

Year 10: Summer 2023

Maths Workbook

We have put together some work for you that will help ensure that your skills and knowledge are kept up to date ready for the lead up to your exams.

Being able to work independently will be critical for your success at GCSE and beyond.

If you have any problems with the work, we can be contacted by email. Try to complete as much as you can.

7 Days of Maths:

- Each day there will be a Numeracy worksheet to complete. These exercises should be done with as many mental strategies as possible, only resorting to calculators if you are truly stuck. These are your warm-ups
- Additionally, you will find that each day has 4 worksheets

You are NOT expected to complete all 4!

There are four levels of mathematical challenge, and you should aim to complete one worksheet that you are comfortable with, and one worksheet that you find difficult but not impossible.

Worksheets 1 & 2 cover primarily Foundation level topics, whereas worksheets 3 & 4 cover primarily Higher level.

Day 1

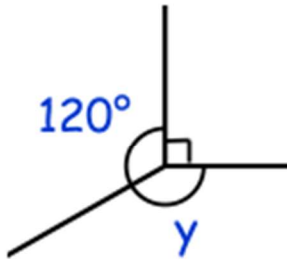
Warmup

Write the number 1804 in words.

A carton of milk costs 57p

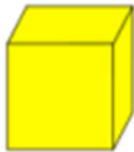


Find the cost of three cartons of milk.



Find y

Sketch the net of a cube

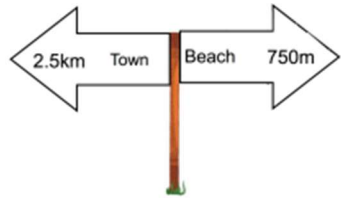


Calculate 50% of £3

Calculate 10% of £7

Worksheet 1&2

Work out 0.3×0.7



Work out the distance between the town and the beach.

State your units.

The same type of dinner plate is sold in two different packs.

Small pack
Contents
3 plates

£5.25



Large pack
Contents
12 plates

£21.24

Which is better value for money?

Share \$40 in the ratio 2:3

Factorise $15y + 20$

The table shows the ages of an under-21 rugby squad.

Age	Frequency
18	5
19	5
20	9
21	4

Find the mean age

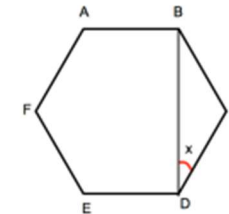
Harry rounds a number, y , to one decimal place.

His answer is 3.2.

Write down the error interval for y .

Shown below is a regular hexagon ABCDEF.

Calculate the size of angle BDC.

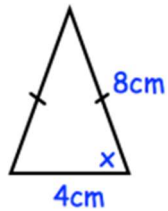


Calculate the gradient of the straight line passing through (0, 2) and (3, 11).

Write down the equation of the line.

How long would it take someone to run 10km at 4 metres per second?

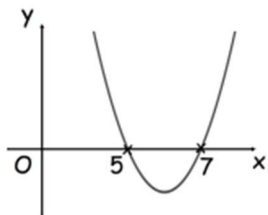
Worksheet 3&4



Find x

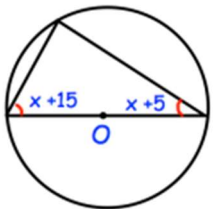
A rectangular rugby pitch has width 64 metres, measured to the nearest metre. The length of the pitch is 115 metres, measured to the nearest 5 metres.

Write down the upper bound of the perimeter of the pitch.



Shown is a sketch of $y = x^2 - 12x + 35$

Find the coordinates of the minimum point of the graph.



Find x



A puzzle is completed by 120 students. The quickest time was 8 seconds. 90 of the students took less than 40 seconds. The median and interquartile range are equal. The range is double the interquartile range. Draw a possible box plot for this information

Express as a single fraction.

$$\frac{1}{x+1} + \frac{4}{x-2}$$

Salary (£1000s)	Frequency
$0 < s \leq 10$	8
$10 < s \leq 20$	48
$20 < s \leq 30$	50
$30 < s \leq 50$	11
$50 < s \leq 200$	3

Calculate an estimate of the median salary

Show the equation

$$x^3 + 3x = 1$$

has a solution between $x=0$ and $x=1$

Show the equation

$$x^3 + 3x = 1$$

can be rearranged to give

$$x = \frac{1}{3} - \frac{x^3}{3}$$

Starting with $x_1 = 0$

use the iteration formula

$$x_{n+1} = \frac{1}{3} - \frac{(x_n)^3}{3}$$

three times to find a solution to

$$x^3 + 3x = 1$$

Day 2

Warmup

Martha is buying carrots.
The scale shows the amount she buys.

What amount of carrots does she buy?



Write the following numbers in order of size.

Start with the smallest number.

0.51 0.2 0.19 0.203 0.6

9:24 AM

The time on the clock is 9:24am.

Write 9:24am as 24 hour time:

Write 1:15pm as 24 hour time:

Menu
Tea £1.50
Coffee £2.00
Flapjack £2.50

Jack pays for **two coffees** and **two flapjacks**.

Altogether how much do they cost?



Max pays for one **tea**, one **coffee** and one **flapjack**.

He pays with a £10 note.

How much change should he get?

Worksheet 1&2

Simplify $a + a + a$

Simplify $4ac + 5ac$

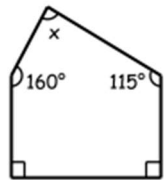
Shade 3 more triangles to make a pattern with rotational symmetry order 3.



A theatre has 52 rows of seats. Each row has 19 seats.

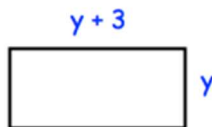
Estimate how much money is raised.

Tickets cost £9.75 each. All tickets are sold for a show.

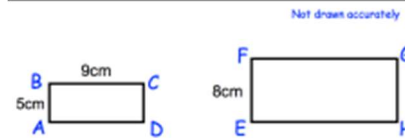


Work out x .

Write an expression, in terms of y , for the perimeter of the rectangle.



Solve $5(x + 3) = 31$



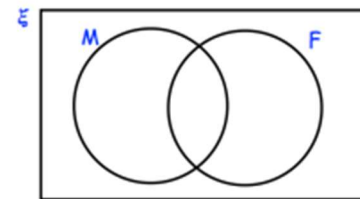
Work out the length of FG .

Rectangles $ABCD$ and $EFGH$ are similar.

$$u = v - at$$

$$v = 9 \quad a = -5 \quad t = \frac{1}{4}$$

Work out the value of u .



$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$
 $M = \text{Multiples of 3}$
 $F = \text{Factors of 30}$

Complete the Venn diagram

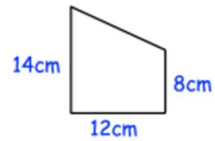
A number is chosen at random

Find $P(M \cup F)$

A number is chosen at random

Find $P(M \cap F)$

Worksheet 3&4



A frame is made from wire.
The frame is a trapezium
Calculate the total amount of wire needed to make the frame.

Give your answer to 1 decimal place.

The equation below can have irrational or rational solutions.

$$5x^2 = \frac{1}{a}$$

Write down a value for **a** which gives rational solutions.

Write down a value for **a** which gives irrational solutions.

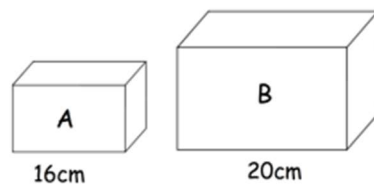
Write down a value for **a** which gives no solutions.

Cuboids A and B are similar but made from different materials.
Both cuboids are placed on a table.

The pressure on the table due to Cuboid A is 3.5 newtons/cm².
Cuboid A exerts a force of 420N on the table.

The pressure on the table due to Cuboid B is 4 times larger than Cuboid A.

Work out the force exerted by cuboid B on the table.



Show the equation $3x^3 + 7x = 5$ has a solution between 0 and 1

Show that $3x^3 + 7x = 5$ can be rearranged to give

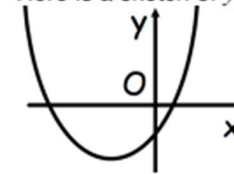
$$x = \frac{5}{7} - \frac{3x^3}{7}$$

Starting with $x_0 = 0$ use the iteration formula

$$x_{n+1} = \frac{5}{7} - \frac{3x_n^3}{7}$$

three times to find an estimate for the solution to $3x^3 + 7x = 5$

Here is a sketch of $y = 2x^2 + 5x - 12$



Find the equation of the line of symmetry of the graph.

The ratio of A to B is 1:400 where 400 is given to the nearest 100.

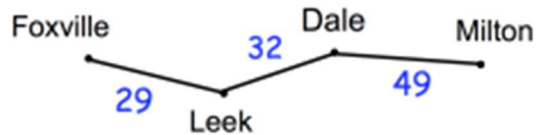
B is 5×10^{15} correct to one significant figure

Calculate the minimum value of A
Give your answer in standard form.

Day 3

Warmup

The distances, in miles, between four towns are shown on the map.



Work out the distance between Foxville and Milton.



Look at the four digit cards above.

Create the smallest possible two digit **odd** number.

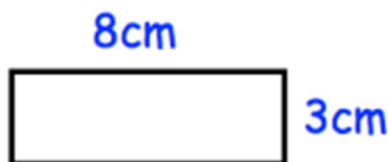
You may only use each card once.



A television costs £275

Work out the cost of two televisions

Work out the perimeter of this rectangle.



Complete the tally chart

Blue Blue Red Green White

Blue White Red Red Red

Red Red Green Blue

Colour	Tally	Frequency
Blue		
White		
Red		
Green		

Worksheet 1&2

Max earns £220 per week.
He is given an increase of 10%.

What is his new salary?

	French	German
Male	14	
Female		8

There are twice as many boys studying French than girls.

The total number of students is 50.

Find the missing numbers.

If $15 \times 34 = 510$

Use that information to work out:

150×34

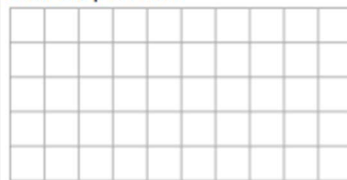
30×34

1.5×34



Front

Draw the plan view.



Simplify $7w - 2w$

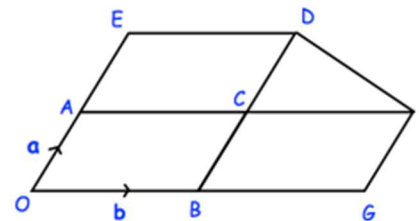
Simplify $7h + 5k + h - 3k$

Write 237.5% as a fraction.
Give your answer in its simplest form.

Every weekday, Sohail runs $2\frac{1}{2}$ miles.
On a Saturday and a Sunday, he runs $4\frac{2}{3}$ miles.

How far does Sohail run over the course of 1 week?

Calculate the density of a piece of wood with a mass of 21g and a volume of 35cm^3



In the diagram OBDE and OAFG are parallelograms.

B is the midpoint of OG.

A is the midpoint of OE.

$$\vec{OA} = \mathbf{a} \quad \text{and} \quad \vec{OB} = \mathbf{b}$$

Express, in terms of \mathbf{a} and \mathbf{b} , the vector

\vec{OE}

Express, in terms of \mathbf{a} and \mathbf{b} , the vector

\vec{BA}

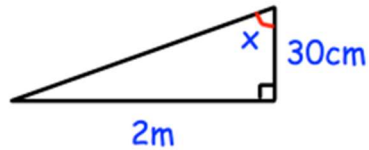
Worksheet 3&4

$$f(x) = (4x - 5)(x + 1)^2$$

Find $f(-2)$

Solve using the quadratic formula, to 1 decimal place.

$$x^2 - x - 10 = 0$$



Find x

Find the equation of the straight line through the points (1, 12) and (3, 8).

The point (c, 10) lies on the same line. Find c

$$5^n = \frac{25^q}{5^{q+3}}$$

Write n in terms of q .

Simplify

$$\left(\frac{2x}{3}\right)^{-2} \div \frac{5}{x}$$

A microwave is placed on a worktop. The area of the microwave in contact with the table is 600cm^2 to the nearest 5cm^2

Work out the upper bound of the force exerted by the microwave on the worktop.

The pressure on the worktop is 2450 Newtons/m^2 to 3 significant figures

Write $0.08\dot{2}$ as a fraction in its simplest form.

One solution of the equation $\sin x = 0.72$ is $x = 46^\circ$

Find another solution of this equation for values of x between 0° and 360°



The diagram shows a solid made up of a cone and a hemisphere.

Show the volume of the solid is $\frac{28}{3}\pi x^3$

Day 4

Warmup

16×10

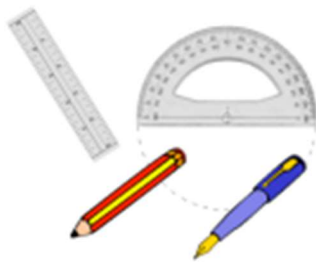
91×100

7.2×10

0.6×100

Draw a kite

Draw a parallelogram



A ruler costs 65p
A protractor costs 72p
A pencil costs 19p
A pen costs 26p

James buys one ruler, one protractor, one pencil and one pen.

How much change should he receive from £5?

Work out the total cost.

Simplify

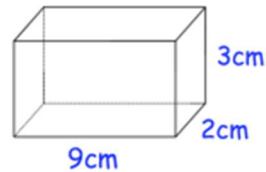
$$\frac{15}{20}$$

Worksheet 1&2

Solve

$$\frac{x}{2} - 3 = 7$$

Work out the volume of the cuboid.



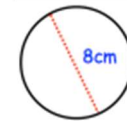
Expand and simplify

$$(x + 5)^2$$

Scale: 1cm represents 100km



Calculate the actual distance from C to D



Calculate the area of the circle.
Leave your answer in terms of π

The cost of a table is £ x
A TV costs £15 more than a table.
The total cost of a table and a TV is £335.

Find the cost of a TV.

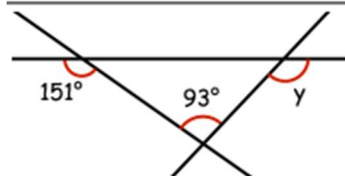
The weight of a 2p coin is 7g.

Find the weight of £8 worth of 2p coins.
Give your answer in kilograms.

The line L has gradient 7 and passes through the point (0, 2).

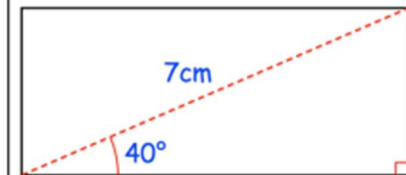
Write down the equation of the line L.

Write down the equation of a line parallel to L.



Find the size of angle y .

Work out the area of the rectangle.
Give your answer to 1 decimal place.



Above are 3 straight lines.

Worksheet 3&4

Solve, giving your answers to one decimal place.

$$8x^2 - 8x - 9 = 0$$

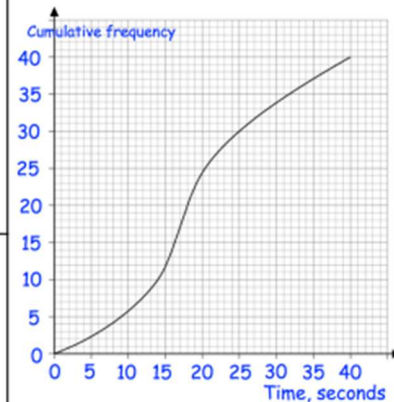
Lorcan invested £4000 in a savings for one year. He receives interest at the end of the year.

Lorcan gives 30% of the interest to his sister, Beth. Lorcan gives Beth £7.20.

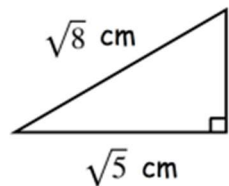
Work out the percentage interest rate for the savings account.

The graph shows information about the time taken by 40 children to answer a question.

Find an estimate for the interquartile range.



Show that less than 20% of the children took longer than 30 seconds.



Calculate the length of the missing side. Leave your answer as a surd.

Work out

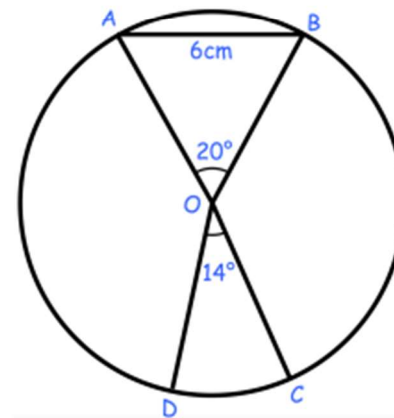
$$4^{-\frac{5}{2}}$$

Show using algebra

$$1.0\dot{2}\dot{4} = 1\frac{4}{165}$$

Rationalise the denominator

$$\frac{2 - \sqrt{3}}{\sqrt{2} - 1}$$



Which has the greatest area, triangle OAB or sector ODC?

Day 5

Warmup

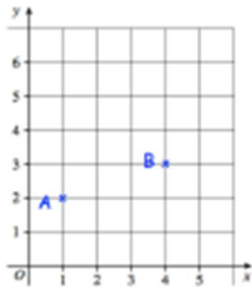


Name this 3D shape



Name this 3D shape

Write down the value of the **6** in the number 17629.



Write down the coordinates of point A

Write down the coordinates of point B

Work out 8 squared.

Work out 12 squared.

Mary has £1.20

David has £2

How much money should David give Mary so that they have the same amount?

Worksheet 1&2

2 4 3 4 8 1 14

What is the median?

What is the mode?

Anna has a mobile phone.
Text messages cost 3p each.
Calls cost 5p per minute.
She also has to pay £10 each month.

In September, Anna:
- made 100 minutes of calls
- sent 70 text messages.
How much was her bill in September?

In the grid, each row adds up to the number to the right.

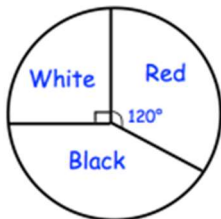
Find the values of w, x, y and z.

w	w	w	w	20
w	w	x	x	24
w	x	x	y	25
w	x	y	z	30



Write down the type of triangle shown.

Work out the perimeter of the triangle.



The pie chart shows the colours of counters in a bag.
There are 48 counters in total.

How many are red?

Expand $4y^2(5y^2 - 2a)$

Solve $x^2 + 3x - 4 = 0$

Height (h metres)	Frequency
$1.50 \leq h < 1.55$	6
$1.55 \leq h < 1.60$	10
$1.60 \leq h < 1.65$	24
$1.65 \leq h < 1.75$	17
$1.75 \leq h < 1.85$	3

Calculate an estimate of the mean height.

Solve the simultaneous equations

$$y + 1 = 2x$$

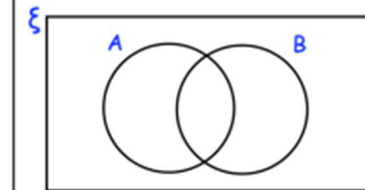
$$y = x + 2$$

$$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

$$A = \{\text{multiples of } 4\}$$

$$B = \{\text{factors of } 20\}$$

Draw a Venn diagram for this information.



Worksheet 3&4

Work out $49^{\frac{1}{2}}$

Solve

$$4x^2 - 25 = 0$$

Simplify

$$\frac{5x^2 - 13x + 6}{x^2 - 4}$$

There are 20 sweets in a bag.

x of the sweets are strawberry flavour and the rest are chocolate.

Zuzanna picks a sweet at random from the bag and notes its flavour. She **replaces** the sweet and then picks another at random.

Write down an expression for the probability that both sweets are strawberry flavour.

$xy = a$ where a is a constant

Select the correct statement

y is directly proportional to x

x is directly proportional to y

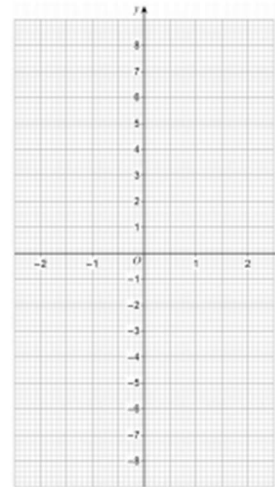
y is directly proportional to $\frac{1}{x}$

y is inversely proportional to $\frac{1}{x}$

Show algebraically that

$$0.9\dot{1}\dot{3}$$

can be written as $\frac{452}{495}$

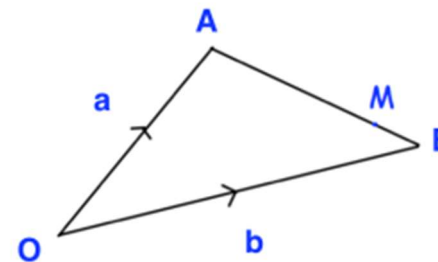


$$f(x) = \frac{x + 1}{3}$$

Find $f^{-1}(x)$

Draw

$$y = f(x) \text{ and } y = f^{-1}(x)$$



OAB is a triangle.

M is a point on AB such that $AM : MB = 5 : 2$

$$\vec{OA} = \mathbf{a} \quad \vec{OB} = \mathbf{b}$$

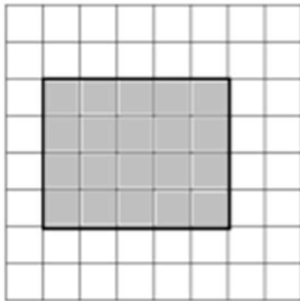
Express \vec{MO} in terms of \mathbf{a} and \mathbf{b}

Day 6

Warmup

$442 + 1480$

$5020 - 1352$



A rectangle is drawn on a centimetre squared paper.

Work out the perimeter of the rectangle.

Location	Elevation
Georgetown	-2 metres
Amsterdam	-1 metre
Paris	34 metres
New Orleans	-2 metres
Salton City	-38 metres
Dublin	8 metres

List the cities that are below sea-level, 0 metres.

Which city has the highest elevation?

Which city has the lowest elevation?



(a) Convert 75 miles into kilometres

(b) Convert 40 kilometres into miles

Worksheet 1&2

$$\boxed{2} \times \boxed{} = \boxed{-16}$$

$$\boxed{} \times \boxed{-7} = \boxed{42}$$

Foxtown				
52	Sandcliff			
70	32	Red Island		
31	14	28	Donhampton	

The table shows the distances in miles by road between some towns.

Which two towns are the furthest apart?

Solve $x + 5 = 7$

Solve $2w - 1 = 13$

A red light flashes every 4 seconds.

A blue light flashes every 9 seconds.

They have both just flashed at the same time.

How long until they both flash again at the same time?

Multiply out $x(x + 3)$

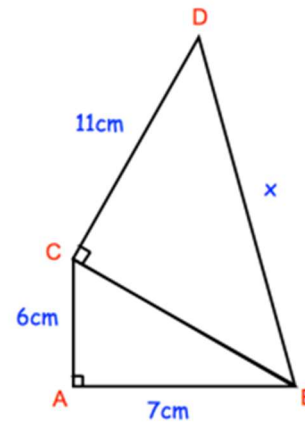
Expand $3(2y - 1)$

Solve the inequality $2x + 9 > 19 - 8x$

Sketch the range of possible solutions on a number line.



Find x



Complete the table of values for $y = x^3$ and draw its graph

x	-2	-1	0	1	2
y					



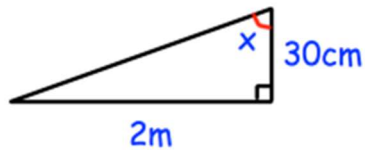
Worksheet 3&4

$$f(x) = (4x - 5)(x + 1)^2$$

Find $f(-2)$

Solve using the quadratic formula, to 1 decimal place.

$$x^2 - x - 10 = 0$$



Find x

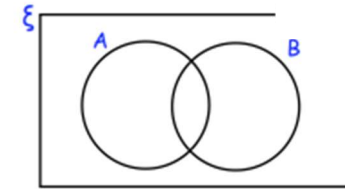
Find the equation of the straight line through the points (1, 12) and (3, 8).

The point (c, 10) lies on the same line. Find c

$$5^n = \frac{25^q}{5^{q+3}}$$

Write n in terms of q .

$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$
 $A = \{\text{square numbers}\}$
 $B = \{\text{cube numbers}\}$

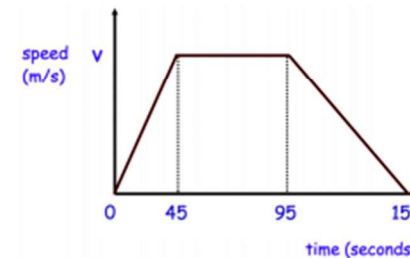


Find $P(A \cup B)$

Find the probability of B given A.

$$f(x) = \frac{4x}{3} - 2$$

Work out the value of $f^{-1}(10)$



Work out the value of v .

Here is a speed-time graph for a train journey.

The journey took 150 seconds.
 The train travelled 1.53km in the 150 seconds.

Day 7

Warmup

Here is a list of numbers

8 9 11 13 14 15

Write down an even number from the list.

Write down a square number from the list.

Write down two numbers that add to give 22 from the list.

$$680 \div 20$$

Mary buys a lemon cupcake and a strawberry cupcake.
Each cupcake costs £1.35

She pays with a £5 note.
How much change should she receive?



Draw two lines that are parallel

Draw two lines that are perpendicular

A theatre has 20 rows.
There are 15 seats in each row.
During a show at the theatre, there are 30 empty seats.

Work out how many people are watching the show.

Worksheet 1&2

Vicky buys an ice cream for €2.16 in Berlin.
The exchange rate is £1 = €1.60

Find the cost of the ice cream in pounds.

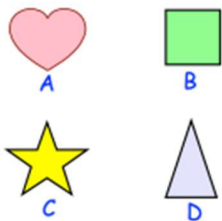
Calculate the nth term for

2, 7, 12, 17, 22

Using the nth term, work out the 100th term

Country	Frequency	
France	3	
Wales	4	
England	11	

Jayden is drawing a pie chart.
Work out the size of each angle.



Shape	A	B	C	D
Order of rotational symmetry				

Expand $5(y + 4)$

Expand $2(3y + 1)$

Write down **all** the integer values of x that satisfies $-7 \leq 2x + 1 < 8$

Maria buys 30 bags of marshmallows at a total cost of £45.
Each bag says that it contains 20 to 30 marshmallows.

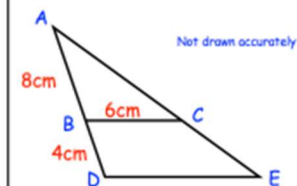
She says each marshmallow costs 7.5p

Explain how Maria has reached this conclusion.

Work out the lowest possible cost of each marshmallow

ABD and ACE are straight lines.
BC is parallel to DE.

Work out the length of DE



$7x - 1$ cm



$5x + 13$ cm

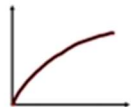
Shown is a square.
Calculate the perimeter of the square.

Worksheet 3&4

Solve $5x^2 - 11x - 4 = 0$ using the quadratic formula.

Reggie measured the length and width of a rectangle. He measured the length to be 18cm correct to the nearest centimetre. He measured the width to be 10cm correct to the nearest 10 centimetres.

Calculate the lower bound for the area of this rectangle.

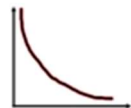


$$y \propto \frac{1}{x}$$

Match each graph to the correct relationship.



$$y \propto \sqrt{x}$$



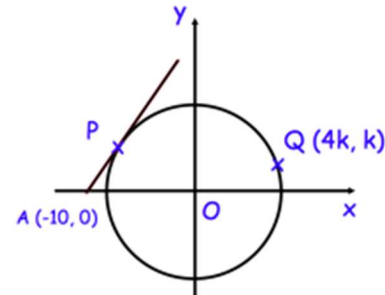
$$y \propto x$$

Simplify $\sqrt{18}$

Find the exact value of $\sin(90^\circ) + \cos(60^\circ)$

A car travelled for 135 minutes, to the nearest 5 minutes. It travelled for a total distance of 120 km, to the nearest 10km

Work out the greatest possible average speed, in m/s

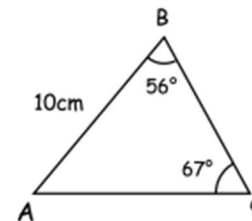


AP is a tangent to the circle. Angle OAP = 60°

Find the value of k to 1 decimal place.

Make q the subject of

$$\frac{p}{qr} = 2 + \frac{1}{r}$$



Find the area of ABC.