Sparx Maths

# Year 9 Term 1

## Revision Workbook

# About this workbook

This workbook supports the revision of topics covered in **Year 9 Term 1** of the Sparx Maths Curriculum.

The workbook is divided into two sections:

- **Fluency questions** on each unit to practise the key concepts.
- **Mixed questions** on all topics to strengthen and deepen understanding.
  This section contains more challenging reasoning questions, cross-topic questions and problem solving questions.

If you use Sparx Maths you can find more questions and videos by searching for the following Sparx topic codes in Independent Learning.

Topic codes are also given with each question.

| Units | Sparx topic codes |
|---|---|
| Fractions, decimals and percentages review | U888 U594 U881 U916 U554 U349 |
| Percentage change | U773 U533 U671 U286 U278 |
| Theoretical and experimental probability | U166 U580 U280 |
| Calculations with standard form | U264 U290 U161 |
| Linear inequalities | U738 U145 U337 |
| Factorising and solving quadratic equations | U178 U963 U228 |
| Rearranging formulae | U556 |
| Constructing bisectors and perpendicular lines | U787 U245 |
| Circles and cylinders | U221 U373 U464 U915 |

Calculator questions are marked with this symbol

Non-calculator questions are marked with this symbol

**Q1**
U881

What is $\frac{1}{3}$ of $15$?

Answer: .....

**Q2**
U881

Work out $\frac{3}{4}$ of $32$

Answer: .....

**Q3**
U554

Work out $70\%$ of $30$

10% of 30 is 3

70% of 30 is ☐

**Q4**
U554

Work out $14\%$ of $700\,\text{kg}$.

Answer: ..... kg

**Q5**
U594

Write the values below in ascending order.

$6\%, \quad \frac{23}{50}, \quad 0.4$

Answer: .....

**Q6**
U916

What is $\frac{1}{19}$ of $323$?

Answer: .....

**Q7**
U916

Evelyn is driving $423$ miles from Glasgow to Swansea.
When she is $\frac{9}{10}$ of the way through her journey, how many miles has she driven?

Answer: ..... miles

**Q8**
U349

Calculate $9\%$ of $97$

Answer: .....

**Q9**
U349

Elizabeth asked $125$ people if they can speak more than one language.
$36\%$ of the people she asked said that they can.
How many people said that they can speak more than one language?

Answer: .....

# Percentage change

**Q1**

U773

Increase $580$ by $25\%$

Answer: .....

**Q2**

U773

A kitchen originally cost $£7000$.
In a sale, this cost is reduced by $6\%$.
How much does the kitchen cost in the sale?

Answer: $£$ .....

**Q3**

U533

Tommy takes out a loan of $£2600$.
It gathers **simple interest** at a rate of $2.5\%$ per annum.
He pays back the loan after $10$ years. How much money does he have to pay back?

Answer: $£$ .....

**Q4**
U671

**Decrease** $£61$ by $24\%$

Answer: $£$ .....

**Q5**
U671

The value of a building is currently $£251{,}000$.
If the value **increases** by $3.5\%$, what will the new value be?

Answer: $£$ .....

**Q6**
U286

$14\%$ of a value is $£91$.
Work out the original value.

Answer: $£$ .....

**Q7**
U286

The price of a book set has been **reduced** by $35\%$.
The new price is $£48.10$
What was the original price of the book set?

Answer: $£$ .....

**Q8**
U286

Some friends went out for a meal. The restaurant added a $10\%$ service charge to the cost of the meal.
The total bill was $£159.50$ including the service charge.
What was the cost of the meal?


**Q9**
U278

If $120$ increases to $168$, what percentage increase is this?

Answer: _____ %

**Q10**
U278

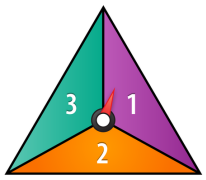
If $£2500$ decreases to $£1900$, what percentage decrease is this?

Answer: _____ %

**Q1**

U166

Aleena spins the fair spinner shown below.




a) What is the probability that she spins a 2? Give your answer as a fraction in its simplest form.

Answer: .....

b) If Aleena spins the spinner $12$ times, how many times can she expect to spin a 2?

Answer: .....

**Q2**

U166

A factory is producing bags. The probability that a bag has a fault is $11\%$.
If the factory makes $600$ bags in a day, how many do you expect to be faulty?

Answer: .....

**Q3**

U580

Joe spun a spinner with four coloured sections a total of $20$ times. The table below shows how many times the spinner landed on each colour.

| Colour | Black | Pink | Yellow | Turquoise |
|---|---|---|---|---|
| Frequency | 7 | 6 | 2 | 5 |

a) What is the experimental probability of the spinner landing on pink? Give your answer as a decimal.

Answer: .....

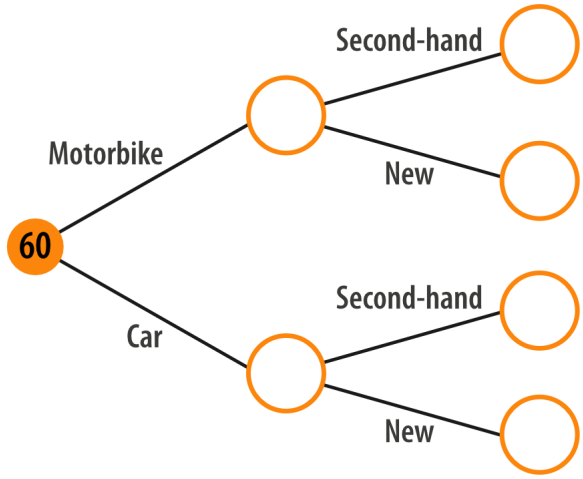
b) Explain how Joe could improve his experiment to get a better estimate for the probability.

Answer: .....

.....

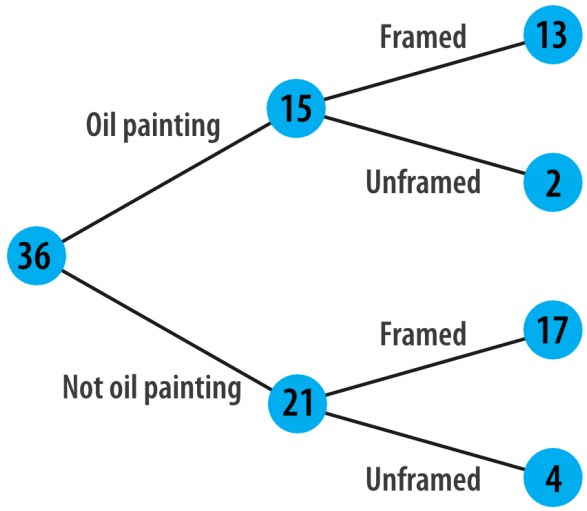
**Q4**
U280

A garage has $60$ vehicles for sale, which are all either new or second-hand.
$28$ of the vehicles are motorbikes and the rest are cars.
Of the motorbikes, $7$ are second-hand.
$3$ of the cars are new.
Complete the frequency tree to show this information.




**Q5**
U280

The frequency tree below shows information about the paintings in an art gallery.
What is the **probability** that a painting chosen at random is framed?
Give your answer as a fraction in its simplest form.




Answer: _____

# Calculations with standard form

**Q1**
U264

Calculate $(6 \times 10^{20}) \div (2 \times 10^{5})$
Give your answer in standard form.

Answer: .....

**Q2**
U264

Calculate $(9 \times 10^{2}) \times (3 \times 10^{4})$
Give your answer in standard index form.

Answer: .....

**Q3**
U290

Work out $(7 \times 10^{4}) + (6 \times 10^{4})$
Give your answer in standard index form.

Answer: .....

**Q4**
U290

Work out $(5.2 \times 10^{11}) - (7 \times 10^{9})$
Give your answer in standard form.

Answer: .....

**Q5**
U161

Use a calculator to work out

$$\frac{4.37 \times 10^{8}}{7.13 \times 10^{-3}}$$

Give your answer in standard form to 3 significant figures.

Answer: .....

**Q6**
U161

A grain of sand has a mass of $1.28 \times 10^{-2}$ grams.
What is the total mass of $1.9 \times 10^{10}$ grains of sand?
Give your answer in standard form.

Answer: ..... g

# Linear inequalities

**Q1**
U759

Solve the following inequality:
$3y + 8 \geq 23$

Answer: .....

**Q2**
U738

Solve $8x + 3 < 18 - 2x$

Answer: .....

**Q3**
U145

List **all** of the integer values that $x$ could take to satisfy the following inequality:
$6 < 2x \leq 10$

Answer: .....

**Q4**
U145

Solve $20 \leq \frac{x}{4} + 12 \leq 24$

Answer: .....

# Factorising and solving quadratic equations

**Q1**
U178

Fully factorise $w^2 + 8w + 12$

Answer: .....

**Q2**
U178

Factorise $k^2 + 9k - 10$ fully

Answer: .....

**Q3**
U178

Fully factorise $d^2 - 15d + 56$

Answer: .....

**Q4**
U963

Fully factorise $u^2 - 64$

Answer: .....

**Q5**
U228

Find the **two** solutions to the equation
$(x - 10)(x + 7) = 0$

Answer: .....

**Q6**
U228

a) Fully factorise $x^2 + 7x + 12$

Answer: .....

b) Use your answer to part a) to solve $x^2 + 7x + 12 = 0$

Answer: .....

**Q7**
U228

Solve this equation by factorising:
$y^2 + 5y - 14 = 0$

Answer: .....

# Rearranging formulae

**Q1**
U556

Make $h$ the subject of this formula:
$h + z = u$

Answer: .....

**Q2**
U556

Rearrange $\frac{d}{c} = a$ to make $d$ the subject.

Answer: .....

**Q3**
U556

Rearrange $bn - w = f$ to make $n$ the subject.

Answer: .....

**Q4**
U556

Make $d$ the subject of this formula:
$c = \frac{d - 3r}{13}$

Answer: .....

**Q5**
U556

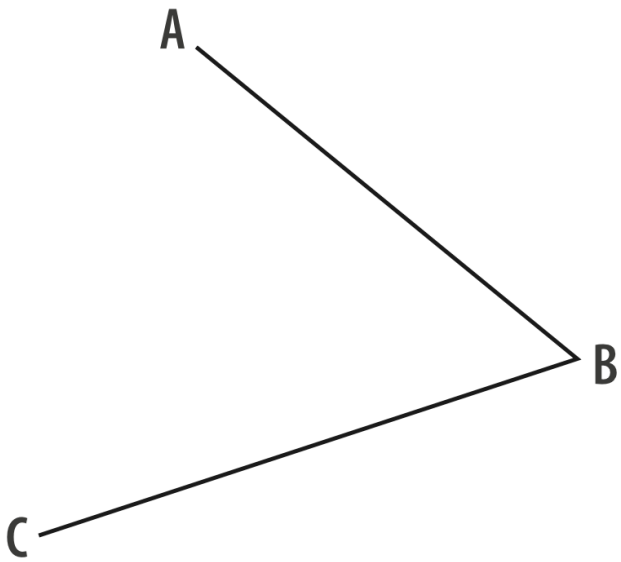
Make $v$ the subject of this formula:
$v(n + t) = d$

Answer: .....

# Constructing bisectors and perpendicular lines

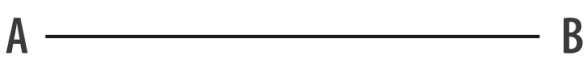
**Q1**
U787

Use a ruler and a pair of compasses to construct the bisector of angle $ABC$.
You must show all of your construction lines.




**Q2**
U245

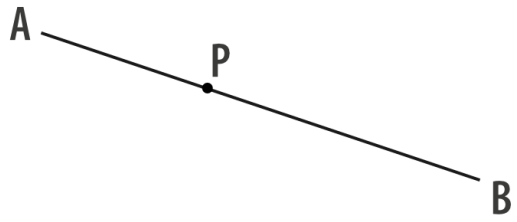
Use a ruler and a pair of compasses to construct the perpendicular bisector of line $AB$.
You must show all of your construction lines.



**Q3**

U245

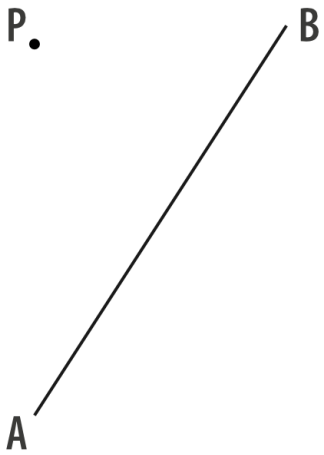
Use a ruler and a pair of compasses to construct the perpendicular to line $AB$ which passes through point $P$.
You must show all of your construction lines.




**Q4**

U245

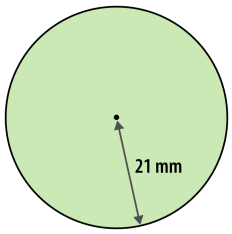
Use a ruler and a pair of compasses to construct the perpendicular from point $P$ to the line $AB$.
You must show all of your construction lines.



**Q1**

U950

The radius of the circle below is $21\text{ mm}$.
Calculate the area of the circle.
Give your answer to 1 d.p.



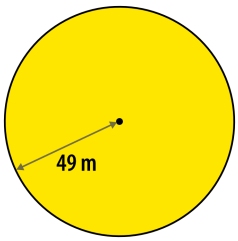

Not drawn accurately

Answer: _____ $\text{mm}^2$

**Q2**

U604

The circle below has a radius of $49\text{ m}$.
What is the circumference of the circle?
Give your answer to 1 d.p.



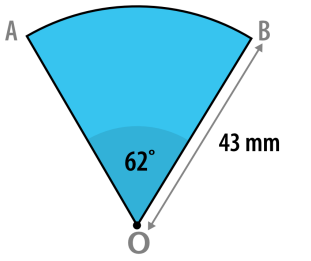

Not drawn accurately

Answer: _____ $\text{m}$

**Q3**

U221

$OAB$ is a sector of a circle as shown below.
Work out the length of the arc $AB$.
Give your answer to 1 d.p.




Not drawn accurately

Answer: _____ $\text{mm}$

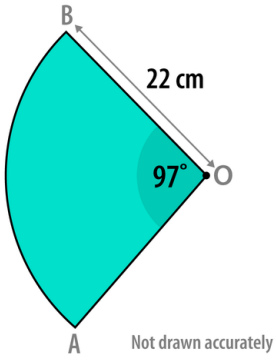
**Q4**

U373

$OAB$ is a sector of a circle as shown below.

Work out the area of $OAB$.

Give your answer to 1 d.p.




Answer: ..... $cm^2$

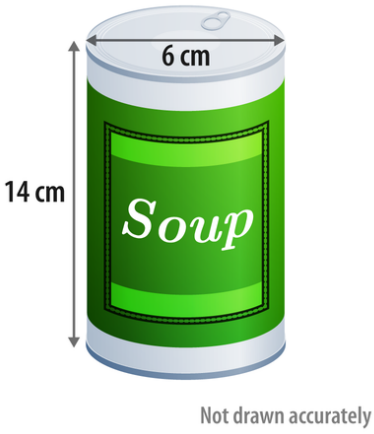
**Q5**

U464

The can of soup below is cylinder shaped.

Work out the total surface area of the can.

Give your answer to 1 d.p.

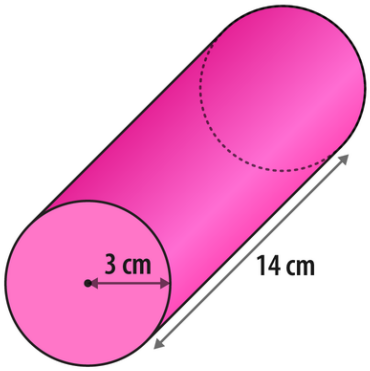



Answer: ..... $cm^2$

**Q6**

U915

The cylinder below has a radius of $3\,\text{cm}$ and a length of $14\,\text{cm}$.
Work out the volume of the cylinder.
Give your answer to the nearest integer.



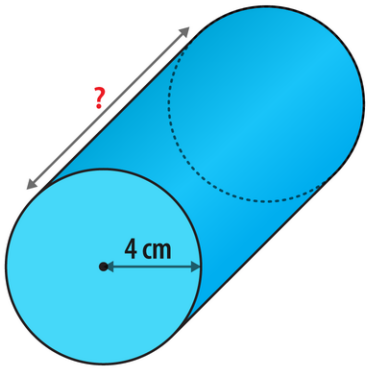

Not drawn accurately

Answer: _____ $\text{cm}^3$

**Q7**

U915

The cylinder below has a radius of $4\,\text{cm}$ and a volume of $350\,\text{cm}^3$.
Work out the length of the cylinder.
Give your answer to 2 d.p.

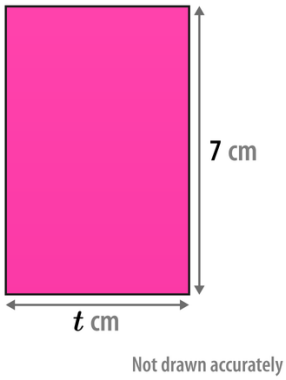



Not drawn accurately

Answer: _____ $\text{cm}$

**Q1**
U337

The rectangle below has an area of **at least** $28\,\text{cm}^2$.
Write and solve an inequality for the possible values of $t$.




Not drawn accurately

Answer: .....

**Q2**
U594
U456

What is the median value in this list?

$\frac{6}{10}, \quad \frac{1}{2}, \quad 0.9, \quad 75\%, \quad 0.03$

Answer: .....

**Q3**
U881

The original price of a suit was $£60$.
In a sale, it was **reduced by** $\frac{1}{10}$ of its original price.
What was its sale price?

**Q4**
U337

Samuel thinks of a number, $k$. He triples it and then subtracts $11$ to get an answer that is less than $43$.

a) Write an inequality to represent this.

Answer: _____

b) Solve your inequality to find the possible values of $k$.

Answer: _____

**Q5**
U166

$180$ people enter a competition.
The probability of winning the competition is $\frac{1}{6}$ and each winner gets a prize of $£8$.
How much prize money would you expect to be won **in total**?

Answer: $£$ _____

**Q6**
U161
U291

Find the mean of the numbers below.
$3.25 \times 10^7$
$6.54 \times 10^5$
$8.21 \times 10^6$
Give your answer in standard form to 3 significant figures.

Answer: _____

**Q7**
U683

A spinner has four sections labelled A, B, C and D.
The probabilities of it landing on sections A, B and C are shown in the table below.
Complete the table to show the probability, as a percentage $(\%)$, of the spinner landing on section D.

| Section | Probability |
|---|---|
| A | $\frac{1}{20}$ |
| B | 0.23 |
| C | 37% |
| D | ☐ % |

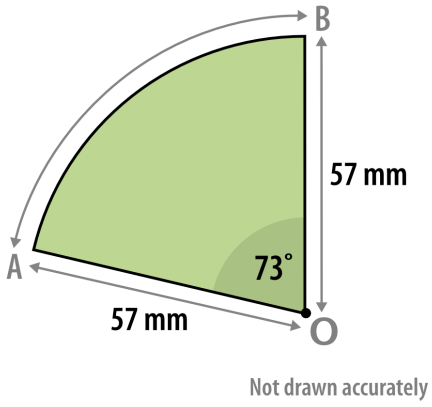
**Q8**
U556

Make $x$ the subject of
$\sqrt{x+7} = p$

Answer: .....

**Q9**
U221

$OAB$ is a sector of a circle as shown below.
Calculate the **perimeter** of the sector $OAB$.
Give your answer to 1 d.p.



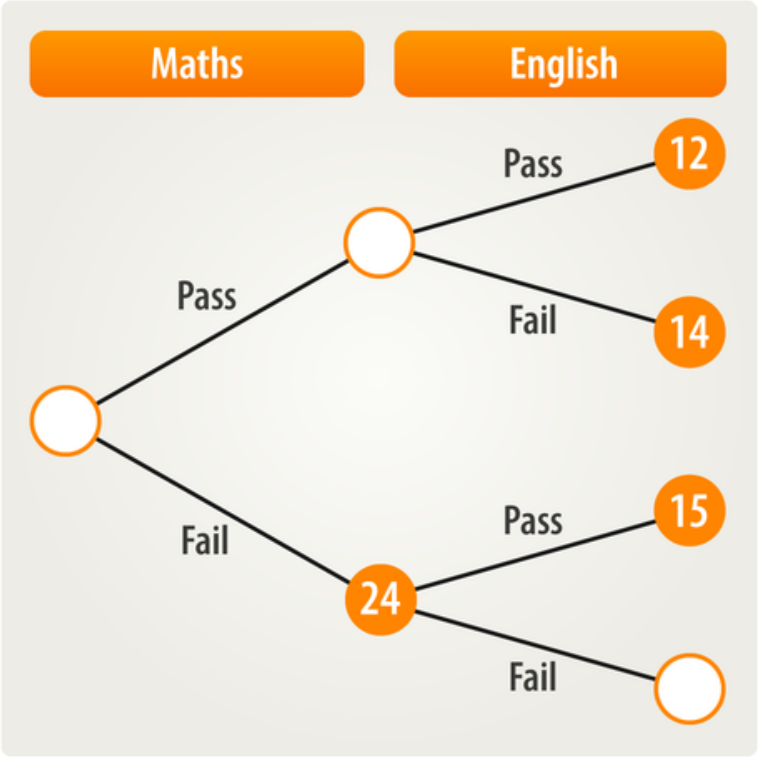

Not drawn accurately

Answer: ..... mm

**Q10**

U280

A group of students sat a maths test and an English test.
The frequency tree below shows some information about whether the students passed or failed each test.
A student is chosen at random from the group. What is the probability that they failed **at least** one test?
Give your answer as a fraction in its simplest form.




Answer: .....

**Q11**

U963

Fully factorise the expression $9 - f^2$

Answer: .....

**Q12**

U161
U526

Find the range of the numbers below

$6.12 \times 10^7$

$48\,300\,000$

$750\,000$

$9.42 \times 10^6$

Give your answer in standard form.

Answer: .....

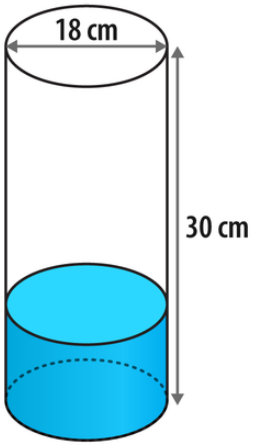
**Q13**

U915
U349

The cylindrical vase below is $23\%$ filled with water.

Work out how much water is in the vase.

Give your answer to 1 d.p.




Not drawn accurately

Answer: ..... $\text{cm}^3$

**Q14**
U286

During a javelin throwing competition, Joseph achieves a new personal best distance by throwing the javelin $92.88\,\text{m}$.
This is an increase of $8\%$ from his previous personal best distance.
Work out Joseph's previous personal best distance.

Answer: ..... m

**Q15**
U556

Rearrange $y = \frac{n}{z}$ to make

a) $n$ the subject.

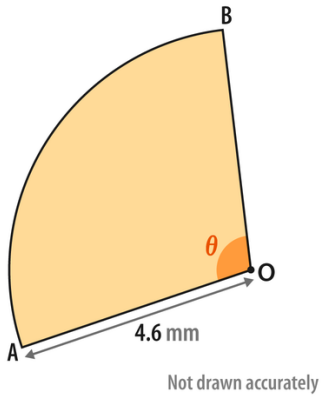
Answer: .....

b) $z$ the subject.

Answer: .....

**Q16**
U373

$\text{OAB}$ is a sector of a circle. The area of $\text{OAB}$ is $18\,\text{mm}^2$.
Calculate the central angle, $\theta$, to 1 d.p.




Answer: ..... °

**Q17**
U228

Use factorising to solve the equation below.

$x^2 - 5x = 0$

Answer: .....

**Q18**
U166

The probability of winning a prize in a competition is $16\%$. How many people need to enter the competition for the expected number of winners to be $32$?

Answer: .....

**Q19**
U161

$(a \times 10^b) \times (5.2 \times 10^7) = 4.264 \times 10^3$

Given that $a \times 10^b$ is in standard form, work out the values of $a$ and $b$.

Answer: $a =$ ..... $b =$ .....

Q20

U245

Draw a circle with radius $5\,\text{cm}$, and then draw any two chords on that circle.
Construct the perpendicular bisector of each of your chords.
You must show all of your construction lines.
Where do the perpendicular bisectors intersect?

Answer: .....

**Q21**

U580

Aiden had a six-sided dice numbered from 1 to 6. He rolled it $120$ times.

a) If the dice were fair, how many times would you expect it to have landed on 3?

Answer: .....

b) Aiden recorded that the dice landed on 3 a total of $19$ times. Is the dice definitely biased or definitely not biased, or is it impossible to tell? Write a sentence to explain your answer.

Answer: .....

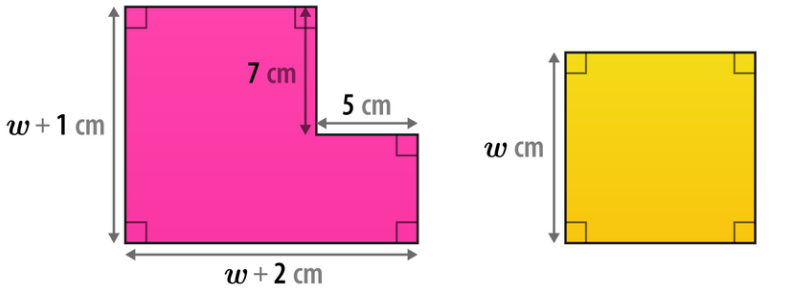
.....

.....

**Q22**

U337

A compound shape and a square are both shown below.
The area of the compound shape is greater than the area of the square.
Work out the smallest possible integer value of $w$.




Not drawn accurately

Answer: .....

**Q23**

U178

a) What is the value of $d^2 + 8d + 7$ when $d = 10$?

Answer: .....

b) Fully factorise $d^2 + 8d + 7$.

Answer: .....

c) Using your answer to part b), work out the two prime factors of $187$.

Answer: ..... and .....

**Q24**

U278

The table below shows the population of a town, recorded in different years.
Calculate the percentage decrease in the population between 2000 and 2005.
Give your answer to the nearest $1\%$.

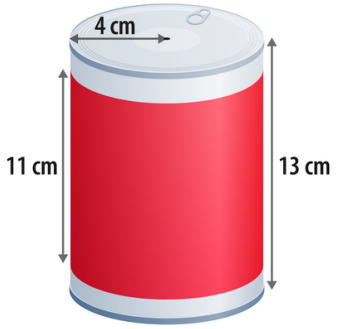
| Year | Population of the town |
|---|---|
| 2000 | 24,699 |
| 2005 | 17,958 |
| 2010 | 22,043 |

Answer: ..... %

**Q25**

U464

A red label is wrapped all the way around the curved surface of a cylindrical can, as shown below.




Not drawn accurately

a) What is the area covered by the label?
Give your answer to 1 d.p.

Answer: ..... $\text{cm}^2$

b) What percentage of the total surface area of the can is covered by the label?
Give your answer to the nearest $1\%$.

Answer: ..... $\%$

**Q26**

U228

Expand and factorise to solve
$x^2 + 5(3x + 10) = 0$

Answer: .....

**Q27**

U556

a) Which of the equations below is equivalent to $y = x(a + b)$?

$a = \frac{y - b}{x}$ $a + b = \frac{y}{x}$

Answer: .....

b) Write down two more equations that are equivalent to $y = x(a + b)$

Answer: .....

**Q28**

U161

The mass of a hydrogen atom is $1.67 \times 10^{-24}$ grams.

The mass of an oxygen atom is $2.66 \times 10^{-23}$ grams.

A molecule of water contains $2$ atoms of hydrogen and $1$ atom of oxygen.

a) Calculate the mass of one molecule of water, giving your exact answer in standard form.

Answer: ..... g

b) Calculate the number of molecules in $1$ gram of water, giving your answer in standard form to 3 significant figures.

Answer: ..... molecules

**Q29**

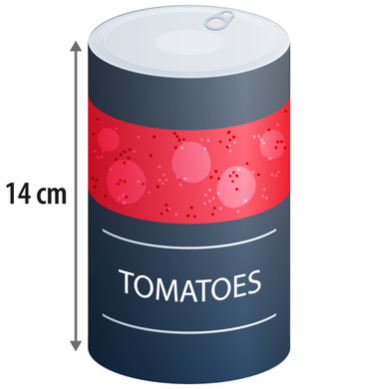
U915

U464

A tin of tomatoes has a volume of $126\pi\ \text{cm}^3$. The tin is $14\ \text{cm}$ tall, and has a label which covers the entire curved surface area of the tin.

Work out the area covered by the label.

Give your answer in terms of $\pi$.




Not drawn accurately

Answer: _____ $\pi\ \text{cm}^2$

**Q30**

U278

A number was decreased by $38\%$.

By what percentage would the new value need to be increased in order to return to its original value?

If your answer is a decimal, then round it to 1 d.p.

Answer: _____ $\%$

Q31

U245

U787

Use a ruler and a pair of compasses to construct a $45^\circ$ angle.
You must show all of your construction lines.

# Answers

## Fractions, decimals and percentages review

**Q1** 5

**Q2** 24

**Q3** 21

**Q4** 98 kg

**Q5** 6% -> 0.4 -> $\frac{23}{50}$

**Q6** 17

**Q7** 380.7 miles

**Q8** 8.73

**Q9** 45

## Percentage change

**Q1** 725

**Q2** £ 6580

**Q3** £ 3250

**Q4** £ 46.36

**Q5** £ 259785

**Q6** £ 650

**Q7** £ 74

**Q8** £ 145

**Q9** 40 %

**Q10** 24 %

## Theoretical and experimental probability

**Q1** a) $\frac{1}{3}$

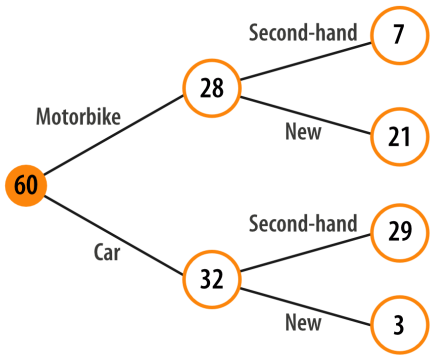
b) 4

**Q2** 66

**Q3** a) 0.3

b) He could increase the number of spins

**Q4**




**Q5** $\frac{5}{6}$

## Calculations with standard form

**Q1** $3 \times 10^{15}$

**Q2** $2.7 \times 10^{7}$

**Q3** $1.3 \times 10^{5}$

**Q4** $5.13 \times 10^{11}$

**Q5** $6.13 \times 10^{10}$

**Q6** $2.432 \times 10^{8}$ g

# Answers

## Linear inequalities

**Q1** $y \geq 5$

**Q2** $x < 1.5$

**Q3** $4 \quad 5$

**Q4** $32 \leq x \leq 48$

## Factorising and solving quadratic equations

**Q1** $(w+2)(w+6)$

**Q2** $(k-1)(k+10)$

**Q3** $(d-7)(d-8)$

**Q4** $(u+8)(u-8)$

**Q5** $x = 10$ or $x = -7$

**Q6** a) $\left(x+3\right)\left(x+4\right)$

b) $x = -4$ or $x = -3$

**Q7** $y = -7$ or $y = 2$

## Rearranging formulae

**Q1** $h = u - z$

**Q2** $d = ac$

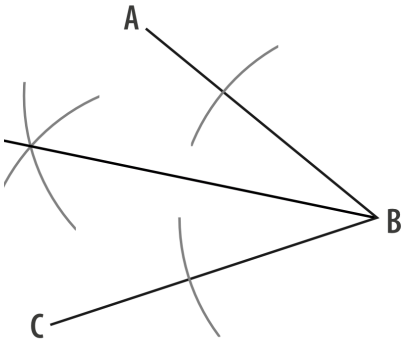
**Q3** $n = \frac{f+w}{b}$

**Q4** $d = 13c + 3r$

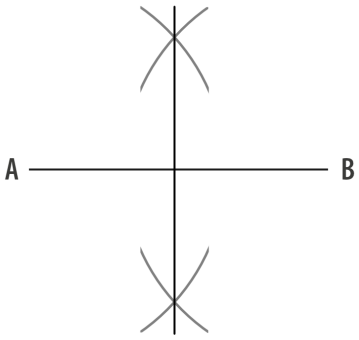
**Q5** $v = \frac{d}{n+t}$

## Constructing bisectors and perpendicular lines

**Q1**

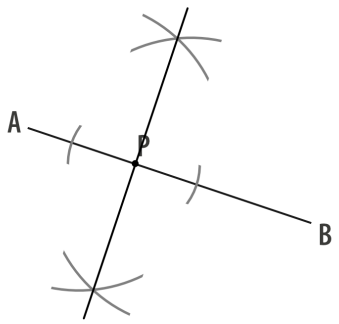



**Q2**

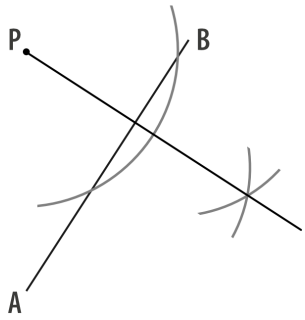


## Constructing bisectors and perpendicular lines

**Q3**




**Q4**




## Circles and cylinders

**Q1** $1385.4\ \text{mm}^2$

**Q2** $307.9\ \text{m}$

**Q3** $46.5\ \text{mm}$

**Q4** $409.7\ \text{cm}^2$

**Q5** $320.4\ \text{cm}^2$

**Q6** $396\ \text{cm}^3$

**Q7** $6.96\ \text{cm}$

## Mixed questions

**Q1** $t \geq 4$

**Q2** $\frac{6}{10}$

**Q3** £ 54

**Q4** a) $3k - 11 < 43$

b) $k < 18$

**Q5** £ 240

**Q6** $1.38 \times 10^7$

**Q7** 35 %

**Q8** $x = p^2 - 7$

**Q9** 186.6 mm

**Q10** $\frac{19}{25}$

**Q11** $(3 + f)(3 - f)$

**Q12** $6.045 \times 10^7$

**Q13** $1755.8 \text{ cm}^3$

**Q14** 86 m

**Q15** a) $n = yz$

b) $z = \frac{n}{y}$

**Q16** $97.5^\circ$

**Q17** $x = 0$ or $x = 5$

**Q18** 200

**Q19** $a = 8.2$

$b = -5$

**Q20** The centre of the circle

**Q21** a) 20

b) Impossible to tell, because although the number of 3's is close to the expected number, there is still a chance the dice may be biased. More throws would help us to be more sure the dice was fair.

**Q22** 12

**Q23** a) 187

b) $(d + 7)$ $(d + 1)$

c) 11 and 17

**Q24** 27 %

**Q25** a) $276.5 \text{ cm}^2$

b) 65 %

**Q26** $x = -5$ or $x = -10$

## Mixed questions

**Q27** a) $a + b = \frac{y}{x}$

b) Any pair of correct equations e.g.
$a = \frac{y}{x} - b$
$b = \frac{y}{x} - a$

**Q28** a) $2.994 \times 10^{-23}$ g

b) $3.34 \times 10^{22}$ molecules

**Q29** $84\ \pi\ \text{cm}^2$

**Q30** $61.3\ \%$

**Q31**