(MR BARTON'S ANSWERS)

1MA0
Edexcel GCSE
Mathematics (Linear) – 1MA0
Paper 1H (Non-Calculator)

Higher Tier
Practice Paper 1B (Set N)

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.	Nil

Instructions

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
You must NOT write on the formulae page.
Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 18 questions in this question paper. The total mark for this paper is 72.
Calculators must not be used.

Advice

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
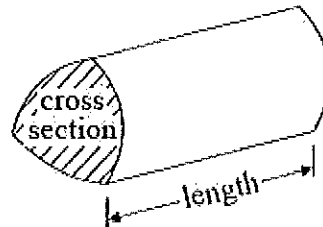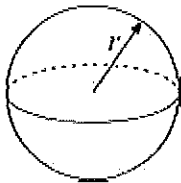Return at the end to those you have left out.

Formulae: Higher Tier

You must not write on this formulae page.
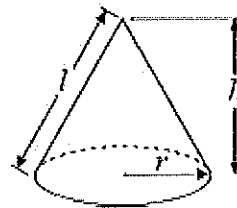**Anything you write on this formulae page will gain NO credit.**

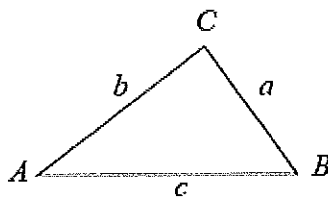**Volume of prism** = area of cross section × length

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

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

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

Curved surface area of cone = $\pi r l$

In any triangle ABC

The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by
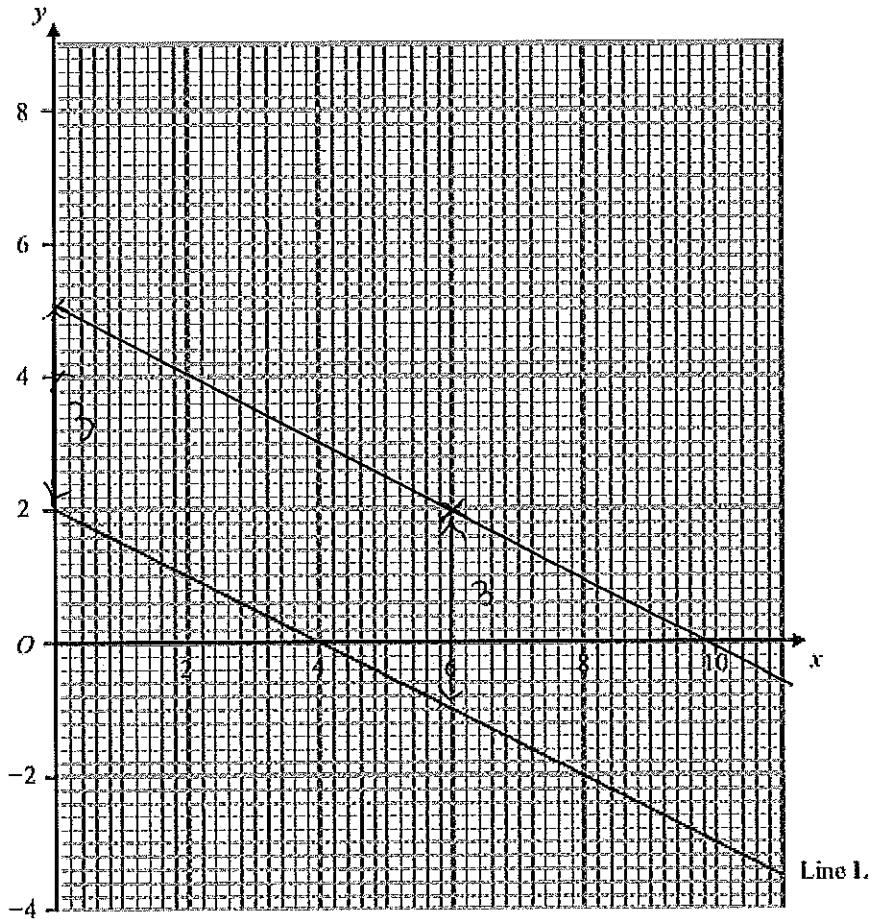
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

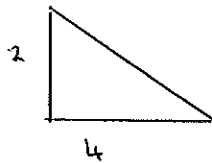**Area of triangle** = $\frac{1}{2}ab \sin C$

Answer ALL EIGHTEEN questions.
Write your answers in the spaces provided.
You must write down all stages in your working.
You must NOT use a calculator.

1.

Line L is drawn on the grid.

(a) Work out the gradient of Line L.

$-\frac{2}{4} = -\frac{1}{2}$

..................$-\frac{1}{2}$.................. (2)

Another line, Line M, is parallel to Line L and passes through the point (6, 2).
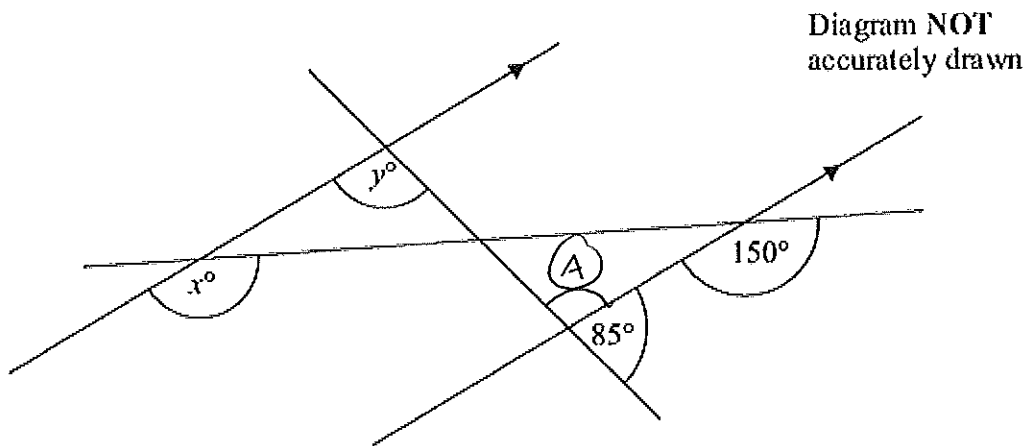
(b) Find an equation for Line M.

line shifted 3 up

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

.......................$y = -\frac{1}{2}x + 5$....................... (2)

(4 marks)

[Full marks on this question was achieved by 9.8% of students]

2.

Find the value of *y*.
Give reasons for your answer.

$\widehat{A}$ = 95°   (Angles on a straight line = 180°)

y = 95°   (alternate angles are equal)

....

(2)

(Total 2 marks)

[Full marks on this question was achieved by 8.7% of students]

4

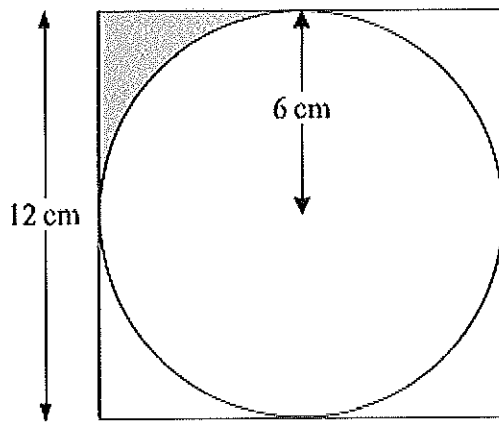**3.** The diagram shows a circle drawn inside a square.

Diagram **NOT** accurately drawn

The circle has a radius of 6 cm.
The square has a side of length 12 cm.

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

Area of square = $12 \times 12 = 144 \ cm^2$

Area of circle = $\pi r^2 = \pi \times 6^2 = 36\pi$

Area outside circle = $144 - 36\pi$

Shaded area is $\frac{1}{4}$ of this

$= \dfrac{144 - 36\pi}{4}$ = $\boxed{36 - 9\pi}$

....cm²

(Total 3 marks)

[Full marks on this question was achieved by 8.6% of students]

5

4.

Diagram NOT
accurately drawn

8 cm

6 cm

20 cm
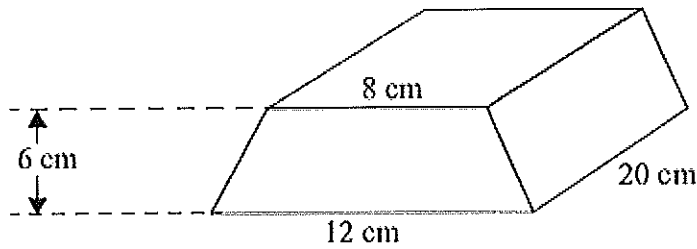
12 cm

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

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

The density of the metal is 5 g/cm^3.

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

$$\text{Area of Base} = \frac{(8+12)}{2} \times 6 = 10 \times 6 = 60 \text{ cm}^2$$

$$\text{Volume} = 60 \times 20 = 1200 \text{ cm}^3$$
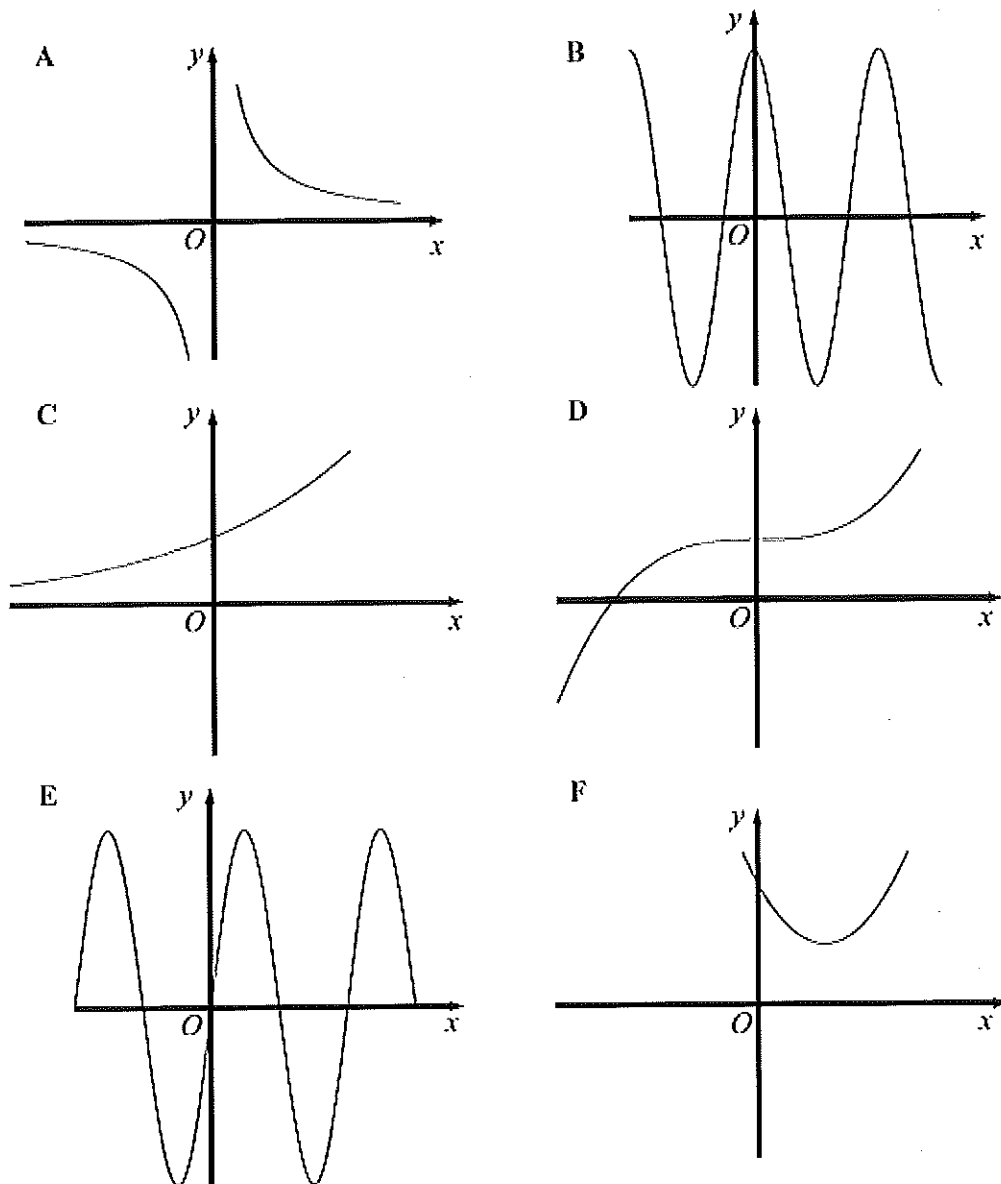

$$\text{mass} = \text{density} \times \text{volume}$$

$$= 5 \times 1200$$

$$= 6000 \text{ grams} \qquad \dots\dots\underline{6}\dots\dots \text{ kg}$$

(Total 5 marks)

[Full marks on this question was achieved by 8.9% of students]

6

5.

A

B

C

D

E

F

Each equation in the table represents one of the graphs A to F.

Write the letter of each graph in the correct place in the table.

Equation	Graph
$y = 4 \sin x°$	E
$y = 4 \cos x°$	B
$y = x^2 - 4x + 5$	F
$y = 4 \times 2x$	C
$y = x^3 + 4$	D
$y = \dfrac{4}{x}$	A

} Think about $(0,0)$

→ mean 4^{2x}

✗

(Total 3 marks)

[Full marks on this question was achieved by 6.4% of students]

6. (a) Simplify fully $\dfrac{x^2 + 3x - 4}{2x^2 - 5x + 3}$

$= \dfrac{(x + 4)(x - 1)}{(2x + 1)(x - 3)}$

....

(3)

(b) Write $\dfrac{4}{x+2} + \dfrac{3}{x-2}$ as a single fraction in its simplest form.

$= \dfrac{4(x-2)}{(x+2)(x-2)} + \dfrac{3(x+2)}{(x+2)(x-2)}$

$= \dfrac{4x-8}{(x+2)(x-2)} + \dfrac{3x+6}{(x+2)(x-2)}$ $= \dfrac{7x-2}{(x+2)(x-2)}$

....

(3)

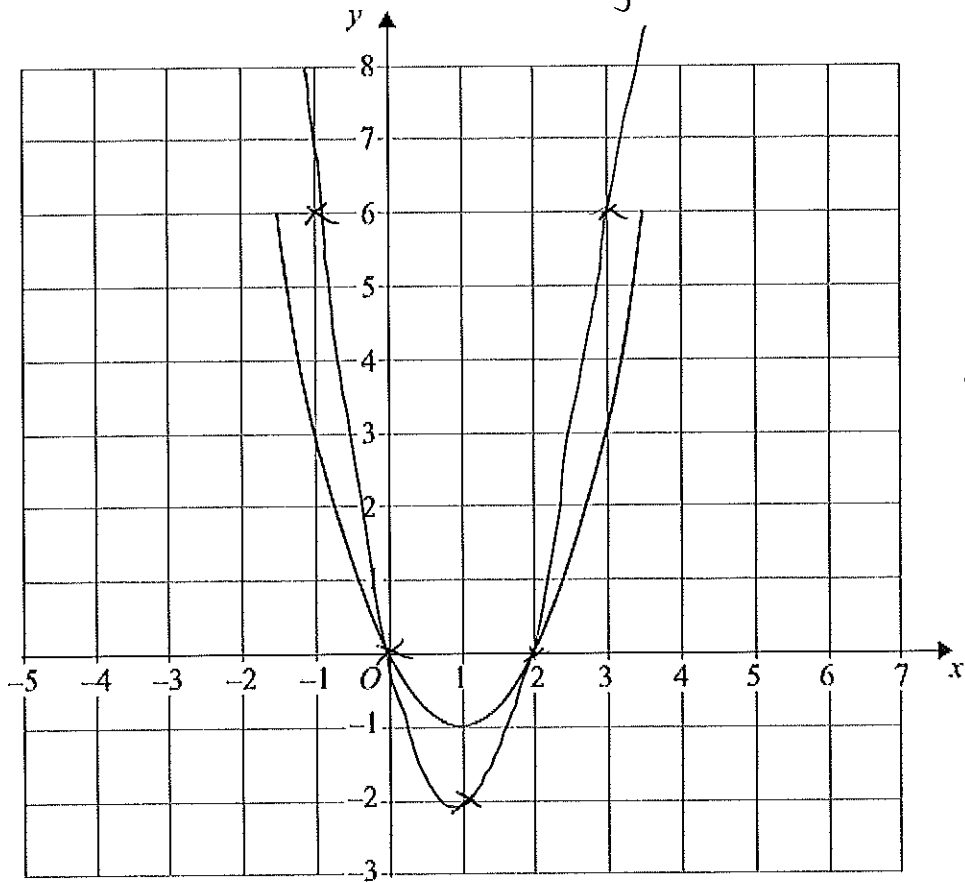$= \dfrac{4x-8+3x+6}{(x+2)(x-2)}$

(Total 6 marks)

[Full marks on this question was achieved by 6.3% of students]

8

7. The graph of $y = f(x)$ is shown on the grid.

On this grid, sketch the graph of $y = 2f(x)$

Stretch SF 2 in y - direction

All points 2x as far vertically from x-axis

(Total 2 marks)

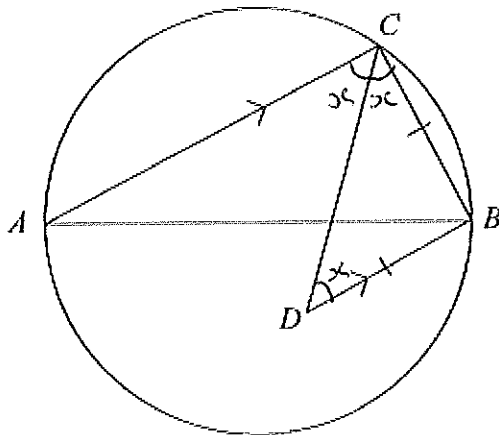*[Full marks on this question was achieved by 5.3% of students]*

9

8.

Diagram NOT accurately drawn

AB is a diameter of a circle.
C is a point on the circle.
D is the point inside the circle such that *BD* = *BC* and *BD* is parallel to *CA*.
Find the size of angle *CDB*.
You must give reasons for your answer.

$ACB = 90^\circ$ (angles in a semi-circle)

$ACD = CDB = x$ (alternate angles are equal)

$DCB = COB = x$ (isosceles triangle)

$90 = 2x \Rightarrow x = 45^\circ$

$\therefore CDB = 45^\circ$

.... °

(Total 4 marks)

[Full marks on this question was achieved by 4.6% of students]
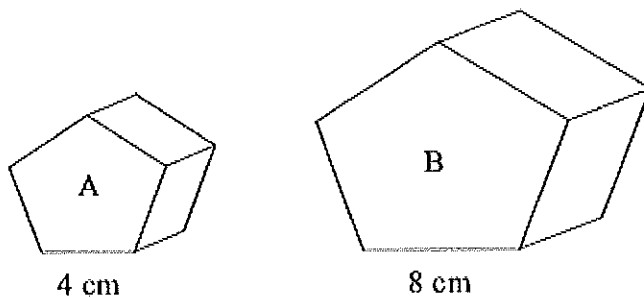
10

9. The diagram shows two similar solids, A and B.

Diagram **NOT**
accurately drawn

4 cm   8 cm

Solid A has a volume of 80 cm^3.

(a) Work out the volume of solid B.

$$Length \quad SF \; = \quad \times 2$$

$$\therefore \quad Volume \quad SF = \; \times 2^3 \; = \; \times 8$$

$$Volume \; \text{of} \; B = \; \overset{8}{\cancel{4}} \times 80 = \; \cancel{\text{volume}}$$

$$640 \; cm^3$$

.....................................cm^3

(2)

Solid B has a total surface area of 160 cm^2.

(b) Work out the total surface area of solid A.

$$Length \quad SF \; = \quad \times 2$$

$$Area \quad SF \; = \quad \times 2^2 \; = \; \times 4$$

$$\therefore \quad Surface \; area \; = \; 160 \div 4 \; = \; 40 cm^2$$

.....................................cm^2

(2)

(Total 5 marks)

[Full marks on this question was achieved by 4.5% of students]

10.
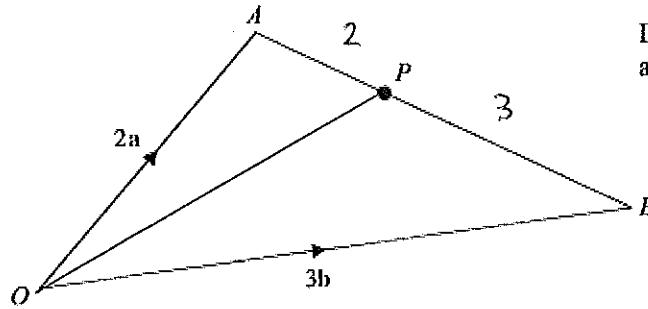
Diagram NOT accurately drawn

OAB is a triangle.

$\overrightarrow{OA} = 2\mathbf{a}$

$\overrightarrow{OB} = 3\mathbf{b}$

(*a*) Find AB in terms of **a** and **b**.

$-2a + 3b$

$\overrightarrow{AB}$ = ...
(1)

P is the point on AB such that $AP : PB = 2 : 3$

(*b*) Show that $\overrightarrow{OP}$ is parallel to the vector **a** + **b**.

$\overrightarrow{OP} = \overrightarrow{OA} + \overrightarrow{AP}$

$= 2a + \frac{2}{5}(\overrightarrow{AB})$

$= 2a + \frac{2}{5}(-2a + 3b)$ ∴ parallel to $a + b$

$= 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b = \frac{6}{5}(a + b)$
(3)

(Total 4 marks)

[*Full marks on this question was achieved by 4.0% of students*]

12

11. Expand and simplify $(2 + \sqrt{2})(3 + \sqrt{8})$

Give your answer in the form $a + b\sqrt{2}$, where a and b are integers.

$$= 6 + 2\sqrt{8} + 3\sqrt{2} + \sqrt{16}$$

$$= 6 + 2 \times \sqrt{4} \times \sqrt{2} + 3\sqrt{2} + 4$$

$$= 6 + 2 \times 2\sqrt{2} + 3\sqrt{2} + 4$$

$$= 6 + 4\sqrt{2} + 3\sqrt{2} + 4$$

$$= 10 + 7\sqrt{2}$$

....

(Total 4 marks)

[Full marks on this question was achieved by 3.8% of students]

12. Given that $\dfrac{8-\sqrt{18}}{\sqrt{2}} = a + b\sqrt{2}$, where a and b are integers, find the value of a and the value of b.

$$\frac{8-\sqrt{18}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2} - \sqrt{36}}{2}$$

$$= \frac{8\sqrt{2} - 6}{2}$$

$$= 4\sqrt{2} - 3$$

$$= -3 + 4\sqrt{2}$$

$a = $ ....-3.................

$b = $ ....4.................

(Total 3 marks)

[Full marks on this question was achieved by 2.9% of students]

13. Solve $\qquad 2x^2 - 9x + 4 = (2x - 1)^2$

$$2x^2 - 9x + 4 = (2x-1)(2x-1)$$

$$2x^2 - 9x + 4 = 4x^2 - 2x - 2x + 1$$

$$2x^2 - 9x + 4 = 4x^2 - 4x + 1$$

$-2x^2$ ⎫
$+9x$ ⎬
-4 ⎭

$$-9x + 4 = 2x^2 - 4x + 1$$

$$4 = 2x^2 + 5x + 1$$

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

$$0 = (2x - 1)(x + 3)$$

$x = \dfrac{1}{2} \qquad x = -3$

(Total 4 marks)

[Full marks on this question was achieved by 2.4% of students]

14.

6 cm

h

2√3 cm
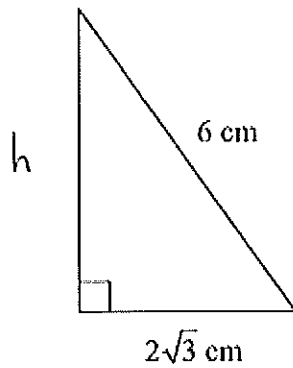
Diagram NOT
accurately drawn

The diagram shows a right-angled triangle.

The length of the base of the triangle is 2√3 cm.

The length of the hypotenuse of the triangle is 6 cm.

The area of the triangle is A cm^2.

Show that $A = k \sqrt{2}$ giving the value of k.

$$h = \sqrt{6^2 - (2\sqrt{3})^2}$$

$$= \sqrt{36 - (2\sqrt{3}) \times (2\sqrt{3})}$$

$$= \sqrt{36 - (4 \times 3)}$$

$$= \sqrt{36 - 12}$$

$$h = \sqrt{24}$$

$$Area = \frac{b \times h}{2}$$

$$= \frac{\sqrt{24} \times 2\sqrt{3}}{2}$$

$$= \frac{2\sqrt{72}}{2}$$

$$= \sqrt{72}$$

$$= \sqrt{36} \times \sqrt{2}$$

$$= \boxed{6\sqrt{2}}$$

....

(Total 5 marks)

[Full marks on this question was achieved by 2.3% of students]
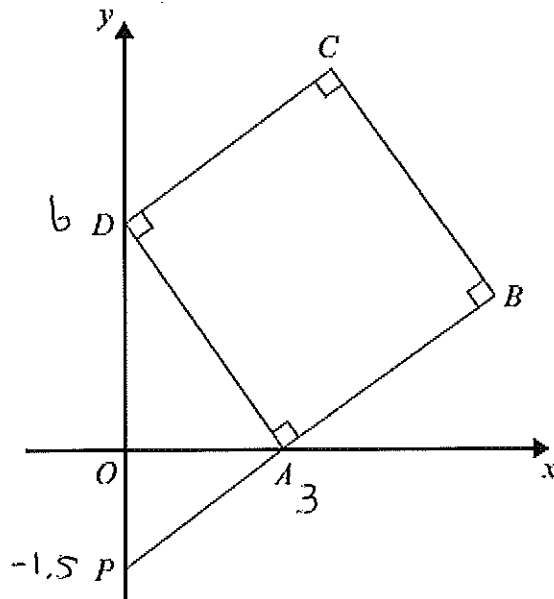
16

15.

Diagram **NOT** accurately drawn

ABCD is a square.
P and *D* are points on the *y*-axis.
A is a point on the *x*-axis.
PAB is a straight line.

The equation of the line that passes through the points *A* and *D* is $y = -2x + 6$

$D = (0, 6)$

Find the length of *PD*.

At A, $y = 0$ → $0 = -2x + 6$

$+2x$ $2x = 6$

$\div 2$ $x = 3$

$\boxed{\text{Line PAB}}$

Gradient $= \frac{1}{2}$ as it's perpendicular to DA with gradient -2

point A $= (3, 0)$

$\begin{pmatrix} x_1 = 3 \\ y_1 = 0 \\ m = \frac{1}{2} \end{pmatrix}$

$y - y_1 = m(x - x_1)$

$y - 0 = \frac{1}{2}(x - 3)$

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

→ $y = \frac{1}{2}x - 1.5$

$DP = 6 + 1.5$

$= \boxed{7.5}$

....

(Total 4 marks)

[Full marks on this question was achieved by 1.8% of students]

17

16.
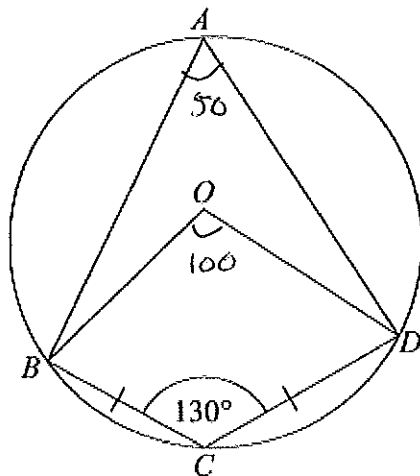
A, *B*, *C* and *D* are points on a circle, centre *O*.
BC = *CD*.
Angle *BCD* = 130°.

(a) Write down the size of angle *BAD*.
Give a reason for your answer.

$$BAD = 180 - 130 = 50° \quad (\text{opposite angles in a cyclic}$$
$$\text{quadrilateral add to } 180°)$$

..................................°
(2)

(b) Work out the size of angle *ODC*.
Give reasons for your answer.

$$BOD = 100° \quad (\text{angle at the centre is double that of}$$
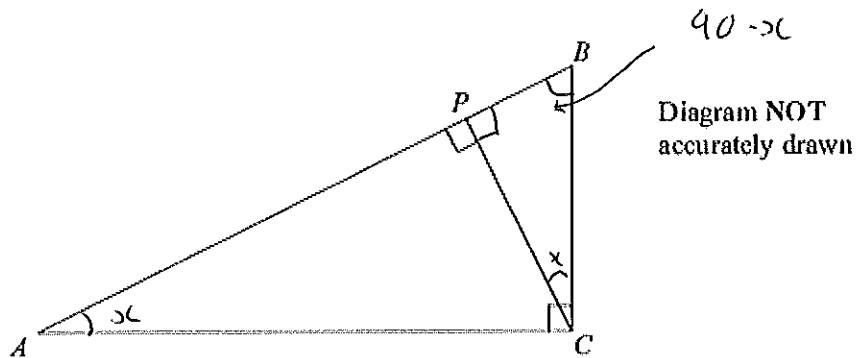$$\text{the circumference})$$

$$ODC = \frac{360 - 100 - 130}{2}$$
$$= \boxed{65°}$$

(angles in a quadrilateral add to
360° AND opposite angles in
a kite are equal)

..................................°
(4)

(Total 6 marks)

[Full marks on this question was achieved by 1.4% of students]

18

17.

Diagram NOT accurately drawn

In the diagram,

ABC is a triangle,
angle $ACB = 90°$,
P lies on the line AB,
CP is perpendicular to AB.

Prove that the angles of triangle APC are the same as the angles of triangle CPB.

$APC = 90°$, $CPB = 90°$ (angles on a straight line add to $180°$)

If $CAP = x$, $ABC = 90 - x$ (angles in a triangle add to $180°$)

∴ $BCP = 180 - 90 - (90 - x) = x$

(angles in a triangle add to $180°$)

∴ Each triangle has angles of $90°$, x and $90 - x$

(Total 3 marks)

[Full marks on this question was achieved by 0.6% of students]
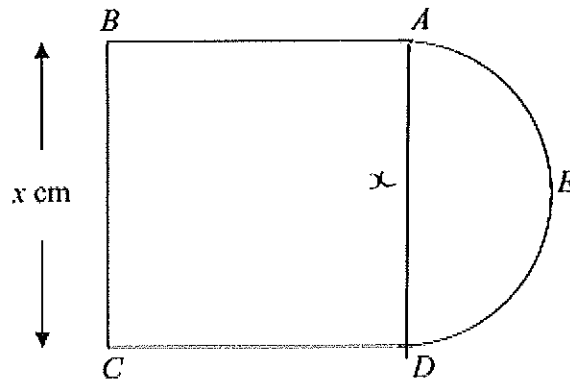
18. Here is a shape *ABCDE*.

Diagram **NOT** accurately drawn

AB, *BC* and *CD* are three sides of a square.
BC = *x* cm.
AED is a semicircle with diameter *AD*.

The perimeter, *P* cm, of the shape *ABCDE* is given by the formula

$$P = 3x + \frac{\pi x}{2}$$

(a) Rearrange this formula to make *x* the subject.

×2   } $2P = 6x + \pi x$

Factorise   } $2P = x(6 + \pi)$

÷ $(6 + \pi)$ } $\dfrac{2P}{6 + \pi} = x$

....

(2)

20

The area, A cm^2, of this shape is given by $A = kx^2$ where k is a constant.

(b) Find the exact value of k.
    Give your answer in its simplest form.

Area of Square $ABCD$ = $x \times x$ = x^2

Area of Semi-circle = $\frac{1}{2} \pi r^2$

$$= \frac{1}{2} \pi \left(\frac{x}{2}\right)^2$$

$$= \frac{1}{2} \pi \left(\frac{x}{2} \times \frac{x}{2}\right)$$

$$= \frac{1}{2} \pi \frac{x^2}{4}$$

$$= \frac{1}{8} \pi x^2$$

Total Area

$$= x^2 + \frac{1}{8} \pi x^2$$

$$= x^2 \left(1 + \frac{1}{8} \pi\right)$$

....

(3)

(Total 5 marks)

[*Full marks on this question was achieved by 0.1% of students*]

TOTAL FOR PAPER = 72 MARKS

END

Practice Paper 1B (Set N)

Question	Date of original linear paper	Original question number
1	June 2011	21
2	March 2012	4(b)
3	November 2012	12
4	November 2011	16
5	March 2012	20
6	June 2012	23
7	June 2012	26(b)
8	November 2011	19
9	November 2012	25
10	June 2011	26
11	March 2012	22
12	June 2011	22(b)
13	November 2011	20(b)
14	November 2011	21
15	November 2012	23
16	March 2012	19
17	June 2011	17
18	March 2012	21