

Using the grid, solve the equations

$$x^2 + y^2 = 9$$

$$x + y = 2$$

Given

$$f(x) = \frac{x - 9}{3}$$

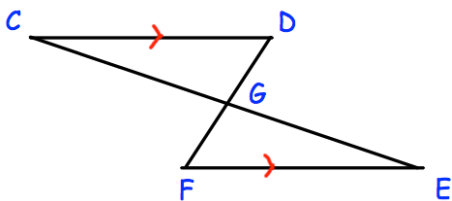
$$g(x) = 5x - 7$$

Solve

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

Solve

$$5x^2 - 7x - 24 \geq 0$$



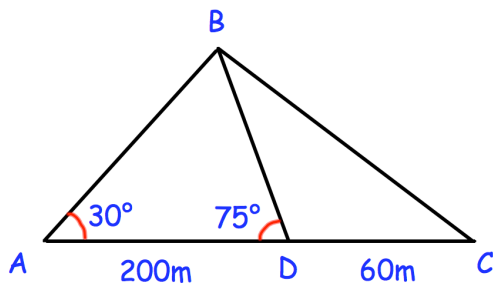
In the diagram, the lines CE and DF intersect at G.

CD and FE are parallel and $CD = FE$.
Prove that triangles CDG and EFG are congruent.



A gym runs many exercise classes.
 Monday: 5 different classes
 Tuesday: 6 different classes
 Wednesday: 8 different classes
 Thursday: 8 different classes
 Friday: 10 different classes.

Shea goes to one exercise class on 4 different days.
 How many different possible combinations are there?



Find the length of BD

Find the length BC

Find the size of angle DBC

Liquid A has a density of 0.9g/cm^3
 Liquid B has a density of 1.4g/cm^3
 Liquid C has a density of 0.75g/cm^3

200g of liquid A, 1kg of liquid B and 500g of liquid C are mixed to make liquid D.

Work out the density of liquid D

3rd April

Higher Plus 5-a-day



Corbettmaths

Solve $5x^2 - 2x - 11 = 0$
Giving answers to 2 significant figures

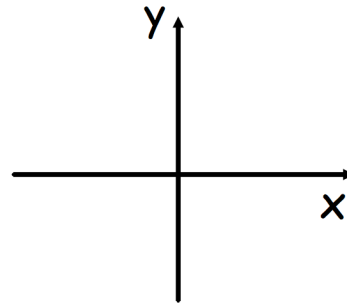
B is 5 miles due North of A
C is 7 miles due East of B.

Find the distance of A from C

Calculate the bearing of A from C

Sketch the graph

$$y = 3^x$$



$$f(x) = 3x - 1$$

$$g(x) = 2x + 4$$

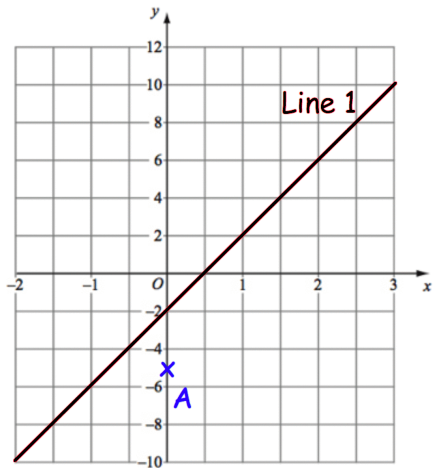
Find
 $gf(x)$



a is inversely proportional to the cube root of b .

When $a = 60$, $b = 3.375$

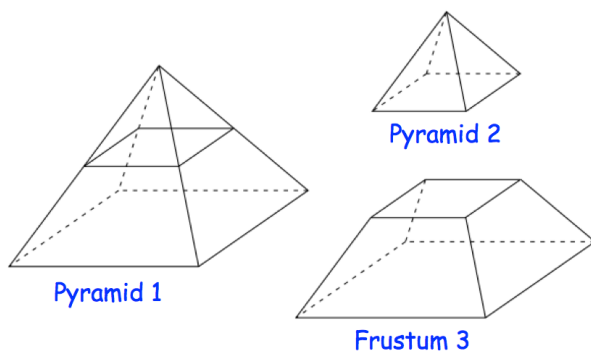
Find b when $a = 90$



Find the equation of the line perpendicular to Line 1, that passes through the point A

Find the shortest distance between Line 1 and the point A

A square based pyramid 1 is divided into two parts: square based pyramid 2 and a frustum 3, as shown.

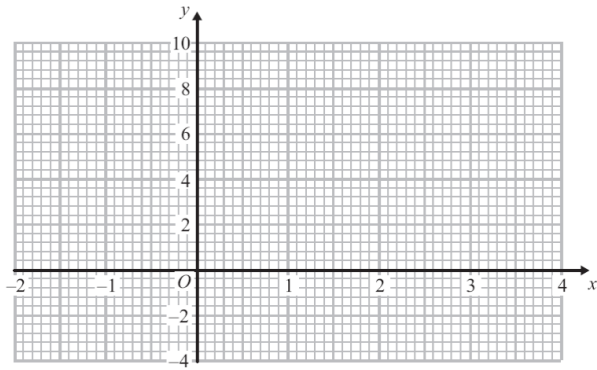


Pyramid 1 has a base of side length 12cm.

Pyramid 2 has a base of side length 4cm.

The perpendicular height of pyramid 1 is 15cm.

Calculate the volume of frustum 3.



Draw the graph $y = x^2 - x$ for values of x from -2 to 3

By drawing an appropriate linear graph, solve the equation
 $x^2 - 3x + 1 = 0$
 Give your answers to 1 decimal place

Express 4^{3x+5} in the form 2^y

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

Jesse chooses two apples from the crate, without replacement.
 The probability that he selects two bad apples is $\frac{1}{28}$

Prove $x^2 - x - 56 = 0$

Find x , the number of apples in the crate



Show that

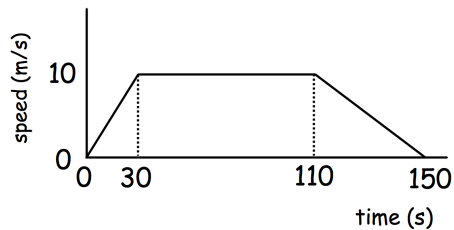
$$(n + 5)^2 - (n - 5)^2$$

is positive for all positive values of n .

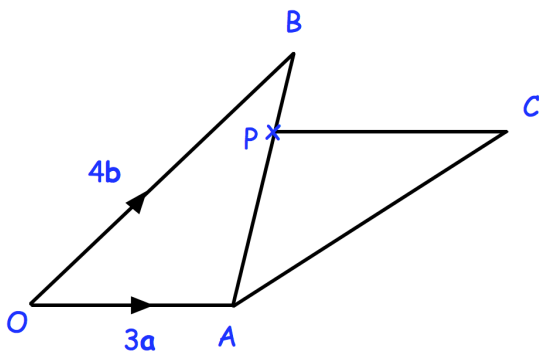
A group of students want to estimate how many woodlice live in a greenhouse. They catch and mark 20 woodlice. They return the 20 woodlice to the greenhouse. They then catch 50 woodlice and 11 are marked

Estimate the number of woodlice in the greenhouse.

A train takes 150 seconds to travel between station A and station B.



Work out the average speed during the 150 second journey.



$$\vec{OA} = 3\mathbf{a}$$

$$\vec{OB} = 4\mathbf{b}$$

$$\vec{PC} = 1.5\vec{OA}$$

P is a point on \vec{AB} such that $AP : PB = 3 : 1$

Find the vector \vec{OC} in terms of \mathbf{a} and \mathbf{b}



Two clay models of the Statue of Liberty are mathematically similar.



The smaller model has a height of 15cm.

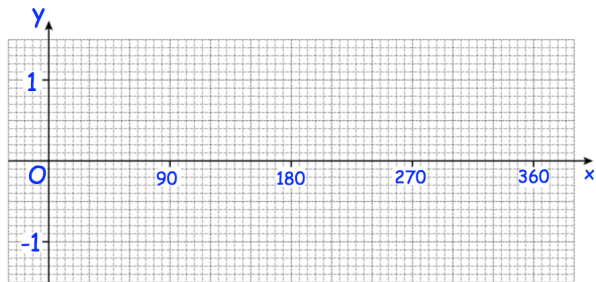
The larger model has a height of 20cm.

The smaller model weighs 108g.

Work out the mass of the larger model.

Write $x^2 - 6x + 17$ in the form $(x - a)^2 + b$

Sketch $y = -\cos x^\circ$



Solve

$$x^2 + y^2 = 36$$

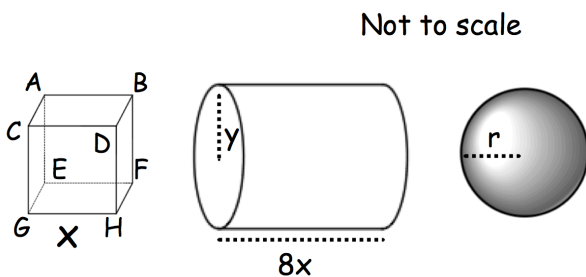
$$\frac{1}{2}x = y + 3$$



Solve

$$\frac{3}{x+1} = \frac{5-2x}{x-1}$$

Cube ABCDEFGH has side length x .
 A cylinder has radius y and length $8x$.
 The radius of the cylinder, y , is equal to the diagonal, AH , of the cube.
 The volume of the cylinder is equal to the volume of a sphere.



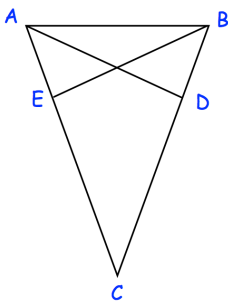
Express the radius of the sphere, r , in term of x .

Work out

$$81^{-\frac{3}{4}}$$

Simplify

$$(16x^8)^{\frac{3}{4}}$$



ABC is an isosceles triangle with $AC = BC$.
 D and E are points on BC and AC such that $CE = CD$.
 Prove triangles ACD and BCE are congruent.



Prove that

$(n + 1)^2 + (n + 3)^2 - (n + 5)^2$ is equivalent to $(n + 3)(n - 5)$

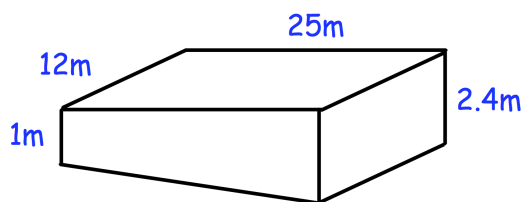
A circle has equation

$$x^2 + y^2 = \frac{1}{9}$$

Write down the length of its radius

Solve $6x^2 - 13x + 7 < 0$

Shown below is a swimming pool



The swimming pool is full of water. Kevaughn begins to empty the swimming pool at a constant rate.

The level of the water goes down by 5cm in the first 20 minutes.

Work out how long it takes in total to empty the swimming pool.



The pressure of a tyre is 32 pounds per square inch.

Given 1 pound = 0.4536 kilograms

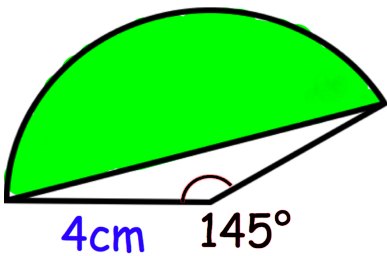
1 inch = 2.54 centimetres

Work out the pressure in grams per square centimetre.

Given

$$(x + a)^2(x - 2) = x^3 + bx^2 + 12x - 72$$

Find a and b



Find the area of the segment

Isla has a box of counters.

		Shape		
		Circle	Triangle	Square
Colour	Blue	6	2	5
	Red	8	9	11

Isla picks two counters at random. Calculate the probability that the two counters are different colours.

The first 4 terms of a sequence are:

800, 790, 775, 755, ...

Which term is the first to be negative?



Charlotte invests £5000.
The bank pays 10% interest for the first year and then $y\%$ compound interest every year after that.

After three years, Charlotte has £5610.55

Calculate y

The distance between the points $(-3, -4)$ and $(q, 5)$ is 15.

Find the possible values of q .

Use completing the square to find the equation of the line of symmetry of the curve $y = x^2 + 8x + 5$

The minute hand of a clock is 8cm long. The hour hand is 1.5cm shorter.

Calculate the distance between the tips of the hands at 8 o'clock.

Find the exact values of w

$$3^{w^2} = 9 \times 27^{w+5}$$



$$f(x) = (x + 5)(x + 3a)$$

Given

$$f(0) = 18$$

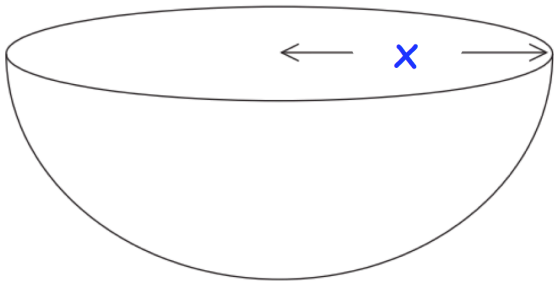
Find a

Two consecutive positive integers are multiplied together.
The result is added to the larger of the two integers.

Prove the answer is a square number

A is directly proportional to the cube root of B.

Find the percentage increase in A if B is increased by 30%.



A solid glass paperweight has a mass of 500 grams.

The glass has a density of 3.5g/cm^3

The paperweight is a hemisphere.

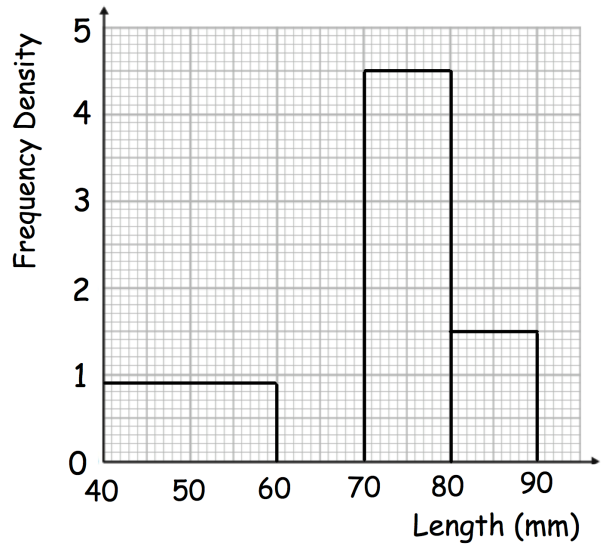
Find x



100 students guess the length of a line.
The lowest guess was 41mm and the highest guess was 89mm.

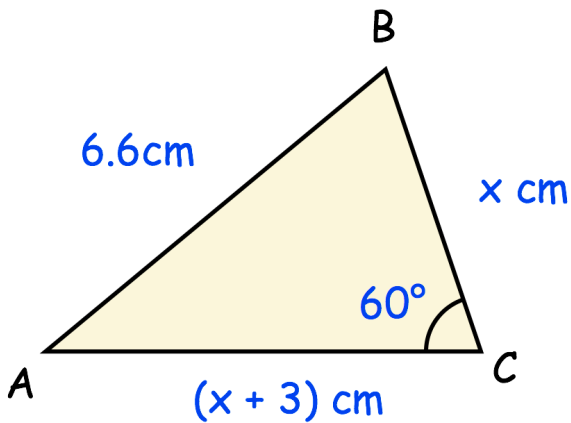
Complete the histogram

Work out an estimate for the mean of the guesses.



$w^4 < 25$ and $3y + w = 10$

Find the possible range of values of y



Calculate the perimeter of ABC.
Give your answer to 1 decimal place.



Show that the equation

$$x^3 + 5x = 4$$

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

Show that the equation $x^3 + 5x = 4$ can be rearranged to give

$$x = \frac{4}{5} - \frac{x^3}{5}$$

Starting with $x_0 = 0$
use the iteration formula

$$x_{n+1} = \frac{4}{5} - \frac{x_n^3}{5}$$

three times to find an estimate for the solution of $x^3 + 5x = 4$

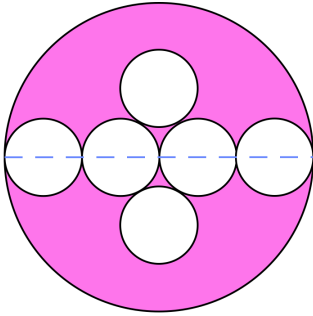
Trevor is a car salesman.
He bought a car for £5000.
Currently he is holding a sale with 35% off the price of all cars.
Trevor wants to sell the car so that he makes a 10% profit on the price he paid.

How much should Trevor advertise the car for?

Here are the first 5 terms of a quadratic sequence

8 15 24 35 48

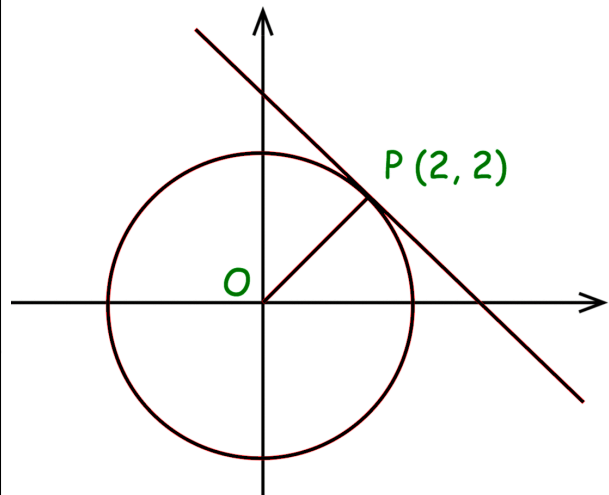
Find an expression, in terms of n , for the n th term of this quadratic sequence.



Six congruent small circles are drawn inside of a larger circle.
Find the percentage of the large circle that is shaded.

The diagram shows the circle $x^2 + y^2 = 8$ with a tangent at the point $(2, 2)$

Find the gradient of the line OP.

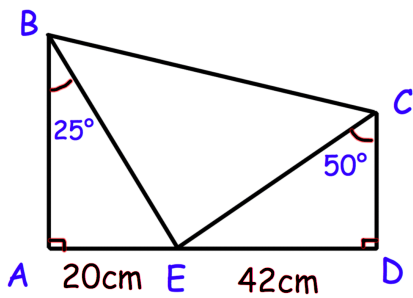


Find the gradient of the tangent

Find the equation of the tangent

Solve

$$\frac{3}{2x-3} + \frac{2}{3x+1} = 1$$



Find the area of ABCD

Find the length of BC

Solve

$$3x^2 - 3 > 4x + 1$$

James has two bags of counters. Each bag has the same number of counters, x .

In bag 1, there are 4 red counters and the rest are blue.

In bag 2, there are 5 red counters and the rest are blue.

James picks a counter at random from bag 1, he notes its colour and then places it into bag 2.

He then picks a counter at random from bag 2.

The probability of choosing a red counter from both bags is $\frac{12}{325}$

Work out the total number of blue counters in the two bags



Solve $2x^2 - 7x + 3 < 0$

Shown below is the time taken to deliver 128 meals from a restaurant.

Time, x mins	Frequency
$10 \leq x < 30$	90
$30 \leq x < y$	25
$y \leq x < 120$	13

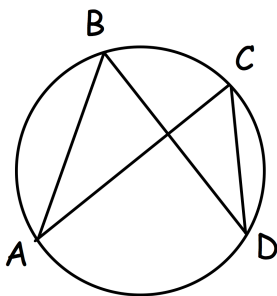
Erin drew a histogram to represent the information.

The frequency density for the second group was five times larger than for the third group.

Find y

Two customers are chosen at random. Find the probability that both received their meals in under 30 minutes.

Prove that the sum of the squares of 3 consecutive positive integers is always 1 less than a multiple of 3.



Prove the angles in the same segment are equal.



Are the lines $4x - y - 5 = 0$ and $x + 4y + 1 = 0$ perpendicular?

Helen says that the cosine of an angle is -1 .

Write down three possible angles

Solve the simultaneous equations

$$x^2 + y^2 = 5$$

$$2x + y - 5 = 0$$

For all values of x

$$f(x) = \frac{2x + 1}{4}$$

Find

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

The graph with equation $y = x^3$ is translated by the vector

$$\begin{pmatrix} -1 \\ 0 \end{pmatrix}$$

Write down the equation of the translated graph



Rearrange

$$y = \frac{7(x - w)}{w} \text{ to make } w \text{ the subject}$$

Weight (x kg)	Frequency
$60 < x \leq 64$	10
$64 < x \leq 68$	20
$68 < x \leq 72$	30
$72 < x \leq 76$	15
$76 < x \leq 80$	18
$80 < x \leq 84$	7

The weights of some rugby players are recorded in the table.

Find the median by using linear interpolation.

Two players are chosen at random. Calculate the probability that both players are over 80kg

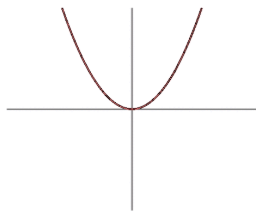
Find the set of values of x for which $x^2 - 36 > 0$ **and** $x^2 + 4x - 21 > 0$

The line l is a tangent to the circle $x^2 + y^2 = 90$ at the point P.
P is the point (3, 9)
The line l crosses the x-axis at the point Q.

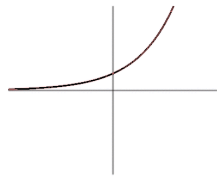
Work out the area of triangle OPQ.



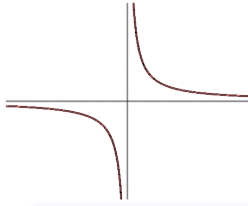
Graph A



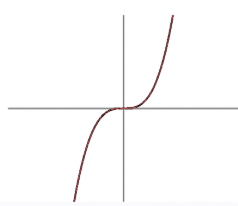
Graph B



Graph C



Graph D

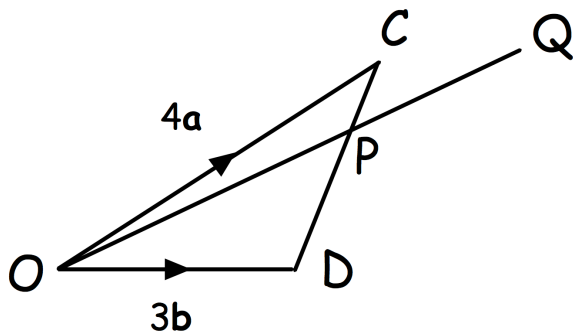


$y = x^2$ is graph A

$y = x^3$ is graph

$y = 2^x$ is graph

$y = \frac{1}{x}$ is graph



P is a point on the line CD, such that CP:PD = 1:3

Find the vector

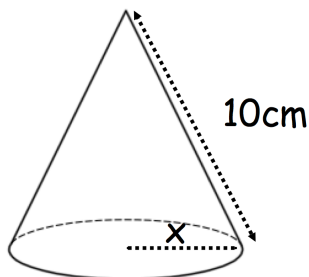
\vec{OP}

The line OP is extended, such that

$OP = \frac{3}{5}OQ$

Find the vector

\vec{CQ}



The total surface area of the cone is $39\pi \text{ cm}^2$

Find the length of the radius.



Show the equation

$$x^3 + 6x = 25$$

has a solution between 2 and 3.

Show the equation

$$x^3 + 6x = 25$$

can be rearranged to give

$$x = \sqrt[3]{25 - 6x}$$

Starting with $x_0 = 0$

use the iteration formula

$$x_{n+1} = \sqrt[3]{25 - 6x_n}$$

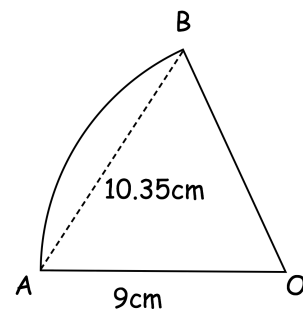
three times to find an estimate for the solution of $x^3 + 6x = 25$

Shown is sector OAB.

O is the centre of the circle.

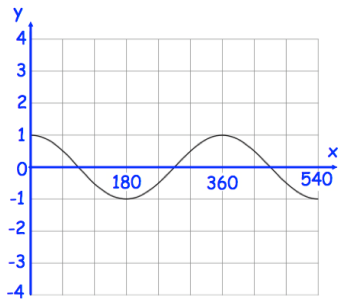
AB is a chord with length 10.35cm

Find the area of the sector OAB.



The graph $y = x^2 + 9x - 10$ has a line of symmetry.

Write down the equation of the line of symmetry.



Write down the equation of the graph shown

The width of a rectangle is equal to the length of each side of a square.
The length of the rectangle is 6cm less than 4 times its width.

Find the perimeter of the rectangle.

The area of the square is 504cm^2 less than the area of the rectangle

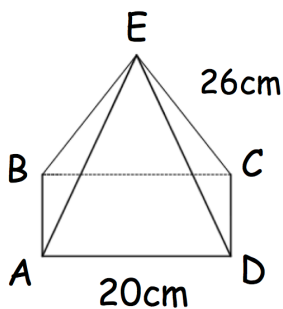
Write

$$\frac{6}{\frac{1}{\sqrt{2}} + \sqrt{2}}$$

in the form $a\sqrt{2}$, where a is an integer

Find the value of

$$\left(\frac{125}{216}\right)^{-\frac{4}{3}}$$

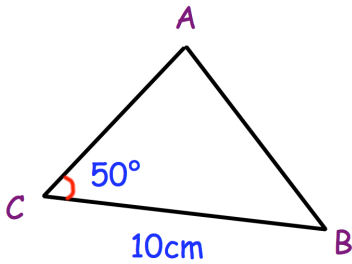


Shown is a square based pyramid
Find the angle between the face ABE and the base ABCD



Simplify fully

$$\frac{1}{3x^2 - x - 14} \div \frac{1}{2x^2 - x - 10}$$



The area of ABC is 22.981cm^2
Calculate the length of AB

Given

$$f(x) = \frac{1}{2x + 1}$$

find $f(3)$

Write down a value of x for which $f(x)$
is not defined.

By using completing the square, find
the coordinates of the turning point of
the curve with equation
 $y = x^2 - 12x - 3$

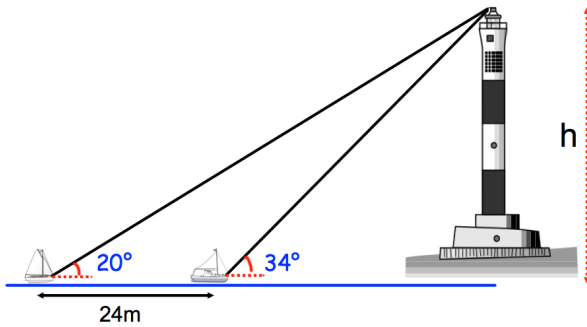
The first 5 terms in a quadratic
sequence are:

8 11 16 23 32

Find the first term in the sequence
which is greater than 400



Solve $x^2 - 14x + 48 < 0$



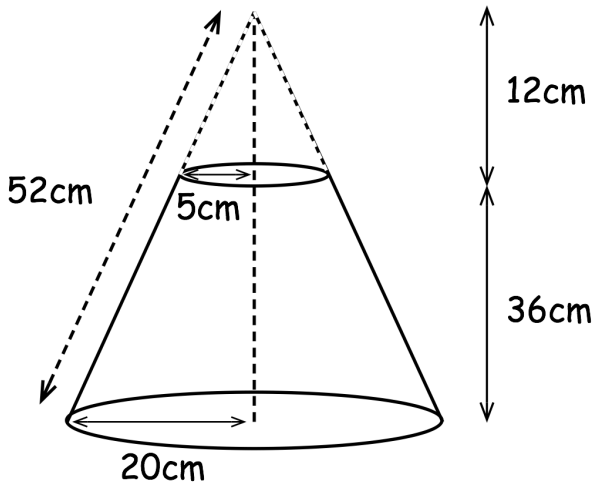
Calculate the height of the lighthouse

$$f(x) = \frac{10}{x} + 1$$

$$g(x) = 2x - 5$$

Dylan says $fg(5) = gf(5)$

Is Dylan correct?



Work out the surface area of the frustum

Work out the volume of the frustum



$$f(x) = \frac{3}{x^2 - 1}$$

Given

$$f(x) = 5$$

find the possible values of x

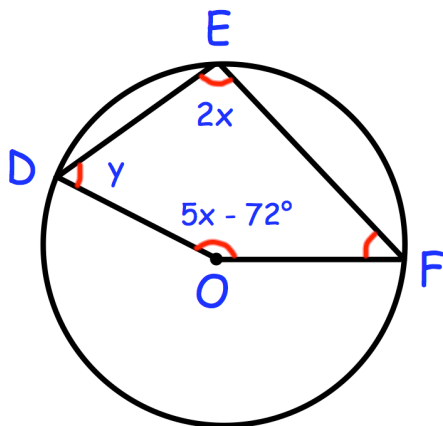
Expand and simplify

$$(x + 1)(x - 2)(2x - 5)$$

The line l_1 has equation $y = 4x + 9$
The line l_2 has equation $5x + 4y - 9 = 0$

Find the gradient of line l_2

Find the coordinates of the point of intersection of l_1 and l_2



Angle $DEF = 2x$

Angle $DOF = 5x - 72^\circ$

Angle $EDO = y$

Angle EFO is 14° smaller than angle DEF

Work out the value of y



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

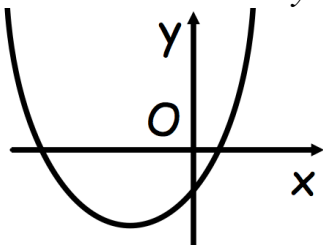
$$x = \frac{5}{7} - \frac{3x^3}{7}$$

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.

27th April

Higher Plus 5-a-day

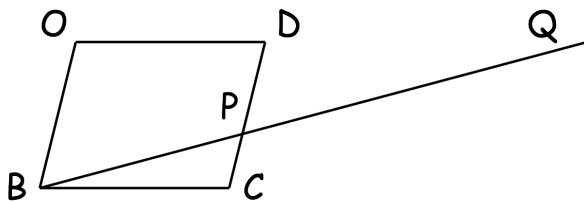


Corbettmaths

$C = 20000$ to 3 significant figures
 $M = 0.24$ to 2 significant figures
 $N = 50$ to 2 significant figures

Find the minimum value of $\frac{C}{MN}$

OBCD is a parallelogram



$$\vec{OB} = \mathbf{b} \quad \vec{OC} = \mathbf{c}$$

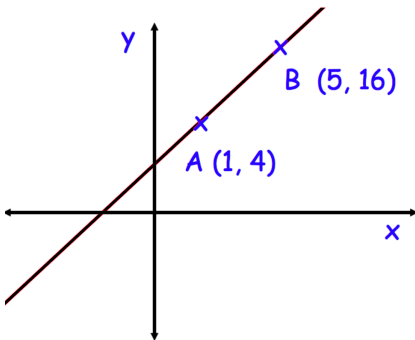
P is a point on CD such that
 $CP : PD = 1 : 2$

Find the vector

$$\vec{BP}$$

$$\vec{PQ} = 2\vec{BP}$$

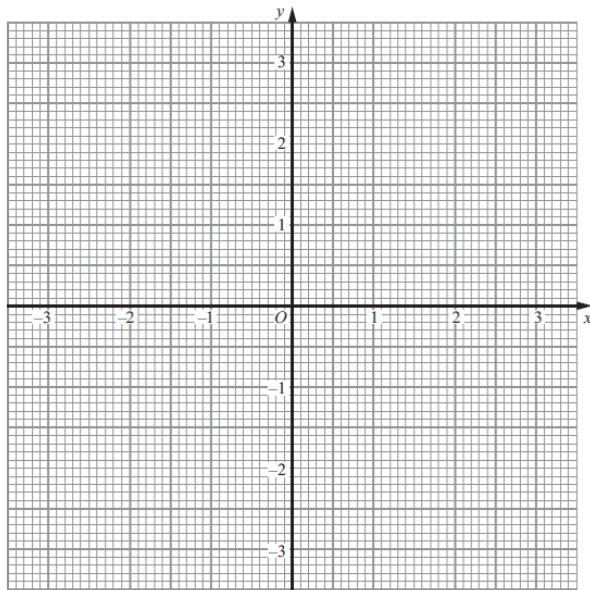
Show ODQ is a straight line.



Shown is a straight line that passes through the points $A(1, 4)$ and $B(5, 16)$

Find the equation of the line

Find the shortest distance between the line and the origin.



Draw $x^2 + y^2 = 4$

Write down the equation of the tangent of the circle at $(0, 2)$

Hours, h	Frequency
$0 < h \leq 5$	27
$5 < h \leq 10$	44
$10 < h \leq 15$	21
$15 < h \leq 20$	8

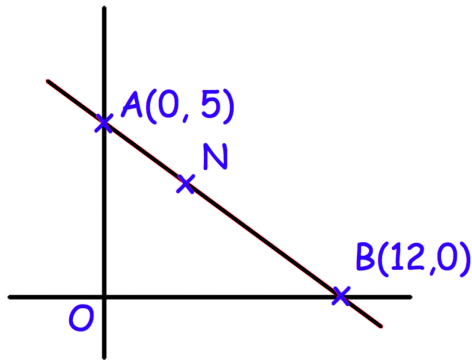
Two students are selected at random. Find the probability that both students revised for more than 15 hours.

Find the possible values of x

$$27^x = 3^{x^2}$$

Find the coordinates of the maximum point of the curve

$$y = -x^2 + 6x - 1$$



$$AN:NB = 1:2$$

Find the equation of the line perpendicular to AB that passes through the point N

Work out the value of

$$25^{-\frac{3}{2}}$$

Expand and simplify

$$(\sqrt{10} - \sqrt{3})(\sqrt{15} + \sqrt{2})$$

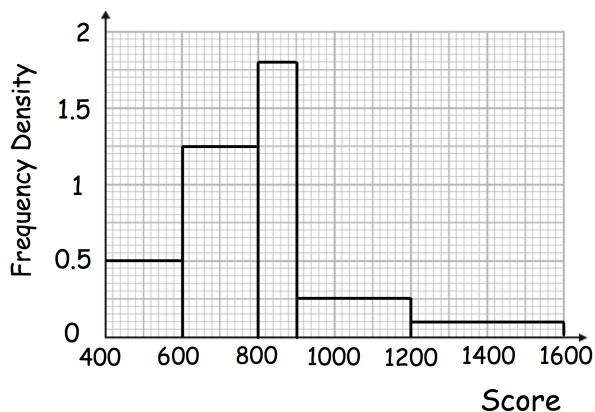
Prove that the sum of the squares of two consecutive integers is one more than double the product of the integers



Write $1.245454545\dots$ as a fraction

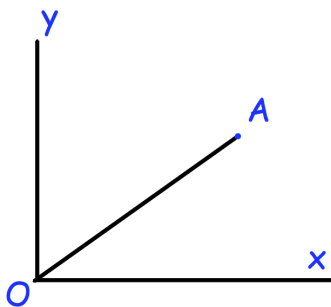
Two positive integers have a difference of 4.
Prove the difference between the squares of the integers is four times the sum of the integers.

The histogram shows information about the scores 645 players obtained in a game.



Estimate the number of players who scored under 700 points.

20% of players scored over Y points.
Work out an estimate for Y.



Shown is a straight line joining O and A.
The length of the line is $\sqrt{1805}$
The gradient of the line is $\frac{1}{2}$
Find the coordinates of A.

