1st August **Higher Plus 5-a-day**

Corbettmaths

Write down the exact value of $\sin 30°$

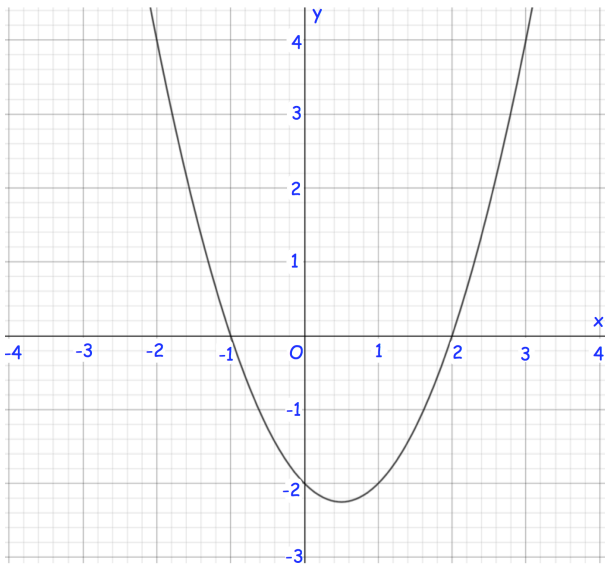
There are x apples in a crate.
3 of the apples are bad.

Mason chooses two apples from the crate, without replacement.

The probability that he selects two good apples is $\frac{5}{12}$

Prove $7x^2 - 79x + 144 = 0$

By using the quadratic formula, find x, the number of apples in the crate



Shown is y = f(x)

Find ff(1)

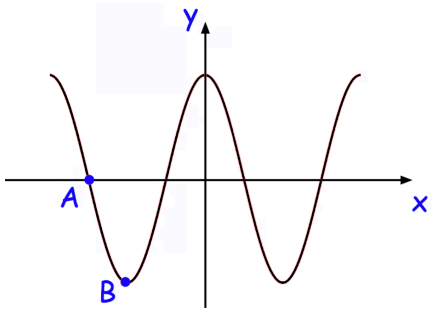
Sketch y = f (x + 3)

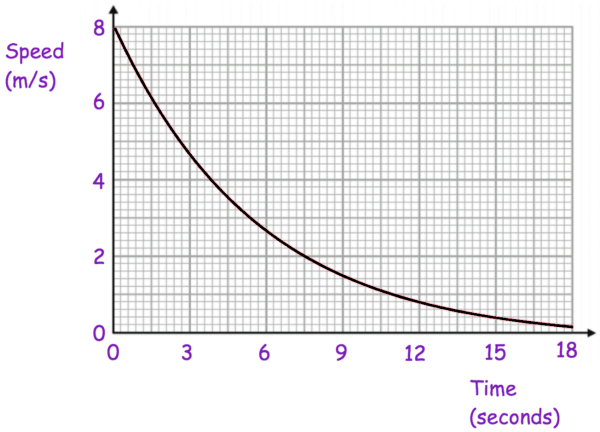
2nd August **Higher Plus 5-a-day**

Corbettmaths

Here is a sketch of y = cos (x)

Write down the coordinates of point A and point B





Work out an estimate for the distance travelled over the first 12 seconds of the journey.
Use 4 strips of equal width.

Find the coordinates where the line $y = x + 8$ and the curve $y = x^2 + 19x + 80$ intersect

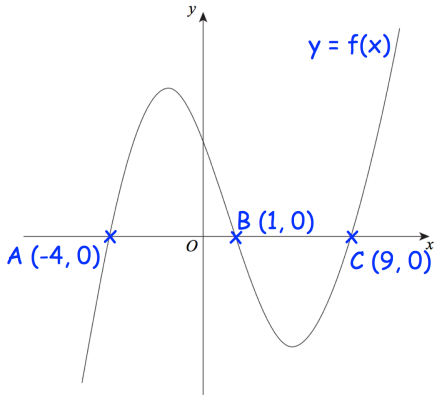
Solve

$$\frac{8^{4+x}}{4^{5-x}} = 0.5$$

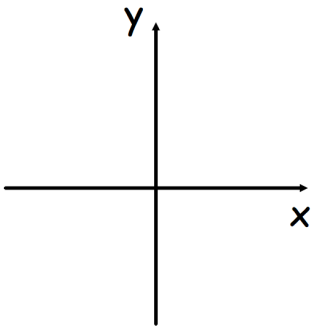
3rd August **Higher Plus 5-a-day**

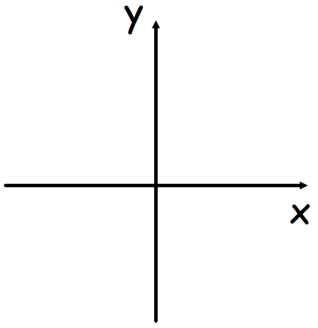
Corbettmaths

Shown is the graph y = f(x)



Sketch
(a) y = f(–x) (b) y = f(x + 3)

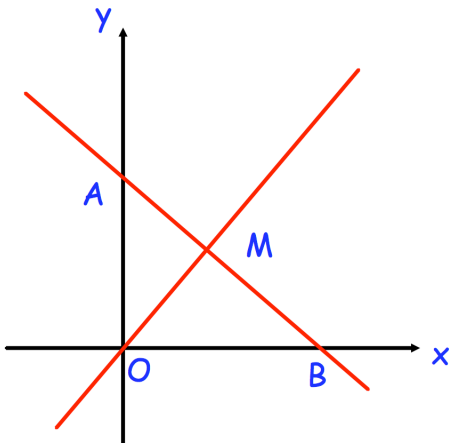




For all values of x

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

Solve
$fg(x) = gf(x)$



The line l_1 passes through the points A and B. It has equation $2x + 5y = 18$.
M is the midpoint of AB.
The line l_2 passes through the origin, O, and M.

Find the equation of line l_2

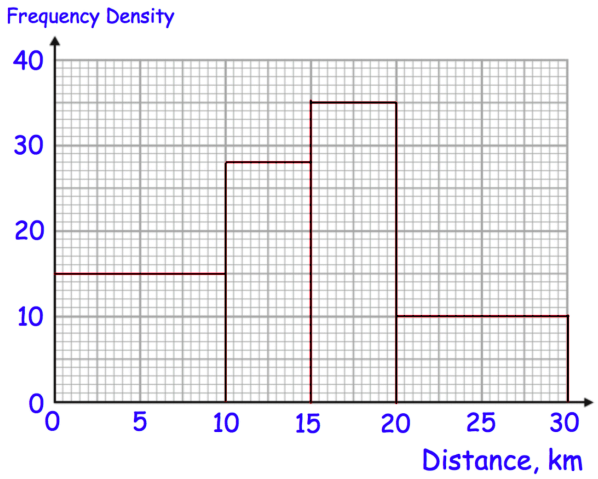
Find the area of triangle OAM.

4th August **Higher Plus 5-a-day**

Corbettmaths

Harry has rounded a number to 10 to one significant figure.

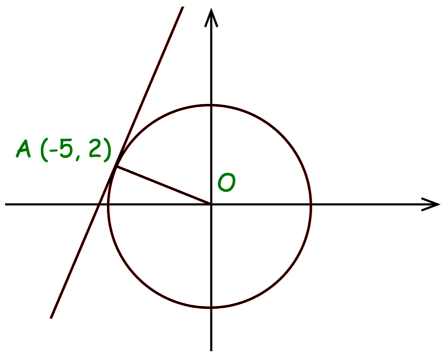
Write down the upper bound and lower bound.



Hannah surveyed students on how far they travel to college.
150 students travelled less than 10km.

How many students did Hannah survey?

Calculate an estimate of the mean distance travelled



The diagram shows the circle $x^2 + y^2 = 29$ with a tangent at the point (–5, 2)

Find the equation of the tangent

The tangent crosses the x-axis at the point B and the y-axis at the point C

Find the length BC

5th August **Higher Plus 5-a-day**

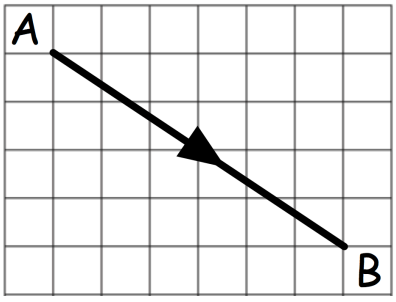
Corbettmaths

Prove algebraically that $0.6\dot{1}\dot{4}$

can be written as $\frac{304}{495}$

$\overrightarrow{AB} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$

Write down a vector that is perpendicular to AB and is two thirds of the length of AB.



The population of birds living on an island is decreasing exponentially.

Martin has begun to monitor the population each year.
Year 6 - Population 8000
Year 8 - Population 4000

What was the population in Year 2?

Two ships, A and B, leave a port at midday.

A travels on a bearing of 095° at a speed of 18km/h.
B travels on a bearing of 113° at a speed of y km/h.

At 14:00 the distance between A and B is 30km.
Boat B was travelling at a slower speed than boat A

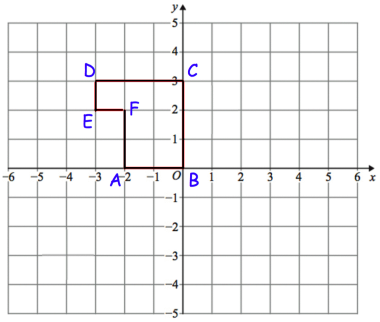
Work out y, the speed of boat B.

6th August	Higher Plus 5-a-day

Corbettmaths

Work out

$16^{-\frac{3}{4}}$



Describe a single transformation so that only vertex F is invariant.

Show that the equation $x^3 + 4x = 8$ has a solution between $x = 1$ and $x = 2$

Show the equation $x^3 + 4x = 8$ can be rearranged to give

$x = \sqrt[3]{8 - 4x}$

Starting with $x_0 = 1$, use the iteration formula $x_{n+1} = \sqrt[3]{8 - 4x_n}$ three times to find an estimate for the solution of $x^3 + 4x = 8$

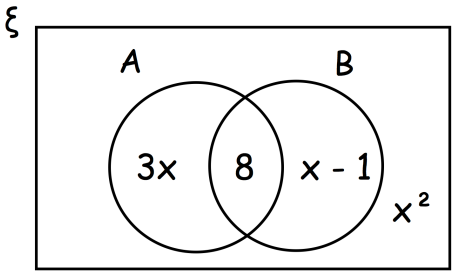
7th August	**Higher Plus 5-a-day**
A and B are similar cuboids volume of A: volume of B = 8 : 1000 Work out surface area of B: surface area of A	
How many even numbers greater than 40000 can be created using the digits 1 2 5 8 9 using each digit once?	
Find the coordinates where the line $x + y = 3$ and the curve $x^2 + 3y = 27$ intersect	
$\frac{61}{330}$ $0.1\dot{7}\dot{8}$ 3^{-2} $\frac{19}{110}$ Arrange in order from smallest to largest	
A solid metal cube has a side length of 6cm to 2 significant figures. The mass of the cube is 3.2×10^3 grams correct to 2 significant figures.	Work out the upper bound for the density of the metal.

8th August **Higher Plus 5-a-day**

Corbettmaths

327 people were surveyed about which countries they had visited.

A are people who have visited Austria.
B are people who have visited Belgium.



A person is chosen at random.

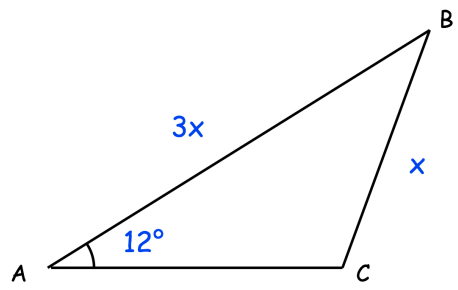
Work out the probability that they have been to Belgium

One of the people who has been to Austria is chosen at random.

Work out the probability that they have not been to Belgium

Simplify

$(\sqrt{32}+7\sqrt{2}\,)^2$



$\angle ACB$ is an obtuse angle.

Find the size of angle $\angle ACB$

Factorise

$6x^2 - 35xy + 49y^2$

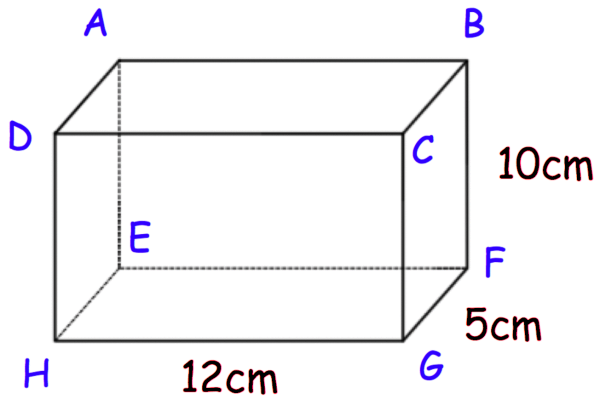
9th August **Higher Plus 5-a-day**

Corbettmaths

$g(x) = 15 - x$ $h(x) = x^3$

Solve $gh(x) = 140$

ABCDEFGH is a cuboid



Calculate the length of BH

Find the size of angle BHF

The nth term of a sequence is
$n^2 - 10n + 30$

By using completing the square, show that every term is positive.

$y = a \times b^x$

Where a and b are positive constants.

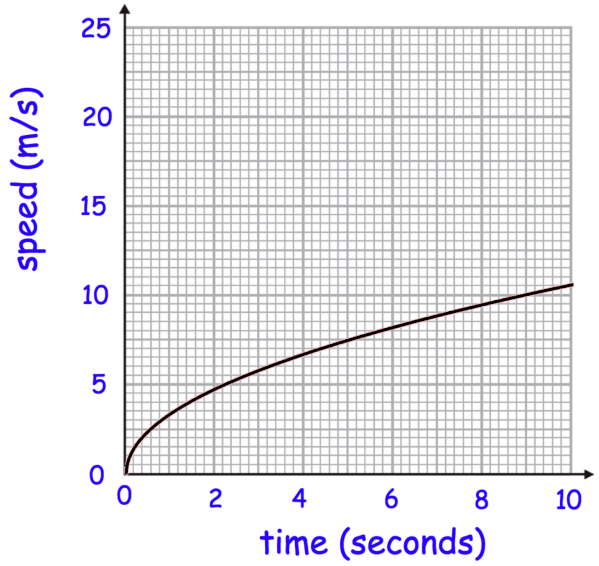
y = 256 when x = 3

y = 16384 when x = 5

Work out y when x = 2

10th August **Higher Plus 5-a-day**

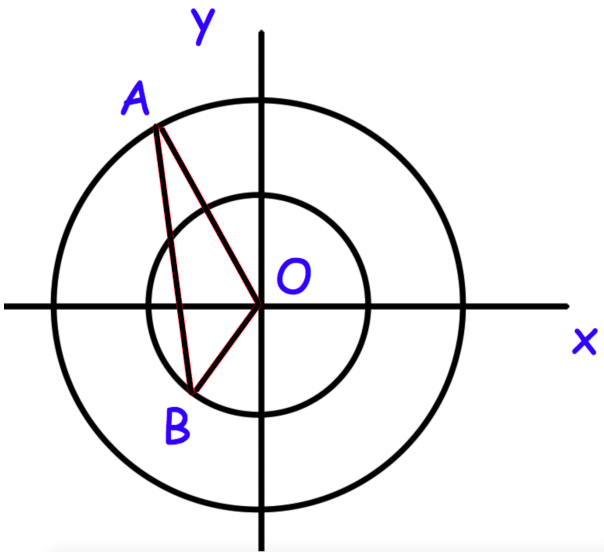
Corbettmaths



Shown is the first 10 seconds of the journey of a car

Work out an estimate for the distance the car travels in these 10 seconds

Is your answer an underestimate or an overestimate?
Explain your answer.



A is a point on a circle.
B is a point on another circle with equation $x^2 + y^2 = 36$

radius of the smaller circle : radius of the large circle is 5 : 7

AB = 12

Work out the size of angle AOB

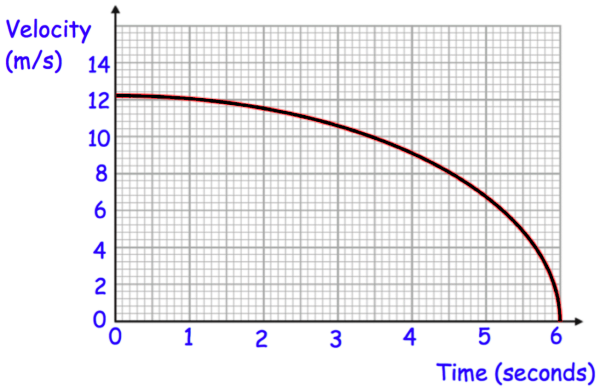
Given

$(ax + b)(x + 4)(x + c) \equiv 2x^3 + 19x^2 + 49x + 20$

Find a, b and c

11th August **Higher Plus 5-a-day**

Corbettmaths



Here is a velocity-time graph for 6 seconds of a journey.

Work out an estimate for the distance travelled over 6 seconds.
Use 3 strips of equal width.

Make h the subject of

$$\sqrt{\frac{r+h}{4rh}} = V$$

Find the equation of the line that is perpendicular to 2x + 3y = 4 and passes through the point (9, 0)

Solve

$$8^{4x+1} - 16^{x-1} = 0$$

12th August **Higher Plus 5-a-day**

Corbettmaths

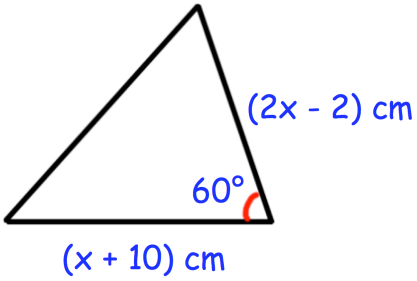
Write as a fraction

$64^{-\frac{2}{3}}$

Aisha saves some of her pocket money each week.

She saves 8p in week 1,
16p in week 2, 26p in week 3,
38p and so on for 20 weeks.

Find the amount she saves in week 20.



The area of the triangle is $90\sqrt{3}$ cm²
Work out the value of x.

The circle C has equation $x^2 + y^2 = 4$

The circle is reflected in the line y = 2 to give circle D

Circle D is translated by the vector $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$

to give circle E

Draw a sketch of circle E

Write down the coordinates of the centre of circle E.

13th August	Higher Plus 5-a-day
Write $\sqrt[3]{w^7}$ as a single power of w	
$f(x) = x^2 + 3x + 8$ show that $f(x+1) - f(x) = 2x + 4$	
Solve the inequality $2x^2 + 9x + 10 > 0$	
Hannah has some coins. £1 10p 10p 20p 50p 20p £1 5p 5p £1 20p £1 Hannah has to pay £2.40 for a coffee. She picks 3 coins at random, without replacement, from her pocket. Work out the probability that she has chosen enough money to pay for the coffee.	

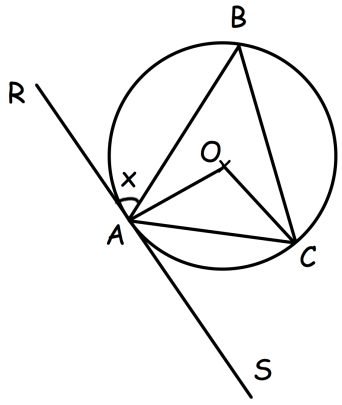
14th August **Higher Plus 5-a-day**

Corbettmaths

Simplify fully

$$\frac{6}{(x-5)(x-3)} + \frac{x}{x-3}$$

A, B and C are points on the circle, centre O.
RS is a tangent to the circle at A.
Angle BCA is 6° larger than angle ABC.



Show angle OAC is $96° - x$

A is directly proportional to the cube root of B.
B is increased by 60%.

Work out the percentage increase in A.

The distance between the points (1, 2) and (16, p) is 17.

Find the possible values of p.

15th August **Higher Plus 5-a-day**

Corbettmaths

Work out

$$\left(\frac{8}{27}\right)^{-\frac{2}{3}}$$

Bag A contains 2x coins
Bag B contains 7x coins

45 coins are taken from Bag B and put into Bag A

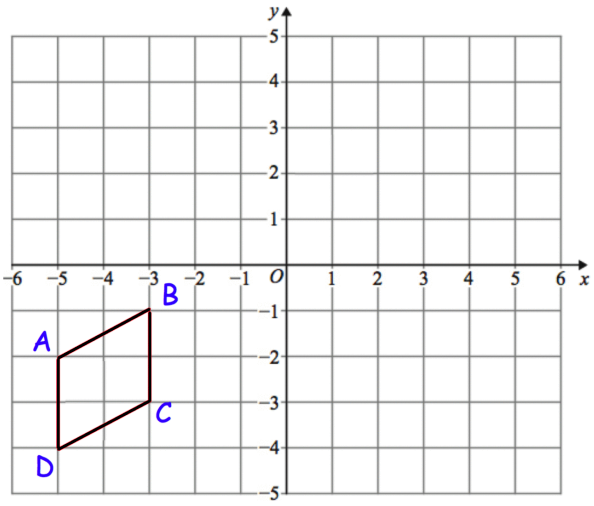
The ratio of coins in Bag A to Bag B is now 11:25

Work out the total number of coins.

Here is quadrilateral ABCD

ABCD is reflected in the line $x = -1$
followed by a reflection in the line $y = -x$
followed by a rotation of 180° about $(-1, -1)$

Which of the vertices are invariant?



Make c the subject of

$$\frac{3}{abc} = 8 - \frac{7}{ab}$$

16th August **Higher Plus 5-a-day**

Corbettmaths

A car travelled for 100 minutes, to the nearest 5 minutes.
It travelled for a total distance of 100 km, to the nearest 10km

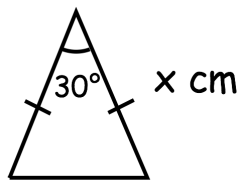
Work out the greatest possible average speed, in m/s

Height (h cm)	Frequency
$110 < h \leq 120$	8
$120 < h \leq 130$	16
$130 < h \leq 140$	25
$140 < h \leq 150$	32
$150 < h \leq 160$	19

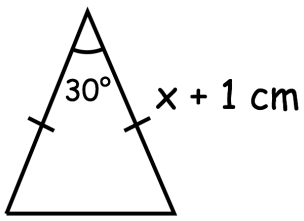
Calculate an estimate of the upper quartile

Solve $2x^2 - x - 6 < 0$

An isosceles triangle is drawn



The lengths of the two equal sides are increased by 1cm



The area of the larger triangle is twice the area of the smaller triangle.

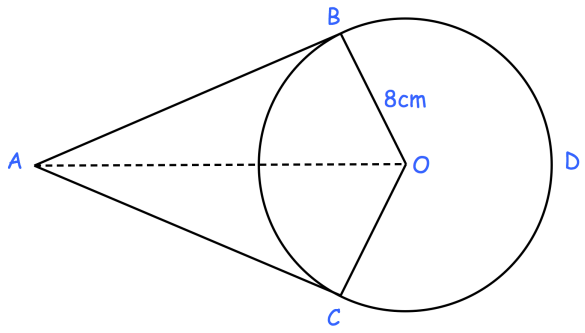
Find x.

17th August **Higher Plus 5-a-day**

Corbettmaths

Expand and simplify

$(3+\sqrt{2})(1-\sqrt{2})$

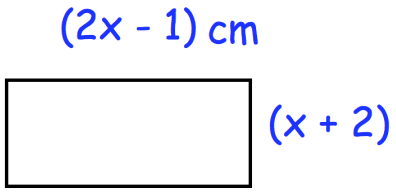


B, C and D are points on a circle of radius 8cm.
AB and AC are tangents to the circle.
AO = 11cm

Work out the length of arc BDC

Work out the area of minor sector BOC

The area of the rectangle is greater than 10cm²



Work out the range of possible values of x

18th August **Higher Plus 5-a-day**

Corbettmaths

Factorise

$8x^2 + 14x - 15$

Find the nth term of the quadratic sequence with the first four terms

10 33 64 103 ….

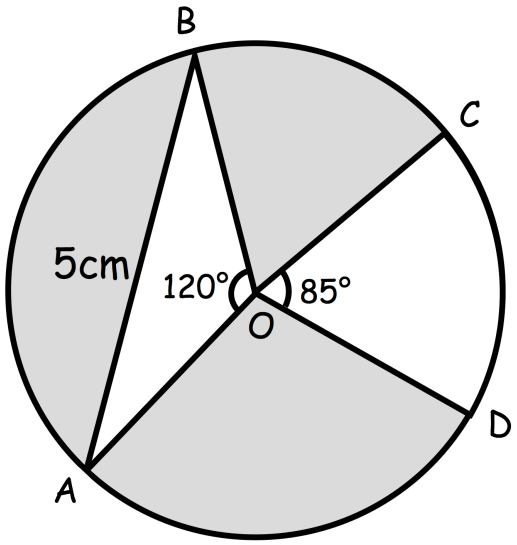
$(x + 2)(x^2 - ax - 4)$

is expanded and simplified

The coefficient of x is 6 times the coefficient of x^2

Find a

A, B, C and D are points on a circle, centre O.



Chord AB = 5cm
Angle AOB = 120°
Angle COD = 85°

Find the area of the shaded region.

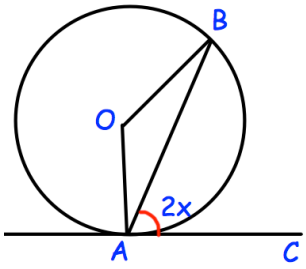
19th August **Higher Plus 5-a-day**

Corbettmaths

There are 12 students in Class A and 15 students in Class B.
Class A and Class B sat a test.

The mean score for the 12 students in Class A was 30
The mean score for all 27 students was y

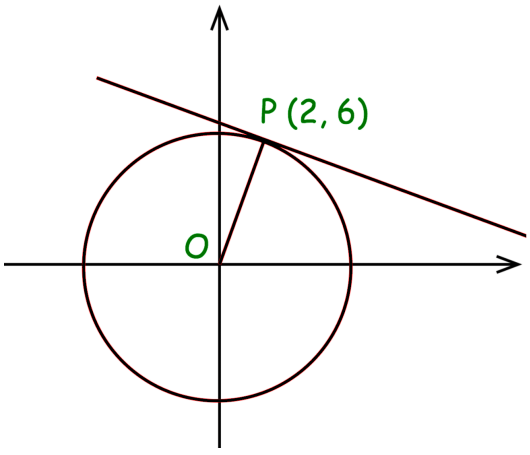
Find an expression in terms of y for the mean score for the students in Class B.



A and B are points on the circumference of a circle, centre O.
CA is a tangent to the circle.
Angle CAB = 2x

Prove that angle AOB = 4x

Give reasons for each stage of your working.



The diagram shows the circle $x^2 + y^2 = 40$ with a tangent at the point (2, 6)

Find the area of the circle

Find the equation of the tangent

20th August **Higher Plus 5-a-day**

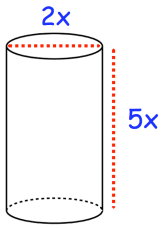
Corbettmaths

Work out

$$\left(\frac{64}{729}\right)^{-\frac{2}{3}}$$

The cylinder has a surface area of 972π cm²

Find x



Simplify

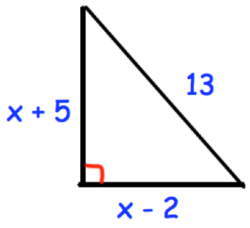
$$\frac{x-1}{2x^3}+\frac{x+4}{x^4}\div\frac{4x+16}{x}$$

In bag 1, there are 3 apples and 1 orange.
In bag 2, there are 2 apples and 3 oranges.

A piece of fruit is picked at random from bag 1 and placed into bag 2.

Then a piece of fruit is picked at random from bag 2 and placed into bag 1.

Find the probability that bag 1 **does not** contain 3 apples and 1 orange.

21st August	Higher Plus 5-a-day
	Find x
Solve $\frac{(4x+3)(x+2)}{x+1} = 3$	
Grace makes chocolate and lemon cupcakes in the ratio 11:2. Some of the cupcakes have sprinkles and the rest do not. The ratio of chocolate cupcakes with sprinkles to without sprinkles is 3:4 The ratio of lemon cupcakes with sprinkles to without sprinkles is 5:2 Work out what fraction of the cupcakes have sprinkles.	
Peter has 18 pieces of fruit in a bowl. There are 9 apples, 6 oranges and 3 bananas. He picks at random three pieces of fruit from the bowl.	Work out the probability that the three pieces of fruit are not the same type.

22nd August **Higher Plus 5-a-day**

Corbettmaths

Given

$$2^y = \frac{1}{16}$$

Find y

Show the equation $x^2 - 5x + 1 = 0$ can be written in the form

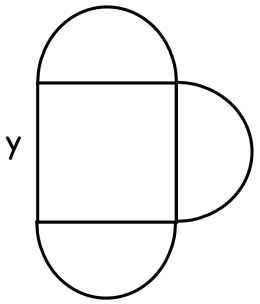
$$x = 5 - \frac{1}{x}$$

Starting with $x_0 = 3$, use the iteration formula

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

twice to find an estimate of the solution of $x^2 - 5x + 1 = 0$

A logo is made from a square and three semi-circles.
The area of the logo is ky^2
Find the exact value of k.



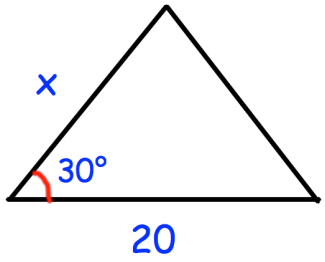
A solid metal cube has side length 8cm.
The density of the metal is 11.3g/cm³

The cube is melted down and the metal is used to make spheres of radius 1cm.
As many spheres as possible are made.

Work out the mass of the metal that is wasted.

23rd August **Higher Plus 5-a-day**

Corbettmaths



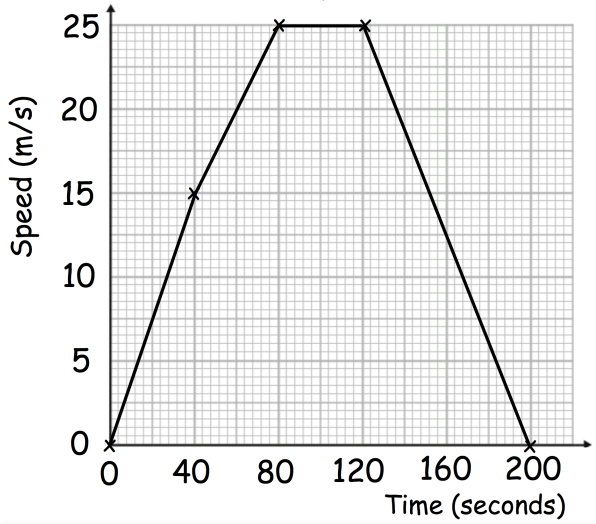
Find the area of the triangle in terms of x.

Given

$$y = \frac{5\sqrt{3}}{2}$$

Write an expression for y^3

The graph shows information about the speed of a train during its journey between two stations, A and B.



The train is halfway between stations A and B at x seconds.

Find x

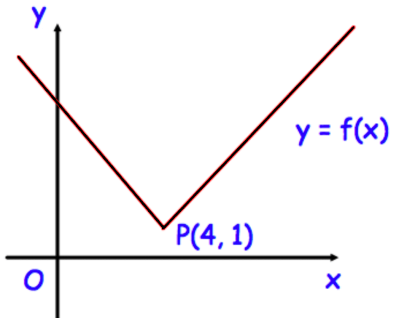
The point (–5, 1) is the turning point of the graph of $y = x^2 + ax + b$

Find a and b

24th August	Higher Plus 5-a-day

Corbettmaths

Solve $x^2 - 8x + 15 \leq 0$



What are the coordinates of the new position of P when the graph y = f(x) is transformed to the graph of y = –f(x)?

Rosie wants to estimate the number of fish that live in a lake.
On Friday, she caught 60 fish and tagged them.
On Sunday, she caught 80 fish and Rosie found that 5 had been tagged.

Work out an estimate for the number of fish in the lake.

The cost of two TVs are in the ratio x:y

When both prices are increased by £40, the ratio is 13:20

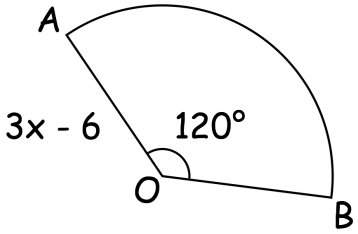
When both prices are decreased by £100, the ratio is 8:15

Find the values of x and y

25th August **Higher Plus 5-a-day**

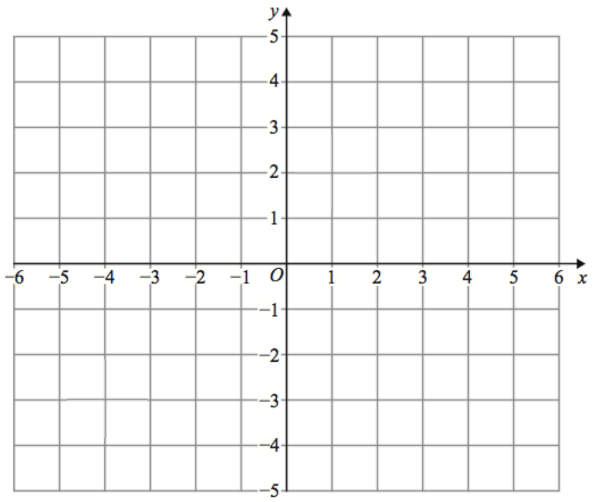
Corbettmaths

Write an expression for the area of sector AOB.

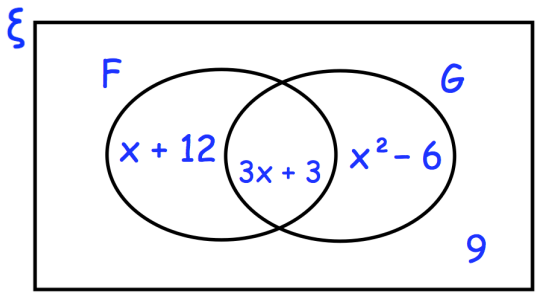


$f(x) = 2x - 1$

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



Solve $f(x) = f^{-1}(x)$



The Venn diagram shows information about the languages studied by 50 students.

ξ = 50 students
F = studies French
G = studies German

Find how many students study both languages

A student is chosen at random.
They study German.
Work out the probability they also study French

26th August **Higher Plus 5-a-day**

Corbettmaths

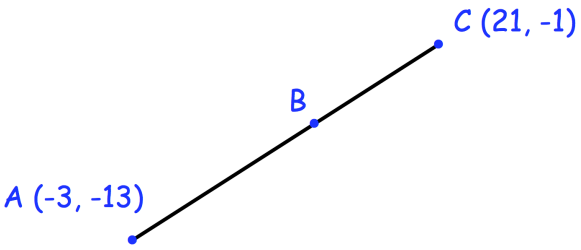
James is creating a password.
He used 2 lowercase letters then 5 digits.

He does not repeat any letter or digit.

How many possible codes can James create?

$\sqrt{45} + x\sqrt{20} = 7\sqrt{5}$

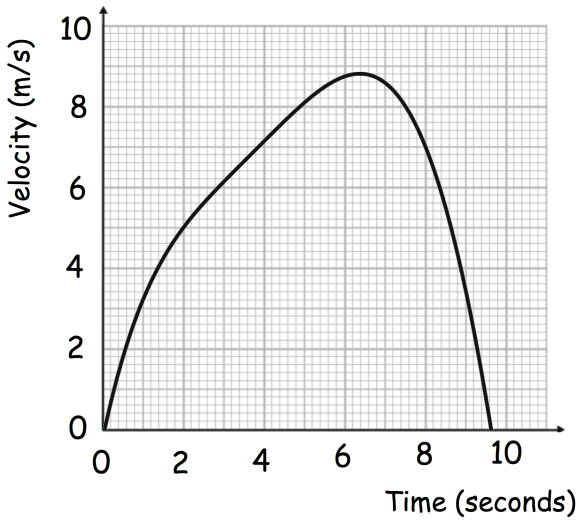
Find x



ABC is a straight line.
AB is 40% longer than BC.

Work out the coordinates of B.

Here is a velocity-time graph for a journey.



Calculate an estimate of the acceleration at 2 seconds.

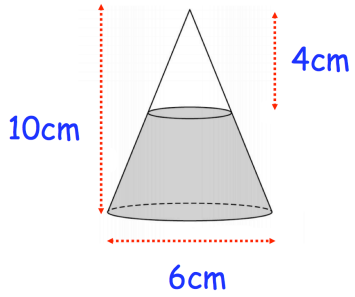
Calculate an estimate of the average acceleration between 7 and 8 seconds.

27th August **Higher Plus 5-a-day**

Corbettmaths

Express in the form $a\sqrt{7}+b$

$$\frac{\sqrt{7}+1}{\sqrt{7}-3}$$



Find the volume of liquid in the container

Make w the subject of

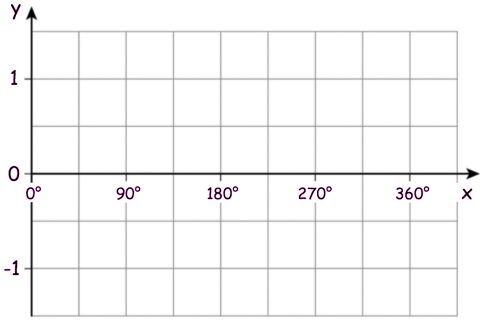
$$\frac{2}{wy}=c-\frac{1}{w}$$

Prove n^3-n is always divisible by 6.

n is an integer greater than 1.

f(x) = x + 90
g(x) = cos x

Draw y = gf(x)



28th August **Higher Plus 5-a-day**

Corbettmaths

Write as a power of 2

$\sqrt[4]{32}$

Without using a calculator, work out

$0.\dot{7} + 2^{-2} \div 0.1\dot{4}\dot{1}$

In year 7 there are 20% more students who do not wear glasses than do.

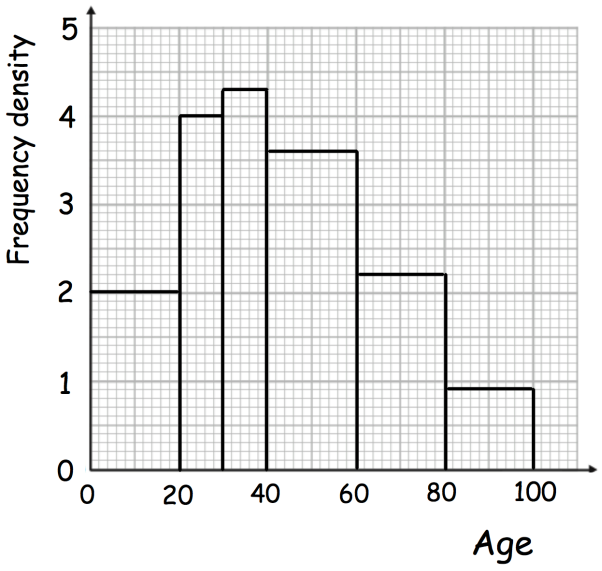
$\frac{3}{20}$ of the students who do not wear glasses are left handed

$\frac{1}{4}$ of the students who wear glasses are left handed

43 of the students in year 7 are left handed.

Find how many students are in year 7

The histogram shows the ages of 257 people who visited a library yesterday.

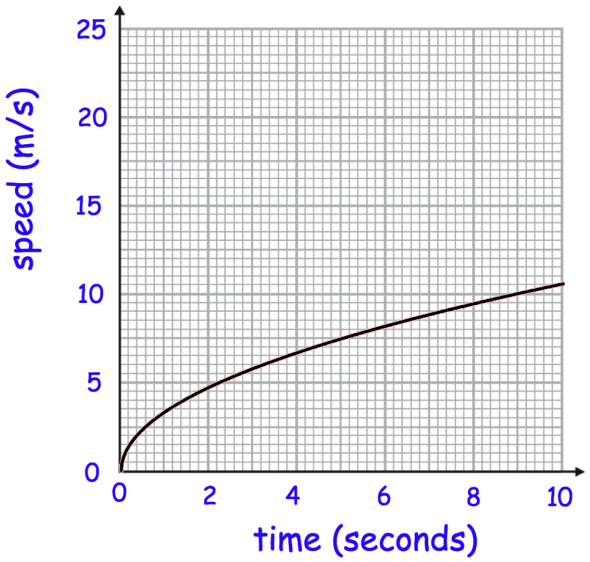


Calculate an estimate of the mean

Calculate an estimate of the median

29th August **Higher Plus 5-a-day**

Corbettmaths

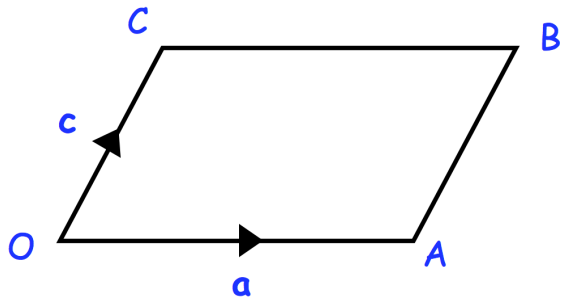


Shown is the first 10 seconds of the journey of a car

Work out an estimate for the acceleration of the car at t = 1.

Work out an estimate for the acceleration of the car at t = 9.

Write down the coordinates of the minimum point of the curve with equation $y = 2x^2 - 6x + 11$



OABC is a parallelogram

$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OC} = \mathbf{c}$

Y is the midpoint of AC
OAD is a straight line where
OA:AD = m : 1

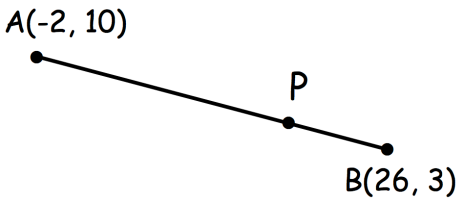
Given that

$$\overrightarrow{YD} = 7\mathbf{a} - \frac{1}{2}\mathbf{c}$$

Find the value of m

30th August **Higher Plus 5-a-day**

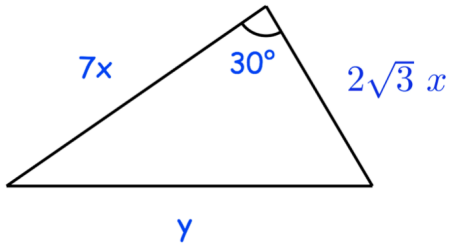
Corbettmaths



APB is a straight line.
AP:PB = 5:2

Work out the coordinates of point P.

Write down the equation of the tangent to the circle $x^2 + y^2 = 25$ at the point (3, 4)



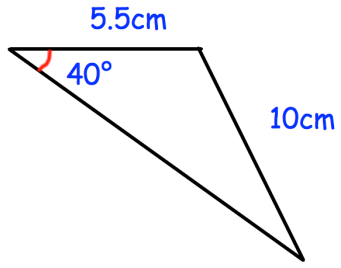
Express y in terms of x

Mr Kelly has two pots of pens.
In pot 1, there are 5 black and 3 green pens.
In pot 2, there are 2 black and 2 green pens.

Mr Kelly removes 3 pens at random from pot 1 and places them into pot 2.

Mr Kelly now removes 2 pens at random from pot 2 and places them in pot 1.

What is the probability that pot 1 now holds 7 black pens and pot 2 holds 5 green pens?

31st August	**Higher Plus 5-a-day**
C has coordinates (–6, 2) D has coordinates (–2, –6) E has coordinates (1, 3) Find the equation of the line perpendicular to CD and passing through E.	Give your answer in the form ax + by + c = 0, where a, b and c are integers.
The speed limit on a road is 50km/h Driving at a constant speed, it took Sam 60 seconds, correct to the nearest 5 seconds, to drive along a section of the road that is 780m long, correct to 2 significant figures.	Could Sam have broken the speed limit while driving along the section of road?
	Calculate the area of the triangle
Find the coordinates of the points where the line $x + 5y = 37$ and the curve $y = x^2 + x + 2$ meet.	
Find the maximum value of $\frac{1}{x^2 + 8x + 20}$	