



Sale
Grammar
School

Mathematics Faculty

UNIT 3 Exam Booster

Geometry and Algebra

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Circumference and Area of a Circle

1. A circular pond has a diameter of 6 m. Calculate its circumference.

$$C = \pi \times 6$$

$$= 18.84\text{m}$$

(2 marks)

2. A circular pond has a radius of 2.2 m.

- (a) Calculate the circumference of the pond.

$$C = 2\pi r$$

$$= 2 \times \pi \times 2.2$$

$$= 13.8\text{m}$$

(2 marks)

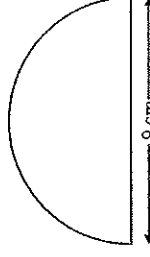
- (b) Calculate the area of the pond.

$$A = \pi \times r^2 = 15.21\text{m}^2$$

$$= \pi \times (2.2)^2$$

(3 marks)

3. A semi-circular protractor has a diameter of 9 cm.



Not drawn accurately

Calculate the perimeter in cm.

half C

$$C = \pi \times d$$

$$= \pi \times 9$$

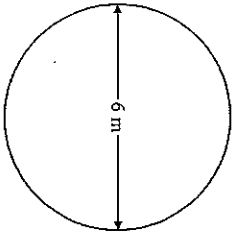
$$= 28.27$$

Perimeter = $(28.27 \div 2) + 9$

$$= 23.14\text{cm.}$$

(3 marks)

4. Jasmin has a pond in her garden.
The surface of the pond is a circle of diameter 6 metres.



Calculate the area of a circle of diameter 6 metres.
Give your answer in terms of π

$$\text{Radius} = 6 \div 2 = 3\text{m}$$

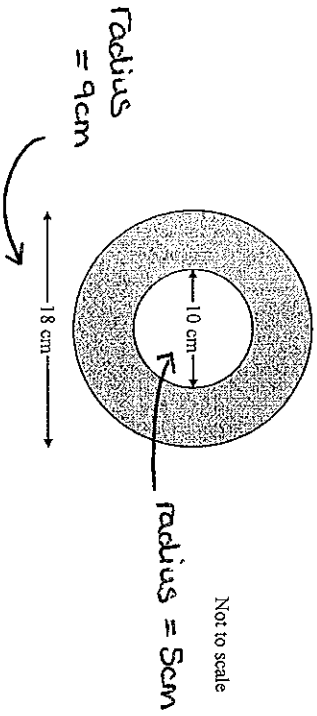
$$A = \pi \times 3^2$$

$$= 28.27\text{m}^2$$

(2 marks)

5. A circular photo frame is shown below.

The diameter of the photo is 10 cm and the outer diameter of the frame is 18 cm.



Calculate the area of the frame.

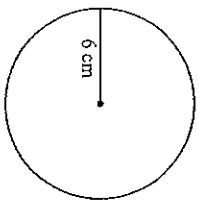
Small circle (10cm) $A = \pi r^2 = \pi \times 5^2 = 78.54\text{cm}^2$

Large circle (18cm) $A = \pi r^2 = \pi \times 9^2 = 254.47\text{cm}^2$

$$\text{Total Area} = 175.93\text{cm}^2$$

(5 marks)

6. The diagram shows a circle of radius 6 cm.



Not drawn accurately

Work out the area of the circle.
Give your answer in terms of π

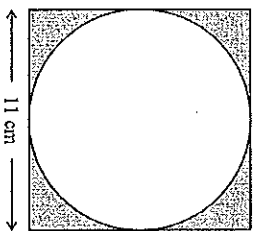
$$\text{Area} = \pi \times r^2$$

$$= \pi \times 6^2$$

$$= 113.1\text{cm}^2$$

(3 marks)

7. The diagram shows a circle which touches all four sides of a square.
The diameter of the circle is 11 cm.



Not drawn accurately

Calculate the total area of the shaded parts of the square (in cm^2).
Give your Answer to a suitable degree of accuracy.

$$\text{Radius of Circle} = 11 \div 2$$

$$= 5.5$$

$$\text{Area of Circle} = \pi \times (5.5)^2$$

$$= 95.03\text{cm}^2$$

$$\text{Area of Square} = 11 \times 11 = 121\text{cm}^2$$

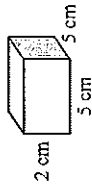
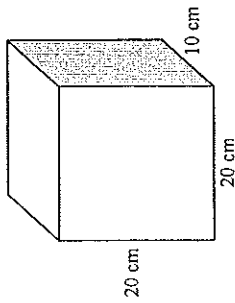
$$\text{Shaded Area} = 25.97\text{cm}^2$$

(4 marks)

Volume of a Prism

- The diagram shows two boxes that are cuboids. The larger box measures 20 cm by 10 cm by 20 cm. It is partly filled with 70 smaller boxes each measuring 5 cm by 5 cm by 2 cm. The smaller boxes are packed so that there are no gaps between them.

Not drawn accurately



How many more smaller boxes could be fitted in the larger box?

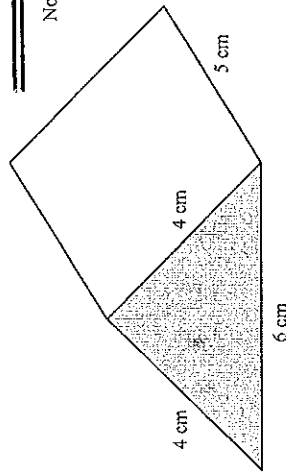
$$\begin{aligned} \text{Volume (Small)} &= 2 \times 5 \times 5 = 50 \text{ cm}^3 \\ \text{Volume (Large)} &= 20 \times 20 \times 10 = 4000 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Number of Boxes} &= 4000 \div 50 \\ &= 80 \end{aligned}$$

$$80 - 70 = 10 \quad (4 \text{ marks})$$

10 more smaller boxes.

- The diagram shows a triangular prism.



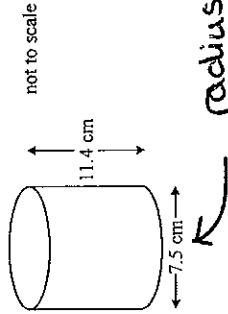
The area of the cross-section is 9.1 cm^2 .

Work out the volume of the triangular prism (in cm^3)

$$\begin{aligned} \text{Volume} &= \text{Area of cross-section} \times \text{Length} \\ &= 9.1 \times 5 \\ &= 45.5 \text{ cm}^3 \end{aligned}$$

(2 marks)

- A cylindrical can of soup has a diameter of 7.5 cm. It is 11.4 cm high.



$$\text{radius} = 7.5 \div 2 = 3.75$$

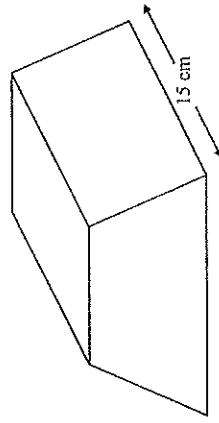
Calculate the volume of the can.

$$\begin{aligned} \text{Area of cross-section} &= \text{area of circle} \\ &= \pi \times 3.75^2 \\ &= 44.18 \text{ cm}^2 \end{aligned}$$

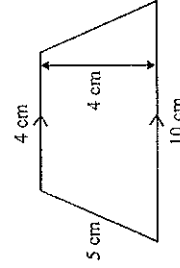
$$\begin{aligned} \text{Volume} &= \text{Area of Circle} \times \text{length of cylinder} \\ &= 44.18 \times 11.4 = 503.6 \text{ cm}^3 \end{aligned}$$

(4 marks)

- The diagram shows a silver bar.



The cross-section of the silver bar is a trapezium.



see Formula Sheet

a, b parallel sides
h = perpendicular distance between a, b

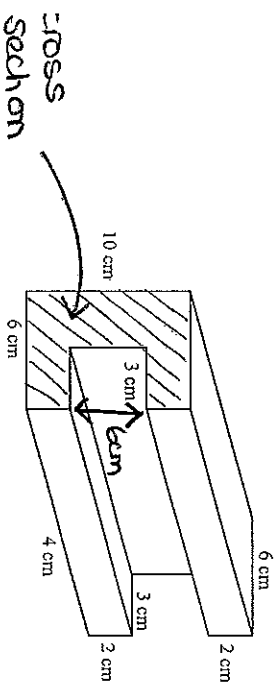
(a) Calculate the area of the cross-section (in cm^2).
 Area of Trapezium = $\frac{1}{2}(a+b)h$
 $= \frac{1}{2}(4+10) \times 4 = 28\text{cm}^2$

(2 marks)

(b) Calculate the volume of the silver bar (in cm^3)

Vol. of Prism = Area of Cross-Section \times length
 $= 28 \times 15 = 420\text{cm}^3$ (2 marks)

5. The diagram shows a beam of uniform cross-section and length 4 metres.



Not to scale

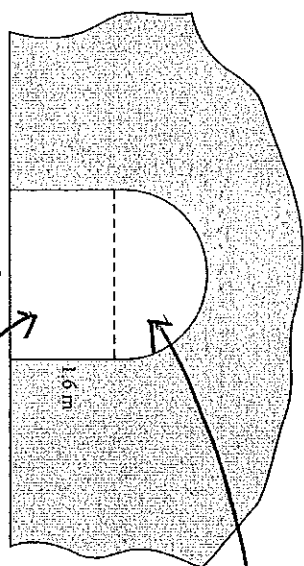
Calculate the volume of the beam.
Give your answer in cubic centimetres.

Area of Cross Section = $(6 \times 10) - (6 \times 3)$
 $= 60 - 18$
 $= 42\text{cm}^2$

Vol. of Prism = Area of Cross-Section \times Length
 (5 marks)

$= 42 \times 4$
 $= 168\text{cm}^3$

6. The sketch shows the entrance to a tunnel.
The uniform cross-section of the tunnel is in the shape of a semi-circle over a rectangle.



Not to scale

Area = 5×1.6
 $= 8\text{m}^2$.

Area of Semi-circle
 $= \frac{\pi \times 2.5^2}{2}$
 $= 9.82\text{m}^2$

The rectangle is 5 metres wide and 1.6 metres high.
The tunnel is 230 metres long.
Calculate the volume of earth removed in digging the tunnel (in m^3)

Area of Cross-Section = $9.82 + 8$
 $= 17.82\text{m}^2$

Vol. of Prism = 17.82×230
 $= 4098\text{m}^3$

(5 marks)

FORMULA SHEET

7. A cylinder has a radius of 5 cm and a volume of 250 cm³. Calculate the height of the cylinder.

$$\begin{aligned} \text{Area of Cross-Section} &= \pi r^2 \\ &= \pi \times 5^2 \\ &= 78.54 \text{ cm}^2 \end{aligned}$$

$$\text{Vol. of Prism} = \text{Area} \times \text{Length}$$

$$\text{Length} = \frac{\text{Vol. of Prism}}{\text{Area}}$$

$$\begin{aligned} &= \frac{250}{78.54} \\ &= 3.18 \text{ m.} \end{aligned}$$

(3 marks)

8. A cylinder contains 17 litres of water. The radius of the cylinder is 15 cm.

Calculate the height of the water in the cylinder.

$$17 \text{ litres} = 17,000 \text{ cm}^3 \text{ (Volume)}$$

$$\text{Area of Cross Section} = \pi r^2$$

$$\begin{aligned} &= \pi \times 15^2 \\ &= 706.86 \text{ cm}^2 \end{aligned}$$

$$\text{Vol. of Prism} = \frac{\text{Area of Cross-Section} \times \text{Length}}{\text{Cross-Section}}$$

$$\text{Length} = \frac{\text{Volume}}{\text{Area of Cross-Section}}$$

$$\begin{aligned} &= \frac{17,000}{706.86} \\ &= 24.05 \text{ cm} \end{aligned}$$

(3 marks)

Quadratic Formula

1. Solve the equation

$$x^2 - 10x - 5 = 0$$

Give your answers to 2 decimal places.

$$a = 1 \quad x = \frac{10 \pm \sqrt{100 - (4 \times 1 \times -5)}}{2}$$

$$b = -10$$

$$c = -5$$

(3 marks)

$$x = 10.48 \text{ or } -0.48$$

2. Solve the equation

$$x^2 + 8x - 5 = 0$$

Give your answers to 2 decimal places.

$$a = 1 \quad x = \frac{-8 \pm \sqrt{64 - (4 \times 1 \times -5)}}{2}$$

$$b = 8$$

$$c = -5$$

$$x = 0.58 \text{ or } x = -8.58$$

(3 marks)

3. Solve the equation

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

giving your answers to 3 significant figures.

$$a = 1 \quad x = \frac{2 \pm \sqrt{4 - (4 \times 1 \times -5)}}{2}$$

$$b = -2$$

$$c = -5$$

$$x = \frac{2 \pm \sqrt{24}}{2}$$

(3 marks)

$$x = 3.45 \text{ or } x = -1.45$$

4. Solve the equation $x^2 + 4x - 10 = 0$

Give your answers to 2 decimal places.

You must show your working.

$$a = 1$$

$$b = 4$$

$$c = -10$$

$$x = \frac{-4 \pm \sqrt{16 - (4 \times 1 \times -10)}}{2}$$

$$x = \frac{-4 \pm \sqrt{56}}{2}$$

(3 marks)

$$x = 1.74 \text{ or } -5.74$$

5. Solve the equation

$$2x^2 - 6x - 1 = 0$$

Give your answers to two decimal places.
You must show your working.

$$a = 2$$

$$b = -6$$

$$c = -1$$

$$x = \frac{6 \pm \sqrt{36 - (4 \times 2 \times -1)}}{4}$$

$$x = \frac{6 \pm \sqrt{44}}{4}$$

(3 marks)

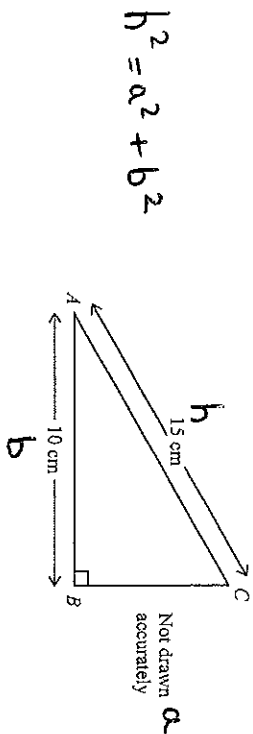
$$x = 3.16$$

$$\text{or } x = -0.16$$

Pythagoras' Theorem

1. The diagram shows a right-angled triangle ABC.

AB = 10 cm and AC = 15 cm



$$h^2 = a^2 + b^2$$

Calculate the length of BC.
Leave your answer as a square root.

$$15^2 = 10^2 + a^2$$

$$a^2 = 15^2 - 10^2$$

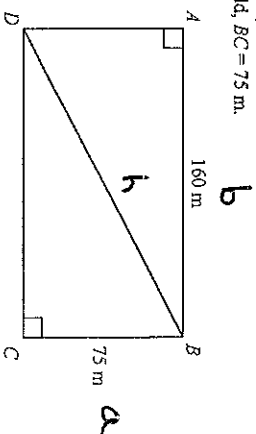
$$= 225 - 100$$

$$= 125$$

$$a = \sqrt{125} = 11.2 \text{ cm}$$

(3 marks)

2. A rectangular field ABCD is shown.
The length of the field, AB = 160 m.
The width of the field, BC = 75 m.



Not to scale

(a) Calculate the length of the diagonal BD.

Give your answer to a suitable degree of accuracy (in m).

$$h^2 = a^2 + b^2$$

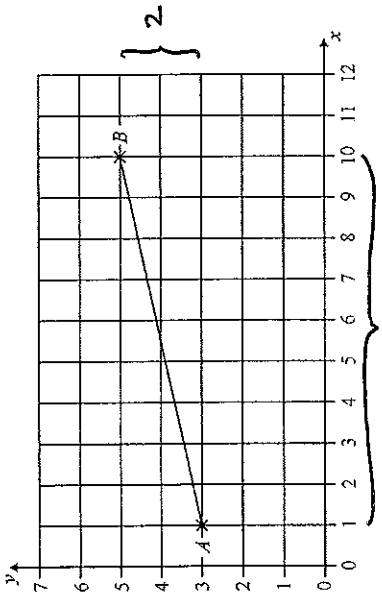
$$= 75^2 + 160^2$$

$$h = 176.7 \text{ m}$$

$$h^2 = 31225$$

(4 marks)

3. The diagram shows the points A (1, 3) and B (10, 5).



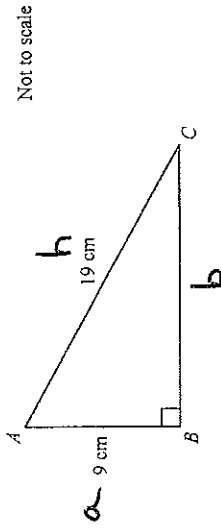
Calculate the distance AB.
Give your Answer to 2 decimal places.

$$AB^2 = 2^2 + 9^2 \quad AB = \sqrt{85}$$

$$= 4 + 81 \quad = 9.22$$

$$AB^2 = 85$$

4. ABC is a right-angled triangle.
AC = 19 cm and AB = 9 cm.



Calculate the length of BC (in cm).

(3 marks)

$$h^2 = a^2 + b^2$$

$$19^2 = 9^2 + b^2$$

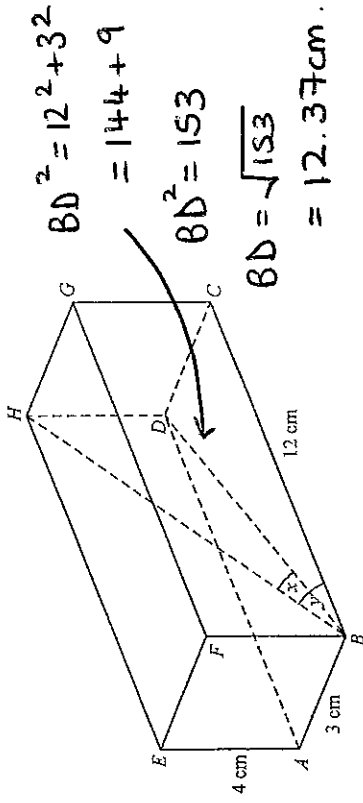
$$361 = 81 + b^2$$

$$b^2 = 280$$

$$b = \sqrt{280}$$

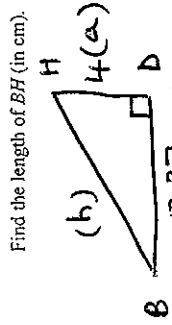
$$= 16.73 \text{ cm}$$

5. The diagram shows a cuboid.
AB = 3 cm, AE = 4 cm, BC = 12 cm.



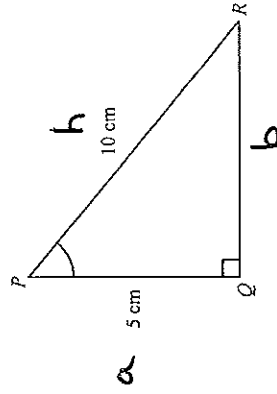
Not drawn accurately

Find the length of BH (in cm).



6. POR is a right-angled triangle.
PR = 10 cm and PQ = 5 cm.

Not drawn accurately 10 cm



Calculate the length QR (in cm).

(3 marks)

$$h^2 = a^2 + b^2$$

$$10^2 = 5^2 + b^2$$

$$100 = 25 + b^2$$

$$b^2 = 100 - 25$$

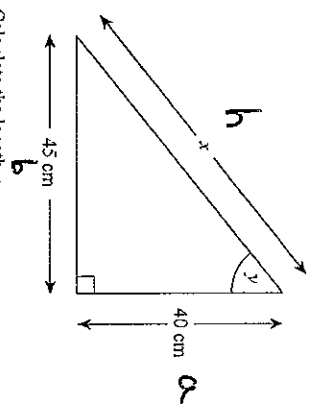
$$= 75$$

$$b = \sqrt{75}$$

$$= 8.66 \text{ cm}$$

Trigonometry (Finding Unknown Sides)

7. A right-angled triangle has the dimensions shown.



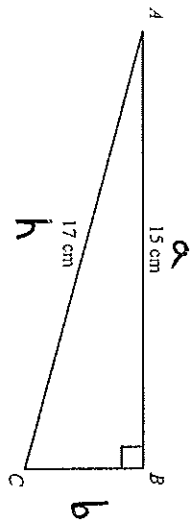
Not drawn accurately

Calculate the length x.
Give your answer to a suitable degree of accuracy (in cm).

$$\begin{aligned}
 x^2 &= 45^2 + 40^2 & x &= \sqrt{3625} \\
 &= 2025 + 1600 & &= 60.21 \text{ cm} \\
 &= 3625 & &
 \end{aligned}$$

(4 marks)

9. ABC is a right-angled triangle.
AB = 15 cm, AC = 17 cm



Not drawn accurately

Calculate the length of the side BC (in cm).

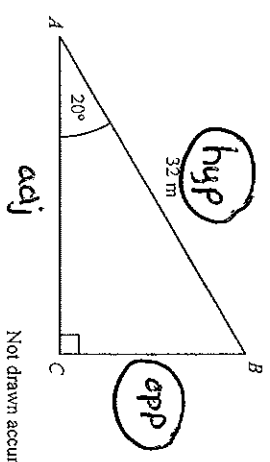
$$\begin{aligned}
 h^2 &= a^2 + b^2 \\
 17^2 &= 15^2 + b^2 \\
 289 &= 225 + b^2
 \end{aligned}$$

(3 marks)

$$\begin{aligned}
 b^2 &= 64 \\
 b &= 8 \text{ cm}
 \end{aligned}$$

Trigonometry (Finding Unknown Sides)

1. The diagram shows a triangle ABC.
Angle A = 20° and angle C = 90°
AB = 32 m



Not drawn accurately

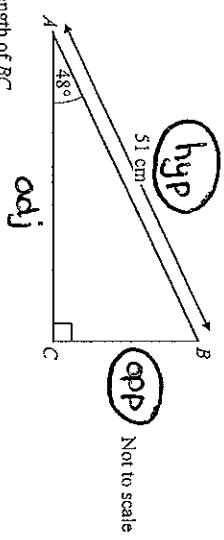
Calculate the height BC (in m).

$$\begin{aligned}
 \sin 20 &= \frac{\text{opp}}{\text{hyp}} = \frac{BC}{32} \\
 BC &= 32 \times \sin 20 = 10.94 \text{ m}
 \end{aligned}$$

(3 marks)

SOH

2. ABC is a right-angled triangle.
AB = 51 cm
Angle CAB = 48°



Find the length of BC.
Give your answer to a suitable degree of accuracy (in cm).

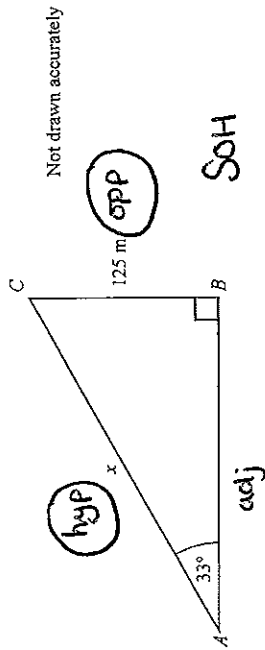
SOH

$$\sin 48^\circ = \frac{\text{opp}}{\text{hyp}} = \frac{BC}{51}$$

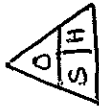
$$\begin{aligned}
 BC &= 51 \times \sin 48 \\
 &= 37.9 \text{ cm}
 \end{aligned}$$

(4 marks)

3. ABC is a right-angled triangle.
 $BC = 125$ m.
 Angle $CAB = 33^\circ$.



Find the length of AC (marked x in the diagram).
 Give your answer to an appropriate degree of accuracy (in m).

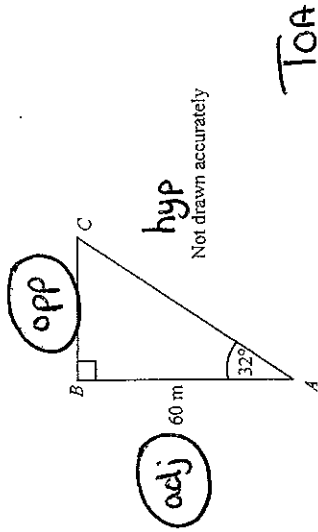


$$\sin 33^\circ = \frac{\text{opp}}{\text{hyp}} = \frac{125}{x}$$

$$x = \frac{125}{\sin 33} = 229.5 \text{ m}$$

(4 marks)

5. ABC is a right-angled triangle.
 $AB = 60$ m.
 Angle $BAC = 32^\circ$



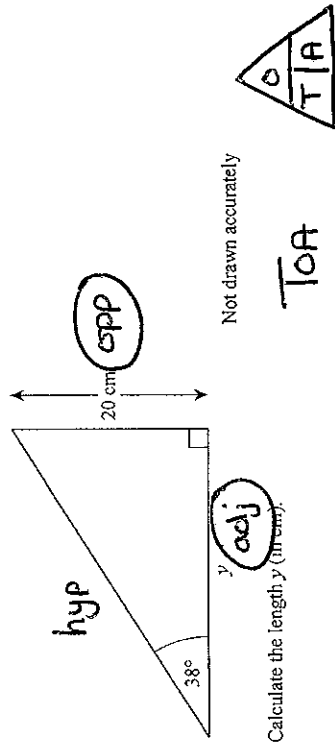
Find the length of BC .

$$\tan 32^\circ = \frac{\text{opp}}{\text{adj}} = \frac{BC}{60}$$

$$BC = 60 \times \tan 32^\circ = 37.5 \text{ m}$$

(3 marks)

- 4.



Calculate the length y (in cm).

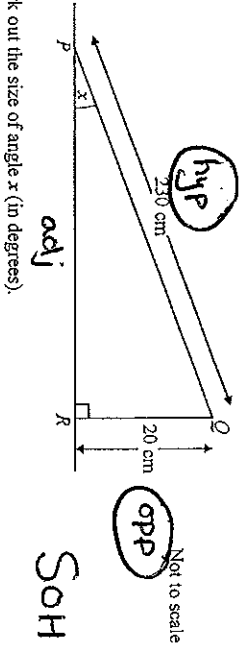
$$\tan 38^\circ = \frac{\text{opp}}{\text{adj}} = \frac{20}{y}$$

$$y = \frac{20}{\tan 38^\circ} = 25.6 \text{ cm}$$

(3 marks)

Trigonometry (Finding Unknown Angles)

1. PQ is the surface of a ramp laid on level ground. The ramp is 230 cm long and 20 cm high, as shown in the diagram.

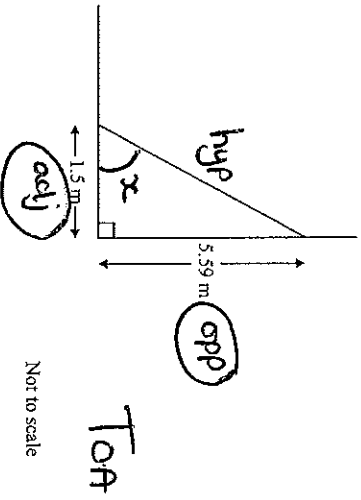


Work out the size of angle x (in degrees).

$$\sin x = \frac{\text{opp}}{\text{hyp}}, \quad \sin x = \frac{20}{230} = 0.0869\dots$$

$$x = \sin^{-1}\left(\frac{20}{230}\right) = 4.99^\circ \quad (3 \text{ marks})$$

2. For a ladder to be safe it must be inclined at between 70° and 80° to the ground. The diagram shows a ladder resting against a wall.



Is it safe?
You must show your working.

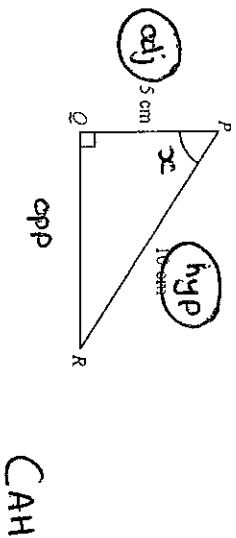
$$\tan x = \frac{\text{opp}}{\text{adj}} = \frac{5.59}{1.5} = 3.7267\dots$$

(3 marks)

$$x = \tan^{-1}\left(\frac{5.59}{1.5}\right) = 74.98^\circ \sim 75^\circ$$

- 3.

PQR is a right-angled triangle. $PR = 10$ cm and $PQ = 5$ cm.

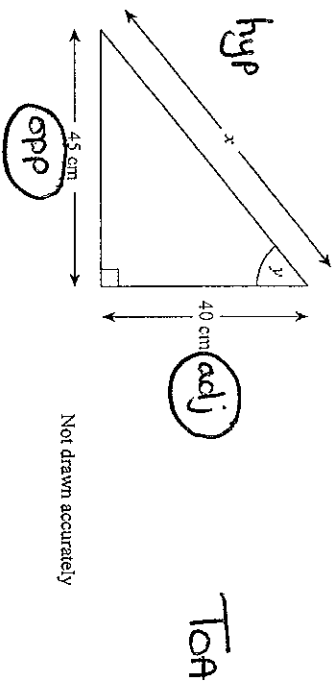


Calculate the size of angle QPR (in degrees).

$$\cos x = \frac{\text{adj}}{\text{hyp}} = \frac{5}{10} = \frac{1}{2}$$

$$x = \cos^{-1}\left(\frac{1}{2}\right) = 60^\circ \quad (3 \text{ marks})$$

4. A right-angled triangle has the dimensions shown.



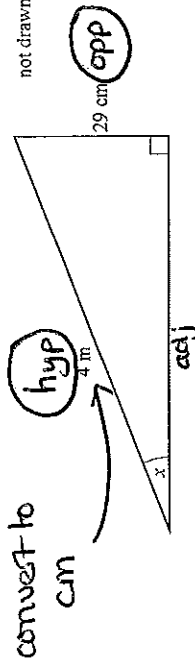
Calculate the size of angle y (in degrees).
Show your working.

$$\tan y = \frac{\text{opp}}{\text{adj}} = \frac{45}{40} = \frac{9}{8}$$

(3 marks)

$$y = \tan^{-1}\left(\frac{9}{8}\right) = 48.4^\circ$$

5. A ramp is 4 metres long and 29 centimetres high. If the ramp is safe for wheelchair users the angle marked x must be 4° or less.



Is this ramp safe for wheelchair users?
You must show your working

$$\sin x = \frac{\text{opp}}{\text{hyp}} = \frac{29}{400}$$

$$x = \sin^{-1} \left(\frac{29}{400} \right)$$

$$x = 4.16^\circ$$

$$x = 4.2^\circ$$

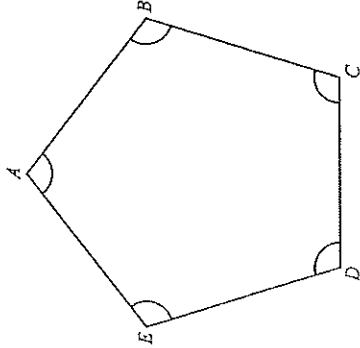
No not safe.

(4 marks)

Interior and Exterior Angles in Polygons

1. $ABCDE$ is a regular pentagon.

Not drawn accurately



$$n = 5 \text{ (sides)}$$

Sum of int. angles

$$= (5-2) \times 180$$

$$= 540^\circ$$

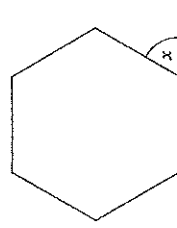
Calculate the size of each interior angle (in degree).

$$540 \div 5 = 108^\circ$$

(3 marks)

2. (a) The diagram below shows a regular hexagon. One side has been extended and the exterior angle is x .

Not drawn accurately



Explain why angle x is 60° .

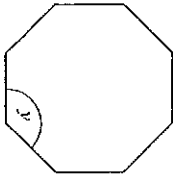
$$\text{Sum of exterior angles} = 360^\circ$$

$$360 \div 6 = 60^\circ$$

(1 mark)

- (b) This diagram shows a regular octagon. One of its interior angles is y .

Not drawn accurately



Calculate the value of y (in degrees).

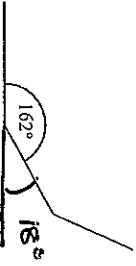
$$\begin{aligned} \text{Sum of Int. Angles} &= (8-2) \times 180 \\ &= 1080. \end{aligned}$$

$$y = 1080 \div 8 = 135^\circ$$

(3 marks)

3. The diagram shows part of a regular polygon. Each interior angle is 162° .

Not drawn accurately



Calculate the number of sides of the polygon.

$$\text{Sum of Ext. Angles} = 360^\circ$$

$$360 \div 18 = 20$$

20 sides.

(3 marks)

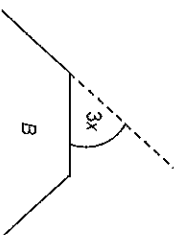
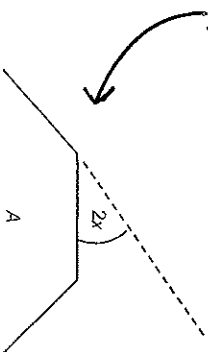
4. The diagram shows parts of two regular polygons A and B.

A has 12 sides and exterior angle $2x$.

B has exterior angle $3x$.

Not drawn accurately

$$\begin{aligned} \text{Sum of exterior angles} &= 360 \\ &= 12 \times 2x \end{aligned}$$



$$\text{So } 24x = 360$$

$$x = 15^\circ$$

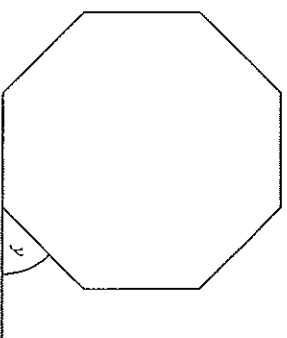
Work out the number of sides of regular polygon B.

$$\begin{aligned} 3x &= 3 \times 15 = 45^\circ \\ 360 \div 45 &= 8 \end{aligned}$$

8 sides

5. The diagram shows a regular octagon.

Not drawn accurately



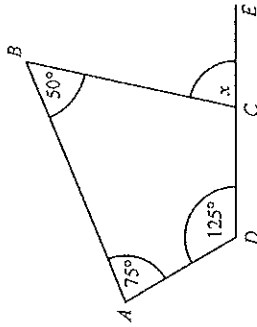
Calculate the size of the exterior angle of the regular octagon, marked y on the diagram.

Octagon has 8 sides

$$360 \div 8 = 45^\circ \quad y = 45^\circ$$

(2 marks)

6. $ABCD$ is a quadrilateral.
The side DC is extended to E .



Not drawn accurately

Work out the value of x (degrees).

4 sided shape (quadrilateral)
Sum of Internal angles = $(4-2) \times 180 = 360^\circ$

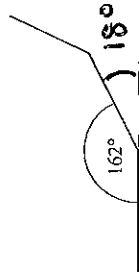
$$360 - (75 + 125 + 50) = 110^\circ$$

$$\text{So } x = 180 - 110 = 70^\circ$$

(3 marks)

7. The diagram shows part of a regular polygon.

Each interior angle is 162° .



Not drawn accurately

Calculate the number of sides of the polygon.

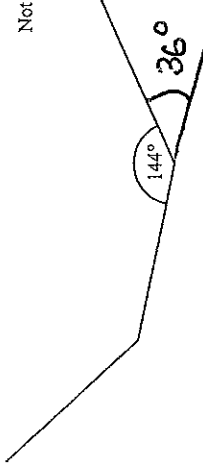
$$360 \div 18 = 20$$

↑
sum of exterior angles = 20 sides

(3 marks)

8. The diagram shows part of a regular polygon.
Each interior angle is 144° .

Not drawn accurately



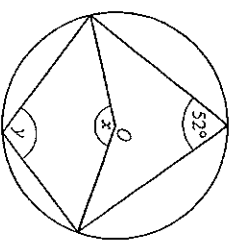
Calculate the size of the exterior angle of the polygon (in degrees).

Exterior angle = 36°

(2 marks)

Circle Theorems

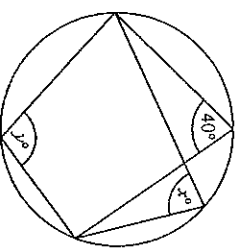
1. O is the centre of the circle.



Not drawn accurately

(i) Find the value of x : angle at centre twice angle at circum. $2x = 52$ $2x = 104$ (1 mark)

(ii) Find the value of y : opp angles in a cyclic quadrilateral (1 mark) add to 180 $y = 180 - 52 = 128$



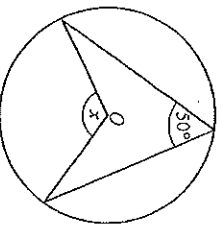
Not drawn accurately

(i) Write down the value of x (degrees): angles in same segment are equal 40 (1 mark)

(ii) Calculate the value of y (degrees): opp angles in cyclic quadrilateral add to 180 (1 mark)

$y = 180 - 40 = 140$

3. (a) The diagram shows a circle with centre O .

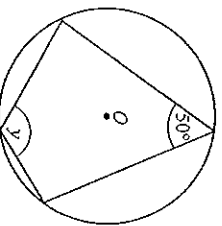


Not drawn accurately

Work out the size of the angle marked x (degrees): angle at centre is twice angle at circum. (1 mark)

$x = 2 \times 50 = 100$

(b) The diagram shows a different circle with centre O .



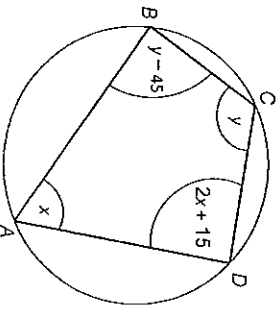
Not drawn accurately

opp. angles in a cyclic quadrilateral add to 180

$y = 180 - 50 = 130$ (1 mark)

Work out the size of the angle marked y .

4. $ABCD$ is a cyclic quadrilateral.



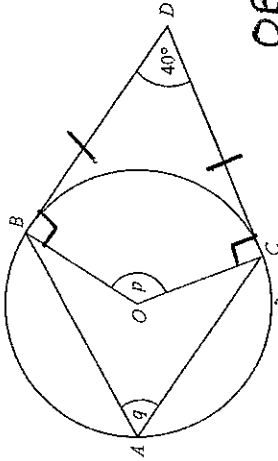
Not drawn accurately

Work out the values of x and y : opp angles in a cyclic quadrilateral add to 180 (4 marks)

$2x + y = 180$
 $y - 45 + 2x + 15 = 180$
 $2x + y = 210$
 $2x = 30$
 $x = 15$

Solve Simultaneous

5. A, B and C are points on the circumference of a circle with centre O .
 BD and CD are tangents.
 Angle $BDC = 40^\circ$



Not drawn accurately

$OBCD$ quadrilateral (internal angles sum to 360°)

$$p = 360 - (90 + 90 + 40)$$

$$p = 140^\circ$$

- (i) Work out the value of p (degrees).

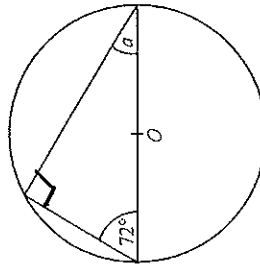
(2 marks)

- (ii) Hence write down the value of q (degrees).

(1 mark)

angle at circumference is half angle at centre
 So $q = 140 \div 2 = 70^\circ$

6. (a) O is the centre of the circle.



Not drawn accurately

Calculate the value of a .

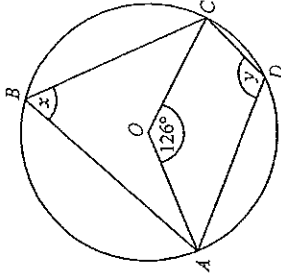
(2 marks)

angle in semi-circle = 90°

$$a = 180 - (72 + 90)$$

$$a = 18^\circ$$

- (b) O is the centre of the circle.
 A, B, C and D are points on the circumference.
 Angle $AOC = 126^\circ$



Not drawn accurately

angle at centre is twice angle at circumference

- (i) Calculate the value of x (degrees).

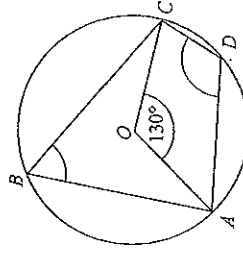
(1 mark)

$$x = 126 \div 2 = 63^\circ$$

- (ii) Calculate the value of y (degrees).

opp angles in a cyclic quadrilateral add to 180°
 $y = 180 - 63 = 117^\circ$

7. A, B, C and D are points on the circumference of a circle centre O .
 $\angle AOC = 130^\circ$



Not drawn accurately

Work out the size of angles ABC and ADC (degrees).

ABC (angle at centre is twice angle at circumference)

(2 marks)

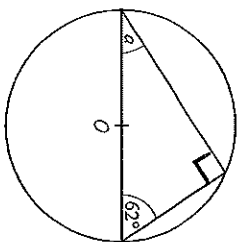
$$ABC = 130 \div 2 = 65^\circ$$

Opp angles in a cyclic quadrilateral add to 180°

$$ADC = 180 - 65$$

$$= 115^\circ$$

8. (a) In the diagram, O is the centre of the circle.



Not drawn accurately

angle in a semi-circle is 90°

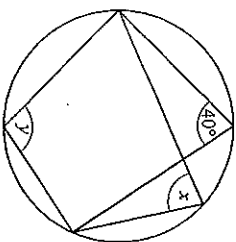
$$a = 180 - (90 + 62)$$

$$a = 18^\circ$$

Calculate the value of a (degrees).

(2 marks)

- (b)



Not drawn accurately

(i) Write down the value of x (degrees).

angles in same segment are equal $x = 40^\circ$ (1 mark)

(ii) Calculate the value of y (degrees).

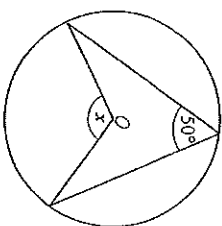
opp angles in cyclic quadrilateral

add to 180° .

$$y = 180 - 40 = 140^\circ$$

(1 mark)

9. (a) The diagram shows a circle with centre O .



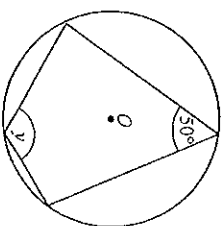
Not drawn accurately

$$x = 2 \times 50 = 100^\circ$$

Work out the size of the angle marked x (degrees).

angle at centre is twice angle at circum. (1 mark)

- (b) The diagram shows a different circle with centre O .



Not drawn accurately

opp angles in a cyclic quadrilateral add to 180°

$$y = 180 - 50 = 130^\circ$$

(1 mark)

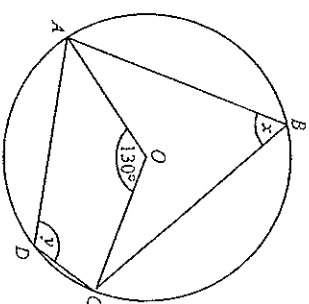
Work out the size of the angle marked y (degrees).

- 10.

In the diagram, O is the centre of the circle.

A , B , C and D are points on the circumference.

Angle $AOC = 130^\circ$



Not drawn accurately

(a) Calculate the value of x (degrees). Give a reason for your answer.

(2 marks)

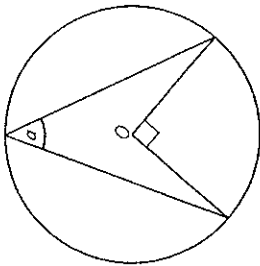
(b) Calculate the value of y (degrees). Give a reason for your answer.

(a) angle at centre is twice angle at circum. (2 marks)

$$x = 130 \div 2 = 65^\circ$$

(b) opp. angles in a cyclic quadrilateral add to 180°

11. (a) In the diagram, O is the centre of the circle.



$$a = 90 \div 2 = 45^\circ$$

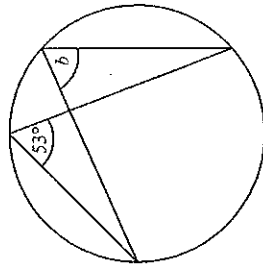
Not drawn accurately

angle at centre is twice angle at circumference

Write down the value of a (degrees).

(1 mark)

(b)



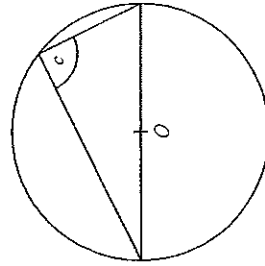
Not drawn accurately

angles in same segment are equal. $b = 53^\circ$

Write down the value of b (degrees).

(1 mark)

(c) In the diagram, O is the centre of the circle.



Not drawn accurately

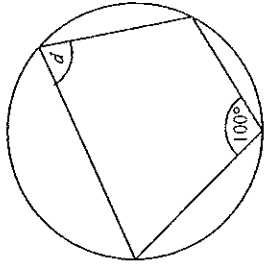
angle in semi-circle is 90° .

Write down the value of c (degrees).

(1 mark)

$$c = 90^\circ$$

(d)



Not drawn accurately

Write down the value of d (degrees).

(1 mark)

opp. angles in a cyclic quadrilateral add to 180°

$$d = 180 - 100 = 80^\circ$$

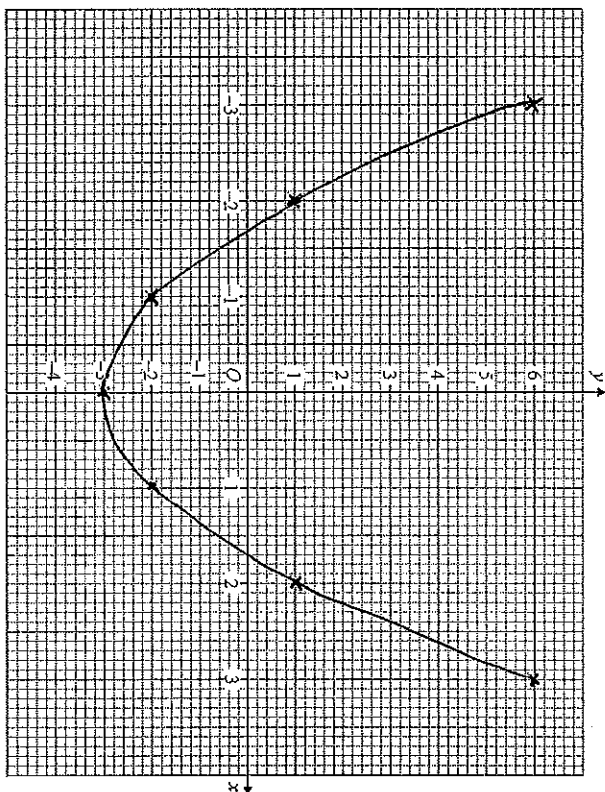
Quadratic Graphs

1. (a) Complete the table of values for $y = x^2 - 3$

x	-3	-2	-1	0	1	2	3
y	6	1	-2	-3	-2	1	6

(1 mark)

- (b) On the grid draw the graph of $y = x^2 - 3$ for values of x from -3 to +3



(2 marks)

- (c) Use the graph to solve the equation $x^2 - 3 = 0$

(2 marks)

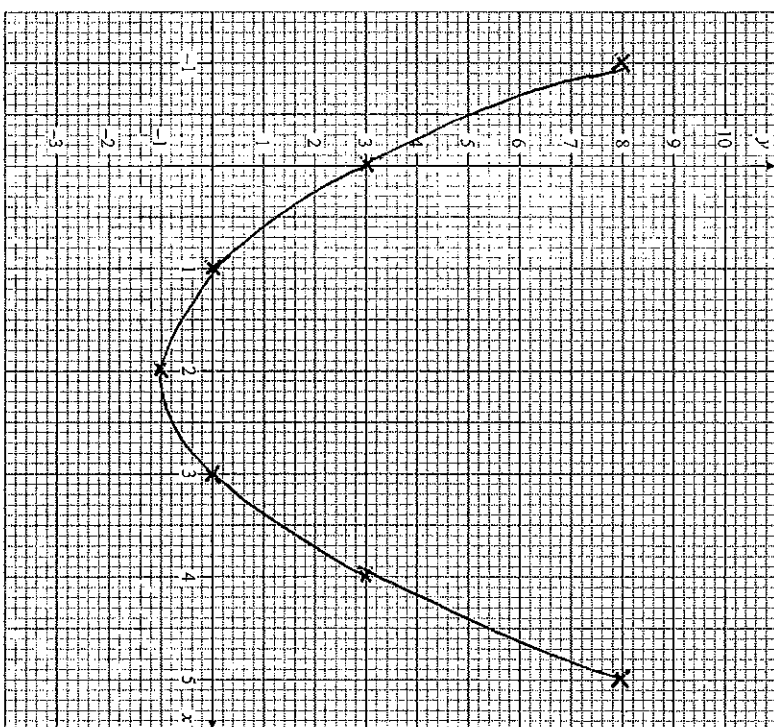
- where graph crosses x-axis
 $x = -1.65$
 $x = 1.65$

2. (a) Complete the table of values for $y = x^2 - 4x + 3$

x	-1	0	1	2	3	4	5
y	8	3	0	-1	0	3	8

(1 mark)

- (b) On the grid below, draw the graph of $y = x^2 - 4x + 3$ for values of x between -1 and +5.



(2 marks)

- (c) Write down the solutions of $x^2 - 4x + 3 = 0$

(1 mark)

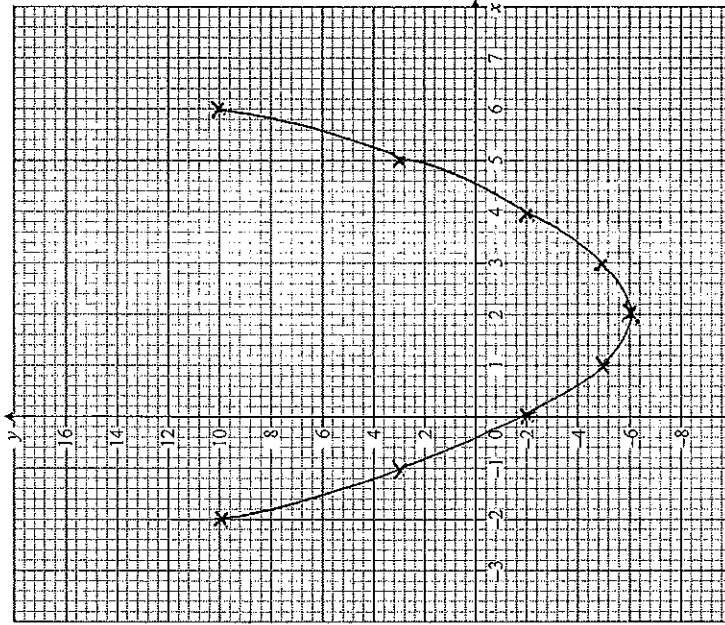
where graph crosses x-axis
 $x = 1$
 $x = 3$

3. (a) Complete the table of values for $y = x^2 - 4x - 2$

x	-2	-1	0	1	2	3	4	5	6
y	10	3	-2	-5	-6	-5	-2	3	10

(1 mark)

- (b) On the grid below, draw the graph $y = x^2 - 4x - 2$ for values of x between -2 and 6.



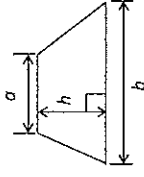
(2 marks)

- (c) Use your graph to write down the solutions of the equation $x^2 - 4x - 2 = 0$

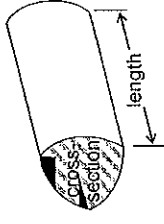
where graph crosses x -axis

$$x = -0.4$$

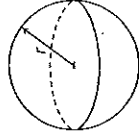
$$x = 4.6$$



$$\text{Area of trapezium} = \frac{1}{2}(a+b)h$$

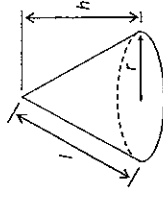


$$\text{Volume of prism} = \text{area of cross-section} \times \text{length}$$



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

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



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

$$\text{Curved surface area of cone} = \pi r l$$

In any triangle ABC

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

$$\text{Sine rule } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

