1MA0
Edexcel GCSE
Mathematics (Linear) – 1MA0
Paper 2H (Calculator)
Higher Tier
Practice Paper 2A (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 14 questions in this question paper. The total mark for this paper is 60.
Calculators may be used.
If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

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.
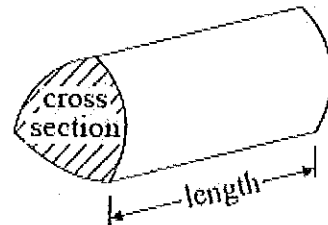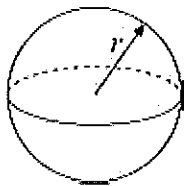Return at the end to those you have left out.

Formulae: Higher Tier

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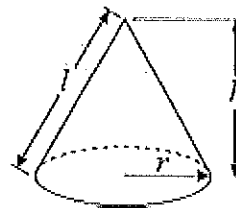**Anything you write on this formulae page will gain NO credit.**

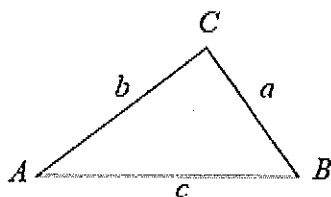**Volume of prism** = area of cross section × length

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 $ax2 + bx + c = 0$
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 = $\frac{1}{2} ab \sin C$

2

Answer ALL FOURTEEN questions.
Write your answers in the spaces provided.
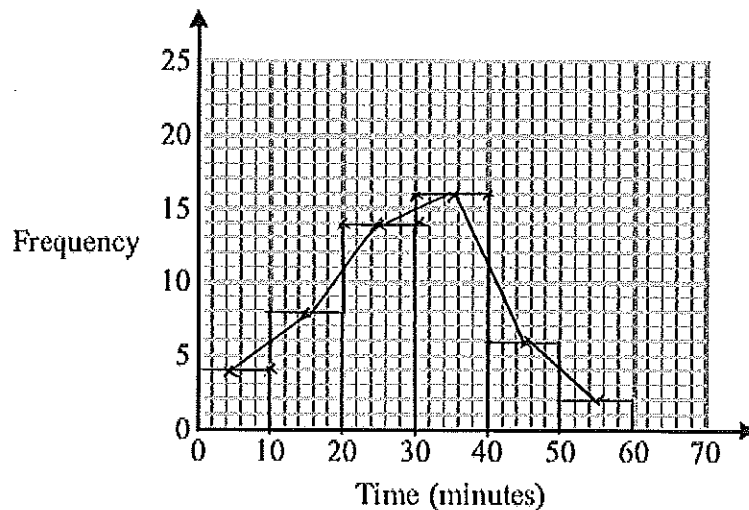You must write down all stages in your working.

1. The frequency table gives information about the times it took some office workers to get to the office one day.

Time (*t* minutes)	Frequency	Midpoint
$0 < t \le 10$	4	5
$10 < t \le 20$	8	15
$20 < t \le 30$	14	25
$30 < t \le 40$	16	35
$40 < t \le 50$	6	45
$50 < t \le 60$	2	55

(a) Draw a frequency polygon for this information. 50

(2)

(b) Write down the modal class interval. most popular $30 \le t \le 40$

(1)

One of the office workers is chosen at random.

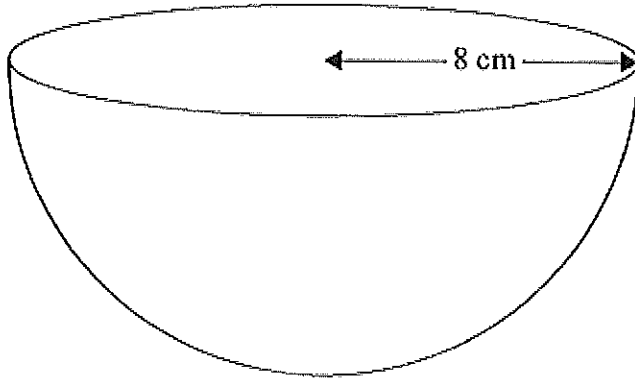(c) Work out the probability that this office worker took more than 40 minutes to get to the office.

8 took more than 40 mins

50 in total

$8/50$ or $4/25$

(2)

(Total 5 marks)

[Full marks on this question was achieved by 10.0% of students]

2. The diagram shows a solid hemisphere of radius 8 cm.

Work out the total surface area of the hemisphere.
Give your answer correct to 3 significant figures.

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

$\therefore$ hemisphere $= 2\pi r^2 + \pi r^2$

$= 3\pi r^2$

$= 3\pi \times 8^2$

$= 192\pi$

$\approx 603.185789...$

$= 603 \text{ cm}^2 \ (3sf)$

.... cm^2

(Total 3 marks)

[Full marks on this question was achieved by 9.7% of students]

4

3. Solve $3x^2 - 4x - 2 = 0$

Give your solutions correct to 3 significant figures.

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

$a = 3$
$b = -4$
$c = -2$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-2)}}{2 \times 3}$$

$$x = \frac{4 \pm \sqrt{40}}{12}$$

$$x = \frac{4 + \sqrt{40}}{12} = 0.860379... = 0.860 \ (3sf)$$

$$\text{or} \quad x = \frac{4 - \sqrt{40}}{12} = -0.193712... = -0.194 \ (3sf)$$

(Total 3 marks)

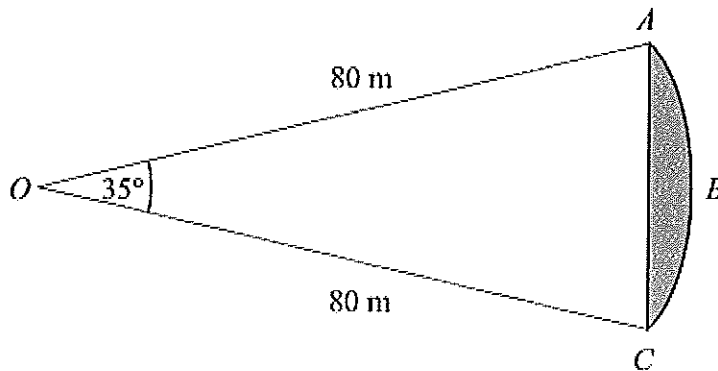*[Full marks on this question was achieved by 9.2% of students]*

5

4.

Diagram **NOT** accurately drawn

ABC is an arc of a circle centre *O* with radius 80 m.
AC is a chord of the circle.
Angle *AOC* = 35°.

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

Area of sector $OABC = \frac{35}{360} \times \pi \times 80^2 = 1954.7687...$

Area of $\triangle OAC = \frac{1}{2} ab \sin(c)$

$= \frac{1}{2} \times 80 \times 80 \times \sin(35)$

$= 1835.4445...$

Shaded $= 1954.7687... - 1835.4445...$

$= 119.32...$

$= 119 \ (3sf)$
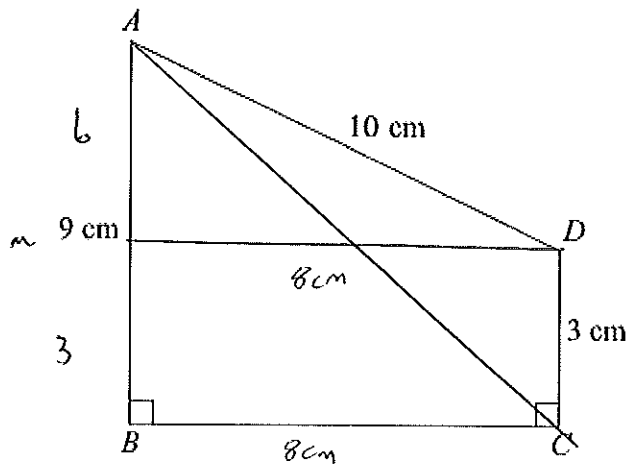
.... m²

(Total 5 marks)

[Full marks on this question was achieved by 9.0% of students]

5. *ABCD* is a trapezium.

Diagram **NOT** accurately drawn

A

6

M   9 cm

10 cm

D

8cm

3 cm

B   8cm   C

$AD = 10$ cm
$AB = 9$ cm
$DC = 3$ cm
Angle *ABC* = angle *BCD* = 90°

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

A

6

M   10   D

$MD = \sqrt{10^2 - 6^2}$

$= \sqrt{64} = 8 \, cm = BC$

A

9cm
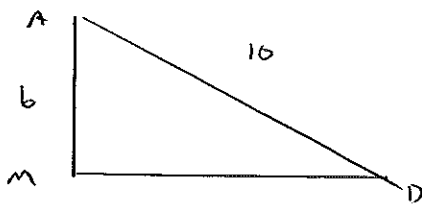
B   8cm   C
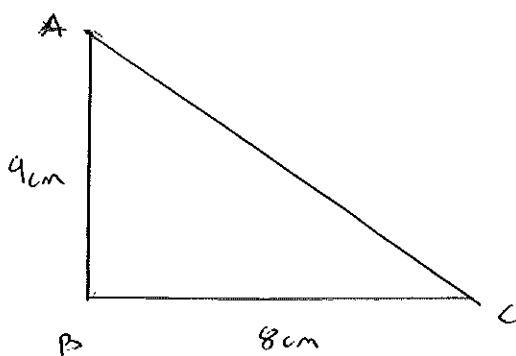
$AC = \sqrt{9^2 + 8^2}$

$= \sqrt{145}$

$= 12.0415...$

12.0 cm (3sf)

.... cm

(Total 5 marks)

[Full marks on this question was achieved by 8.8% of students]

7

6.
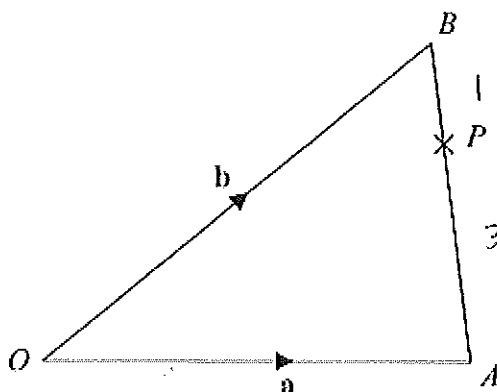
Diagram **NOT** accurately drawn

OAB is a triangle.

$\overrightarrow{OA}$ = **a**

$\overrightarrow{OB}$ = **b**

(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

$-a + b$

....

(1)

P is the point on *AB* such that *AP* : *PB* = 3 : 1

(b) Find $\overrightarrow{OP}$ in terms of **a** and **b**.
Give your answer in its simplest form.

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

$$= a + \frac{3}{4}(\overrightarrow{AB})$$

$$= a + \frac{3}{4}(-a + b)$$

$$= a - 0.75a + 0.75b$$

$$= 0.25a + 0.75b$$

$$or \quad \frac{1}{4}a + \frac{3}{4}b$$

....

(3)

(Total 4 marks)

[Full marks on this question was achieved by 7.8% of students]

8

7.
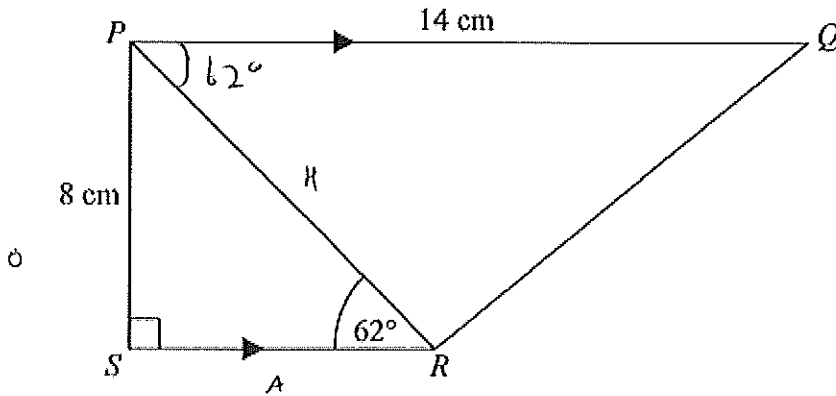
PQRS is a trapezium.
PQ is parallel to *SR*.
Angle *PSR* = 90°.
Angle *PRS* = 62°.
PQ = 14 cm.
PS = 8 cm.

(a) Work out the length of *PR*.
Give your answer correct to 3 significant figures.

$$\sin(62) = \frac{8}{PR}$$

$\times PR$ $\Big\{$ $PR \times \sin(62) = 8$

$\div \sin(62)$ $\Big\}$ $PR = \frac{8}{\sin(62)} = 9.06056..$

9.06 (3sf)

.... cm
(3)

(b) Work out the length of *QR*.
Give your answer correct to 3 significant figures.

$QPR = 62°$ (alternate angles equal)

cosine rule!

$QR^2 = 14^2 + 9.0605..^2 - 2 \times 14 \times 9.0605.. \times \cos(62)$

$QR^2 = 158.940...$

.... cm
(4)

$QR = \sqrt{158.94...} = 12.6091..$ $= 12.6 cm$ (3sf) (Total 7 marks)

[Full marks on this question was achieved by 6.6% of students]
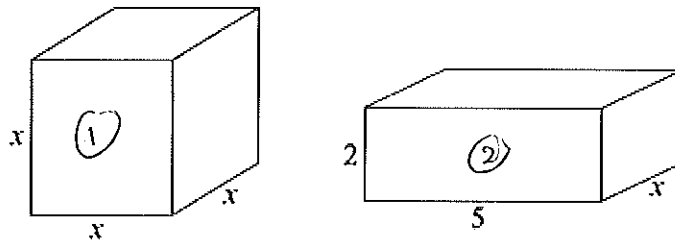
9

8. The diagram shows a cube and a cuboid.

Diagram **NOT** accurately drawn

All the measurements are in cm.
The volume of the cube is 100 cm^3 more than the volume of the cuboid.

(a) Show that $x^3 - 10x = 100$

① Volume $= x^3$

② Volume $= 2 \times 5 \times x = 10x$

$$x^3 = 10x + 100$$
$-10x$ $\{$ $x^3 - 10x = 100$

(2)

(b) Use a trial and improvement method to find the value of x.
Give your answer correct to 1 decimal place.
You must show **all** your working.

x	$x^3 - 10x$	
5	75	small
6	156	big
5.4	103.464	big
5.3	95.877	small
5.35	99.6303	small

Must be $x = 5.4$ (1dp)

$x = $ ....

(4)

(Total 6 marks)

[Full marks on this question was achieved by 5.4% of students]

9. Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of 8}$$

for all positive integer values of n.

Expand:

$$(2n+3)(2n+3) - [(2n-3)(2n-3)]$$

$$4n^2 + 6n + 6n + 9 - [4n^2 - 6n - 6n + 9]$$

$$4n^2 + 12n + 9 - [4n^2 - 12n + 9]$$

$$= 24n$$

$$= 8 \times 3n$$

Anything $\times 8$ is a multiple of 8

10. Solve $\dfrac{5(2x+1)^2}{4x+5} = 5x-1$

$\times(4x+5)$ $\Big\{$

$5(2x+1)^2 = (4x+5)(5x-1)$

$5(2x+1)(2x+1) = (4x+5)(5x-1)$

$5\left[4x^2 + 2x + 2x + 1\right] = 20x^2 \overset{=}{+} 4x + 25x - 5$

$\cancel{20x^2}$

$5\left[4x^2 + 4x + 1\right] = 20x^2 + 21x - 5$

$20x^2 + 20x + 5 = 20x^2 + 21x - 5$

$-20x^2$ $20x + 5 = 21x - 5$

$-20x$ $5 = x - 5$

$+5$ $10 = x$

$\boxed{x = 10}$

....

(Total 5 marks)

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

12

11. Find the exact solutions of $x + \dfrac{3}{x} = 7$

$$\times \; x \quad \begin{cases} x^2 + 3 = 7x \\[2mm] x^2 - 7x + 3 = 0 \end{cases}$$

$-7x$

$a = 1$

$b = -7$

$c = 3$

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

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(1)(3)}}{2 \times 1}$$

$$x = \frac{7 \pm \sqrt{37}}{2}$$

$$x = \frac{7 + \sqrt{37}}{2} \quad \text{or} \quad x = \frac{7 - \sqrt{37}}{2}$$

....

(Total 3 marks)

[Full marks on this question was achieved by 2.8% of students]
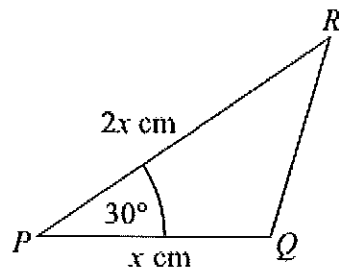
*12.   The diagram shows the triangle *PQR*.

Diagram **NOT**
accurately drawn

$PQ = x$ cm
$PR = 2x$ cm
Angle $QPR = 30°$

The area of triangle $PQR = A$ cm^2

Show that $x = \sqrt{2A}$

$\text{Area of } \triangle = \frac{1}{2} ab \sin(c)$

$= \frac{1}{2} (x)(2x) \sin(30)$

$= x^2 \times \sin(30)$

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

$\text{Area of } \triangle = A$

$\rightarrow \quad \frac{1}{2} x^2 = A$

$\times 2 \quad \Big\{ \quad x^2 = 2A$

$\sqrt{} \quad \Big| \quad x = \sqrt{2A}$

(Total 3 marks)

[Full marks on this question was achieved by 2.5% of students]

14

13. (a) Solve $2x^2 + 9x - 7 = 0$

Give your solutions correct to 3 significant figures.

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

$a = 2$
$b = 9$
$c = -7$

$$x = \frac{-9 \pm \sqrt{9^2 - 4 \times (2) \times (-7)}}{2 \times 2}$$

$$x = \frac{-9 \pm \sqrt{137}}{4}$$

$$x = \frac{-9 + \sqrt{137}}{4} = 0.67617... = 0.676$$ (3sf)

OR

$$x = \frac{-9 - \sqrt{137}}{4} = -5.17617... = -5.18$$ (3sf)

....

(3)

(b) Solve $\frac{2}{y^2} + \frac{9}{y} - 7 = 0$

Give your solutions correct to 3 significant figures.

From a), $y^2 = \frac{1}{x^2} \rightarrow y = \frac{1}{x}$

So, if $x = 0.676$, $y = \frac{1}{0.676} = 1.479 = 1.48$ (3sf)

$x = -5.18$, $y = \frac{1}{-5.18} = -0.193$ (3sf)

....

(2)

(Total 5 marks)

[Full marks on this question was achieved by 0.9% of students]

14. (i) Factorise $2t^2 + 5t + 2$

$$(2t + 1)(t + 2)$$

....

(ii) t is a positive whole number.

The expression $2t^2 + 5t + 2$ can never have a value that is a prime number.

Explain why.

Prime numbers have exaclty 2 factors, one of
which $= 1$. Neither $(2t+1)$ or $(t+2)$ could $= 1$
$\therefore 2t^2 + 5t + 2$ can not be prime!

(Total 3 marks)

[Full marks on this question was achieved by 0.5% of students]

TOTAL FOR PAPER = 60 MARKS

END

Practice Paper 2A (Set N)

Question	Date of original linear paper	Original question number
1	November 2012	12
2	November 2011	24
3	June 2012	22
4	March 2012	23
5	November 2012	15
6	June 2012	26
7	November 2011	20
8	November 2012	11
9	June 2012	21
10	March 2012	24
11	November 2011	19
12	November 2012	25
13	November 2012	22
14	November 2012	14