

Brilliant Maths Revision

GREEN PACK

Grade 5

Name:

If you complete this pack, you can trade it in for the next grade up – ask your maths teacher

1) Write as a power of 8

a) $8^4 \times 8^3$

b) $8^{12} \div 8^7$

2) Write as a power of 3

a) $3^2 \times 3^9$

b) $3^{10} \div 3^3$

3) Simplify

a) $k^5 \times k^2$

b) $x^4 \div x^2$

c) $\frac{k^{11}}{k^6}$

d) $(k^8)^2$

4) Simplify

eg. $(2xy^3)^4 = 2xy^3 \times 2xy^3 \times 2xy^3 \times 2xy^3 = 16x^4y^{12}$

a) $(2xy^5)^3$

b) $(2x^2y^2)^3$

c) $(4xy^4)^2$

d) $(3xy^2)^4$

5) $2^x \times 2^y = 2^{10}$

and

$2^x \div 2^y = 2^2$

Work out the value of x and the value of y .

6) $5^x \times 5^y = 5^{12}$

and

$5^x \div 5^y = 5^6$

Work out the value of x and the value of y .

7) $a = 2^x$, $b = 2^y$

Express in terms of a and b

a) 2^{x+y}

b) 2^{2x}

c) 2^{3y}

d) 2^{x+2y}

Expanding and Simplifying Brackets

1) Expand and simplify

a) $(x + 3)(x + 2)$

b) $(x + 5)(x + 3)$

c) $(x + 1)(x + 4)$

d) $(x + 6)(x + 4)$

e) $(x + 5)(x + 7)$

2) Expand and simplify

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

b) $(x - 7)(x + 2)$

c) $(x - 1)(x + 3)$

d) $(x + 4)(x - 3)$

e) $(x - 5)(x + 5)$

3) Expand and simplify

a) $(x - 3)(x - 4)$

b) $(x - 2)(x - 6)$

c) $(x - 1)(x - 1)$

d) $(x - 7)(x - 2)$

e) $(x - 4)(x - 5)$

4) Expand and simplify

a) $(x - 7)(x + 1)$

b) $(p - 6)(p + 4)$

c) $(e - 3)(e - 7)$

d) $(x + 8)(x + 1)$

e) $(x - 5)(x - 5)$

5) Expand and simplify

a) $(2x + 3)(2x + 1)$

b) $(3p - 4)(2p + 5)$

c) $(e - 3)(3e - 4)$

d) $(4x - 6)(2x + 1)$

e) $(2x - 3)(2x + 3)$

6) Expand and simplify

a) $(2x + y)(3x + 2y)$

b) $(3p - 2q)(4p + 5q)$

c) $(4e - 3f)(2e - 2f)$

d) $(6x - y)(6x + y)$

e) $(3x - 2y)(x - 5y)$

- 1) A shop sells small boxes and large boxes for storing CDs.

A small box stores x CDs.

A large box stores y CDs.

Emma buys 8 small boxes and 5 large boxes.

Emma can store a total of T CDs in these boxes.

Write down a formula for T in terms of x and y .

- 2) Batteries are sold in packets and boxes.

Each packet contains 4 batteries.

Each box contains 20 batteries.

Tony buys p packets of batteries and b boxes of batteries.

Tony buys a total of N batteries.

Write down a formula for N in terms of p and b .

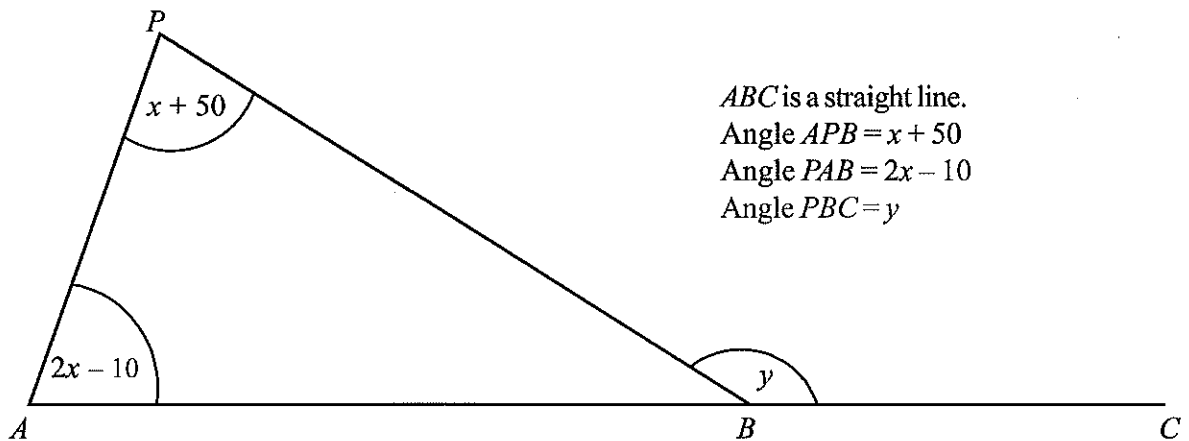
- 3) Compasses cost c pence each.

Rulers cost r pence each.

Write down an expression for the total cost, in pence, of 2 compasses and 4 rulers.



4)



- a) Show that $y = 3x + 40$
 Give reasons for each stage of your working.
- b) Given that y equals 145 degrees
- (i) Work out the value of x .
 - (ii) Work out the size of the largest angle in triangle APB .

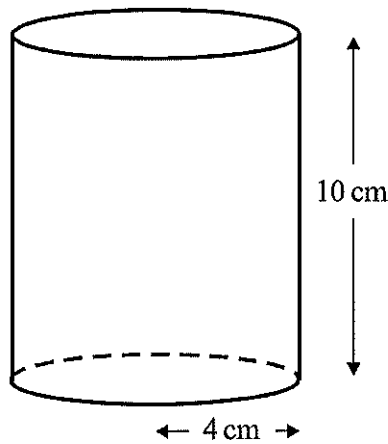
- 1) Solve the inequality $6x - 3 < 9$
- 2) Solve $4x + 1 = 2x + 12$
- 3) a) Solve the inequality $3t + 1 < t + 13$
b) If $2t^2 = 72$ find a value of t
- 4) Solve $3(x + 2) = 8$
- 5) Solve the inequality $6y \geq y + 10$
- 6) Solve $4(2x - 3) = 5x + 7$
- 7) $h = 5t^2 + 3$
Work out the value of t when $h = 48$
- 8) Solve $3(2p - 4) = 2p + 12$
- 9) Solve the equation $4x + 1 = 19$
- 10) Solve $\frac{29 - x}{3} = x + 5$
- 11) Solve $3x - 10 = x + 30$
- 12) Solve the inequality $3x - 2 > x + 7$
- 13) Solve the inequality $\frac{2x}{3} < 10$



- 1) Tony went on holiday to Miami.
He travelled from London by plane.
The distance from London to Miami is 7120 km.
The plane journey took 8 hours.
Calculate the average speed of the plane.



- 2) A solid cylinder has a radius of 4 cm and a height of 10 cm.

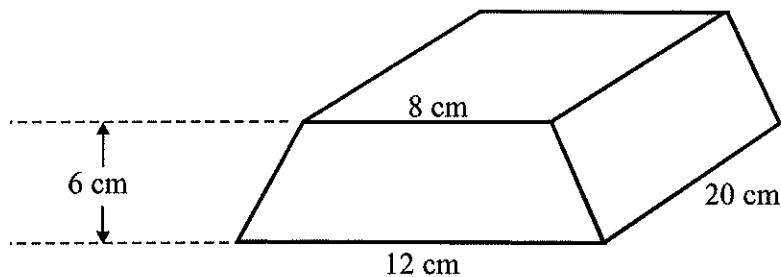


- a) Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

The cylinder is made of wood.
The density of the wood is 0.7 grams per cm^3

- b) Work out the mass of the cylinder.
Give your answer correct to 3 significant figures.

3)



The diagram shows a solid prism made from metal.
The cross-section of the prism is a trapezium.

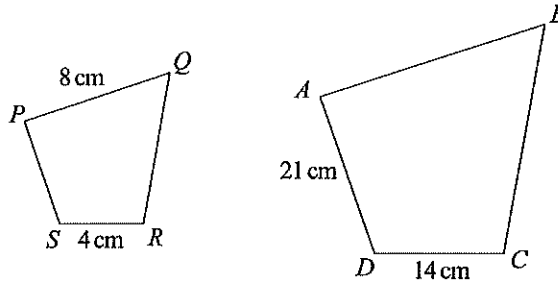
The parallel sides of the trapezium are 8 cm and 12 cm.
The height of the trapezium is 6 cm.
The length of the prism is 20 cm.

The density of the metal is 4 g/cm^3 .

Calculate the mass of the prism.
Give your answer in kilograms.

Similar Shapes

- 1) The diagram shows two quadrilaterals that are mathematically **similar**.

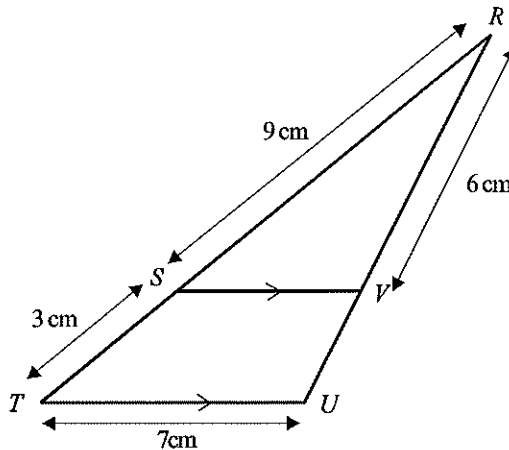


- Calculate the length of AB
- Calculate the length of PS



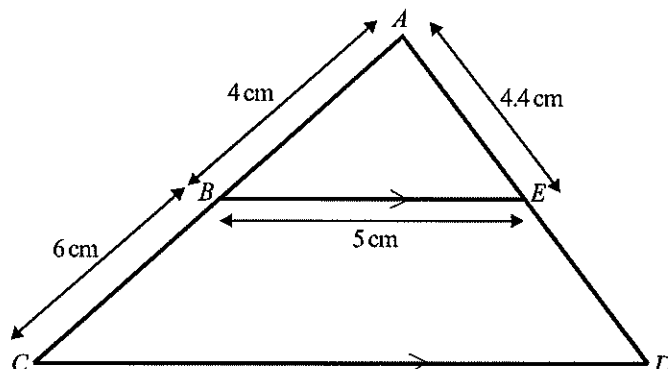
- 2) SV is parallel to TU .
 RST and RVU are straight lines.
 $RS = 9$ cm, $ST = 3$ cm, $TU = 7$ cm, $RV = 6$ cm

Calculate the length of VU .



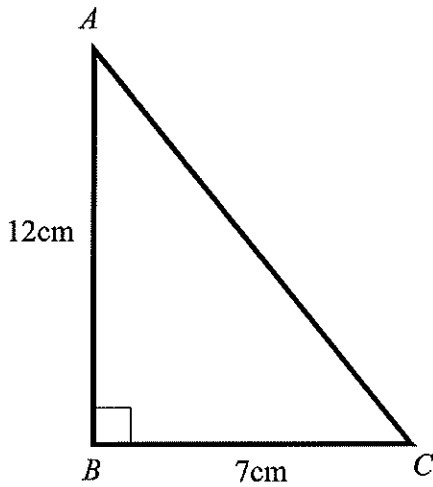
- 3) BE is parallel to CD .
 ABC and AED are straight lines.
 $AB = 4$ cm, $BC = 6$ cm, $BE = 5$ cm, $AE = 4.4$ cm

- Calculate the length of CD .
- Calculate the length of ED .

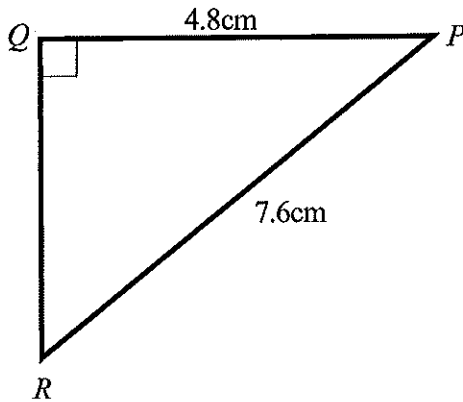


Pythagoras' Theorem

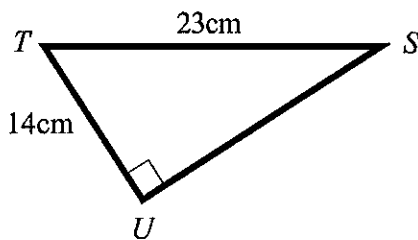
- 1) Find the length of side AC .
Give your answer to 1 decimal place.



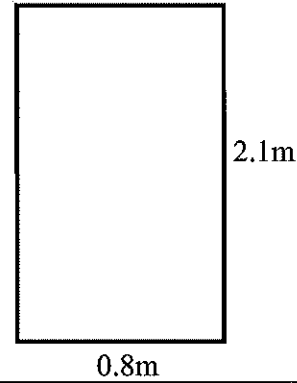
- 2) Find the length of side QR .
Give your answer to 1 decimal place.



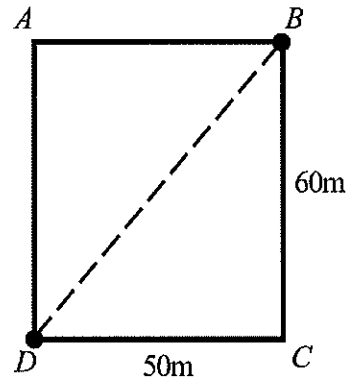
- 3) Find the length of side SU .
Give your answer to 1 decimal place.



- 4) Below is a picture of a doorway.
Find the size of the diagonal of the doorway.
Give your answer to 1 decimal place.

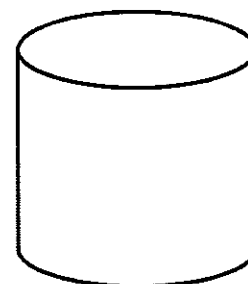


- 5) In the sketch of the rectangular field, below,
James wants to walk from B to D .



Which of the following routes is shorter and by how much?
From B to C to D or straight across the field from B to D .
Give your answer to the nearest metre.

- 6) Fiona keeps her pencils in a cylindrical beaker as shown below.
The beaker has a diameter of 8cm and a height of 17cm .
Will a pencil of length 19cm fit in the beaker without poking out of the top?
All workings must be shown.



- 1) A number, x , rounded to 1 decimal place is 4.7

Write down the error interval for x .

- 2) A number, y , rounded to 2 decimal places is 12.36

Write down the error interval for y .

- 3) A number, x , rounded to 1 significant figure is 400.

Write down the error interval for x .

- 4) A number, y , rounded to 2 significant figures is 67000.

Write down the error interval for y .

- 5) A number, x , rounded to 3 significant figures is 24100.

Write down the error interval for x .

1) Meg says,

“The sum of three prime numbers is always odd.”

Write an example to show that Meg is incorrect.

2) Mike says.

“If you cube a prime number, the result will always be odd.”

Give an example to show that Mike is wrong.

3) Explain why an odd number plus another odd number plus an even number is always even.

4) P is an odd number.

Q is an even number.

Explain why $2P + 2Q - 1$ is always odd.

5) P is an odd number.

Q is an even number.

Tim says that $P + Q$ is always a prime number.

Explain why Tim is wrong.

1) Factorise and solve the following equations:

a) $x^2 + 5x + 6 = 0$

b) $x^2 + 9x + 20 = 0$

c) $x^2 + x - 6 = 0$

d) $x^2 + 5x - 24 = 0$

e) $x^2 - 6x + 8 = 0$

f) $x^2 - 3x - 28 = 0$

g) $2x^2 + 7x + 3 = 0$

h) $6x^2 + 11x + 3 = 0$

i) $3x^2 + 13x - 10 = 0$

j) $3x^2 - 34x + 63 = 0$

You need to be able to do these

these are an extension - quite hard!

2) Lucy said that -1 is the only solution of x that satisfies the equation $x^2 + 2x + 1 = 0$

Was Lucy correct?

Show working to justify your answer

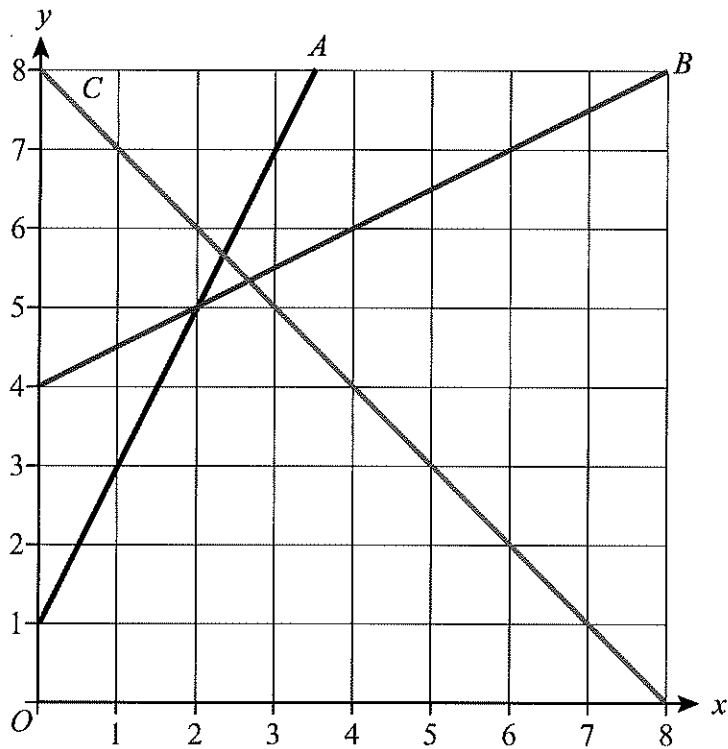
3) Ben said that -5 is the only solution of x that satisfies the equation $x^2 + 10x + 25 = 0$

Was Ben correct?

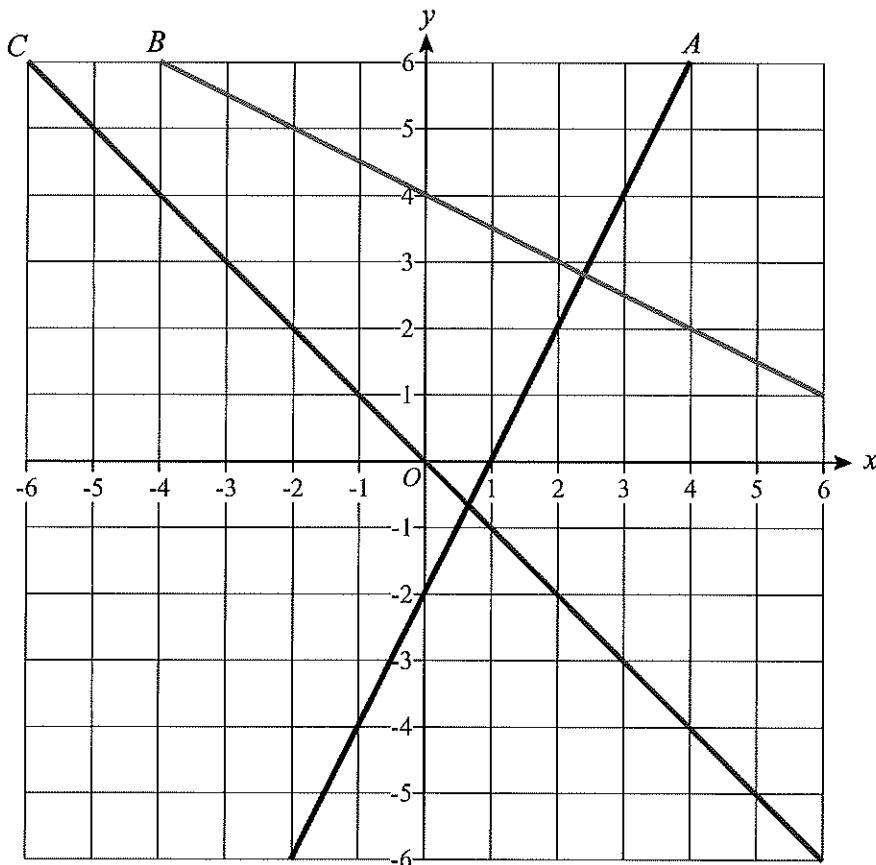
Show working to justify your answer

Finding the Equation of a Straight Line

- 1) Find the equations of lines A , B and C on the axes below



- 2) Find the equations of lines A , B and C on the axes below

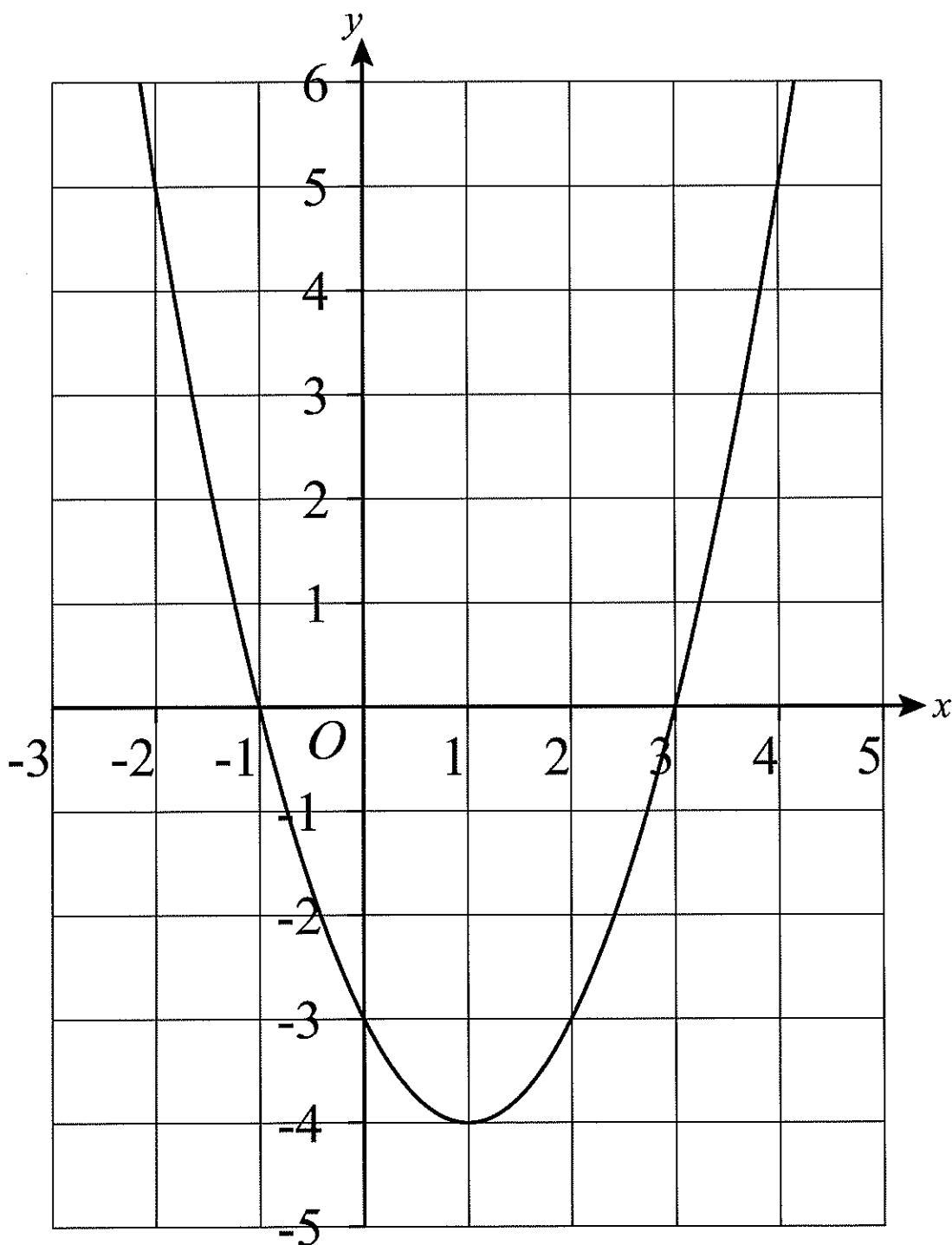


Roots and Turning Points of Quadratics

1) The graph of $y = x^2 - 2x - 3$ is shown.

Write down the coordinates of:

- The turning point of the curve.
- The roots of the equation $x^2 - 2x - 3 = 0$
- The intersection of the curve with the y -axis.



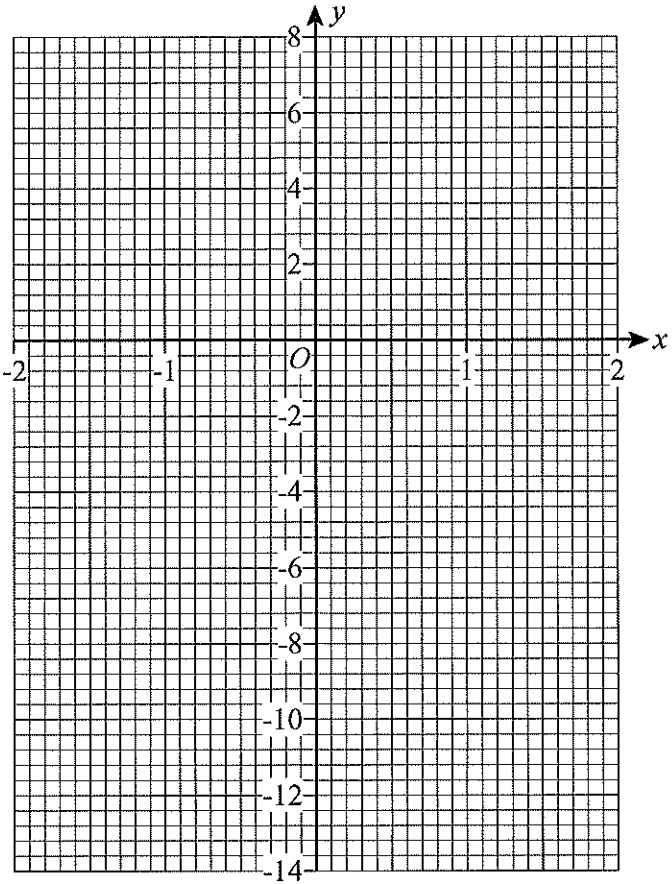
Cubic and Reciprocal Graphs



1) a) Complete this table of values for
 $y = x^3 + x - 4$

x	-2	-1	0	1	2
y	-14			-2	

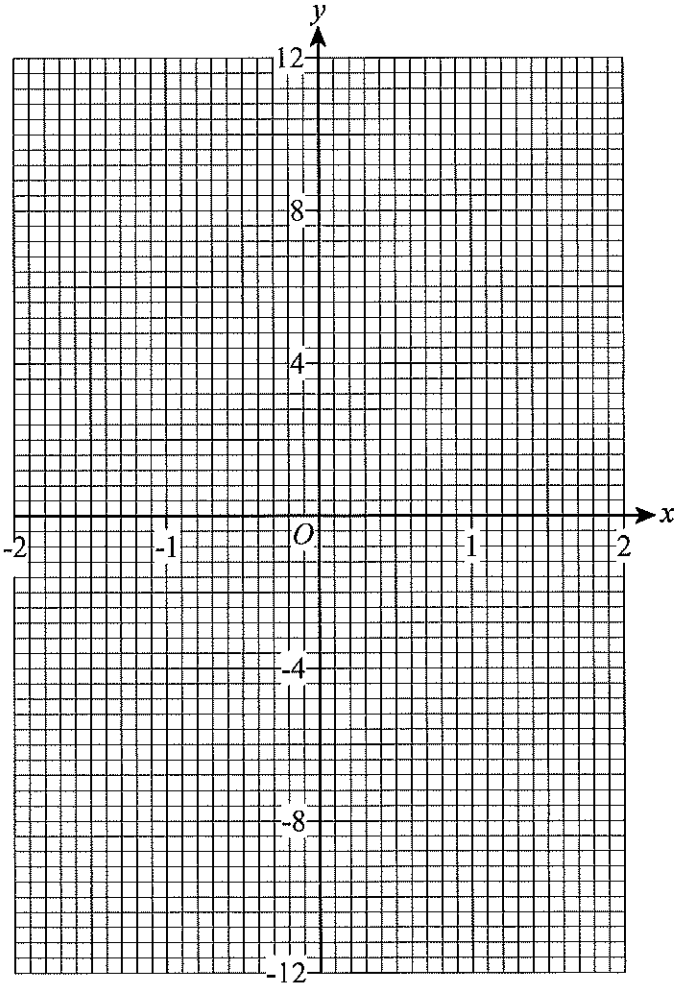
- b) On the grid, draw the graph of
 $y = x^3 + x - 4$
- c) Use the graph to find the value of x when $y = 2$



2) a) Complete this table of values for
 $y = x^3 + 2x$

x	-2	-1	0	1	2
y	-12		0		

- b) On the grid, draw the graph of
 $y = x^3 + 2x$
- c) Use the graph to find the value of x when $y = -6$



3) Sketch the graph of $y = 1 + \frac{1}{x}$

- 1) The 1st term of a geometric progression is 5 and the common ratio is 2.
 - a) Write down the first four terms of the progression.
 - b) What is the 10th term of the progression?

- 2) The 1st term of a geometric progression is 2 and the common ratio is 4.
 - a) Write down the first four terms of the progression.
 - b) What is the 7th term of the progression?



- 3) The 1st and 3rd terms of a geometric progression are 7 and 63.
 - a) What is the common ratio of the progression?
 - b) Write down the first four terms.
 - c) Work out the 15th term of the progression.













- 4) The 5th term of a geometric progression is 11664.
The 6th term of the progression is 69984.
What is the 1st term of the progression?



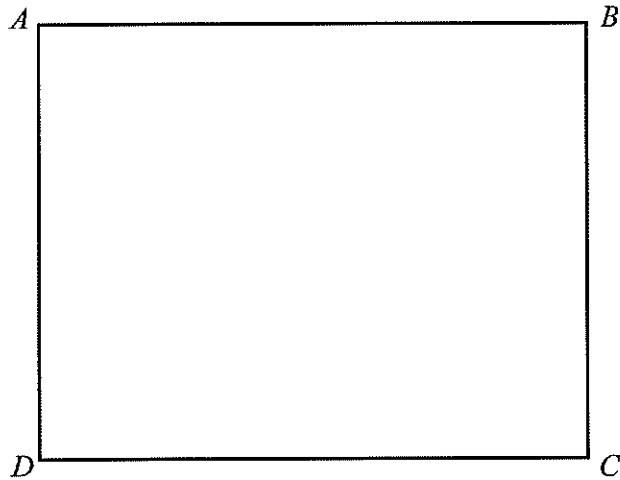
- 5) The first four terms of a geometric progression are 1875, 375, 75, ...
 - a) What is the common ratio of the progression?
 - b) Work out the 8th term of the progression.



- 6) The third term of a geometric progression is 192.
The 4th term of the progression is 48.
What is the 1st term of the progression?

-  1) Henry places £6000 in an account which pays 4.6% compound interest each year.
Calculate the amount in his account after 2 years.
-  2) Sarah puts £8600 in a bank. The bank pays compound interest of 3.8% per year.
Calculate the amount Sarah has in her account after 4 years.
-  3) Mary deposits £10000 in an account which pays 5.6% compound interest per year.
How much will Mary have in her account after 5 years?
-  4) Susan places £7900 in an account which pays 2.4% compound interest per year.
How much interest does she earn in 3 years?
-  5) Harry puts money into an account which pays 6% compound interest per year.
If he puts £23000 in the account for 5 years how much interest will he earn altogether?
-
-  6) Laura buys a new car for £14600.
The annual rate of depreciation is 23%.
How much is the car worth after 3 years?
-  7) The rate of depreciation of a particular brand of computer is 65% per year. If the cost of the computer when new is £650 how much is it worth after 2 years?
-  8) Sharon pays £3500 for a secondhand car.
The annual rate of depreciation of the car is 24%.
How much will it be worth four years after she has bought it?
-
-  9) Dave places £17000 in an account which pays 4% compound interest per year.
How many years will it take before he has £19122.69 in the bank?
-  10) A new motorbike costs £8900.
The annual rate of depreciation is 18% per year.
After how many years will it be worth £2705.66?

1)



$ABCD$ is a rectangle.

Shade the set of points inside the rectangle which are **both** more than 4 centimetres from the point D **and** more than 1 centimetre from the line AB .

2) Two radio transmitters, A and B , are situated as below.

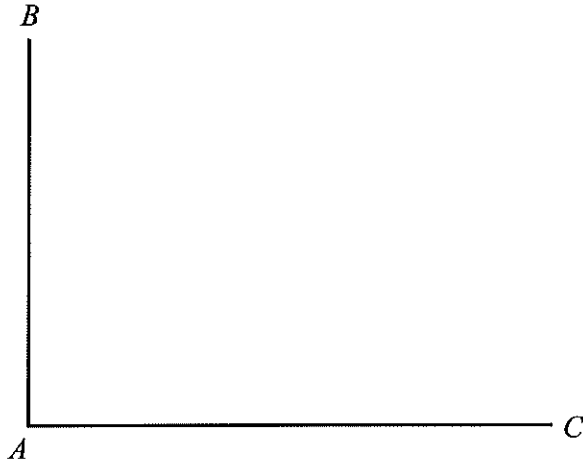


Transmitter A broadcasts signals which can be heard up to 3 km from A .

Transmitter B broadcasts signals which can be heard up to 6 km from B .

Shade in the area in which radio signals can be heard from both transmitters. Use a scale of 1 cm = 1 km.

- 1) Draw the locus of all points which are equidistant from the lines AB and AC .



- 2) Draw the locus of all points which are equidistant from the points A and B .

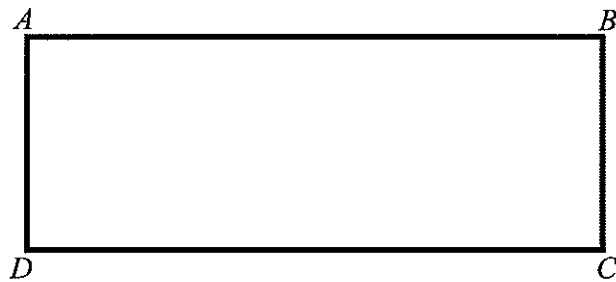
$A \times$

$\times B$

- 1) Draw the locus of all points that are exactly 3 cm from the line PQ .



- 2) Draw the locus of all points that are exactly 4 cm from the rectangle $ABCD$

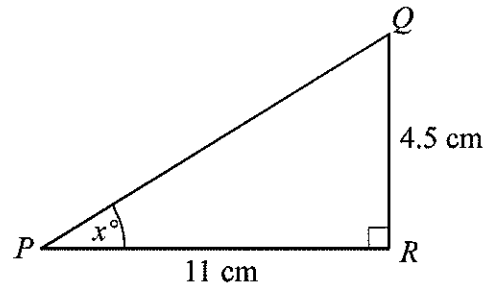


Trigonometry



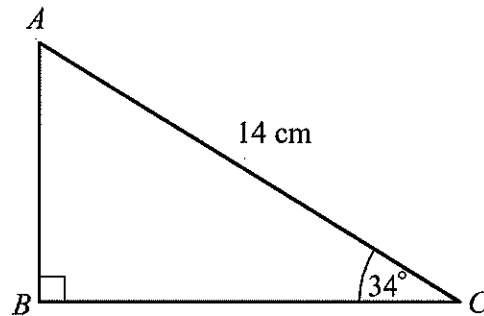
- 1) PQR is a right-angled triangle.
 $PR = 11$ cm.
 $QR = 4.5$ cm
 Angle $PRQ = 90^\circ$

Work out the value of x .
 Give your answer correct to 1 decimal place.



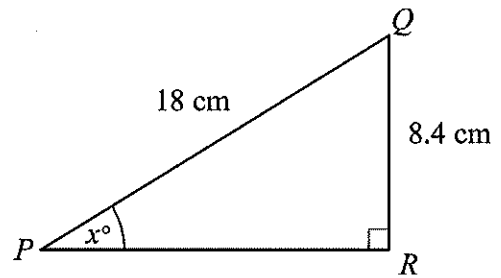
- 2) $AC = 14$ cm.
 Angle $ABC = 90^\circ$
 Angle $ACB = 34^\circ$

Calculate the length of BC .
 Give your answer correct to 3 significant figures.



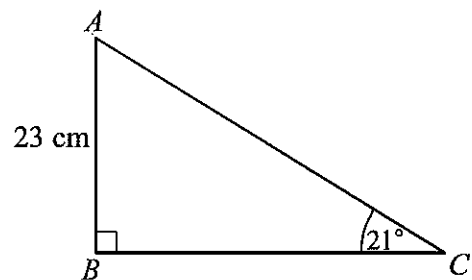
- 3) PQR is a right-angled triangle.
 $PQ = 18$ cm.
 $QR = 8.4$ cm
 Angle $PRQ = 90^\circ$

Work out the value of x .
 Give your answer correct to 1 decimal place.



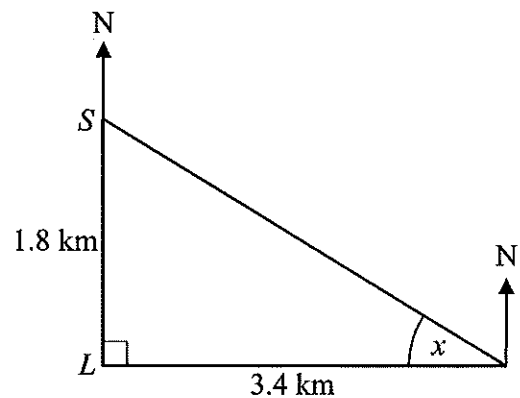
- 4) $AB = 23$ cm.
 Angle $ABC = 90^\circ$
 Angle $ACB = 21^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.



- 5) A lighthouse, L , is 3.4 km due West of a port, P .
 A ship, S , is 1.8 km due North of the lighthouse, L .

Calculate the size of the angle marked x .
 Give your answer correct to 3 significant figures.

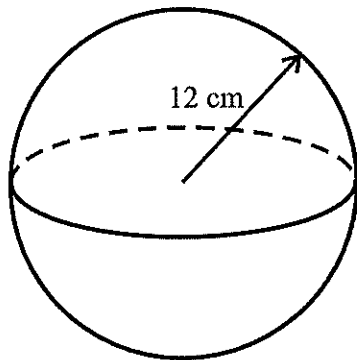


$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

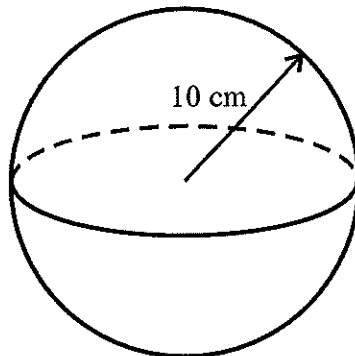
$$\text{Surface area of a sphere} = 4\pi r^2$$



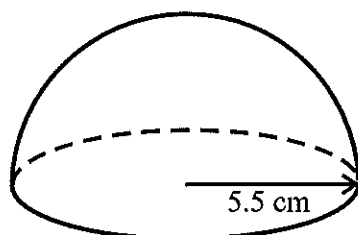
- 1) a) Work out the volume of the sphere.
b) Work out the surface area of the sphere.



- 2) a) Work out the volume of the sphere, leaving your answer in terms of π .
b) Work out the surface area of the sphere, leaving your answer in terms of π .

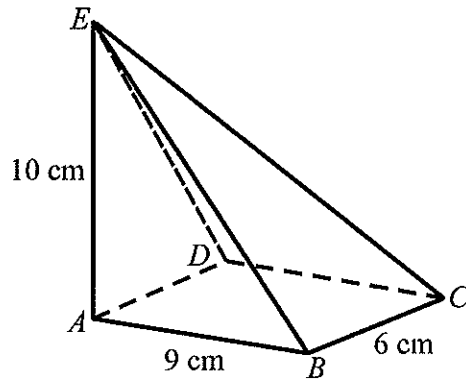


- 3) a) Work out the volume of the solid hemisphere.
b) Work out the surface area of the solid hemisphere.



$$\text{Volume of a pyramid} = \frac{1}{3} \times \text{base area} \times \text{height}$$

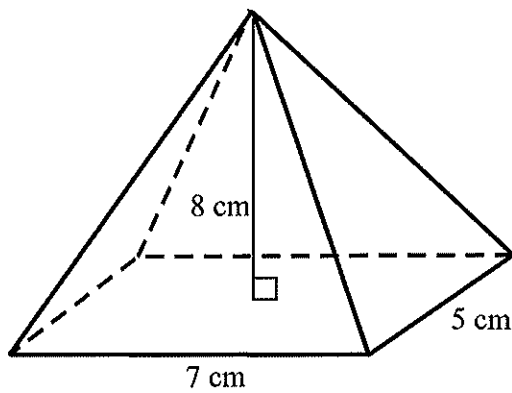
- 1) The pyramid has a rectangular base and E is vertically above A .



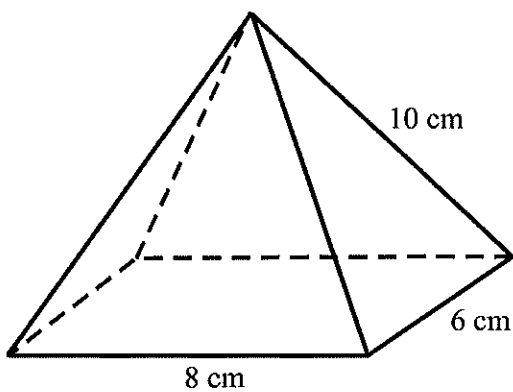
Find the volume of the pyramid.



- 2) Find the volume of this pyramid.



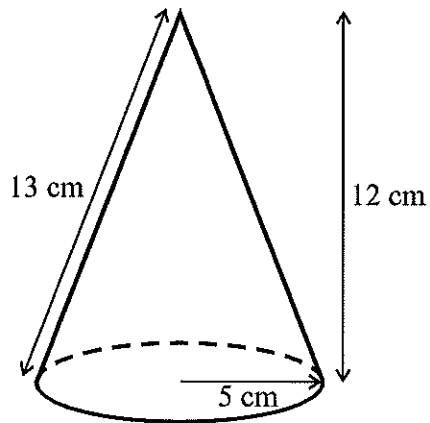
- 3) Find the volume of this pyramid.



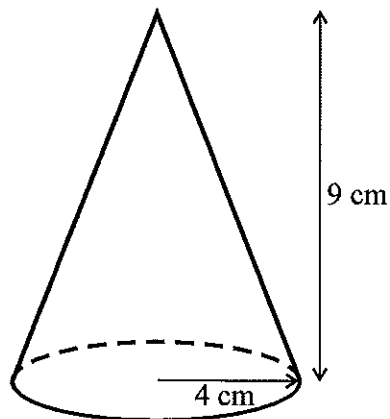
$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$
$$\text{Curved surface area} = \pi r l$$



- 1)
 - a) Work out the volume of the cone.
 - b) Work out the curved surface area of the cone.
 - c) The total surface area of the cone.

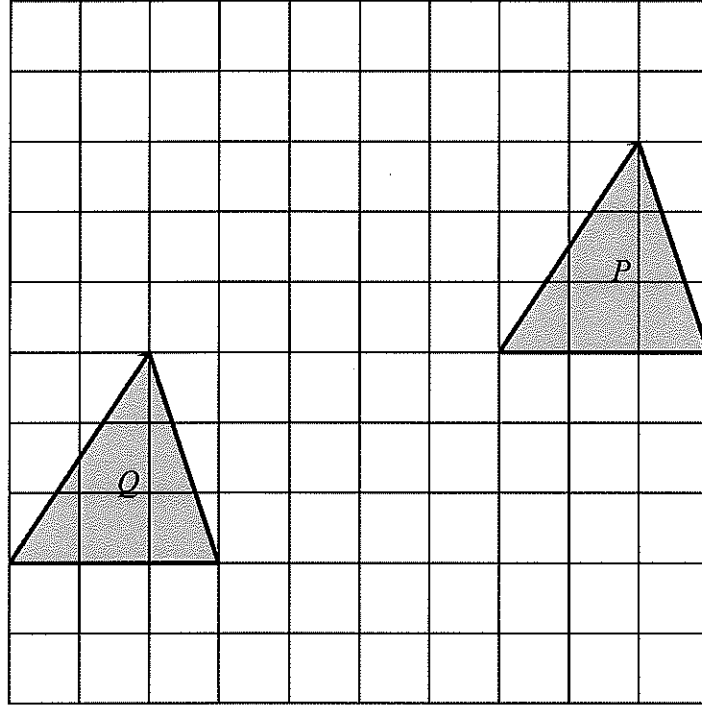


- 2) Work out the volume of the cone, leaving your answer in terms of π .



- 1) The translation of triangle P to triangle Q is described by column vector \mathbf{v} .

Write down \mathbf{v} .



- 2) Here are two column vectors: $\mathbf{f} = \begin{bmatrix} -2 \\ 5 \end{bmatrix}$ $\mathbf{g} = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$

Work out

- $2\mathbf{f}$
- $-\mathbf{g}$
- $\mathbf{f} + \mathbf{g}$
- $\mathbf{f} - \mathbf{g}$
- $2\mathbf{f} + 4\mathbf{g}$
- $3\mathbf{g} - \mathbf{f}$

- 1) There are 5 red pens, 3 blue pens and 2 green pens in a box.
Jerry takes at random a pen from the box and gives the pen to his friend.
Jerry then takes at random another pen from the box.
Work out the probability that both pens are the same colour.



- 2) There are 3 red sweets, 2 blue sweets and 4 green sweets in a bag.
Jack takes a sweet at random.
He eats the sweet.
He then takes another sweet at random.

Work out the probability that both sweets are the same colour.



- 3) There are 13 buttons in a bag.
9 buttons are white.
4 buttons are black.
Carol takes a button at random from the bag, and keeps it.
She now takes another button from the bag.

Work out the probability that Carol takes a button of each colour.

Stratified Sampling



- 1) Ellen wants to do a survey with Years 9, 10 and 11 at her school. The table shows the number of students in each of these year groups.

Year 11	Year 10	Year 9
750	700	900

Ellen takes a sample of 50 students stratified by year group.

Work out the number of students from Year 10 in the sample.



- 2) The table shows information about the year groups of 1000 students in a school.

Year group	7	8	9	10	11	12	13
Number in year	157	180	166	140	132	114	111

Tony takes a sample of 50 of these students, stratified by year group.

Calculate the number of Year 8 students he should have in his sample.



- 3) The table shows information about Ben's collection of 652 coins.

Country	France	Spain	Germany	Italy	Total
Number of coins	240	182	133	97	652

Ben takes a sample of 50 coins stratified by country.

Work out the number of coins from Italy in this sample.



- 4)

	Male	Female
Lower sixth	399	602
Upper sixth	252	198

The table gives information about the number of students in the two years of a sixth form.

Amy wants to interview some of these students.

She takes a random sample of 70 students stratified by year and by gender.

Work out the number of students in the sample who are male and in the lower sixth.