and 45%; spot the mistake

10 5% of 120

Answer _____

11 35% of 40

Answer _____

12 Ali says 5% of £60 is 60 ÷ 5. Spot his mistake. What is 5% of £60?

Answer _____

13 Dev: 'divide by 5 to find 5%'. Eve: 'halve 10% to find 5%'. Who is correct?

Answer _____

Platinum · Build 2.5%, 6%, 12.5%, 17.5% and 95%

14 12.5% of 80

Answer _____

15 Dan finds 17.5% of £60 as 10% + 5% + 2%. Spot his mistake. What is 17.5% of £60?

Answer _____

8.5 Percentages of an Amount (Calculator)

I can find a percentage of an amount with a calculator.

KEY IDEAS

A percentage is a decimal multiplier

Divide the percentage by 100 to get the decimal.

Percentage ÷ 100 Decimal

Over 100% gives a decimal bigger than 1.

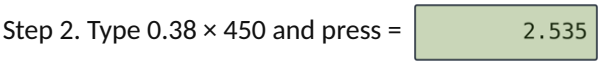
Find a percentage with a calculator

Write the percentage as a decimal. Then multiply.

38% of 450 Money: round to the nearest penny

Step 1. Write 38% as a decimal: 0.38 13% of £19.50

Step 2. Type 0.38 × 450 and press =





2.535 → £2.54

Step 3. 38% of 450 = 171 Look at the third decimal place. 5 rounds up.

Percentages are number machines

Each percentage is a multiplier that does the job in one step.

60 → × 0.2 → 12 **× 0.2 finds 20%**

80 → × 0.75 → 60 **× 0.75 finds 75%**

50 → × 1.3 → 65 **× 1.3 finds 130%**

More than 100%: the answer is bigger than the start.

WORKED EXAMPLES

Example 1 · done for you

Use a calculator to work out 23% of 400.

23% of 400

1	Write the percentage as a decimal. Divide by 100.	23% = 0.23
2	'Of' means multiply. Type 0.23 × 400 into the calculator.	0.23 × 400 = 92
3	Write the answer.	23% of 400 = 92

Answer 92

Say the rule: Write the percentage as a decimal. Then multiply it by the amount, because 'of' means times.

Your turn This machine finds 60% of the input. Work out the output.



Answer

Example 2 · finish it

Use a calculator to work out 7% of £650.

7% of £650

1. Write 7% as 0.07. It is NOT 0.7. → 7% = 0.07
2. Multiply the decimal by the amount. → 0.07 × 650 = _____
3. Money has 2 decimal places, so write £45.50. → _____

Answer

Say the rule: fill the gap. Write the percentage as a decimal. Then _____ it by the amount, because 'of' means times.

Your turn Use a calculator to work out: 15% of 300

Answer

Example 3 · finish it on your own

A school has 1250 pupils. 18% of them walk to school. How many walk?

18% of 1250

1. Write the percentage as a decimal. → 18% = _____
2. Multiply the decimal by the amount. → 0.18 × 1250 = _____
3. Write the answer with the units. → _____

Answer

Say the rule in your own words: _____

Your turn Work out 17% of £240.



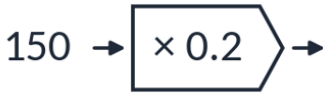
Answer

PRACTICE · 15 QUESTIONS

Work in the space in each box. ✎ means write your working in your maths book. If it says plot, draw or mark, do it on the diagram.

Bronze · Use a decimal multiplier to find a percentage

1 This machine finds 20% of the input. Work out the output.



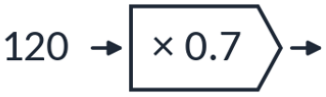
Answer _____

2 This machine finds 30% of the input. Work out the output.



Answer _____

3 This machine finds 70% of the input. Work out the output.



Answer _____

4 40% of 250

Answer _____

5 35% of 80

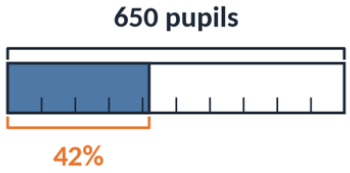
Answer _____

6 80% of 65

Answer _____

Silver · Percentage of an amount with a calculator

7 42% of 650 pupils walk to school. How many walk?



Answer _____

8 29% of 800

Answer _____

9 78% of 600

Answer _____

Gold · Money to the nearest penny; spot the mistake

10 A coat costs £68. A shop takes off 15%. How much is taken off?

Answer _____

11 Work out 23% of £19.99. Round to the nearest penny.

Answer _____

12 Sam types 35 × 200 for 35% of 200. Spot his mistake. What is 35% of 200?

Answer _____

13 Which calculation finds 4% of 50?0.4 × 50, 0.04 × 50, 4 × 50

Answer _____

Platinum · Decimal percentages and percentages over 100%

14 Work out 2.5% of £1260.

Answer _____

15 Which is bigger: 12% of 450 or 8% of 700? Show your working.

Answer _____

8.6 Increase and Decrease by a Percentage

I can increase or decrease an amount by a percentage.

KEY IDEAS

Increase: add the percentage to 100%

Increase £120 by 15%.

Before

100% + 15% = 115% £120 × 1.15 = £138

115% = 1.15 the multiplier Increase → the multiplier is bigger than 1.

Decrease: take the percentage off 100%

Decrease £120 by 15%.

Before

100% − 15% = 85% £120 × 0.85 = £102

85% = 0.85 the multiplier Decrease → the multiplier is smaller than 1.

Multipliers to learn

Increase starts 1 point something. Decrease starts 0 point something.

Change Increase Decrease

Check: 1 + 0.1 = 1.1 and 1 − 0.1 = 0.9

Increases of 100% or more

100% is the whole. An increase of 100% doubles it.

+100% £40 × 2 = £80

100% + 100% = 200% = × 2

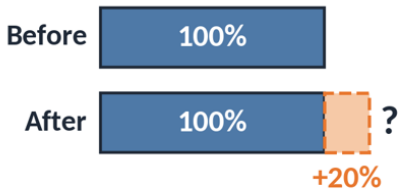
+250% £40 × 3.5 = £140

100% + 250% = 350% = × 3.5

WORKED EXAMPLES

Example 1 · done for you

Increase £60 by 20%.

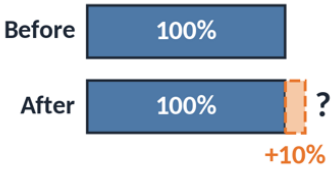


1. An increase of 20% means the new amount is 120% of the old amount. — 100% + 20% = 120%
2. Write 120% as a decimal. This number is called the multiplier. — 120% = 1.2
3. Multiply the old amount by the multiplier. — £60 × 1.2 = £72

Answer £72

Say the rule: Add the increase to 100% (or take the decrease from 100%). That decimal is the multiplier.

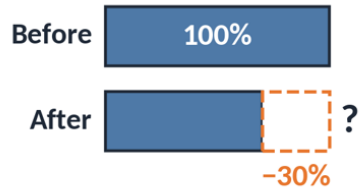
Your turn The bar shows a rise of 10%. What is the multiplier?



Answer .....

Example 2 · finish it

Decrease 250 by 30%.



1. A decrease of 30% means 70% of the old amount is left. — 100% − 30% = 70%
2. Write 70% as a decimal. The multiplier is 0.7. — 70% = _____
3. Multiply the old amount by the multiplier. — 250 × 0.7 = _____

Answer

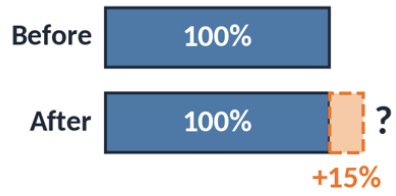
Say the rule: fill the gap. Add the increase to 100% (or take the decrease from 100%). That decimal is the _____.

Your turn Write the multiplier. Decrease by 10%

Answer

Example 3 · finish it on your own

Increase £80 by 15%.



1. An increase means ADD the percentage to 100%. — 100% + 15% = _____
2. The multiplier is 1.15. — 115% = _____
3. Multiply the old amount by the multiplier. — £80 × 1.15 = _____

Answer

Say the rule in your own words: _____

Your turn This machine increases by 15%. Work out the output.



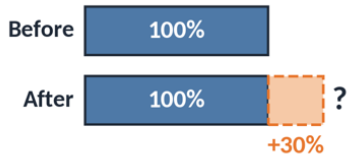
Answer

PRACTICE · 15 QUESTIONS

Work in the space in each box. ✎ means write your working in your maths book. If it says plot, draw or mark, do it on the diagram.

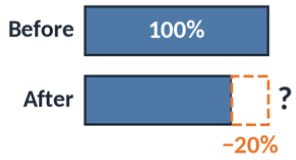
Bronze · Write the multiplier for a percentage change

1 The bar shows a rise of 30%. What is the multiplier?



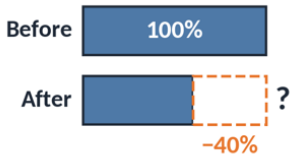
Answer _____

2 The bar shows a fall of 20%. What is the multiplier?



Answer _____

3 The bar shows a fall of 40%. What is the multiplier?



Answer _____

4 Increase by 25%

Answer _____

5 Increase by 5%

Answer _____

6 Decrease by 35%

Answer _____

Silver · Increase or decrease using the multiplier

7 This machine decreases by 20%. Work out the output.



Answer _____

8 Increase 120 by 25%.

Answer _____

9 Decrease 60 by 30%.

Answer _____

Gold · Percentage changes in real life; spot the mistake

10 A bus fare of £2.40 rises by 5%. Work out the new fare.

Answer _____

11 A town has 24 500 people. It grows by 4%. How many people now?

Answer _____

12 Sam increases 80 by 20% by doing 80 × 0.2. Spot his mistake. Work out the answer.

Answer _____

13 Eve says the multiplier for a 7% rise is 1.7. Spot her mistake. What is it?

Answer _____

Platinum · Decimal percentages, over 100%, and explain

14 Decrease £64 by 2.5%.

Answer _____

15 Which multiplier increases an amount by 6%?0.6, 1.6, 1.06

Answer _____

8.7 VAT, Profit and Loss

I can work out VAT, profit and loss.

KEY IDEAS

VAT is added to the price

VAT is 20%. A jacket costs £70 before VAT.

Price before VAT £70 Method 1: find the VAT, then add

20% of £70 = £14

VAT (20% of £70) £14

£70 + £14 = £84

Price after VAT £84

Method 2: a multiplier

This is what you pay. 100% + 20% = 120% = 1.2

£70 × 1.2 = £84

A percentage profit or loss

The percentage is a percentage of what you PAID. Bought for £250.

20% profit 20% of £250 = £50 or use the multiplier:

£250 + £50 = £300 £250 × 1.2 = £300

20% loss 20% of £250 = £50 or use the multiplier:

£250 − £50 = £200 £250 × 0.8 = £200

Profit and loss

Compare what you PAID with what you SOLD it for.

Profit Loss

Bought for £30 Bought for £30

Sold for £45 Sold for £22

Sold for MORE than bought Sold for LESS than bought

profit = sold − bought loss = bought − sold

£45 − £30 = £15 £30 − £22 = £8

WORKED EXAMPLES

Example 1 · done for you

A bike costs £150 before VAT. VAT is 20%. Work out the price after VAT.

Price before VAT
£150
VAT is 20%

1. VAT is a tax added to the price. 10% of £150 is £15, so 20% is £30. → VAT = 20% of £150 = £30
2. Add the VAT to the price before VAT. → £150 + £30 = £180
3. This is what the customer pays. → Price after VAT = £180

Answer £180

Say the rule: Find the VAT, then add it to the price before VAT.

Your turn Work out the VAT.

Price before VAT
£80
VAT is 20%

Answer

Example 2 · finish it

A phone costs £240 before VAT. VAT is 20%. Use a multiplier to work out the price after VAT.

1. Adding 20% VAT means the price after VAT is 120% of the price before VAT. — 100% + 20% = 120%
2. The multiplier is 1.2. — 120% = _____
3. Multiply the price before VAT by 1.2. — £240 × 1.2 = _____

Answer

Say the rule: fill the gap. Find the VAT, then _____ it to the price before VAT.

Your turn VAT is 20%. Work out the VAT on this price. £120

Answer

Example 3 · finish it on your own

A shop buys a clock for £90 and sells it for £117. Work out the profit.

1. Profit is what the shop gets minus what the shop paid. — Profit = _____
2. The shop paid £90 and sold it for £117. — _____
3. Check: the selling price is bigger than the cost price, so it is a profit. — Profit = _____

Answer

Say the rule in your own words: _____

Your turn Work out the price of the coat after VAT.

Coat
Price: £60
VAT rate: 20%
Price after VAT: ?

Answer

PRACTICE · 15 QUESTIONS

Work in the space in each box. ✎ means write your working in your maths book. If it says plot, draw or mark, do it on the diagram.

Bronze · Work out the VAT on a price

1 Work out the VAT.

Price before VAT
£50
VAT is 20%

Answer _____

2 Work out the VAT.

Price before VAT
£30
VAT is 20%

Answer _____

3 Work out the VAT.

Price before VAT
£200
VAT is 20%

Answer _____

4 £65

Answer _____

5 £350

Answer _____

6 £45

Answer _____

Silver · Work out the price after VAT

7 Work out the price of the lamp after VAT.

Lamp
Price: £25
VAT rate: 20%
Price after VAT: ?

Answer _____

8 £325

Answer _____

9 £750

Answer _____

Gold · Work out profit and loss; spot the mistake

10 Work out the profit.

Lamp
Bought for £25
Sold for £34

Answer _____

11 Work out the profit.

Chair
Bought for £60
Sold at a 20% profit

Answer _____

12 Sam says the profit is £65. Spot his mistake. Work out the profit.



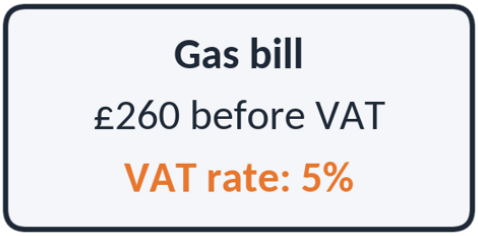
Answer _____

13 Which one is a loss?Buy £45, sell £52, Buy £45, sell £38, Buy £45, sell £45

Answer _____

Platinum · Compare prices and explain; VAT at other rates

14 Work out the price after VAT.



Answer _____

15 Eve says £35 plus 20% VAT is £28. Spot her mistake. Work out the correct price.

Answer _____

8.8 Simple Interest and Income Tax

I can work out simple interest and income tax.

KEY IDEAS

Simple interest is the SAME every year

£600 in a bank at 5% simple interest a year.

5% of £600 = £30

Year 1 Year 2 Year 3 3 × £30 = £90

total interest

Interest for 1 year × number of years = total interest

How much is in the account at the end?

Add the total interest to the money you saved.

£600 saved +£90

£600 + £90 = £690

At the end there is £690 in the account.

Income tax: only part of your pay is taxed

Pay £24 000. The first £12 000 is tax-free. The rest is taxed at 20%.

Tax-free £12 000 Taxed £12 000

£24 000 − £12 000 = £12 000

20% of £12 000 = £2400

Tax = £2400. Do NOT take 20% of all £24 000.

WORKED EXAMPLES

Example 1 · done for you

Ali puts £400 in a bank. The bank pays 3% simple interest a year. Work out the interest for 1 year.

Savings account
£400 saved
3% simple interest a year

1. Simple interest is a percentage of the money in the bank. — Interest = 3% of £400
2. Find 1% by dividing by 100. Then multiply by 3. — 1% of £400 = £4, 3% = 3 × £4
3. The bank pays £12 for the year. — Interest for 1 year = £12

Answer £12

Say the rule: Find the interest for 1 year, then times it by the number of years.

Your turn Work out the interest for 1 year.

Savings account
£1000 saved
3% simple interest a year

Answer ____

Example 2 · finish it

Mia puts £500 in a bank at 4% simple interest a year. Work out the total interest in 3 years.

1. Work out the interest for 1 year first: 4% of £500. → 4% of £500 = £20
2. Simple interest is £20 each year, because the interest does not grow. → _____
3. Multiply the interest for 1 year by the number of years. → 3 × £20 = _____

Answer

Say the rule: fill the gap. Find the interest for 1 year, then times it by the number of _____.

Your turn Work out the simple interest for 1 year. £1500 at 4%

Answer

Example 3 · finish it on your own

Kay earns £20 000. The first £12 000 is tax-free. The rest is taxed at 20%. Work out her tax.



1. Tax is only paid on the part that is NOT tax-free. Subtract the tax-free amount. → £20 000 − £12 000 = _____
2. Work out 20% of the taxed part: 10% is £800, so 20% is £1600. → 20% of £8000 = _____
3. Kay pays £1600 tax in the year. → Tax = _____

Answer

Say the rule in your own words: _____

Your turn Work out the total interest.

Savings account
£200 saved
5% simple interest a year
for 2 years

Answer

PRACTICE · 15 QUESTIONS

Work in the space in each box. ✎ means write your working in your maths book. If it says plot, draw or mark, do it on the diagram.

Bronze · Simple interest for 1 year

1 Work out the interest for 1 year.

Savings account
£200 saved
5% simple interest a year

Answer _____

2 Work out the interest for 1 year.

Savings account
£800 saved
2% simple interest a year

Answer _____

3 Work out the interest for 1 year.

Savings account
£250 saved
4% simple interest a year

Answer _____

4 £900 at 2%

Answer _____

5 £350 at 10%

Answer _____

6 £2000 at 1.5%

Answer _____

Silver · Simple interest for more than 1 year

7 Work out the total interest.

Savings account
£400 saved
3% simple interest a year
for 4 years

Answer _____

8 Work out the simple interest in 3 years.£700 at 4% a year

Answer _____

9 Work out the simple interest in 4 years.£3000 at 3% a year

Answer _____

Gold · Income tax: tax only on the part above the tax-free amount

10 Work out the income tax.

Income £20 000



Tax-free £12 000

Rest is taxed at 20%

Answer _____

11 Work out the income tax.

Income £18 000

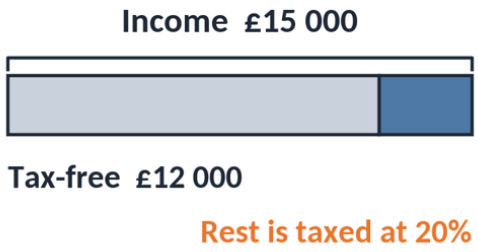


Tax-free £12 000

Rest is taxed at 20%

Answer _____

12 Sam says the tax is 20% of £15 000. Spot his mistake. Work out the tax.



Answer _____

13 Dan earns £11 000. The first £12 000 is tax-free. Dan says he pays £2200 tax. Is Dan right?

Answer _____

Platinum · Interest and tax: harder numbers, explain

14 £2400 earns 2.5% simple interest a year. Work out the interest for 3 years.

Answer _____

15 Jo says there is £120 in the account after 5 years. Spot his mistake. Find the correct amount.

Savings account
£200 saved
10% simple interest a year

Answer _____

Remember it · mixed review

Questions from earlier topics. Do them without looking back, then check the answers at the back.

R1 Ratio Share £32 in the ratio 3 : 1.

Answer _____

R2 Sequences Write the nth term of 5, 9, 13, 17, …

Answer _____

R3 Substitution Work out the value of $3x - 2$ when $x = 4$.

Answer _____

R4 Proportion 5 kg of potatoes cost £10. How much do 9 kg cost?

Answer _____

DNEP Education · Year 10 Set 5 · Half Term 2 Topics Book: Answers (teacher copy)

Answers

8 Percentages

8.1 Per Cent Means Out of 100

YT1 45%	**YT2** 91%	**YT3** 29%
1 20%	**2** 50%	**3** 7%
4 68%	**5** 33%	**6** 76%
7 73%	**8** 55%	**9** 3%
10 70%	**11** 88%	**12** 25% IS shaded; 75% is not
13 100 − 45 − 30 = 25%	**14** Per cent means out of 100	**15** 66%

8.2 Fractions as Percentages

YT1 50%	**YT2** 8%	**YT3** 20%
1 70%	**2** 25%	**3** 90%
4 47%	**5** 75%	**6** 10%
7 60%	**8** 85%	**9** 22%
10 28%	**11** 66%	**12** 75%
13 $\frac{3}{5}$	**14** 0.375 = 37.5%	**15** No : $\frac{1}{8} = 0.125 = 12.5\%$

8.3 Percentages and Decimals

YT1 0.63	**YT2** 0.1	**YT3** 35%
1 0.4	**2** 0.25	**3** 0.09
4 0.5	**5** 0.24	**6** 0.71
7 72%	**8** 90%	**9** 50%
10 1.2	**11** 1.05	**12** 0.06 (6 ÷ 100)
13 No: 125% = 1.25 is more than one whole	**14** 0.125	**15** 3.5

8.4 Percentages of an Amount (No Calculator)

YT1 £12	**YT2** 42 cm	**YT3** £15
1 £9	**2** 30 kg	**3** £18
4 £35	**5** 9 pupils	**6** 120 people
7 16 cm	**8** 91	**9** 75 grams
10 6	**11** 14	**12** £3 (10% is £6, half of 10% is £3)
13 Eve (5% is half of 10%)	**14** 10	**15** £10.50 (the last part is 2.5% = £1.50)

8.5 Percentages of an Amount (Calculator)

YT1 21	**YT2** 45	**YT3** £40.80
1 30	**2** 27	**3** 84
4 100	**5** 28	**6** 52
7 273 pupils	**8** 232	**9** 468
10 £10.20	**11** £4.60	**12** 70 (35% = 0.35, so 0.35 × 200)
13 0.04 × 50	**14** £31.50	**15** 8% of 700 (56 is bigger than 54)

8.6 Increase and Decrease by a Percentage

YT1 1.1	**YT2** 0.9	**YT3** £230
1 1.3	**2** 0.8	**3** 0.6
4 1.25	**5** 1.05	**6** 0.65
7 280	**8** 150	**9** 42
10 £2.52	**11** 25 480	**12** 96 (the multiplier is 1.2)
13 1.07	**14** £62.40	**15** 1.06

8.7 VAT, Profit and Loss

YT1 £16	**YT2** £24	**YT3** £72
1 £10	**2** £6	**3** £40
4 £13	**5** £70	**6** £9
7 £30	**8** £390	**9** £900
10 £9	**11** £12	**12** £15 (65 − 50)
13 Buy £45, sell £38	**14** £273	**15** £42 (VAT is added, not taken off)

8.8 Simple Interest and Income Tax

YT1 £30	**YT2** £60	**YT3** £20
1 £10	**2** £16	**3** £10
4 £18	**5** £35	**6** £30
7 £48	**8** £84	**9** £360
10 £1600	**11** £1200	**12** £600 (20% of £3000)
13 No: all of his pay is tax-free, so the tax is £0	**14** £180	**15** £300 (200 + 5 × 20)

Remember it · mixed review

R1 £24 and £8	**R2** 4n + 1	**R3** 10	**R4** £18