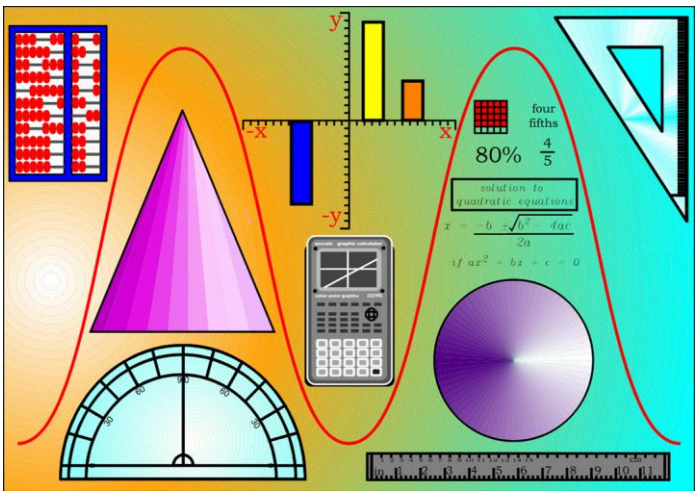
Springburn Academy

Mathematics Department

THE ULTIMATE INTERMEDIATE MATHS 2 REVISION RESOURCE

Enabling you to be engaged in

BRINGING OUT YOUR BEST



Based on Past Papers 2000-2009 by Topic

UNIT 1

UNIT 2

UNIT 3

HOW TO BRING OUT YOUR BEST

SEE then PLAN then DO then CHECK

Understand the Problem **SEE**

- Carefully read the problem.
- Decide what you are trying to do.
- Identify the important data.

GET INSIGHT

Devise a plan **PLAN**

- Gather together all available information;
- ***Consider some possible actions (e.g.HAVE YOU SEEN THIS BEFORE?);***
- look for a pattern;
- ***draw a sketch;***
- make an organised list;
- ***simplify the problem;***
- quess, IMPROVE and check;
- ***make a table;***
- write a number sentence (eg equation);
- ***act out the problem (in your head!);***
- identify a sub-task (e.g. work out third angle of a triangle); and
- ***check the validity of given information.***

ONE OR MORE OF THESE

Carry out the plan **DO**

- Implement a particular plan of attack.
- Revise and modify the plan as needed.
- Create a new plan if necessary.

ACTION

Check the answer **CHECK**

- ✓ Ensure you have used all the **important** information.
- ✓ Decide whether or not the answer makes sense (E.G. SUBSTITUTE or ESTIMATE).
- ✓ Check that all of the given conditions of the problem are met by the answer.
- ✓ ***Put your answer in a complete sentence***.

RELAX

The above is the key to success!

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: Area $= \frac{1}{2}ab \sin C$

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

Volume of a cone: Volume $= \frac{1}{3}\pi r^2 h$

Volume of a cylinder: Volume $= \pi r^2 h$

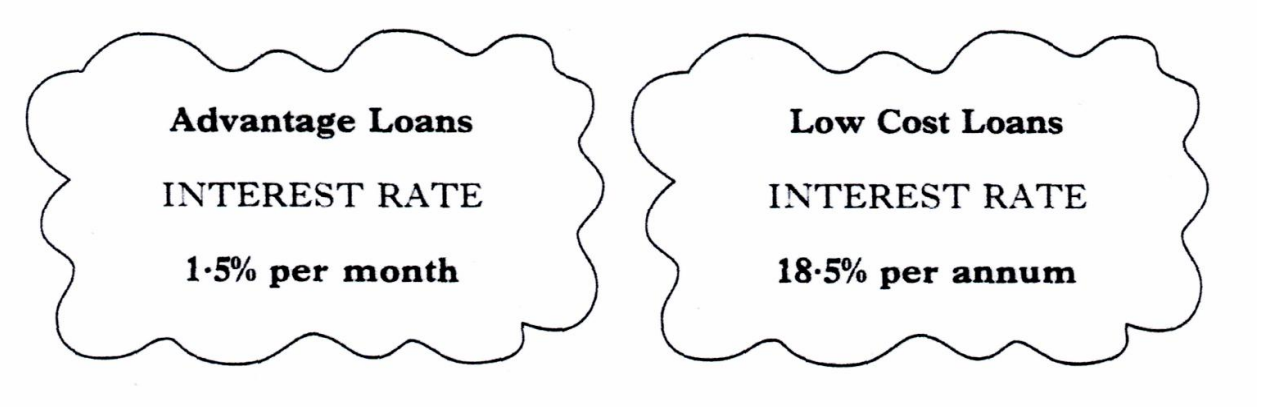
Standard deviation: $s = \sqrt{\dfrac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\sum x^2 - (\sum x)^2 / n}{n-1}}$, where n is the sample size.

UNIT 1 O1 CALCULATIONS INVOLVING PERCENTAGES

- Carry out calculations involving percentages in appropriate contexts: appreciation/depreciation

2000 Paper 2

A4. *Michael wishes to borrow £1000 for 3 months.*
He can choose from ***Advantage Loans*** *or* ***Low Cost Loans.***



Which company costs less? Give a reason for your answer.

4

2001 Paper 2

1. The population of a city is increasing at a steady rate of 2.4% per annum.
The present population is 528000.
What is the expected population in 4 years time?
Give Your answer to the nearest thousand.

3

2002 Paper 2

10. The population of Newtown is 50000.
The population of Newtown is ***increasing*** *at a steady rate of 5% per annum.*
The population of Coaltown is 108000.
The population of Coaltown is ***decreasing*** *at a steady rate of 20% per annum.*
How many years will it take until the population of Newtown is greater than the population of Coaltown?

5

2004 Paper 2

1. The average Scottish house price is £77 900.
The average price is expected to rise by 2.5% per month. What will the average Scottish house price be in 3 months?
Give your answer correct to three significant figures.

3

2005 Paper 2

1. *In the evening, the temperature in a greenhouse drops by 4% per hour.*
   At 8 pm the temperature is 28 ° Celsius.
   What will the temperature be at 11 pm?

3

2006 Paper 2

1. *The value of a boat decreased from £35 000 to £32 200 in one year.*
   (a) What was the percentage decrease?

1

(b) If the value of the boat continued to fall at this rate, what would its value be after a ***further*** *3 years?*
Give your answer to the nearest hundred pounds.

3

2007 Paper 2

1. *Ian's annual salary is £28400.His boss tells him that his salary will increase by 2.3% per annum.*
   What will lan's annual salary be after 3 years?
   Give your answer to the nearest pound.

3

2008 Paper 2

1. *Calculate the* ***compound interest*** *earned when £50000 is invested for 4 years at 4.5% per annum. Give your answer to the nearest penny.*

4

2009 Paper 2

1. *A new book "Intermediate 2 Maths is Fun" was published in 2006.*
   There were 3000 sales of the book during that year.
   Sales rose by 11% in 2007 then fell by 10% in 2008.
   Were the sales in 2008 more or less than the sales in 2006?
   You must give a reason for your answer.

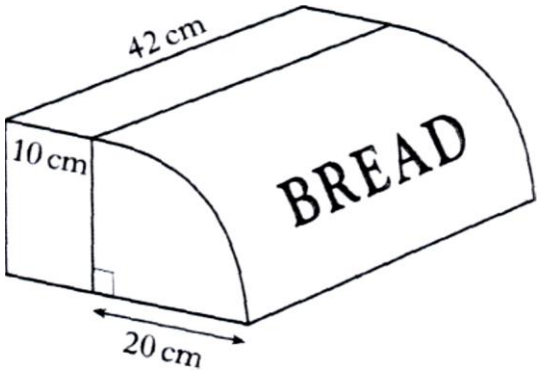
3

UNIT 1 O2 VOLUMES OF SOLIDS

- Find the volumes of spheres, cones and prisms
- Round calculations to a required number of significant figures

2000 Paper 2

A6. A bread bin is in the shape of a prism as shown below.



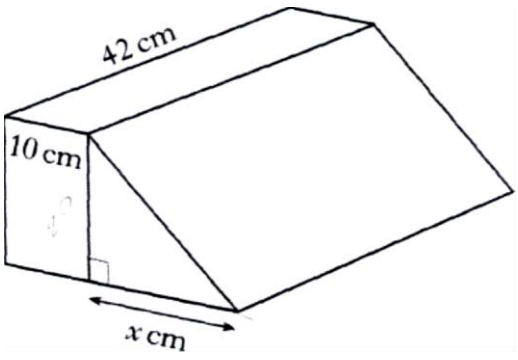
The cross-section of the bread bin consists of a rectangle 20 centimetres by 10 centimetres and a quarter circle.

(a) Calculate the volume of the bread bin.

Give your answer in cubic centimetres, correct to 3 significant figures.

4

(b) The design is changed so that the volume remains the same. The cross-section is now a rectangle 20 centimetres by 10 centimetres and a right-angled triangle as shown in the diagram below.

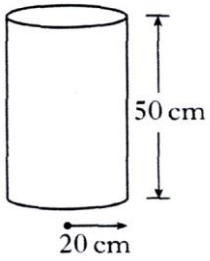


Find x.

3

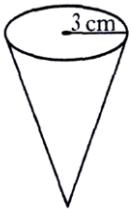
2001 Paper 2

6. *A drinks container is in the shape of a cylinder with radius 20 centimetres and height 50 centimetres.*



(a) *Calculate the volume of the drinks container. Give your answer in cubic centimetres, correct to two significant figures.*

3



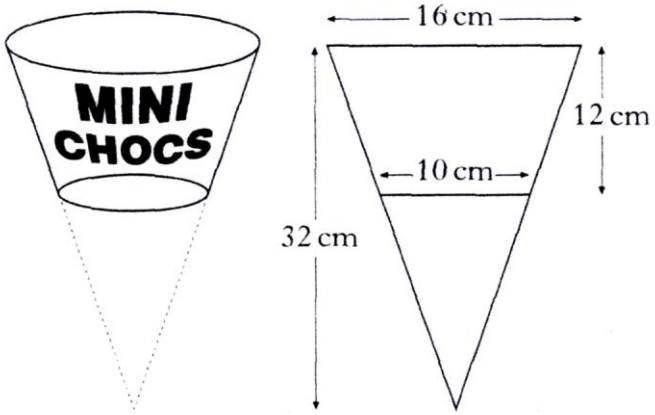
(b) *Liquid from the full container can fill 800 cups, in the shape of cones, each of radius 3 centimetres.*

What will be the height of liquid in each cup?

4

2002 Paper 2

6. *A container to hold chocolates is in the shape of part of a cone with dimensions as shown below.*



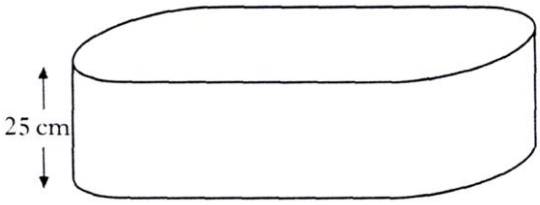
Calculate the volume of the container.

Give your answer correct to one significant figure.

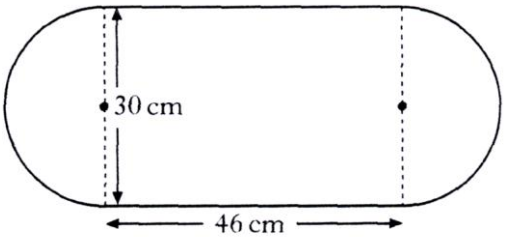
5

2003 Paper 2

6. *A garden trough is in the shape of a prism.*



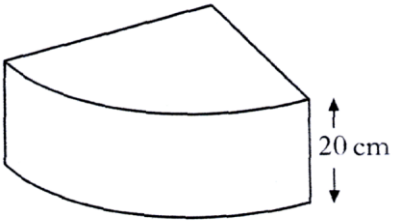
The height of the trough is 25 centimetres.
The cross-section of the trough consists of a rectangle and two semi-circles with measurements as shown.



(a) Find the volume of the garden trough in cubic centimetres.
Give your answer correct to two significant figures.

4

A new design of garden trough is planned by the manufacturer.



The height of the trough is 20 cm.

The uniform cross-section of this trough is a quarter of a circle.

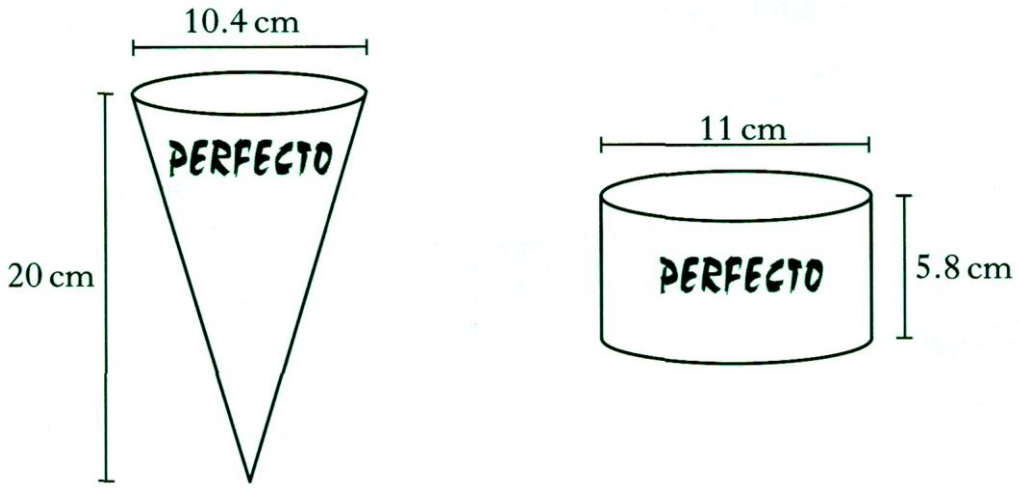
The volume of the trough is 30000cm".

(b) Find the radius of the cross-section.

3

2004 Paper 2

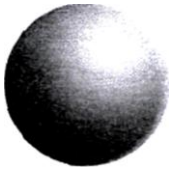
9. *Perfecto Ice Cream is sold in cones and cylindrical tubs with measurements as shown below.*



Both the cone and the tub of ice cream cost the same.
Which container of ice cream is better value for money?
Give a reason for your answer.

5

2005 Paper 2



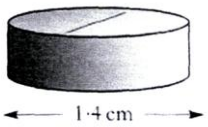
7. *A pharmaceutical company makes vitamin pills in the shape of spheres of radius 0.5 centimetres.*

(a) *Calculate the volume of **one** pill.*
Give your answer correct to two significant figures.

3

The company decides to change the shape of each pill to a cylinder.

(b) *The new pill has the same volume as the original and its diameter is 1.4 centimetres.*
Calculate the height of the new pill.



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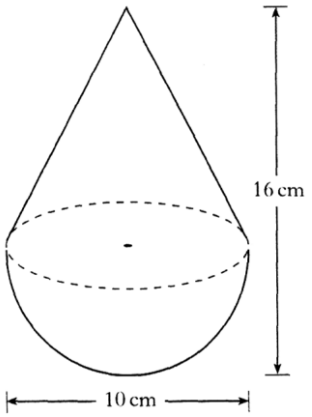
2006 Paper 2

3. *A child's toy is in the shape of a hemisphere with a cone on top, as shown in the diagram. The toy is 10 cms wide and 16 cms high. Calculate the volume of the toy. Give your answer correct to 2 significant figures*



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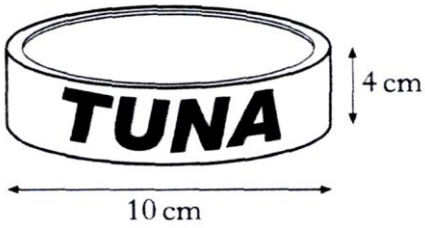
2007 Paper 1

3. *A tin of tuna is in the shape of a cylinder. It has diameter 10 cms and height 4 cms. Calculate its volume.* ***Take π = 3·14.***

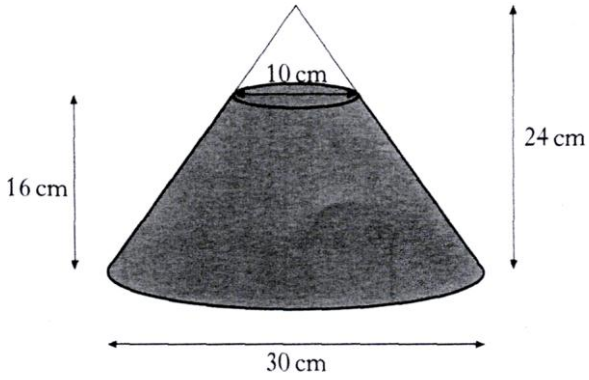


2

2007 Paper 2

5. *A glass ornament in the shape of a cone is partly filled with coloured water.*

The cone is 24 cms high and has a base of diameter 30 cms. The water is 16 cms deep and measures 10 cms across the top.
What is the volume of the water?
Give your answer correct to 2 significant figures.



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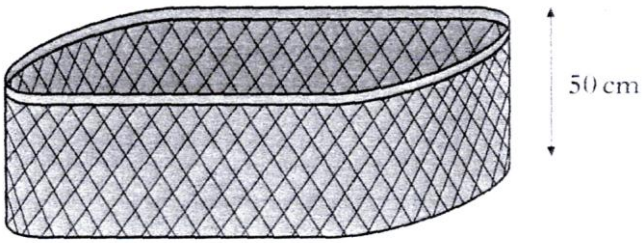
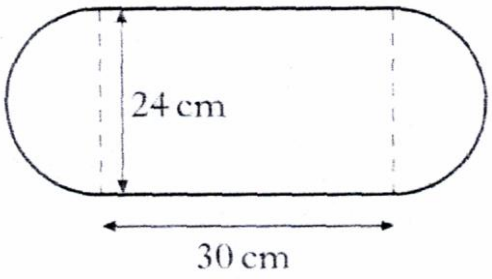
2008 Paper 2

2. *Jim Reid keeps his washing in a basket.*
The basket is in the shape of a prism.



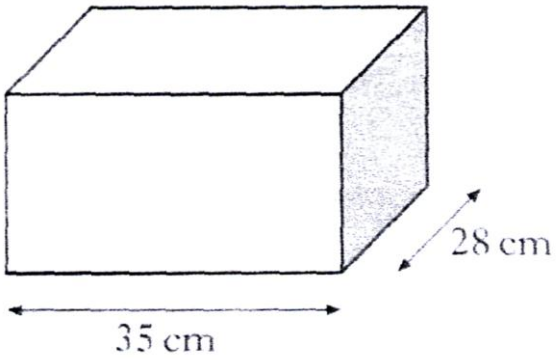
The height of the basket is 50 cms.
The cross section of the basket consists of a rectangle and two semi-circles with measurements as shown.



(a) Find the volume of the basket in cubic centimetres.
Give your answer correct to three significant figures.

4

*Jim keeps his ironing in a storage box which has a volume **half** that of the basket.*



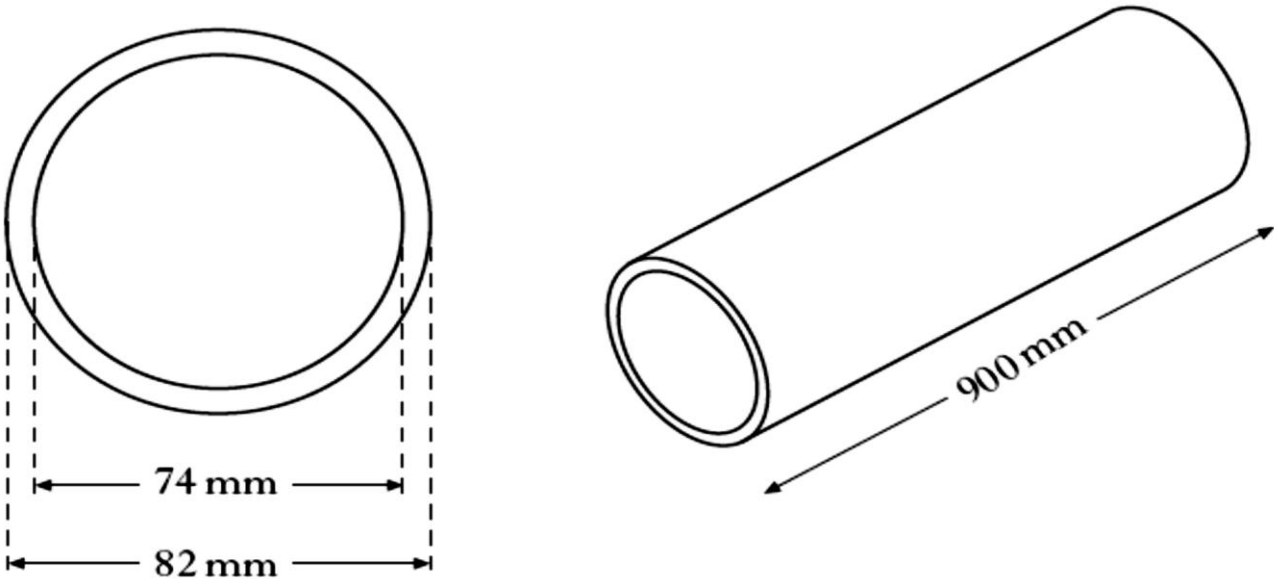
The storage box is in the shape of a cuboid, 35 centimetres long and 28 centimetres broad.

(b) Find the height of the storage box.

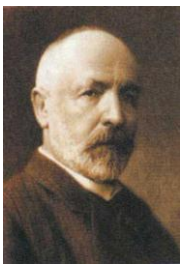
3

2009 Paper 2

3. A company manufactures aluminium tubes.
The cross-section of one of the tubes is shown in the diagram below.



The inner diameter is 74 millimetres.
The outer diameter is 82 millimetres.
The tube is 900 millimetres long.
Calculate the volume of aluminium used to make the tube.
Give your answer correct to three significant figures.



Georg Cantor (founder of set theory and introduced the concept of infinite numbers with his discovery of cardinal numbers. He also advanced the study of trigonometric series.)

"In mathematics the art of proposing a question must be held of higher value than solving it."

POINTS TO PONDER 1

IF YOU GET TO KNOW YOUR COURSE INSIDE OUT BY TRYING ALL OF THESE QUESTIONS AND DOING WELL **then** YOU WILL SENSE THE TYPE OF QUESTION LIKELY TO BE ASKED FOR EACH TOPIC!

UNIT 1 O5 PROPERTIES OF CIRCLES

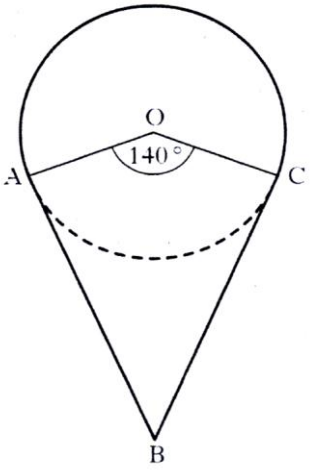
- *find the length of an arc of a circle*
- *find the area of a sector of a circle*

Use the properties of circles*:*

- *relationship between tangent and radius*
- *angle in a semi-circle*
- *the interdependence of the centre, bisector of and a perpendicular to a chord*

2001 Paper 2

10. The diagram shows a mirror which has been designed for a new hotel. The shape consists of a sector of a circle and a kite AOCB.



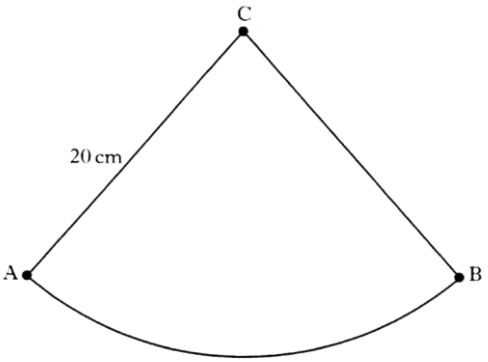
- *The circle, centre O, has a radius of 50 centimetres.*
- *Angle AOC= 140°.*
- *AB and CB are tangents to the circle at A and C respectively.*

Find the perimeter of the mirror.

5

2002 Paper 2

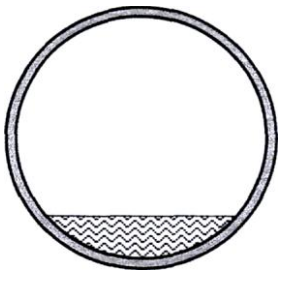
4. A pendulum travels along an arc of a circle, centre C.



The length of the pendulum is 20 cms.
The pendulum swings from A to B.
The length of the arc AB is 28.6 cms.
Find the angle through which the pendulum swings from A to B.

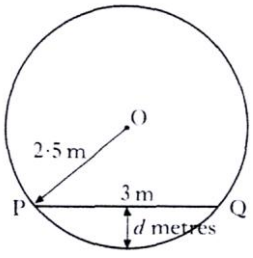
4

9. The diagram shows a circular cross-section of a cylindrical oil tank.



In the figure below,

- *O represents the centre of the circle*
- *PQ represents the surface of the oil in the tank*
- *PQ is 3 metres*
- *the radius OP is 2.5 metres.*

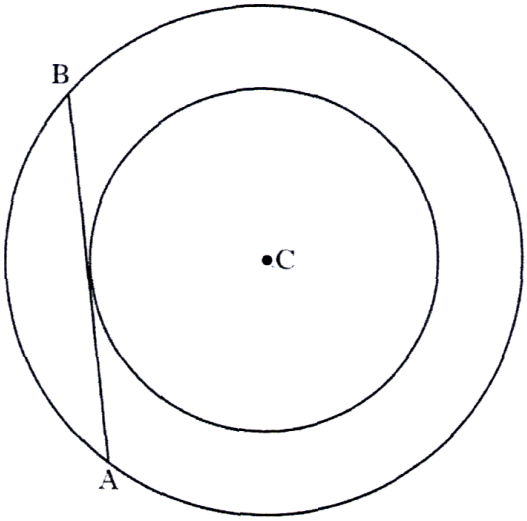


Find the depth, d *metres, of oil in the tank.*

4

2003 Paper 1

7. C is the centre of two concentric circles. AB is a tangent to the smaller circle and a chord of the larger circle. The radius of the smaller circle is 6 centimetres and the chord AB has length 16 centimetres. Calculate the radius of the larger circle.



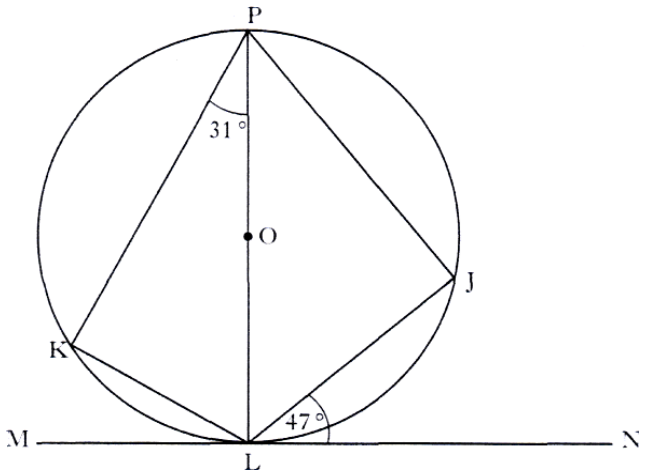
3

2003 Paper 2

1. The tangent, MN, touches the circle, centre O, at L.

- *Angle JLN = 47°.*
- *Angle KPL = 31°.*
-

Find the size of angle KLJ.



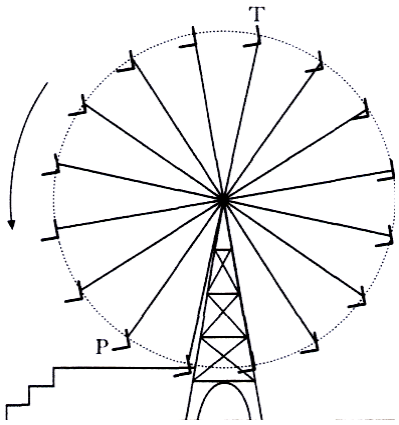
3

8. The diagram below shows a big wheel at a fairground.

The wheel has sixteen chairs equally spaced on its circumference.

The radius of the wheel is 9 metres.

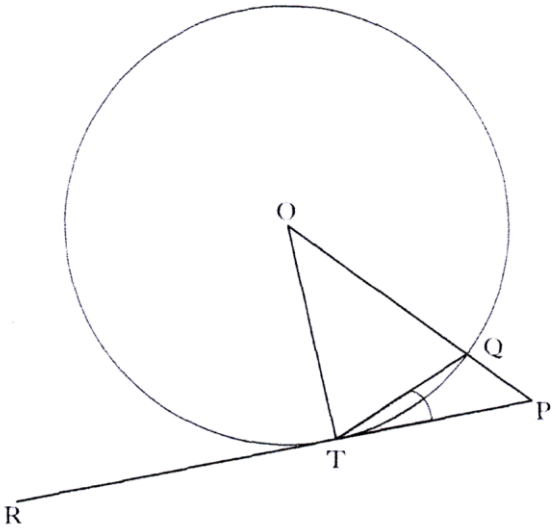
As the wheel rotates in an anticlockwise direction, find the distance a chair travels in moving from position T to position P in the diagram.



4

2004 Paper 1

3. *RP is a tangent to the circle, centre O, with a point of contact T. The shaded angle PTQ = 24°. Calculate the size of angle OPT.*

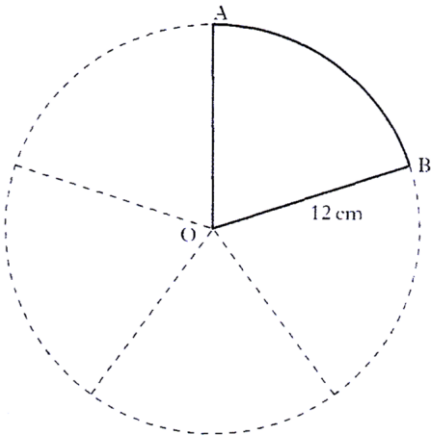


3

2004 Paper 2

4. *A circle, with centre O, and radius 1 2 centimetres, is cut into 5 equal sectors.*

Calculate the perimeter of sector OAB.



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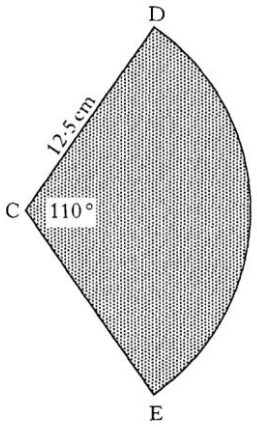
2005 Paper 2

5. *The diagram shows a sector of a circle,*

centre C.

The radius of the circle is 12.5 centimetres and angle DCE is 110°.

Calculate the area of the sector CDE.

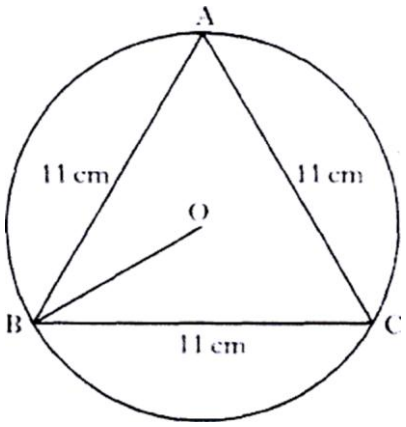


3

2005 Paper 2

9. *Points A. B and C lie on the circumference of a circle, centre O.*

Triangle ABC is equilateral with sides of length 11 centimetres as shown in the diagram.

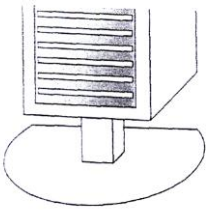


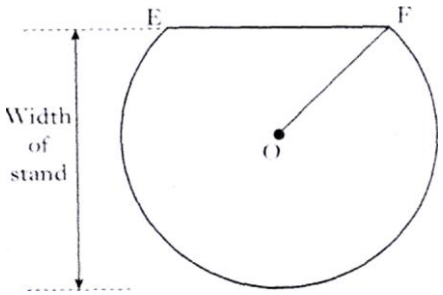
(a) Write down the size of angle OBC. **1**

(b) Calculate the length of the radius OB. **3**

2006 Paper 2

4. *The diagram shows the base of a compact disc stand which has the shape of part of a circle.*
   - *The centre of the circle is O.*
   - *EF is a chord of the circle.*
   - *EF is 18 centimetres.*
   - *The radius. OF, of the circle is 1 5 centimetres.*

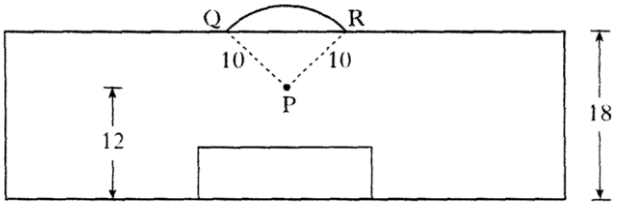




Find the width of the stand. **4**

8. *The diagram shows the penalty area in a football pitch. All measurements are given in yards.*

The penalty spot is marked at point P.
QR is an arc of a circle, centre P, radius 10 yards.
The width of the penalty area is 18 yards and the distance of the penalty spot from the goal line is 12 yards,as shown



(a) *Calculate the size of angle QPR.* **3**

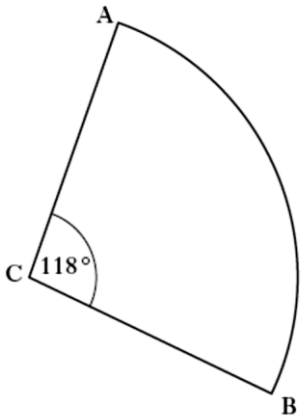
(b) Calculate the length of arc QR. **2**

2007 Paper 2

2. *The diagram shows a sector of a circle, centre C.*

The radius of the circle is 10.5 centimetres and angle ACB is 118 °.

Calculate the length of arc AB.

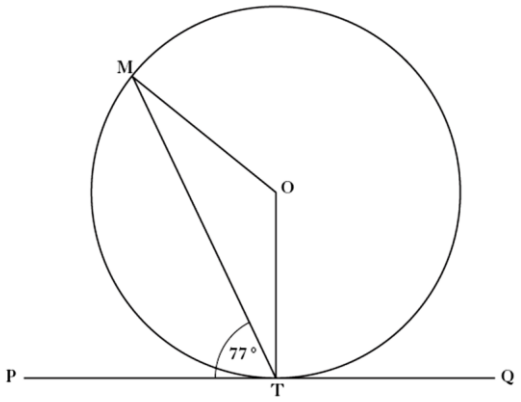


3

4. *The tangent PQ touches the circle, centre O, at T.*
Angle MTP is 77 °.
(a) Calculate the size of angle MOT.

2

(b) The radius of the circle is 8 centimetres. Calculate the length of chord MT.

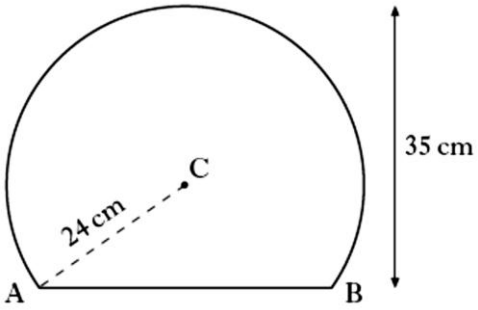


3

14. *A mirror is shaped like part of a circle.*

The radius of the circle, centre C, is 24 centimetres.
The height of the mirror is 35 centimetres.

Calculate the length of the base of the mirror, represented in the diagram by AB.

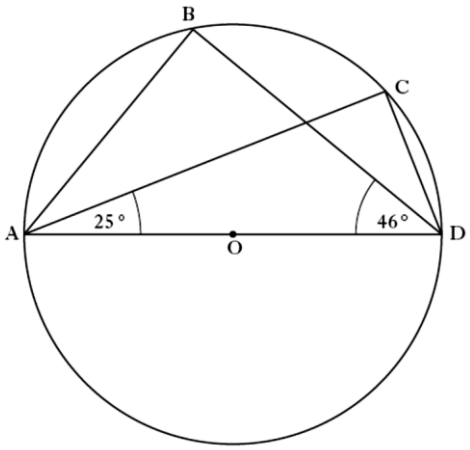


3

2008 Paper 1

7. *AD is a diameter of a circle, centre O.*
B and C are points on the circumference of the circle.
- *Angle CAD = 25 °.*
- *Angle BDA = 46 °.*

Calculate the size of angle BAC.

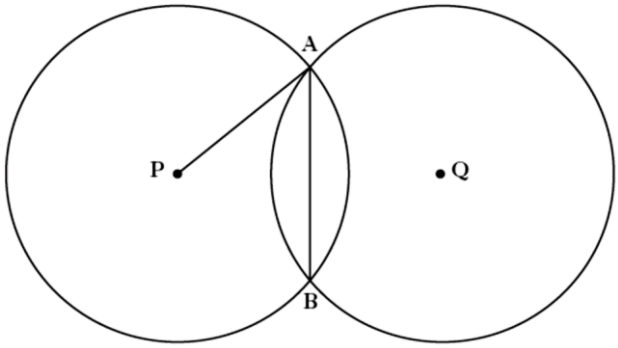


3

2008 Paper 2

9. *Two identical circles, with centres P and Q, intersect at A and B as shown in the diagram.*

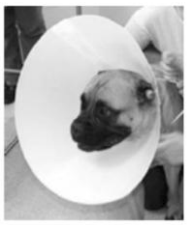
The radius of each circle is 10 centimetres.
The length of the common chord, AB, is 12 centimetres.
Calculate PQ, the distance between the centres of the two circles.



5

2009 Paper 2

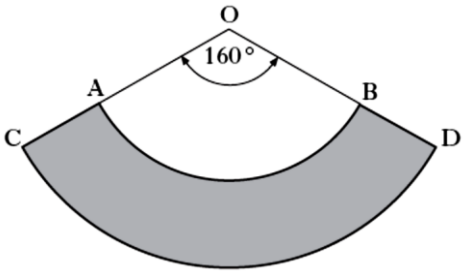
5. *A pet shop manufactures protective dog collars.*
In the diagram the shaded area represents one of these collars.



AB and CD are arcs of the circles with centres at O.
The radius, OA, is 10 inches and the radius, OC, is 18 inches.

Angle AOB is 160 °.

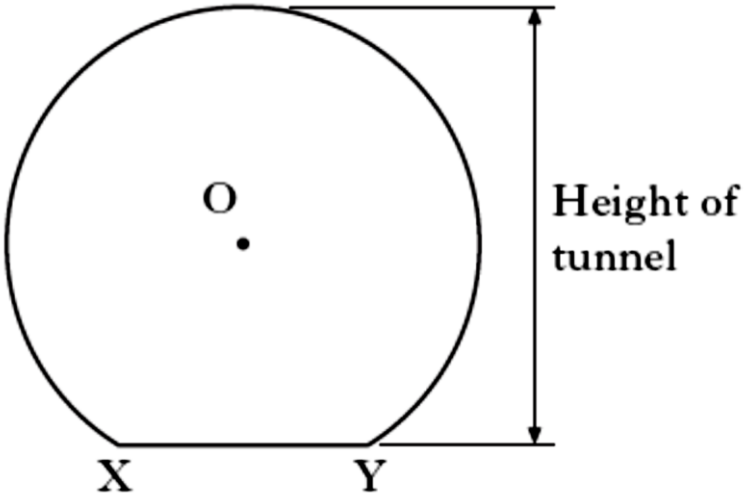
Calculate the area of a collar.



4

2009 Paper 2

14. A railway goes through an underground tunnel.
The diagram below shows the cross-section of the tunnel.
It consists of part of a circle with a horizontal base.



- *The centre of the circle is O.*
- *XY is a chord of the circle.*
- *XY is 1.8 metres.*
- *The radius of the circle is 1.7 metres.*

Find the height of the tunnel.

4

Siméon Poisson,French Mathematician

"Life is good for only two things, discovering mathematics and teaching mathematics"

POINTS TO PONDER 3

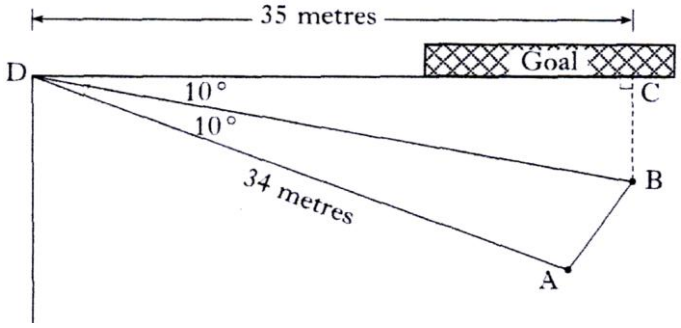
PRETENDING TO TEACH (or actually teaching) TOPICS
IS A VERY EFFECTIVE WAY OF UNDERSTANDING
THE SUBJECT MATTER BETTER!

UNIT 2 TRIGONOMETRY

- *Find the sine, cosine and tangent of angles other than acute angles Z1JJ*
- *Find the area of a scalene tnangic using area* = ±bcsinA
- *Solve scalene triangles by using the Sine / Cosine Rule*
- ***Use the Cosine Rule to find an angle ot a triangle, given all three sides.***

2000 Paper 2

A7. The diagram shows part of a football pitch with players at A, B, C and D.



BC is perpendicular to CD.

CD = 35 metres, angle CDB = 10°, angle BDA = 10°, AD = 34 metres.

Find the distance from A to B.

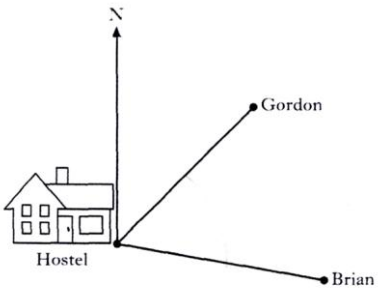
5

2001 Paper 2

4. Gordon and Brian leave a hostel at the same time.

Gordon walks on a bearing of 045 ° at a speed of 4.4 kilometres per hour.
Brian walks on a bearing of 100° at a speed of 4.8 kilometres per hour.

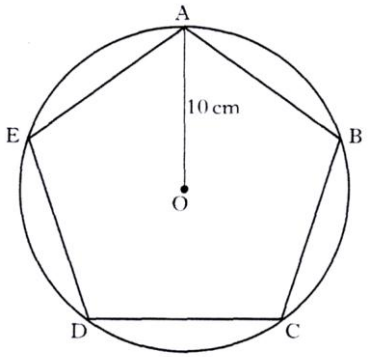
If they both walk at steady speeds, how far apart will they be after 2 hours?



5

8. A regular pentagon ABCDE is drawn in a circle, centre O, with radius 10 centimetres.

Calculate the area of the regular pentagon.

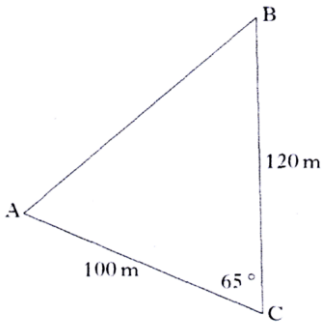


5

2002 Paper 2

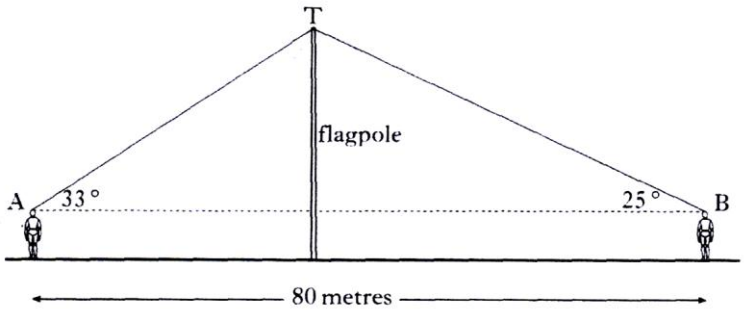
1. *The sketch shows a triangle, ABC.*

   Calculate the area of the triangle.



2

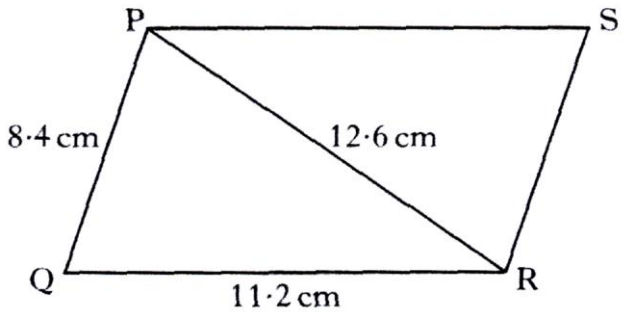
8. *The diagram shows two positions of a surveyor as he views the top of a flagpole.*
   From position A, the angle of elevation to T at the top of the flagpole is 33°.
   From position B, the angle of elevation to T at the top of the flagpole is 25°.
   The distance AB is 80 metres and the height of the surveyor to eye level is 1.6 metres.
   Find the height of the flagpole.



6

2003 Paper 2

10. *The sketch shows a parallelogram, PQRS.*



(a) *Calculate the size of angle PQR.*
Do not use a scale drawing.

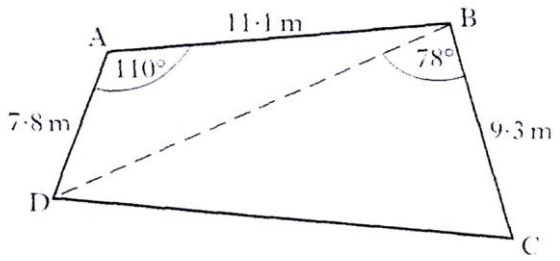
3

(b) *Calculate the area of the parallelogram.*

3

2004 Paper 2

7. *A garden, in the shape of a quadrilateral, is represented in the diagram.*



Calculate:

(a) the length of the diagonal BD;

Do not use a scale drawing

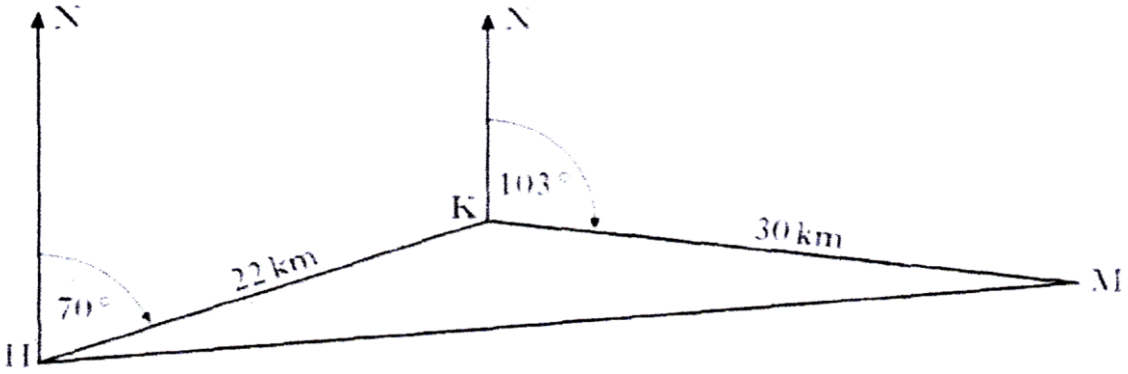
3

(b) the area of the garden.

4

2005 Paper 2

6. *In the diagram three towns. Holton. Kilter and Malbrigg are represented by the points H, K and M respectively.*



A helicopter flies from Holton for 22 kilometres on a bearing of of 70° to Kilter.

It then flies from Kilter for 30 kilometres on a bearing of 103° to Miilbrice.

The helicopter then returns directly to Holton.

(a) (i) Calculate the size of angle HKM,

1

(ii) Calculate the total distance travelled by the helicopter.

Do not use a scale drawing.

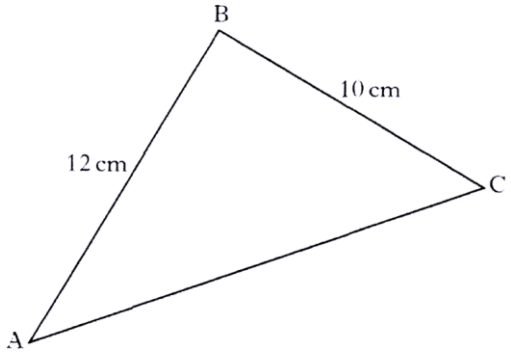
3

(b) A climber is reported missing somewhere in the triangle represented by MKM in the diagram. Calculate the area of this triangle.

2

2006 Paper 1

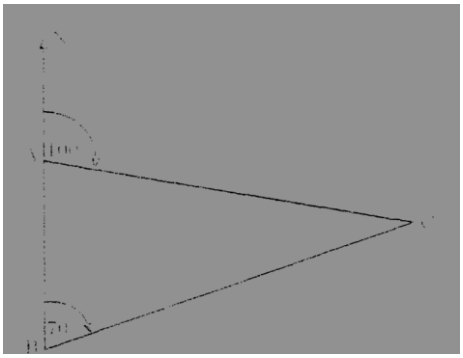
4. Calculate the area of triangle ABC if $\sin B = \frac{2}{3}$



2

2006 Paper 2

10. The diagram below shows the position of three campsites A, B and C.



Alan sets off from campsite A on a bearing of 100° at an average speed of 5.6 kilometres per hour.
At the same time Bob sets off from campsite B on a bearing of 070° .
After 3 hours they both arrive at campsite C.
Who has the faster average speed and by how much?

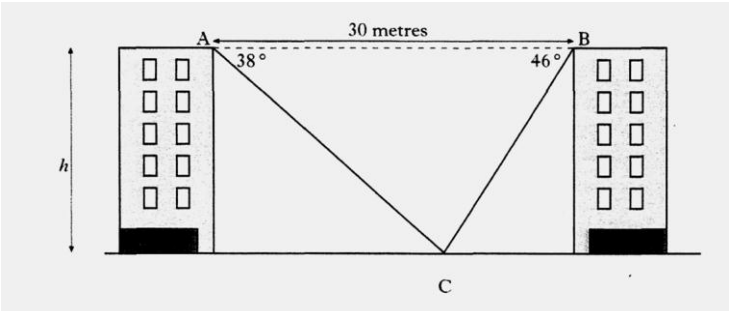
C

5

2007 Paper 2

9. The diagram shows two blocks of flats of equal height.

A and B represent points on the top of the flats and C represents a point on the ground between them.
To calculate the height, **h**, of each block of flats, a surveyor measures the angles of depression from A and B to C.



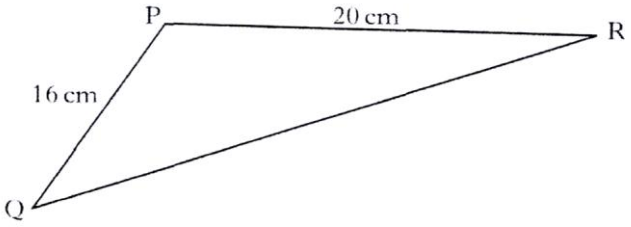
From A, the angle of depression is 38 °. From B, the angle of depression is 46 °.
The distance AB is 30 metres.
Calculate the height, **h**, in metres

2008 Paper 1

6. *Triangle PQR is shown.*

If $\sin P = \frac{1}{4}$, *calculate the*

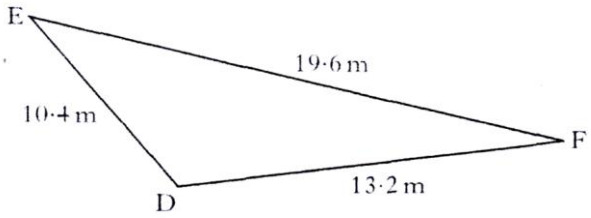
area of triangle PQR.



2

2008 Paper 2

5. *Triangle DEF is shown.*
It has sides of length 10.4 metres, 13.2 metres and 19.6 metres.
Calculate the size of angle EDF.
Do not use a scale drawing.



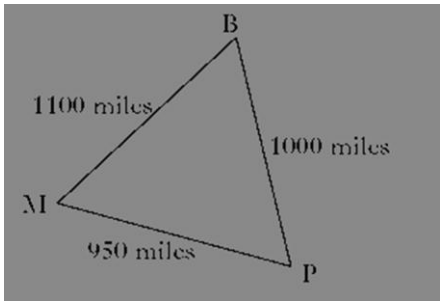
3

2009 Paper 2

6. *The Bermuda triangle is an area in the Atlantic Ocean where many planes and ships have mysteriously disappeared.*

Its vertices are at Bermuda (B), Miami (M) and Puerto Rico (P).

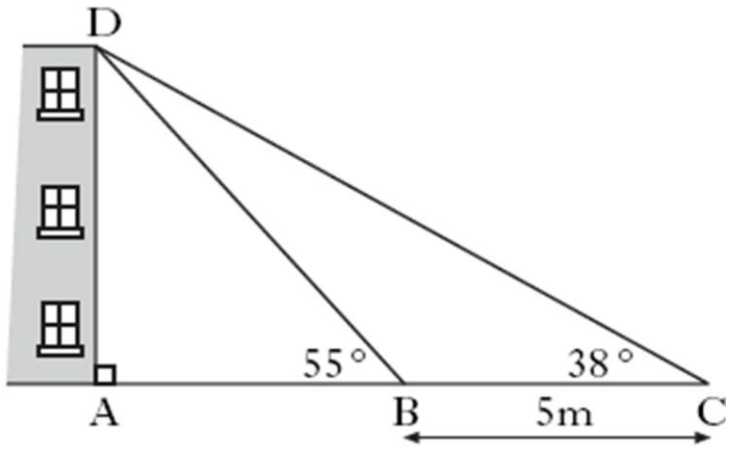
Calculate the size of angle BPM.



5

2009 Paper 2

13. For reasons of safety, a building is supported by two wooden struts, represented by DB and DC as shown.

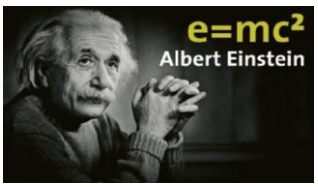


- *Angle ABD = 55 °.*
- *Angle BCD = 38 °.*
- *BC is 5 metres.*

Calculate the height of the building represented by AD.

5

Albert Einstein



"Do not worry too much about your difficulties in mathematics, I can assure you that mine are still greater."

POINTS TO PONDER 4

DIFFICULTY IN UNDERSTANDING MATHS COMES WITH THE TERRITORY!
DON'T GIVE IN IF YOU FIND SOME PARTS DIFFICULT!
REMEMBER THAT FAILURE IS AT LEAST A SIGN THAT YOU HAVE TRIED!
REMEMBER ROBERT THE BRUCE-TRY, TRY AND TRY AGAIN!
(unless, of course, you have success in less than 3 attempts)

UNIT 2 O2 SIMULTANEOUS LINEAR EQUATIONS

- *Construct formulae to describe a lineeir relationship*
- *Know the significance of the point of intersection of two graphs: solve simultaneous linear equations in two variables graphically*
- *Solve simultaneous linear equations in two variables algebraically*

2000 Paper 2

A5. The cost of hiring a car depends on the number of days the car is hired and the number of litres of petrol used.

(a) David hired a car for 3 days and used 50 litres of petrol. The total cost was £88.50.

Let x pounds be the cost per day of hiring a car, and y pounds be the cost of one litre of petrol.
Write down an equation in x and y which satisfies the above condition.

1

(b) Anne hired the same model of car for 4 days and used 60 litres of petrol. The total cost was £113.00.
Write down a second equation in x and y which satisfies this condition.

1

(c) Find the cost per day of hiring the car and the cost of one litre of petrol.

4

2001 Paper 1

3. Find the point of intersection of the straight lines with equations

$2x + y = 5$ *and* $x - 3y = 6$.

4

2002 Paper 2

2. Solve ***algebraically*** *the system of equations*

$3x-y=11$ *and* $2x+y=1$

4

2003 Paper 2

3. Seats on flights from London to Edinburgh are sold at two prices, £30 and £50. On one flight a total of 130 seats was sold.

Let x be the number of seats sold at £30 and y be the number of seats sold at £50.

(a) Write down an equation in x and y which satisfies the above condition.

1

The sale of the seats on this flight totalled £6000.

(b) Write down a second equation in x and y which satisfies this condition.

1

(c) How many seats were sold at each price?

4

2004 Paper 2

5. A sports centre charges different entrance fees for adults and children.

(a) One evening 14 adults and 4 children visited the sports centre.

The total collected in entrance fees was £55.00.

Let £x be the adult's entrance fee and £y be the. child's entrance fee.

Write down an equation in x and y which represents the above condition.

1

(b) The following evening 13 adults and 6 children visited the sports centre. The total collected in entrance tees was £54.50.

Write down a second equation in x and y which represents the above condition.

1

(c) Calculate the entrance fee for an adult and the entrance fee for a child.

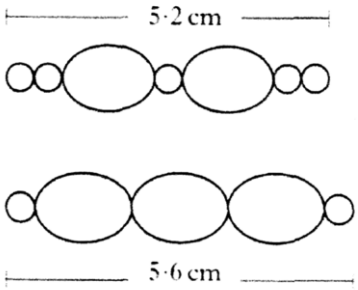
4

2005 Paper 2

4. A jeweller uses two different arrangements of beads and pearls.

The first arrangement consists of 2 beads and 5 pearls and has an overall length of 5.2 centimetres.

The second arrangement consists of 3 beads and 2 pearls and has an overall length of 5.6 centimetres.



Find the length **of one** bead and the length of **one** pearl.

6

2006 Paper 2

2. *Solve algebraically the system of equations*

$4x + 2y = 13$ and $5x + 3y = 17$

3

2007 Paper 1

4. *Find the point of intersection of the straight lines with equations*
$x + 2y = -5$ and $3x - y = 13$.

4

2008 Paper 2

4. *Suzie has a new mobile phone. She is charged x pence per minute for calls and v pence for each text she sends. During the first month her calls last a total of 280 minutes and she sends 70 texts. Her bill is £52.50.*
(a) Write down an equation in x and y which satisfies the above condition.

1

The next month she reduces her bill. She restricts her calls to 210 minutes and sends 40 texts. Her bill is £38.00.
(b) Write down a second equation in x and y which satisfies this condition.

1

(c) Calculate the price per minute for a call and the price for each text sent.

4

2009 Paper 2

4. *There are 14 cars and 60 passengers on the morning crossing of the ferry from Wemyss Bay to Rothesay. The total takings are £344.30.*

(a) Let x pounds be the cost for a car and y pounds be the cost for a passenger.
Write down an equation in x and y which satisfies the above condition.

1

(b) There are 21 cars and 40 passengers on the evening crossing of the ferry.
The total takings are £368.95.
Write down a second equation in x and y which satisfies this condition.

1

(c) Find the cost for a car and the cost for a passenger on the ferry.

4

UNIT 2 O3 SIMPLE GRAPHS, CHARTS and TABLES

- *Extract and interpret data from bar graphs, line graphs, pie charts and stem-and-leaf diagrams*
- *Construct bar graphs. Sine graphs and stem-and-leaf diagrams from given data*
- *Construct and interprets scattergraph from data*
- *Add a cumulative frequency column tor an ungrouped frequency table*
- *Find the median and quartiles from a data set or an ungrouped frequency table*
- *Construct and interpret boxplots and dotplots*
- *Construct a pie chart*

2000 Paper I

A5. A manufacturer of matches claims that there are "on average 60 matches per box". A sample of eleven boxes contains the following numbers of matches per box.

58, 62, 60, 65, 59, 60, 59, 62, 61, 61, 64

(a) From the above data:

find the median, the lower quartile and the upper quartile.

2

(b) Comment on the claim made above.

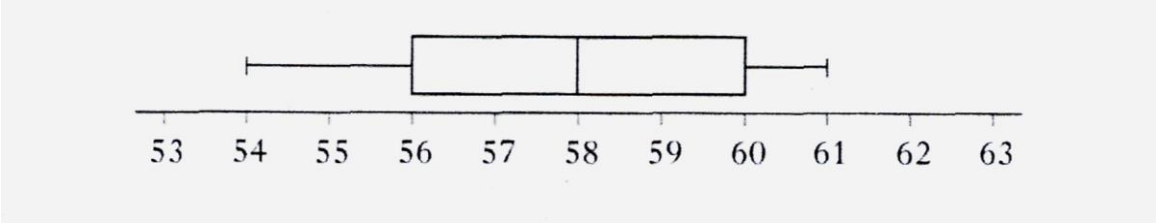
1

(c) Construct a boxplot for the data.

2

(d) A different sample of matchboxes was taken.

The boxplot, shown below, was drawn for the new data.



Does this new data support the manufacturer's claim?
Give a reason for your answer.

1

2001 Paper I

5. *The stem and leaf diagram shows the amounts of money spent by customers in a shop.*

2	1 4 4
3	0 1 5 5 8
4	1 2 3 5 6 9
5	0 1 2 3 5 8 9 9
6	0 0 1 2 6
7	1 2 2
8	0 4 6

$n = 33$ 2|1 represents 21 pence

(a) Using the above information, find (i) the median
(ii) the lower quartile and the upper quartile
(iii) the semi-interquartile range.

1,2,2

(b) What is the probability that a customer chosen at random spent more than 80 pence?

1

2001 Paper 2

3. *The contents of twenty matchboxes were counted.*

44	44	46	45	47	48	47	41	48	45
45	44	42	43	44	46	46	43	49	45

(a) Construct a dot plot for the data.

2

(b) Describe the shape of the distribution.

1

(c) What would you expect the "average contents per matchbox" to be ?

1

2003 Paper 2

2. *A sample of shoppers was asked which brand of washing powder they preferred.*

The responses are shown.

Construct a pie chart to illustrate this information.

Show all your working.

Washing Powder	*Frequency*
Dazzle	250
Cyclo	375
Surfer	125
Cleano	250

3

2004 Paper1

1. *In a class test, the following marks were recorded.*

5	9	10	4	5	5	6	10	5	8
5	7	4	9	7	5	4	6	5	7

(a) *Construct a frequency table for the above data and add a* ***cumulative frequency column.***

2

(b) *What is the probability that a student, chosen at random from this class, obtained a mark higher than 7?*

1

4. *The number of chocolates in each box from a sample of 25 boxes was counted.*

The results are displayed in the dotplot below.

(a) For this sample find:

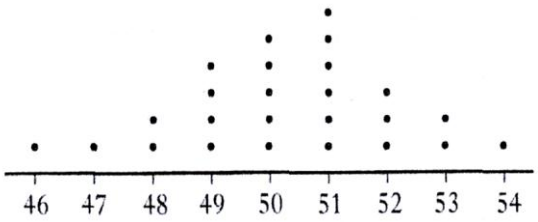
(i) the median;

1

(ii) the lower quartile:

1

(iii) the upper quartile.



1

(b) Use the data from this sample to construct a boxplot.

2

(c) In a second sample of boxes, the semi-interquartile range was 1.5.

Make an appropriate comment about the distribution of data in the two samples.

2

2005 Paper1

4. For a group of freezers in a shop,the volume,in litres, of each one is listed below.

78 81 91 75 85 83 84 78

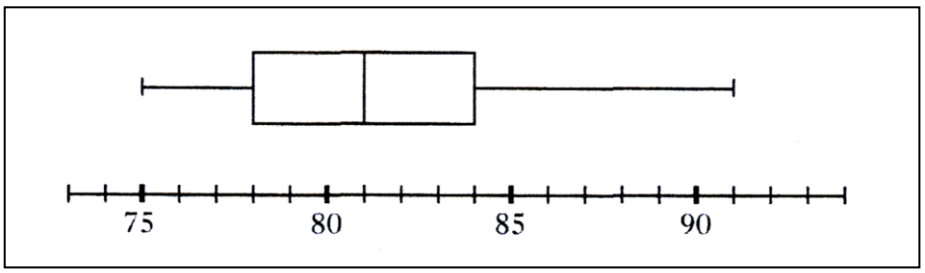
(a) For the given data, calculate:

(i) the median; **1**

(ii) the lower quartile; **1**

(iii) the upper quartile. **1**

One of the numbers from the above list was accidentally missed out. A boxplot was then drawn and is shown below.



(b) Which number was missed out?

Give a reason for your answer.

2

2006 Paper 1

3. In a factory, the number of workers absent each day is recorded for 21 days. The results are listed belou

19	22	19	22	20	21	17
19	21	16	20	19	18	18
20	20	23	19	18	17	19

(a) Construct a dotplot for this data. **2**

(b) Find:

(i) the median; (ii) the lower quartile; (iii) the upper quartile.

1,1,1

(c) What is the probability that, on a day chosen at random from this sample, more than 18 workers were absent?

1

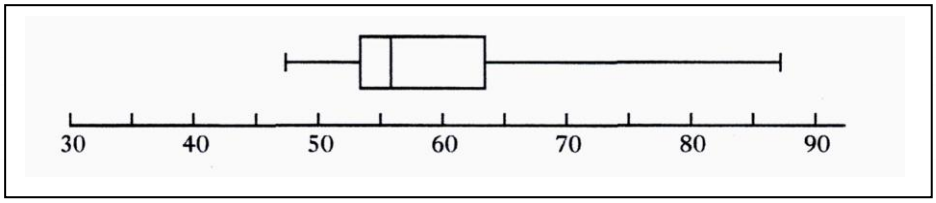
2007 Paper 2

3. *This back-to-back stem and leaf diagram shows the results for a class in a recent mathematics examination*

Girls			Boys									
		1	3									
		9	4	7	9							
8	7	4	3	2	2	5	2	3	4	4	6	6	7	9
		9	4	6	3							
	9	6	3	7	4	8						
		8	1	8	7							
		n = 15			n = 14							

Key
3 | 7 | represents 73%
8 | 7 represents 87%

(a) A boxplot is drawn to represent one set of data.



Does the boxplot above represent the girls' data or the boys' data?
Give a reason for your answer.

1

*(b) For the **other** set of data, find:*
(i) the median; (ii) the lower quartile; (iii) the upper quartile.

1,1,1

(c) Use the answers found in part (b) to construct a second boxplot.

2

(d) Make an appropriate comment about the distribution of data in the two sets.

1

2008 Paper 1

5. *In a survey, the number of books carried by each girl in a group of students was recorded.*
The results are shown in the frequency ta

Number of books	*Frequency*
0	1
1	2
2	3
3	5
4	5
5	6
6	2
7	1

(a) Copy this frequency table and add a cumulative frequency column.

1

(b) For this data, find:
(i) the median; (ii) the lower quartile; (iii) the upper quartile.

1,1,1

(c) Calculate the semi-interquartile range.

1

(d) In the same survey, the number of books carried by each boy was also recorded. The semi-interquartile range was 0.75.
Make an appropriate comment comparing the distribution of data for the girls and the boys.

1

2009 Paper 1

1. The no. of goals scored one weekend by team in the Football League is shown.

0	***1***	***1***	***2***	***1***	***0***	***0***	***5***	***0***	***1***	***3***
0	***2***	***2***	***1***	***1***	***3***	***0***	***0***	***2***	***4***	***1***

(a) Construct a dotplot for the data.

2

(b) The shape of the distribution is

A skewed to the right B symmetric

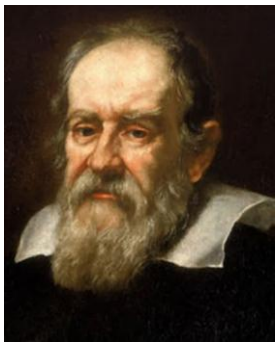
C skewed to the left D uniform.

Write down the letter that corresponds to the correct shape.

1

Galileo Galilei

"The Universe is a grand book which cannot be read until one first learns to comprehend the language and become familiar with the characters in which it is composed. It is written in the language of mathematics"



POINTS TO PONDER 5

CONFIDENCE WITH NUMBERS (often through CALCULATORS)
LEADS TO CONFIDENCE IN MATHEMATICAL CHALLENGES
AND OTHER AREAS OF LIFE!
LEARN THE BASICS and BECOME CONFIDENT
IN THE USE OF ALL GIVEN FORMULA!
SURELY SUCCESS WILL FOLLOW……

UNIT 2 O4 USE OF SIMPLE STATISTICS

- *Calculate the mean, median, mode and range from a data set or an ungrouped frequency table*
- *Calculate the semi-interquartile range from a data set or ungrouped frequency table*
- *Calculate the standard deviation of a data set*
- *Determine the equation of a best-fitting straight line on a scattergraph and use it to estimate a y-value given the x-value*
- *Know that probability is a measure of chance between 0 and 1*
- *Find probability defined as:* $\frac{number\ of\ favourable\ outcomes}{total\ number\ of\ outcomes}$ *where all the outcomes are equally likely*

2000 Paper 1

A1. A group of students scored the following marks in a test.

9 5 6 8 6 9 7 8 6 5

(a) *Construct a frequency table from the above data and add a cumulative frequency column.*

2

(b) *What is the probability that a student chosen at random from this group scored less than 8?*

1

2000 Paper 2

A1. A hotel inspector recorded the volume of wine, in millilitres, in a sample of six glasses.

120 126 125 131 130 124

Use an appropriate formula to calculate the standard deviation.

Show clearly all your working.

4

2001 Paper 1

2. *Two groups of six students are given the same test.*

(a) The marks of Group A are

73 47 59' 71 48 62.

Use an appropriate formula to calculate the mean and the standard deviation.

Show clearly all your working.

4

(b) In Group B, the mean is 60 and the standard deviation is 29.8. Compare the results of the two groups.

2

2002 Paper 1

1. In a tournament a group of golfers recorded the following scores.

74 70 71 73 75 71 73 72
72 75 71 76 74 72 70 73

(a) Construct a frequency table from the above data and add a cumulative frequency column.

2

(b) What is the probability that a golfer chosen at random from this group recorded a score of less than 72?

1

2002 Paper 2

3. (a) *The price, in pence, of a carton of milk in six different supermarkets is shown below.*

66 70 89 75 79 59

Use an appropriate formula to calculate the mean and standard deviation of these prices.
Show clearly all your working.

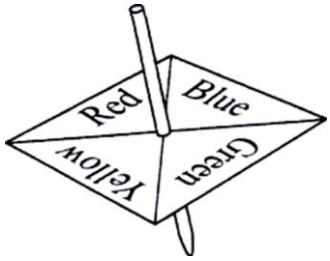
4

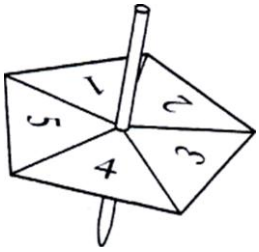
(b) *In six local shops, the mean price of a carton of milk is 73 pence with a standard deviation of 17.7.*
Compare the supermarket prices with those of the local shops.

2

2003 Paper 1

2. *Two spinners are used in an experiment.*





The table below shows some of the possible outcomes when both spinners are spun and allowed to come to rest.

	1	2	3	4	5
Red	R,1	R,2			
Yellow	Y,1				
Blue	B,1				
Green	G,1				

(a) *Copy and complete the table.*

1

(b) *What is the probability that one spinner comes to rest on red and the other on an even number?*

1

2003 Paper 2

5. *A gardener grows tomatoes in his greenhouse.*
The temperature of the greenhouse, in degrees Celsius, is recorded every day at noon for one week.

17 22 25 16 21 16 16

(a) For the given temperatures, calculate:
(i) the mean; (ii) the standard deviation.

1,3

Show clearly all your working.

For best growth, the mean temperature should be (20 ± 5)°C and the standard deviation should be less than 5 °C.

(b) Are the conditions in the greenhouse likely to result in best growth?
Explain clearly your answer.

2

2004 Paper 2

2. *The heights, in millimetres, of six seedlings are given below.*

15 I8 14 17 16 19

(a) Calculate:

(i) the mean and (ii) the standard deviation of these heights.

1,3

Show clearly all your working.

(b) Later the same six seedlings are measured again.
***Each** has grown by 4 millimetres.*
State:(i) the mean; (ii) the standard deviation; of the new heights.

1,1

2005 Paper 1

1. *The stem and leaf diagram below shows the heights of a group of children.*

12	1	2	4	5	9	
13	0	0	1	5	7	8
14	0	2	8	9		
15	1	1	2			

n = 18 12 | 1 represents 121 centimetres

What is the probability that a child chosen at random from this group has a height less than 130 centimetres?

1

2007 Paper 1

1. *The table below shows the results of a survey of First Year pupils.*

	Wearing a blazer	*Not wearing a blazer*
Boys	40	22
Girls	29	9

What is the probability that a pupil, chosen at random from this sample, will be a girl wearing a blazer?

1

6. *(a) Show that the standard deviation of 1, 1, 1, 2 and 5 is equal to* $\sqrt{3}$.

3

(*b*) ***Write down*** *the standard deviation of 101, 101, 101, 102 and 105.*

1

2007 Paper 2

6. *Tasnim rolls a standard dice with faces numbered 1 to 6.*
The probability that she gets a number less than 7 is:

A 0 **B** $\frac{1}{7}$ **C** $\frac{1}{6}$ **D** 1

Write down the letter that corresponds to the correct probability.

1

2008 Paper 1

3. *The stem and leaf diagram shows the number of points gained by the football teams in the Premiership League in a season.*

3	3 3 3 9
4	1 4 5 5 7 8
5	0 2 3 3 6 6
6	0
7	5 9
8	
9	0

(*a*) *Arsenal finished 1st in the Premiership with 90 points. In what position did Southampton fin*

1

(*b*) *What is the probability that a team chosen at random scored less than 44 points?*

1

2008 Paper 2

3. *The results for a group of students who sat tests in mathematics and physics are shown below.*

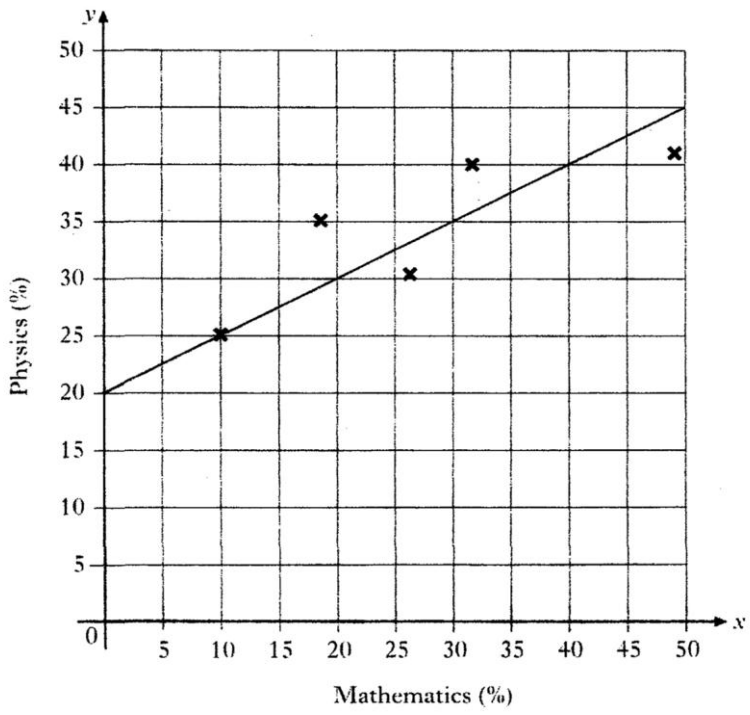
Mathematics (%)	10	18	26	32	49
Physics (%)	25	35	30	40	41

(a) *Calculate the standard deviation tor the mathematics test.* **4**

(b) *The standard deviation for physics was 6.8.*
Make an appropriate comment on the distribution of marks in the two Tests. **1**

These marks are shown on the scattergraph.

A line of best fit has been drawn.



(c) *Find the equation of*

(d) *Another pupil scored the physics test.*

***Use your answer to part** (c) to predict his physics mark.* **1**

2009 Paper 1

5. (a) The marks of a group of students in their October test are listed.

37 41 43 47 56 58 59 61 66 68 70 75

Calculate: (i) the median (ii) the semi-interquartile range.

1,3

(b) The teacher arranges extra homework classes for the students before the next test in December. In this test, the median is 67 and the semi-interquartile range is 7. Make two appropriate comments comparing the marks in the October and December tests

2

2009 Paper 2

2. The heights, in cms, of seven netball players are given below.

173 176 168 166 170 180 171

For this sample, calculate:

(a) the mean;

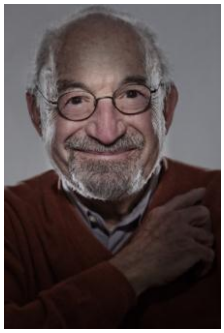
1

(b) the standard deviation.

3

Show clearly all your working.

Stan Gudder (Professor of Maths at University of Denver)



"The essence of mathematics is not to make simple things complicated, but to make complicated things simple"

POINTS TO PONDER 6

MATHEMATICS IS LARGELY BASED ON ROUTINE
and LEARNING HOW TO PUT PROCEDURES INTO PRACTICE!
DON'T LET AN UNUSUAL QUESTION OR DIAGRAM PUT YOU OFF!
MAKE A LIST OF YOUR **STRENGTHS** and **WEAKNESSES** then **IMPROVE**!

UNIT 3 O1 ALGEBRAIC EXPRESSIONS

- *Reduce an algebraic fraction to its simplest form*
- *Appiy the four rules to algebraic fractions*
- *Change the subject of formulae*
- *Simplify surds*
- *Express with a rational denominator*
- *Simplify expressions using the laws of indices*

2000 Paper 1

B8. (a) Express $\frac{a^{\frac{1}{2}} \times a^{\frac{3}{2}}}{a^2}$ *in its simplest form.*

2

(b) Express $\frac{2}{\sqrt{3}}$ *as a fraction with a rational denominator.*

2

(c) Express $\frac{2}{x}+\frac{4}{x+3}, x \neq 0, x \neq -3,$ *as a single fraction in its simplest form.*

3

2001 Paper 1

4. $P = R^2 b - 5$

Change the subject of the formula to R.

3

8. (a) Express $\frac{3}{x}-\frac{5}{x+2}, x \neq 0, x \neq -2,$ *as a single fraction in its simplest form.*

3

(b) Express $\sqrt{18}-\sqrt{2}+\sqrt{72}$ *as a surd in its simplest form.* **3**

2002 Paper 1

7. (a) Express $\sqrt{45}-2\sqrt{5}$ *as a surd in its simplest form.* **2**

(b) Express as a fraction in its simplest form $\frac{1}{x^2}+\frac{1}{x}, x \neq 0$ **2**

2002 Paper 2

11. (a) Simplify $6x^{\frac{3}{2}} \times 2x^{\frac{1}{2}}$

2

(b) Change the subject of the formula $r = 3p + 2t$ to p.

2

2003 Paper 1

6. (a) Express $\frac{\sqrt{40}}{\sqrt{2}}$ as a surd in its simplest form.

2

(b) Simplify $\frac{2x+2}{(x+1)^2}$.

2

2003 Paper 2

7. Change the subject of the formula $y = ax^2 + c$ to x.

2

11. (a) Express $a^{\frac{2}{3}}(a^{\frac{2}{3}} - a^{-\frac{2}{3}})$ in its simplest form.

2

(b) Express $\frac{a}{x} - \frac{b}{y}, x \neq o, y \neq o,$

as a fraction in its simplest form.

2

2004 Paper 2

11. (a) Express $\frac{4}{x+3} + \frac{3}{x}, x \neq -3, x \neq 0,$

as a single fraction in its simplest form.

3

(b) Change the subject of the formula $m = \frac{3x+2y}{p}$ to x

3

(c) Simplify $\frac{3a^5 \times 2a}{a^2}$

3

2005 Paper 1

5. *Simplify* $k^8 \times (k^2)^{-3}$

2

2005 Paper 2

10. (a) *Express* $\frac{7}{\sqrt{2}}$ *as a fraction with a rational denominator.*

2

(b) *Express* $\frac{a}{b} \times \frac{3b}{a^2}$ *as a fraction in its simplest form.*

2

[c] *Change the subject of the formula* $p = q + 2r^2$ *to* r.

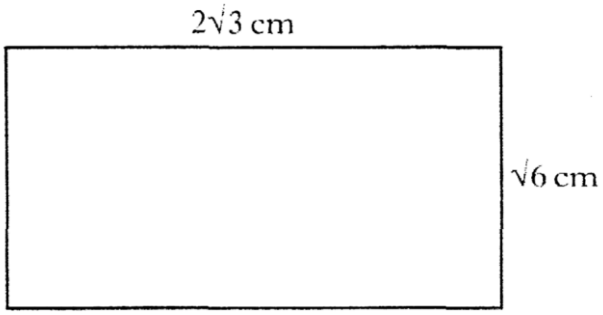
3

2006 Paper 1

9. *Evaluate* $16^{\frac{3}{4}}$.

2

10.



The rectangle has length $2\sqrt{3}$ *centimetres and breadth* $\sqrt{6}$ *centimetres.*
Calculate the area of the rectangle.
Express your answer as a surd in its simplest form.

3

2006 Paper 2

7. *Express* $\frac{3}{(x+1)} - \frac{1}{(x-2)}$, $x \neq -1, x \neq 2$, *as a single fraction in its simplest form.*

3

9. *Change the subject of the formula* $\frac{x}{c} + a = b$ *to* x.

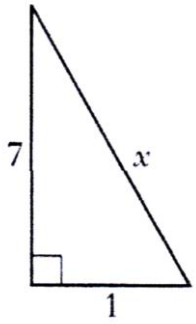
2

2007 Paper 1

9. *A right-angled triangle is shown.*

Using Pythagoras' Theorem, find x.

Express your answer as a surd in its simplest form.



3

2007 Paper 2

7. (a) *Factorise* ***fully*** $2x^2 - 18$.

2

(b) *Simplify* $\dfrac{(2x+5)^2}{(2x-1)(2x+5)}$

1

10. *Express* $\dfrac{5p^2}{8} \div \dfrac{p}{2}$ *as a fraction in its simplest form*

3

11. *Change the subject of the formula* $K = \dfrac{m^2 n}{p}$ *to* m.

3

12. *Simplify the expression below, giving your answer with a positive power.*

$$m^5 \times m^{-8}.$$

2

2008 Paper 2

7. (a) *Simplify* $\dfrac{m^5}{m^3}$.

1

(b) *Express*

$$2\sqrt{5} + \sqrt{20} - \sqrt{45}$$

as a surd in its simplest form.

3

2008 Paper 2

10. Change the subject of the formula $p = q + \sqrt{a}$ to a.

2

11. Express $\frac{2}{a} - \frac{3}{(a+4)}, a \neq 0, a \neq -4$ as a single fraction in its simplest form.

3

2009 Paper 2

8. Express $\frac{2}{x-1} + \frac{4}{x+2}, x \neq 1, x \neq -2$ as a single fraction in its simplest form.

3

10. Change the subject of the formula $A = \frac{1}{2}h(a+b)$ to h.

2

11. Express $\frac{12}{\sqrt{2}}$ with a rational denominator. Give your answer in its simplest form

2

12. Simplify $\frac{ab^6}{a^3b^2}$.

2

Marcel Proust (Writer)

"The real voyage of discovery consists not in seeking new landscapes, but in having new eyes."

POINTS TO PONDER 7

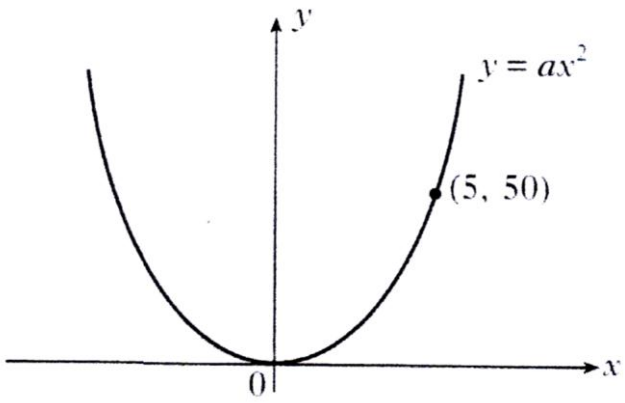
DON'T GIVE UP IF YOU DON'T SUCCEED IMMEDIATELY!
THERE ARE MANY METHODS OF PROBLEM SOLVING!
SOMETIMES YOU HAVE TO TRY A NEW APPROACH!
OPEN YOUR EYES AND **EMBRACE SUCCESS**!

UNIT 3 O2 QUADRATIC FUNCTIONS

- *Recognise quadratics of the form* $y = kx^2$ *and* $y = (x+a)^2 + b; a, b \in Z$ *from their graphs*
- *Identify the nature and coordinates of the turning point and the equation of the axis of symmetry of a quadratic of the form* $y = k(x+a)^2 + b; a, b \in Z, k = \pm 1$ *including* $y = kx^2$
- *Know the meaning of the term 'roots of a quadratic equation'*
- *Solve quadratic equations graphically*
- *Solve quadratic equations by factorisation and by using the quadratic formula*

2000 Paper 1

B6. The diagram below shows the graph of $y = ax^2$.



Find the value of a.

2

2000 Paper 2

B9. (a). Change the subject of the formula $r = \frac{st}{q}$ *to* s.

2

(b) Use an appropriate formula to solve the quadratic equation

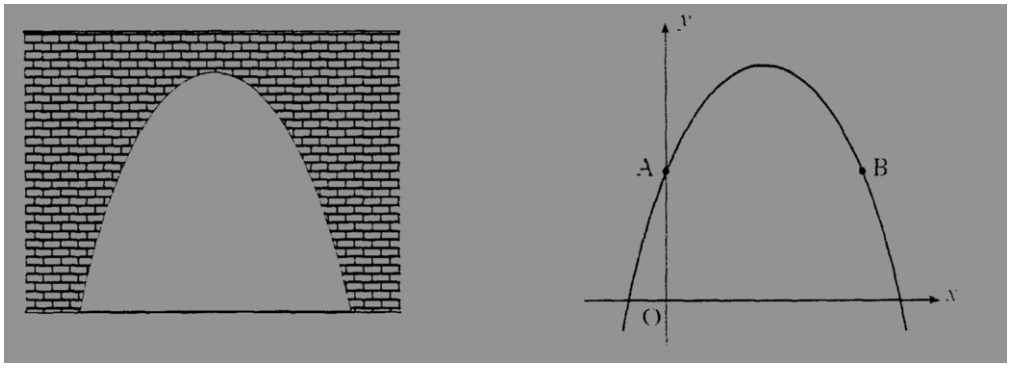
$$3x^2 - 2x - 6 = 0.$$

Give your answer correct to 1 decimal place.

4

2000 Paper 2

B10.



The arch of a railway bridge is represented by a parabola.
The equation of the parabola is $y = 20 - (x-3)^2$.

(a) State the coordinates of the maximum turning point of the parabola. **2**

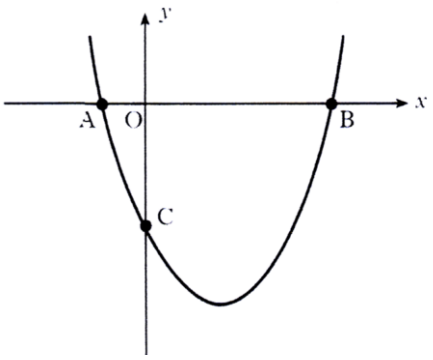
(b State the equation of the axis of symmetry. **1**

(c) Points A and B have the same y-coordinate.
A is the point (0, 11). State the coordinates of B. **2**

2001 Paper 2

5. *The equation of the parabola in the above diagram is* $y = (x-2)^2 - 9$.

(a) State the coordinates of the minimum turning point of the parabola. **2**



(b) Find the coordinates of C. **2**

(c) A is the point (-1,0).

State the coordinates of B. **1**

9. *(a). Express* $a^2(2a^{-\frac{1}{2}} + a)$ *in its simplest form.* **2**

(b) Solve the quadratic equation

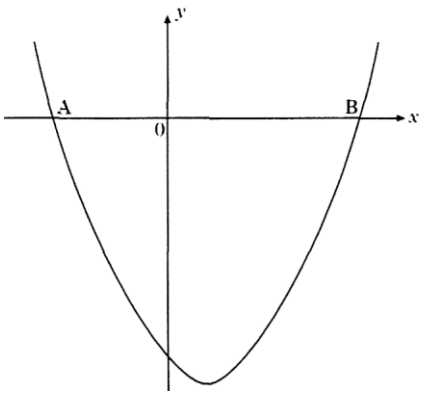
$$3x^2 + 3x - 7 = 0.$$

Give your answer correct to 1 decimal place. **4**

2002 Paper 1

6. The equation of the parabola in the diagram is

$y = (x-1)^2 - 16.$



(a) State the coordinates of the minimum turning point of the parabola. **2**

(b State the equation of the axis of symmetry . **1**

(c) The parabola cuts the .v-axis at A and B. Find the length of AB. **2**

2002 Paper 2

7. Solve the quadratic equation

$$2x^2 + 3x - 1 = 0.$$

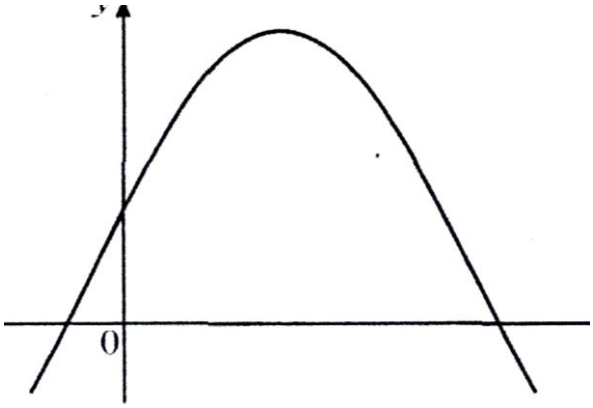
Give your answer correct to 1 decimal place. **4**

2003 Paper 1

8. (a) Factorise $7 + 6x - x^2$. **2**

(b) Hence write down the roots of the equation $7 + 6x - x^2 = 0$. **1**

(c) The graph of $y=7 + 6x - x^2$ is shown in the diagram.



Find the coordinates of the turning point. **3**

2003 Paper 2

9. *Solve the quadratic equation*

$$2x^2 + 4x - 9 = 0.$$

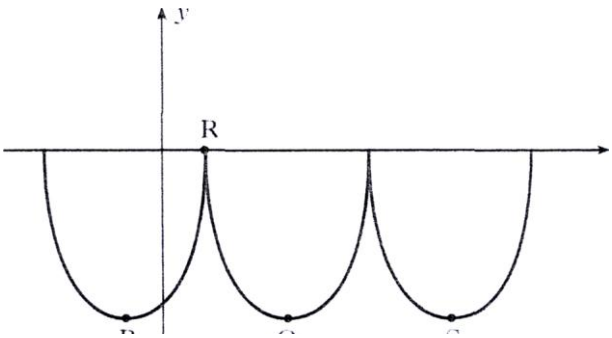
Give your answer correct to 1 decimal place.

4

2004 Paper 1

5. *William Watson's Fast Foods use a logo based on parts of three identical parabolas.*

This logo is represented on the diagram below.



The first parabola has turning point P and equation $y = (x+2)^2 - 16.$

(a) State the coordinates of P.

2

(b) If R is the point(2,0), find the coordinates of Q, the minimum turning point of the second parabola.

1

(c) Find the equation of the parabola with turning point S.

2

2004 Paper 2

6. *Solve the quadratic equation*

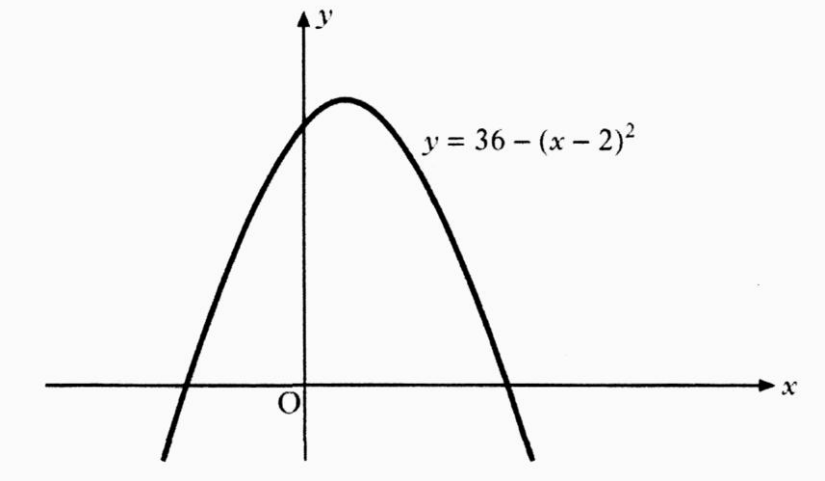
$$2x^2 + 7x - 3 = 0$$

giving the roots correct to 1 decimal place.

4

2005 Paper 1

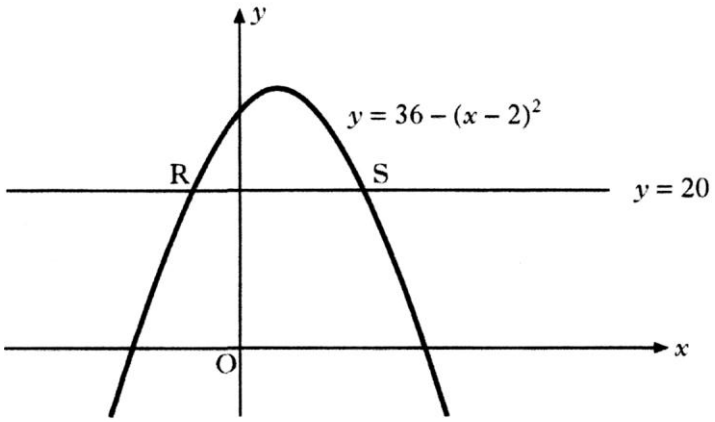
9. The diagram below shows part of the graph of $y = 36 - (x-2)^2$.



(a) State the coordinates of of the maximum turning point. **2**

(b) State the equation of the axis of symmetry. **1**

The line y=20 is drawn.
Its cuts the graph of $y = 36 - (x-2)^2$ at R and S as shown below.



(c) S is the point (6, 20). Find the coordinates of R. **2**

2005 Paper 2

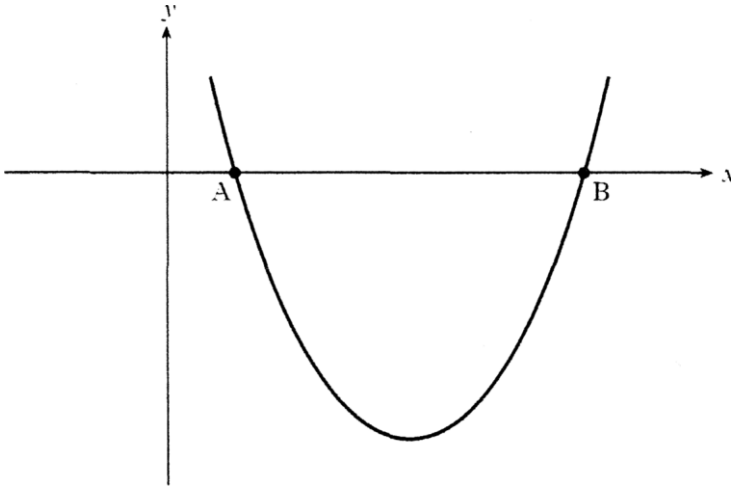
8. Solve the quadratic equation

$$4x^2 - 7x + 1 = 0$$

giving the roots correct to 1 decimal place. **4**

2006 Paper 1

7.



The equation of the parabola in the above diagram is $y = (x-3)^2 - 4$.

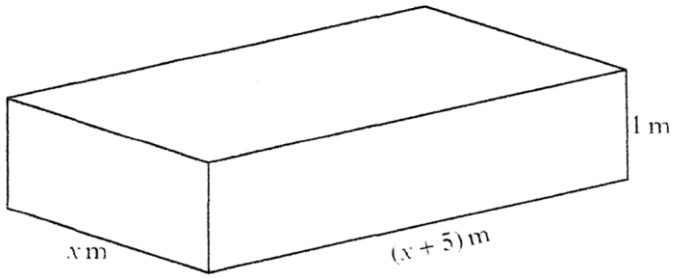
(a) State the coordinates of of the minmum turning point of the parabola. **2**

(b) State the equation of the axis of symmetry. **1**

(c) A is the the point (1, 0). State the coordinates of B. **1**

2006 Paper 2

11. A cuboid is shown below.



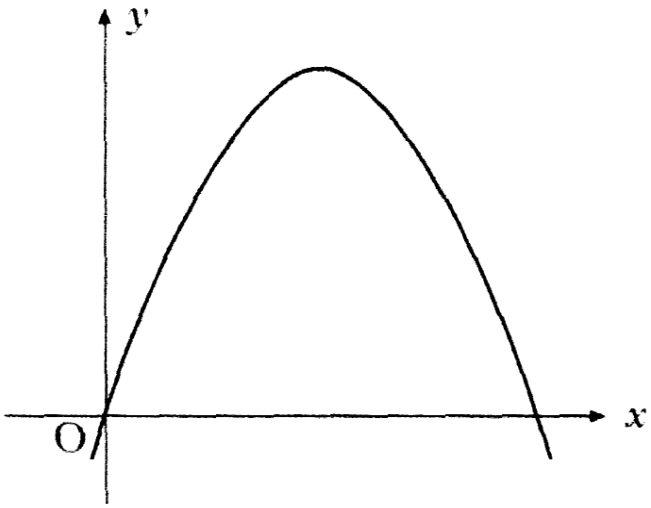
It has length (x+5) metres, breadth x metres, height 1 metre and volume 24 cubic metres.

(a) Show that $x^2 + 5x - 24 = 0$. **2**

(b) Using the equation in part (a), find the breadth of the cuboid. **3**

2007 Paper 1

7. The graph shown below is part of the parabola with equation $y = 8x - x^2$.



(a) By factorizing $8x - x^2$, *find the roots of the equation* $8x - x^2 = 0$. **2**

(b) State the equation of the axis of symmetry of the parabola. **1**

(c) Find the coordinates of the turning point **2**

2007 Paper 2

8. Solve the quadratic equation

$$2x^2 - 6x - 5 = 0$$

giving the roots correct to 1 decimal place. **4**

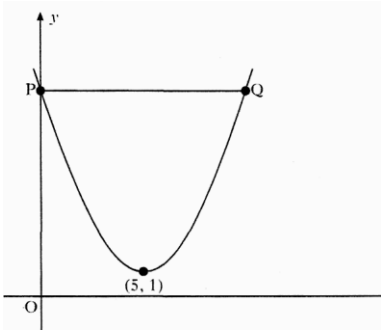
2008 Paper 1

9. The graph shown below is part of the parabola with equation $y = (x + a)^2 + b$.

(a) State the values of a and b. **2**

(b) State the equation of the axis of symmetry of the parabola. **1**

(c) The line PQ is parallel to the y-axis. Find the coordinates of points P and Q. **3**

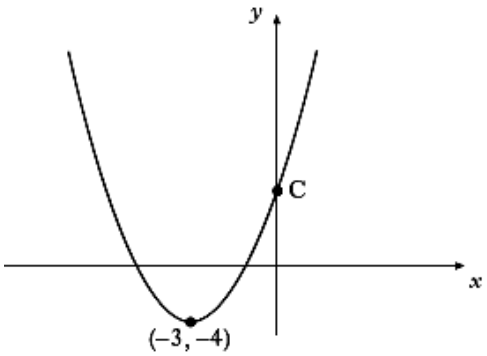


2008 Paper 2

8. Solve the quadratic equation $5x^2 + 4x - 2 = 0$ *giving the roots correct to 2 decimal places.* **4**

2009 Paper 1

9. The diagram below shows part of a parabola with equation of the form $y = (x + a)^2 + b$.



(a) Write down the equation of the axis of symmetry of the graph. **1**

(b) Write down the equation of the parabola. **2**

(c) Find the coordinates of C. **2**

2009 Paper 2

7. Solve the quadratic equation

$$x^2 + 5x + 3 = 0$$

giving the roots correct to 1 decimal place. **4**

Marie Curie (pioneer in researching radioactivity)

"I never see what has been done;
I only see what remains to be done."

POINTS TO PONDER 8

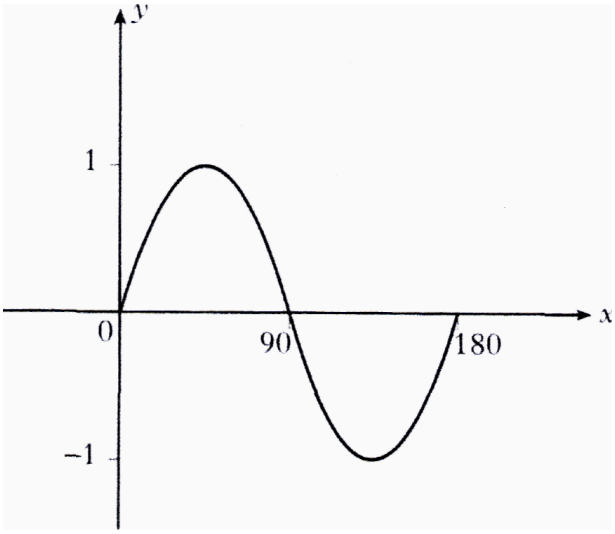
DON'T REVEL IN PREVIOUS SUCCESS!
KEEP YOUR EYE ON CURRENT AND FUTURE CHALLENGES!
FELLING GOOD AT THE END OF YOUR SQA EXAM IS YOUR FINISH LINE!
TURN YOUR WEAKNESSES INTO STRENGTHS!

UNIT 3 O3 FURTHER TRIGONOMETRY

- *Recognise the graphs of sine, cosine and tangent functions*
- *Sketch and identify trigonometric functions*
  - *involving a multiple angle*
  - *involving a phase angle*
- *Solve simple trigonometric equations in degrees*
- *Define the period of a trigonometric function either from its graph or from its equation*
- *Simplify expressions using* $\sin^2 A + \cos^2 A = 1$ *and* $\frac{\sin A}{\cos A} = \tan A$.

2000 Paper 1

B7.



The graph of $y = \sin bx°$ *is shown in the diagram. State the value of b.*

1

2000 Paper 2

B11. (a) Solve the equation $4\sin x° - 1 = 0, \quad 0 \le x \le 360$.

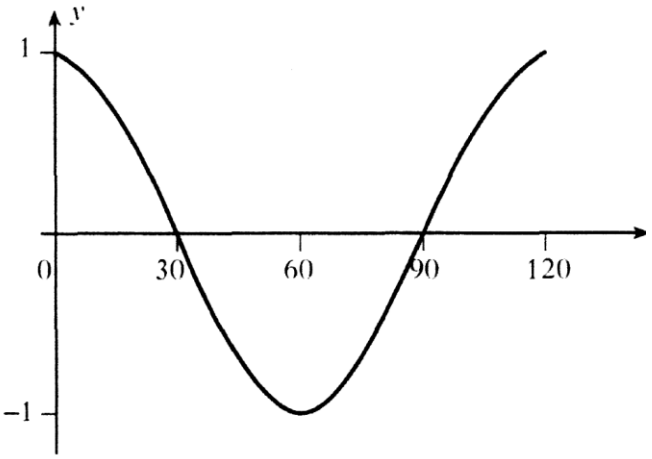
3

(b) Show that $\frac{1 - \cos^2 A}{\cos^2 A} = \tan^2 A$.

2

2001 Paper 1

6.



Part of the graph of $y = \cos bx°$ is shown in the diagram.
State the value of b.

1

2001 Paper 2

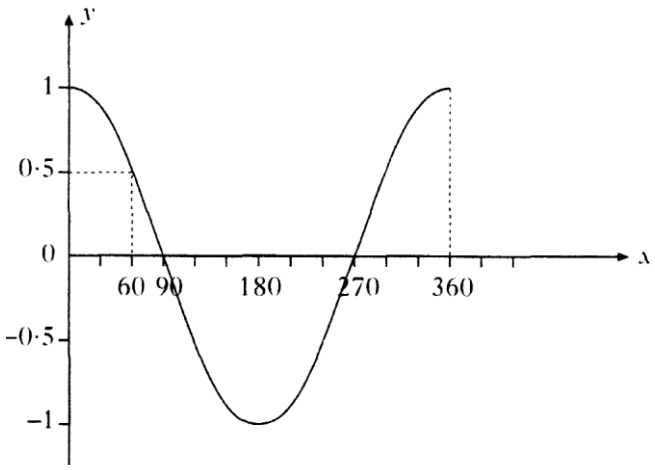
11. *(a) Solve the equation* $4\tan x° + 5 = 0, \quad 0 \le x \le 360.$

3

(b) Show that $\tan x° \cos x° = \sin x°.$

2002 Paper 1

3.

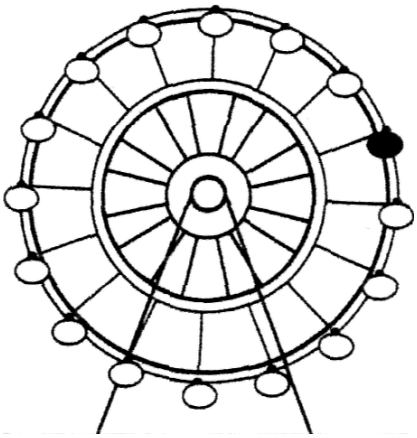


Part of the graph of $y = \cos x°$ is shown above.

If $\cos 60° = 0.5$, *state two values for x for which* $\cos x° = -0.5, \quad 0 \le x \le 360.$

2

2002 Paper 2



12. *At the carnival, the height,* H *metres, of a carriage on the big wheel above the ground is given by the formula*

$H = 10 + 5\sin t^\circ$, *t seconds after starting to turn.*

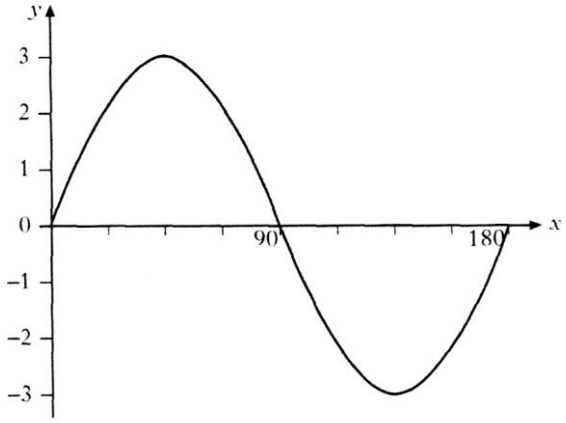
(a) *Find the height of the carriage above the ground after 10 seconds.* **2**

(b) *Find the* ***two*** *times during the first turn of the wheel when the carriage is 12.5 metres above the ground.* **4**

2003 Paper 1

5. *Part of the graph of* $y = a\sin bx^\circ$

is shown in the diagram.



State the values of a and b. **2**

2003 Paper 2

12. (a) *Solve the equation*

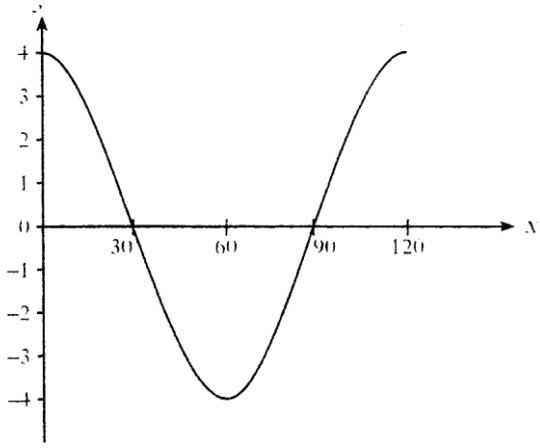
$$2\tan x^\circ + 7 = 0, \quad 0 \le x \le 360.$$ **3**

(b) *Prove that*

$$\sin^3 x^\circ + \sin x^\circ \cos^2 x^\circ = \sin x^\circ.$$ **2**

2004 Paper 1

6. (a) Part of the graph of $y = b\cos ax°$ is shown in the diagram.



State the values of a and b.

2

(b) Express $\sqrt{12} + 5\sqrt{3} - \sqrt{27}$ as a surd in its simplest form.

3

2004 Paper 2

10. (a) Solve the following equation for $0 \le x \le 360$.

$$7\sin x° - 3 = 0$$

3

2005 Paper 1

6 Given that $\tan 45° = 1$, what is the value of $\tan 135°$?

1

7. Sketch the graph of $y = \sin 2x°$, $0 \le x \le 360$.

3

2005 Paper 2

11. (a) Solve the equation

$$7\cos x° - 5 = 0, \quad 0 \le x \le 360.$$

3

(b) Simplify

$$\tan x° \cos x°$$

2

2006 Paper 1

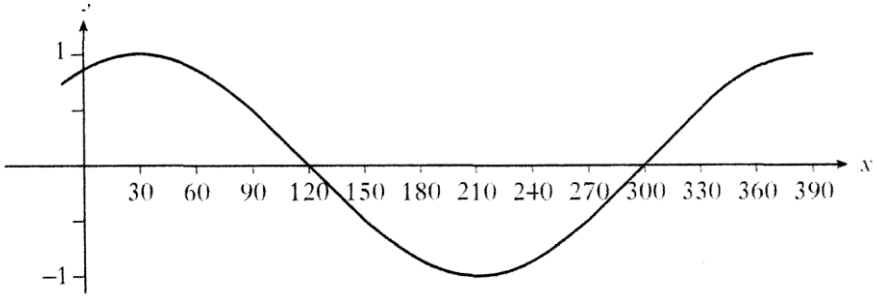
6. *Write the following in order* ***starting with the smallest.***

sin0° ***sin30°*** ***sin200°***

Give a reason for your answer.

2

8. *The graph shown below has an equation of the form* $y = \cos(x - a)^\circ$.

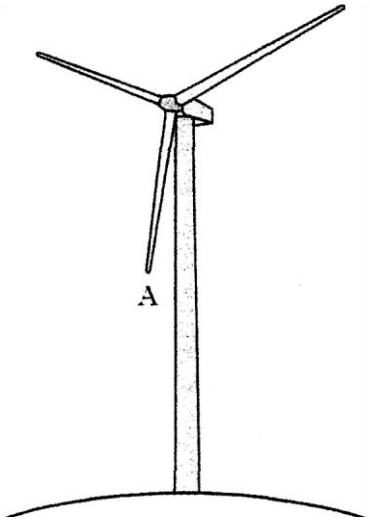


Write down the value of a.

1

2006 Paper 2

12. *The arms of a wind turbine rotate at a steady rate.*



(a) Calculate the height of point A at time 30 seconds.

2

(b) Find ***two*** *times during the first turn of the arms when point A is at a height of 10.5 metres.*

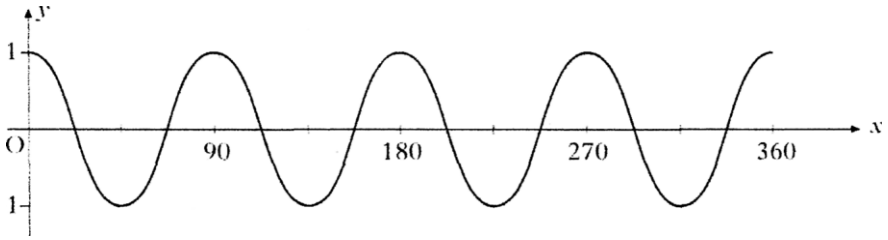
4

2007 Paper 1

8. Given that $\cos 60^\circ = \frac{1}{2}$, what is the value of $\cos 240^\circ$?

1

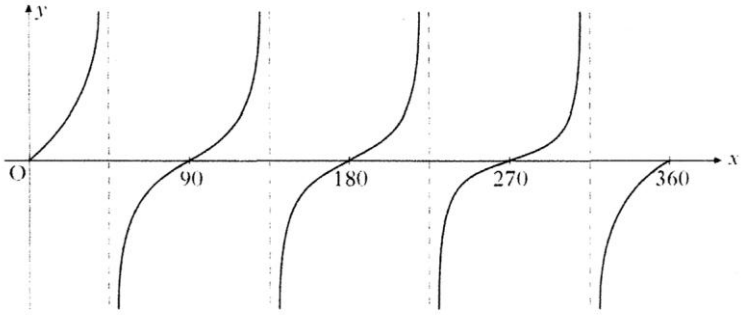
10. (a) Part of the graph of $y = \cos ax^\circ$ is shown below.



State the value of a.

1

(b) Part of the graph of $y = \tan bx^\circ$ is shown below.



1

2007 Paper 2

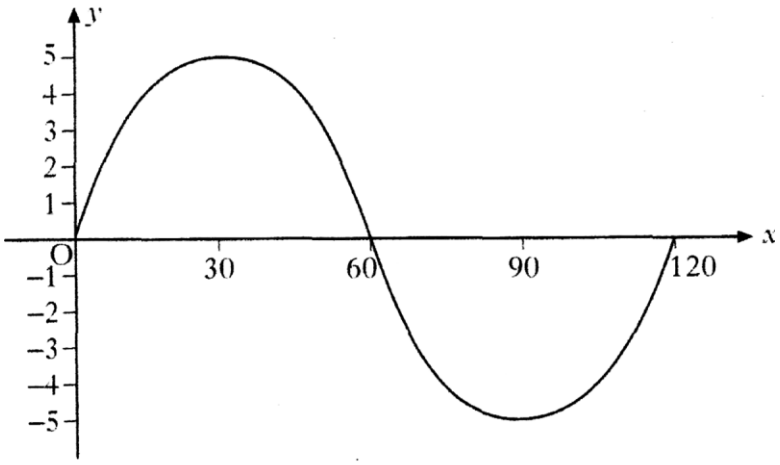
13. Solve the equation

$$5\tan x^\circ - 6 = 2, \quad 0 \le x \le 360.$$

3

2008 Paper 1

8. Part of the graph of $y = a\sin bx°$ is shown in the diagram.



State the values a of b.

2

10. If $\sin x° = \frac{4}{5}$ and $\cos x° = \frac{3}{5}$, calculate the value of tan $x°$.

2

2008 Paper 2

8. Solve the equation $4\cos x° + 3 = 0, \quad 0 \le x \le 360.$

3

2009 Paper 1

6. An angle, a °, can be described by the following statements.

- a is greater than 0 and less than 360
- sin a ° is negative
- cos a ° is positive
- tan a ° is negative

Write down a possible value for a.

1

2009 Paper 1

8. Sketch the graph of y = 4 cos 2x °, 0 ≤ x ≤ 360.

3

10. Simplify $\frac{\cos^3 x^o}{1-\sin^2 x^o}$

2

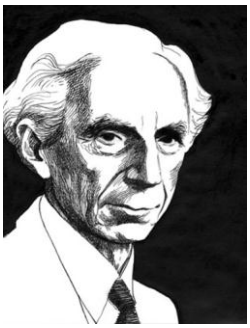
2009 Paper 2

10. Solve the equation $7\sin x^o + 1 = -5, \quad 0 < x < 360.$

3

Bertrand Russell

"What is best in mathematics deserves not merely to be learned as a task but to be assimilated as a part of daily thought, and brought again and again before the mind with ever-renewed encouragement.."

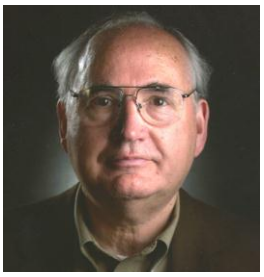


POINTS TO PONDER 9

GO OVER THESE PROBLEMS OFTEN!
INCREASE YOUR MATHS FEEL GOOD FACTOR!
DAY IN DAY OUT **BRING OUT YOUR BEST**…YOU DESERVE NOTHING LESS!

Professor Dana Scott

"It's not pure intellectual power that counts, it's commitment."



POINTS TO PONDER 10

NO POINT IN BEING CLEVER BUT LAZY!
YOU DON'T HAVE TO BE CLEVER TO BE AN EXCELLENT WORKER!
NICE TO BE CLEVER…BETTER TO BE AN EXCELLENT WORKER!
WITH COMMITMENT **YOU WILL DO WELL**!