RECOGNISING ACHIEVEMENT

**Oxford Cambridge and RSA Examinations**

**General Certificate of Secondary Education**

# MATHEMATICS SYLLABUS A
PAPER 5
HIGHER TIER

**1962/5**

**Specimen Paper 2003**

Additional materials: Geometrical instruments
Tracing paper (optional)
Candidates answer on the question paper.

Calculators are **not** allowed.

**TIME** 1 hour 30 minutes

| Candidate Name | Centre Number | Candidate Number |
|---|---|---|
| | | |

## INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- *Answer all the questions*.
- Write your answers, in blue or black ink, in the spaces provided on the question paper.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Show all your working. Marks may be given for working which shows that you know how to solve the problem even if you get the answer wrong.

## YOU ARE NOT ALLOWED TO USE A CALCULATOR IN THIS PAPER

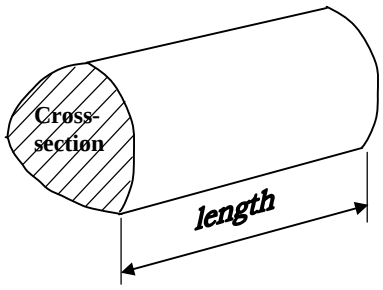
## INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.

| For examiner's use only |
|---|
| |

**FORMULAE SHEET: HIGHER TIER**

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

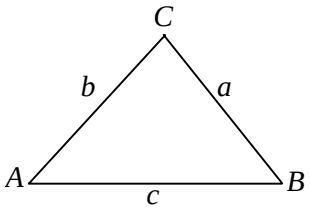



**In any triangle ABC**

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

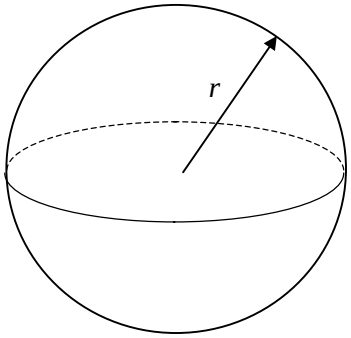
**Cosine rule** $a^2 = b^2 + c^2 - 2bc \cos A$

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



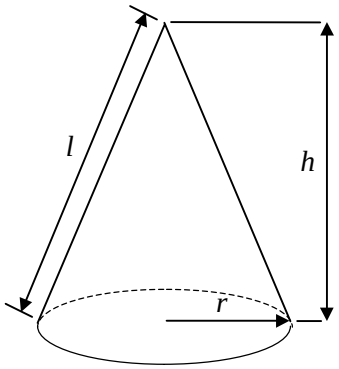

**Volume of sphere** = $\frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** = $\pi r1$



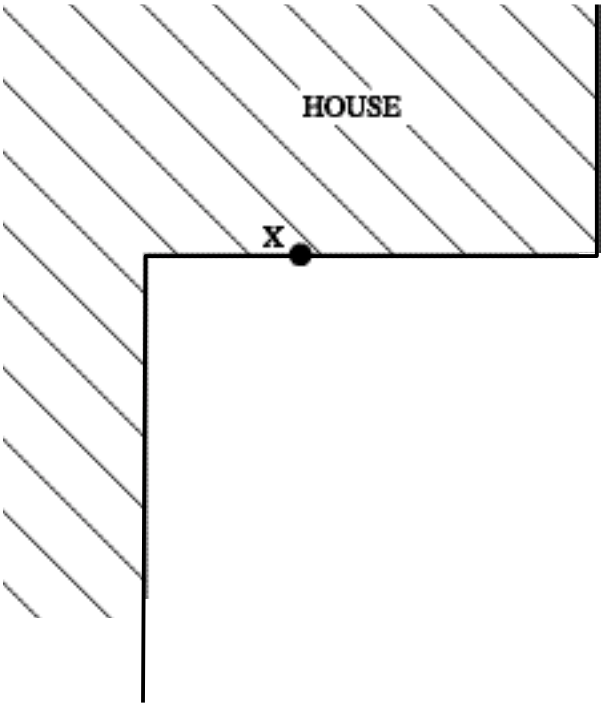

**The Quadratic Equation**

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

**1** The diagram shows the wall of a house drawn to a scale of 2 cm to 1 m.
A dog is fastened by a lead 3m long to a point X on a wall.

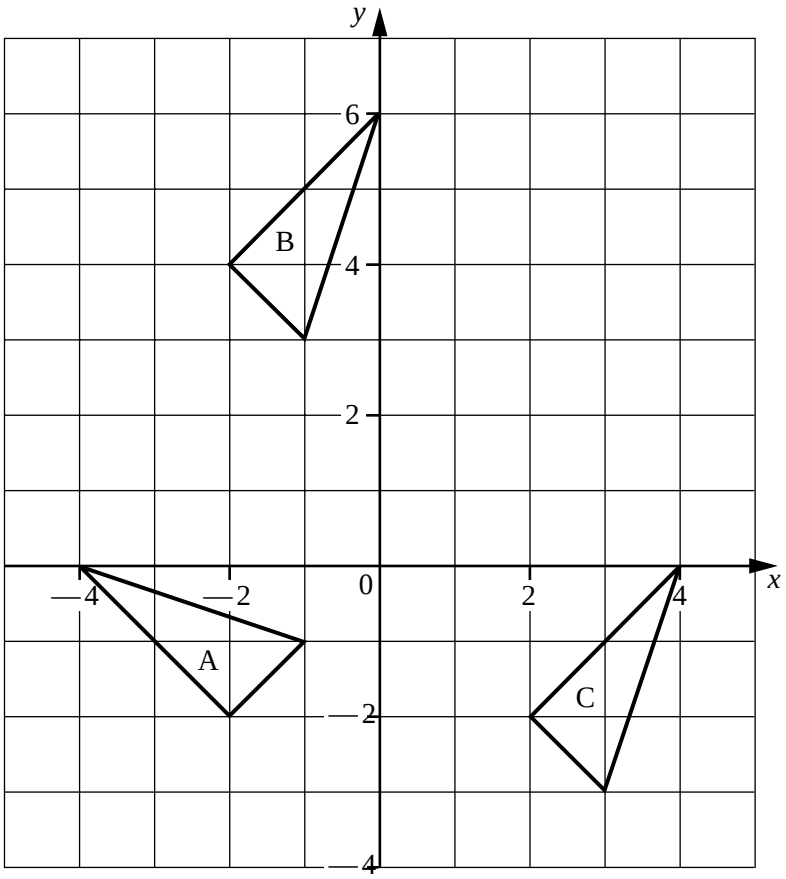
Shade on the diagram the area that the dog can reach.

Scale: 2cm to 1m




**[4]**

**2**




**(a)** Find the centre of the rotation which maps triangle A on to triangle B.

*Answer (a)* _____ , _____ **[1]**

**(b)** Describe the single transformation which maps triangle B onto triangle C.

*Answer (b)*_____

_____

_____ **[2]**

**3** **(a)** Find the value of 24 multiplied by the reciprocal of 24.

Show clear working to explain your answer.

*Answer (a)* _____ **[2]**

**(b)** James said, 'Five divided by zero is five'.

What answer should he have given?

*Answer (b)* _____ **[1]**

**(c)** Jagdeep said, 'The square root of a number is always smaller than the number itself.'

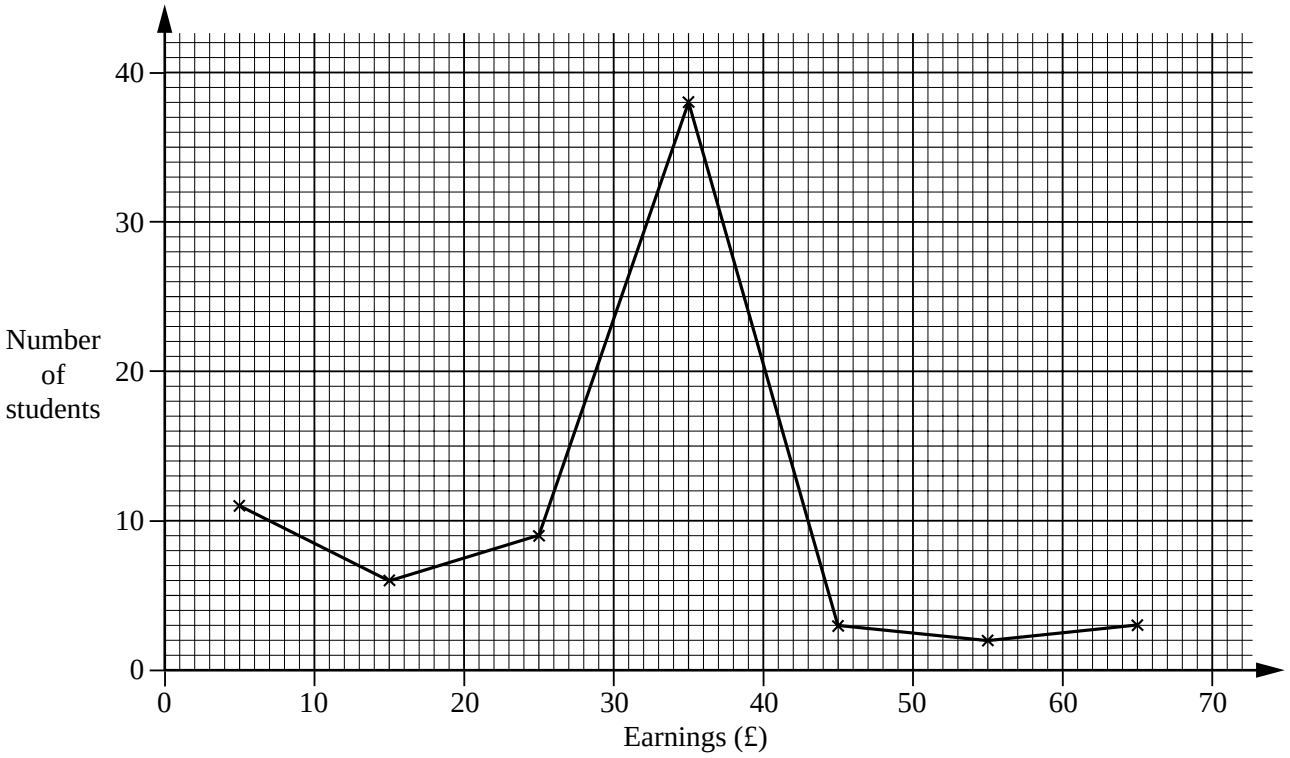
Is he correct?

Give an example to support your answer.

*Answer (c)* _____

**[2]**

**4** A survey was carried out to see how much the sixth formers in a school earn each week from part-time employment.
The frequency polygon below shows the distribution of earnings of the Year 12 students.




The table below shows the distribution of earnings of the Year 13 students.

| Earnings (£x) | Number of Year 13 students |
|---|---|
| $0 < x \leq 10$ | 15 |
| $10 < x \leq 20$ | 27 |
| $20 < x \leq 30$ | 14 |
| $30 < x \leq 40$ | 4 |
| $40 < x \leq 50$ | 1 |

**(a)** Draw, on the same grid, the frequency polygon for the earnings of the Year 13 students.

**[2]**

**(b)** Make two different comparisons between the earnings of the Year 12 and the Year 13 students.

*Answer(b)(1)* _____

_____

_____

*(2)* _____

_____

_____ **[2]**

**5** **(a)** Simplify

**(i)** $p^4 \times p^3$,

*Answer (a)(i)* _____ **[1]**

**(ii)** $\frac{12t^5}{3t^2}$.

*Answer (ii)* _____ **[1]**

**(b)** Solve $3x + 19 \geq 4$.

*Answer (b)* _____ **[2]**

**(c)** Rearrange the following formula to make $w$ the subject.

$$s = \frac{w + y}{2}$$

*Answer (c)* _____ **[2]**

**(d)** The nth term, $t_n$ , of a sequence is given by the formula

$$t_n = \frac{n(n+1)}{2}$$

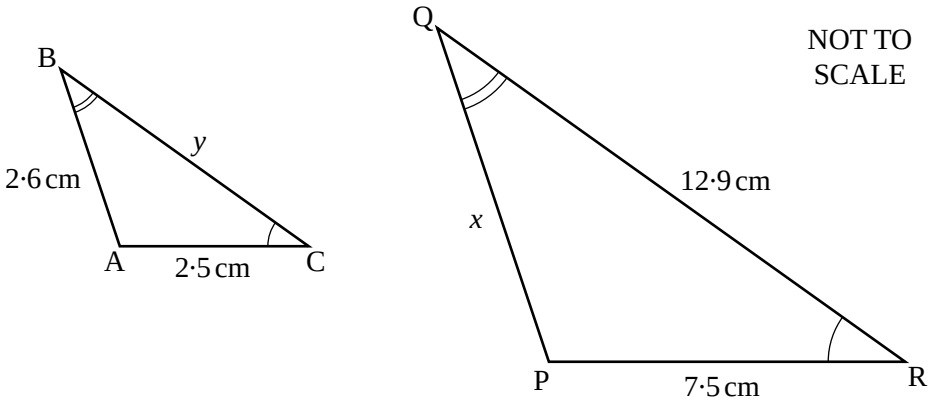
**(i)** Write down the values of $t_1$, $t_2$, $t_3$.

*Answer (d) (i)* _____ **[2]**

**(ii)** This sequence of numbers has a special name. Write down that name.

*Answer (ii)* _____ **[1]**

**6** ABC and PQR are similar triangles.




**(a)** Find the length marked

**(i)** $x$,

*Answer (a)(i)* _____ cm **[3]**

**(ii)** $y$.

*Answer (ii)* _____ cm **[2]**

**(b)** (Area of triangle PQR) = $n \times$ (Area of triangle ABC)
Find the value of $n$.

*Answer (b)* _____ **[2]**

7 A manufacturer investigates how far a car travels before it needs new tyres.
The distances covered by 100 cars before they needed new tyres is shown in the table below.

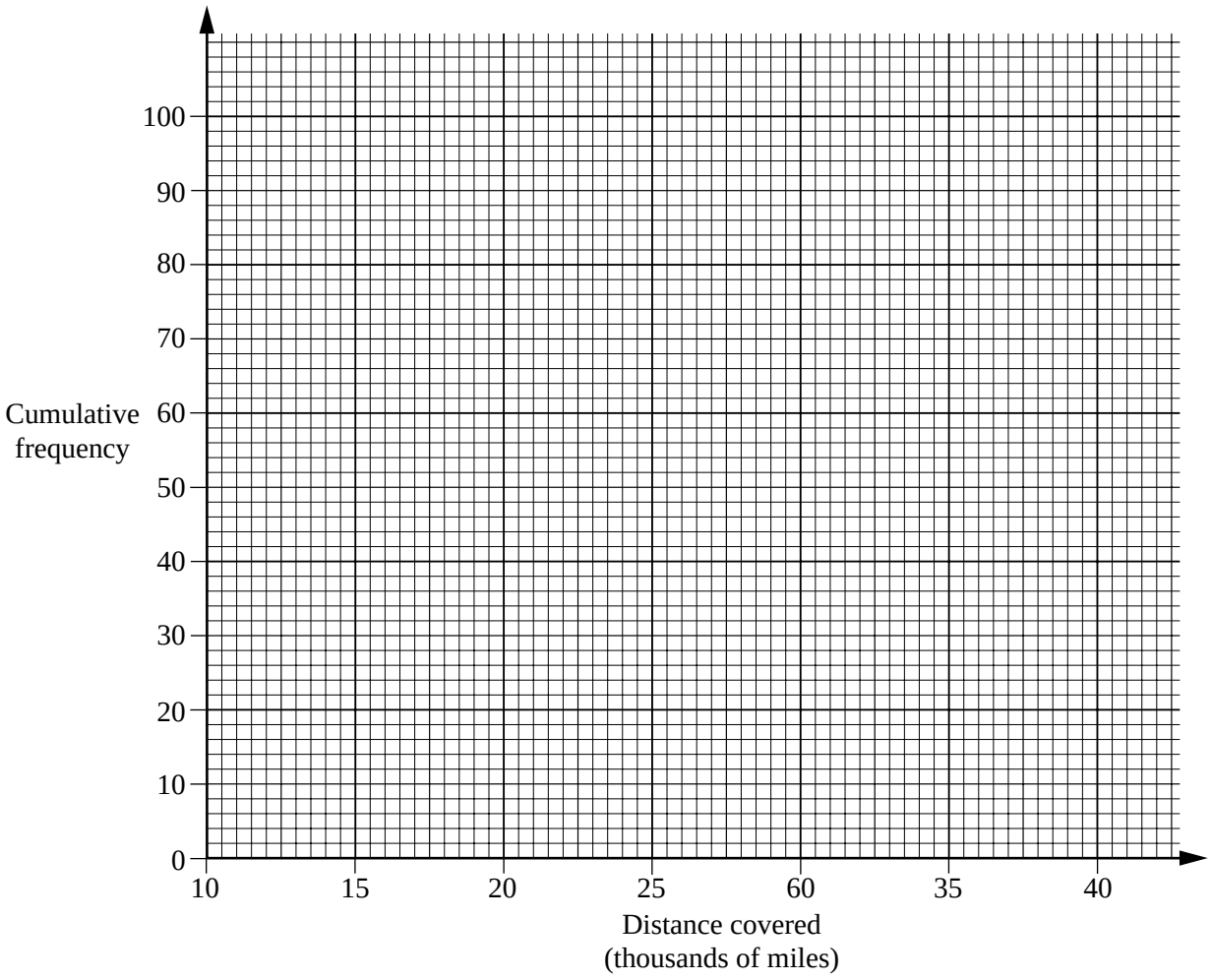
| Distance covered (x thousands of miles) | Number of cars |
|---|---|
| $10 < x < 15$ | 10 |
| $15 < x < 20$ | 23 |
| $20 < x < 25$ | 31 |
| $25 < x < 30$ | 19 |
| $30 < x < 35$ | 12 |
| $35 < x < 40$ | 5 |

**(a)** Complete the cumulative frequency table for 100 cars.

| Distance covered ($x$ thousand miles) | $x < 15$ | $x < 20$ | $x < 25$ | $x < 30$ | $x < 35$ | $x < 40$ |
|---|---|---|---|---|---|---|
| Cumulative Frequency | 10 | | | | | |

**[1]**

**(b)** Draw the cumulative frequency diagram on the grid below.




**[3]**

**7** **(c)** Use your cumulative frequency diagram to estimate the median distance covered.

*Answer (c)* _____ miles **[1]**

**(d)** Use your diagram to estimate how many cars travelled less than 28000 miles before needing new tyres.

*Answer (d)* _____ **[1]**

---

**8** **(a)** **(i)** Write sixty thousand in standard form.

*Answer (a)(i)* _____ **[1]**

**(ii)** Hence, or otherwise, find the value of the square of sixty thousand.
Give your answer in standard form.

_____

_____

*Answer (ii)* _____ **[2]**

**(b)** Work out $4.3 \times 10^{-3} + 2.7 \times 10^{-2}$.

Give your answer in standard form.

_____

_____

_____

_____

*Answer (b)* _____ **[2]**

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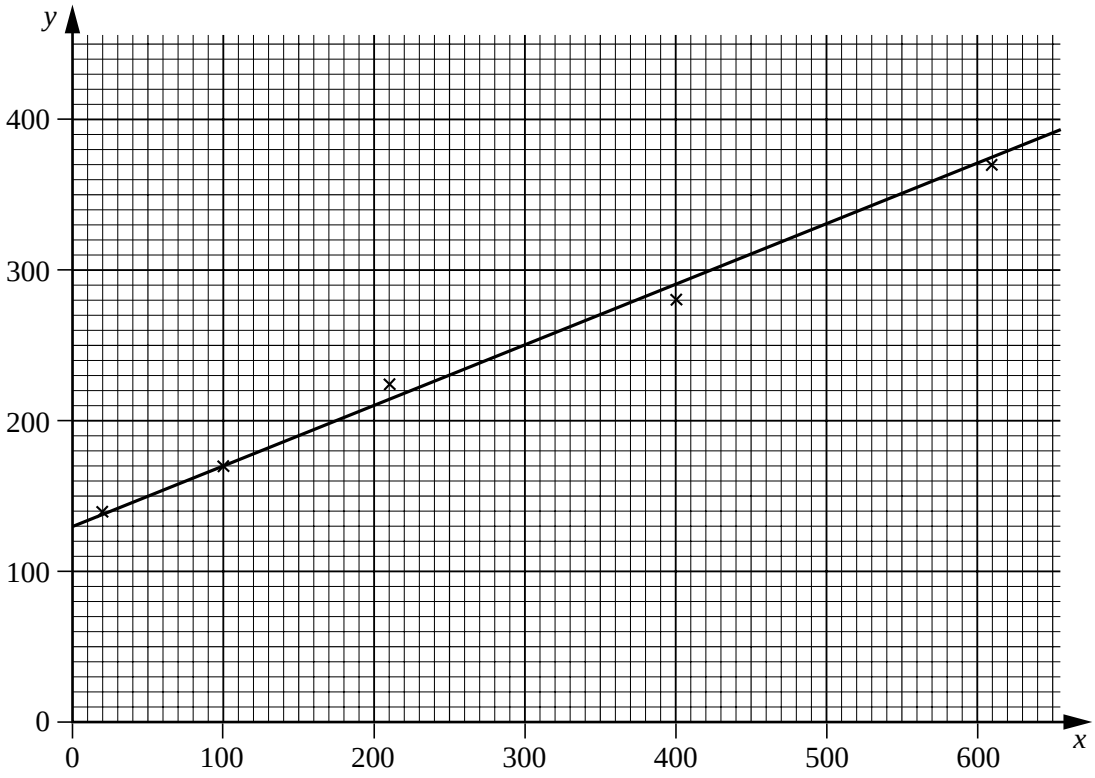
**9** The graph shows the results of a science experiment.
A line of best fit has been put onto the graph.



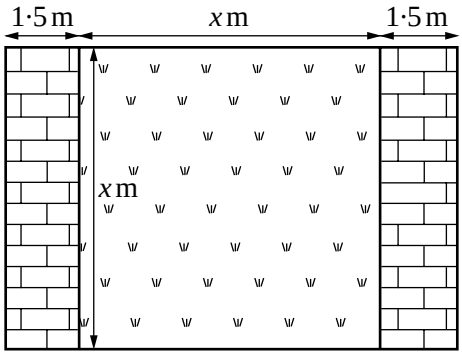

Find the equation of the line.

*Answer* _____ **[4]**

**10** A rectangular garden is made up of a square lawn of side $x$ m and 2 paths 1.5 m wide, as shown in the diagram.

The total area of the garden is 88 $m^2$.

Write down an equation in $x$ and solve it to find the dimensions of the lawn.




NOT TO SCALE

*Answer* _____ m **[5]**

**11** The distance, $d$ km, it is possible to see on a clear day is proportional to the square root of the height, $h$ m, above sea level

Standing on a pier, 4 m above sea level, it is possible to see a distance of 10 km.

**(a)** Find a formula for $d$ in terms of $h$.

*Answer (a)* $d$ = _____ **[2]**

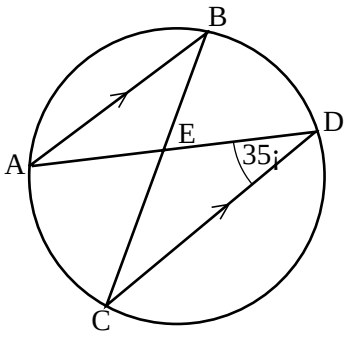
**(b)** Standing on top of the cliffs I can see a distance of 35 km.

How high are the cliffs?

*Answer (b)* _____ m **[2]**

**12** A, B, C and D are points on a circle.
AB is equal in length and parallel to CD.
Lines AD and BC intersect at E.
Angle EDC = 35°.

NOT TO SCALE




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

*Answer (a)* _____

_____

_____ **[1]**

**(b)** **(i)** Find the size of angle AEC.

Show all your working clearly.

_____

_____

_____

*Answer (b)(i)* _____ **[2]**

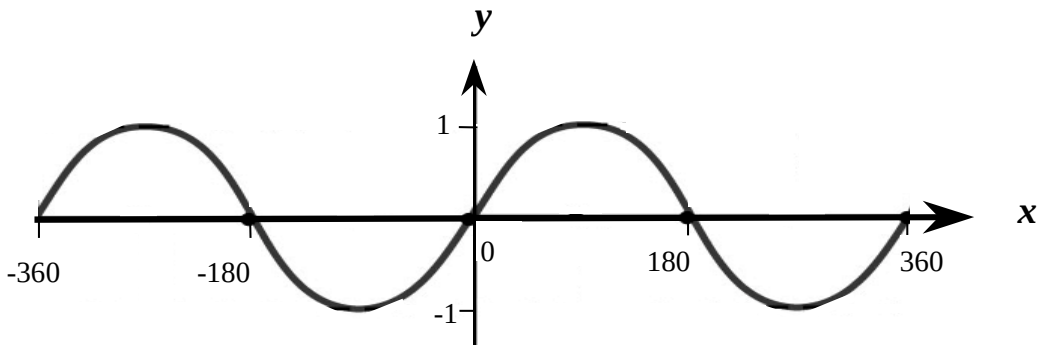
**(ii)** What does this tell you about point E? Give a reason for your answer.

*Answer (ii)* _____

_____

_____ **[2]**

**13** Below is the graph of $y = \sin x°$ for values of $x$ between −360 and 360.




**(a)** One solution of the equation $\sin x° = 0.766$

is $x = -230$.

Find the other solutions for x in the range −360 to 360.

_____

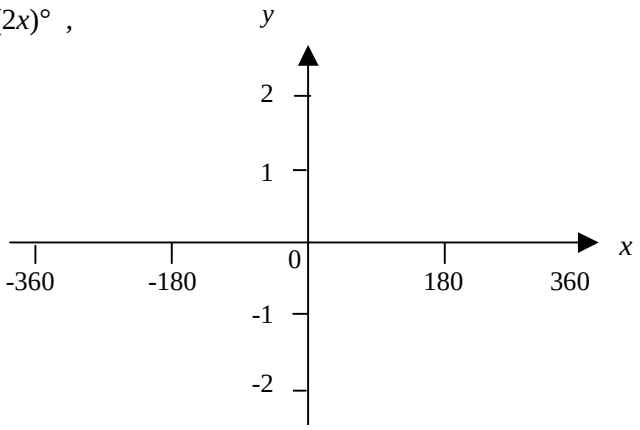
_____

_____

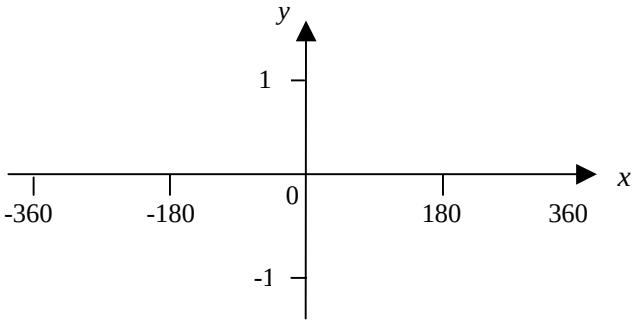
*Answer (a)* _____ **[3]**

**(b)** On the grids below draw the graph of

**(i)** $y = \sin (2x)°$ ,




**(ii)** $y = \sin (x + 90)°$.




**[4]**

**14** **(a)** Express the following in the form $p\sqrt{q}$ where $p$ and $q$ are integers.

$$\frac{4}{\sqrt{2}}$$

*Answer (a)* _____ **[1]**

**(b)** Simplify the following. Give your answer in the form $a + b\sqrt{2}$ where $a$ and $b$ are integers.

$(1 + \sqrt{2})(3 - \sqrt{2})$.

*Answer (b)* _____ **[2]**

**15** In the film 'Shipwreck', the Captain and five passengers remain on board a sinking ship.
There are three lifejackets remaining.
The Captain knows that three of the passengers cannot swim.
In his panic he hands out the lifejackets randomly to three of the five passengers.

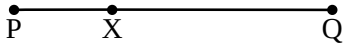
Calculate the probability that he gives the lifejackets to just two of the three non-swimmers.

*Answer* _____ **[5]**

**16** **(a)** Given that $\mathbf{s} = \begin{bmatrix} 3 \\ 4 \end{bmatrix}$ and $\mathbf{t} = \begin{bmatrix} 6 \\ -1 \end{bmatrix}$, find $2\mathbf{s} - \mathbf{t}$.

*Answer (a)* $\begin{bmatrix} \quad \\ \quad \end{bmatrix}$ **[1]**

**(b)** In the diagram XQ = 3PX .




NOT TO SCALE

Given that **PX** = **p** , find in terms of **p**

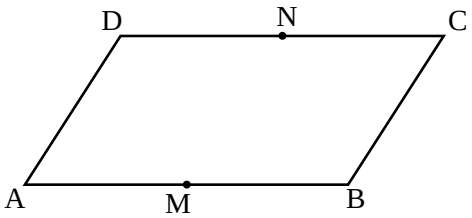
**(i)** **XQ** ,

*Answer (b)(i)* _____ **[1]**

**(ii)** **QP** .

*Answer (ii)* _____ **[1]**

**(c)** In the diagram ABCD is a parallelogram.
M and N are the mid-points of AB and DC.
**AB** = **a** and **AD** = **b** .




Use a vector method to prove that AMCN is also a parallelogram.
Show all your working clearly.

*Answer (c)* _____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

**17** I wish to paint the outside walls of my house.
A tin of paint covers 25 m², correct to the nearest 5 m².
The outside walls of my house have an area of 320 m², correct to the nearest 10 m².
Calculate the maximum number of tins of paint I may have to buy.

*Answer* _____ **[5]**

**18** **(a)** Simplify the following expression.

$$\frac{x^2 + x - 2}{x^2 - 4}$$

*Answer (a)* _____ **[3]**

**(b)** Solve

$$\frac{2x+1}{x-1} = \frac{7x+3}{4x-3}$$

*Answer (b)* _____ **[6]**

**(c)** Solve $(x - 5)(x + 1) > 0$

*Answer (c)* _____ **[2]**

RECOGNISING ACHIEVEMENT

**Oxford Cambridge and RSA Examinations**

**General Certificate of Secondary Education**

# MATHEMATICS SYLLABUS A

PAPER 5
HIGHER TIER

**1962/5**

MARK SCHEME

**Specimen Paper 2003**

| | | | | |
|---|---|---|---|---|
| **1** | Circle, centre X<br>Radius 6 cm<br>Circle, centre corner<br>Radius 2 cm | | 1<br>1<br>1<br>1 | |
| **2** | **(a)** | (1,1) | 1 | |
| | **(b)** | Translation<br>$\begin{bmatrix} 4 \\ -6 \end{bmatrix}$ | 1<br>1 | |
| **3** | **(a)** | **(i)** Evidence of $24 \times \frac{1}{24}$<br>1 | M1<br>B1 | |
| | **(b)** | No answer | 1 | Allow ∞ |
| | **(c)** | correct example<br>correctly evaluated | M1<br>A1 | |
| **4** | **(a)** | Points correct<br>Straight line joins | P1<br>L1 | |
| | **(b)** | Year 12 higher average oe<br>Year 12 wider range oe | 1<br>1 | Accept reasonable alternatives |
| **5** | **(a)** | **(i)** $p^7$<br>**(ii)** $4t^3$ | 1<br>1 | |
| | **(b)** | $x \geq -5$ | 2 | M1 for $3x \geq -15$ |
| | **(c)** | $w = 2s - y$ oe | 2 | M1 for $2s = w + y$ or $s - \frac{y}{2} = \frac{w}{2}$ |
| | **(d)** | **(i)** 1, 3, 6 | 2 | B1 for 2 correct |
| | | **(ii)** Triangular | 1 | Accept Triangle |
| **6** | **(a)** | 7.8 | 3 | B1 for 3 seen<br>and M1 for $3 \times 2.6$ |
| | **(b)** | 4.3 | 2 | M1 for $\frac{12.9}{3}$ |
| | **(c)** | 9 | 2 | M1 for (their 3)² |

| | | | | | |
|---|---|---|---|---|---|
| **7** | **(a)** | 33, 64, 83, 95, 100 | | 1 | |
| | **(b)** | 6 pts plotted<br>Joined | | P2<br>J1 | P1 for 4 or 5 points plotted correctly |
| | **(c)** | 22.5 to 23.5 | | 1 | |
| | **(d)** | 75 to 77 | | 1 | |
| **8** | **(a)** | **(i)** | $6 \times 10^4$ | 1 | |
| | | **(ii)** | $3.6 \times 10^9$ | 2 | B1 for the square of their (i) numerically correct. |
| | **(b)** | $3.13 \times 10^{-2}$ | | 2 | B1 for 0.0313 |
| **9** | | $y = 0.4x + 130$ | | 4 | M1 for correct gradient method<br>and A1 for $m$ = 0.35 to 0.45<br>and B1 for $c$ = + 130 |
| **10** | 8 | | | 5 | B1 for $x(x + 3) = 88$<br>and B1 for $x^2 + 3x - 88 = 0$<br>and M1 for factors that would give 2 of the 3 terms<br>and M1 <u>their</u> factors equated to 0 and $x$ values found |
| **11** | **(a)** | $d = 5\sqrt{h}$ | | 3 | M1 for $d = k\sqrt{h}$<br>and M1 for $k = 10/\sqrt{4}$ or better |
| | **(b)** | 49 | | 2 | M1 for (35/their $k$)² |
| **12** | **(a)** | (35°)<br>same segment oe | | 1 | |
| | **(b)** | **(i)** | 70° dep on M | 2 | M1 for use of parallel lines etc |
| | | **(ii)** | E is centre of circle | 1 | |
| | | | Angle at centre | 1 | |
| **13** | **(a)** | 50, 130, -310 | | 3 | B1 for each value correct |
| | **(b)** | **(i)** | Stretch of ½ from y-axis | 1 | o.e. |
| | | | 'Accurate' curve | 1 | Thro' max min and axis correctly |
| | | **(ii)** | Translate $\begin{bmatrix} -90 \\ 0 \end{bmatrix}$ | 1 | |
| | | | 'Accurate' curve | 1 | .. .. .. .. .. |

| | | | | |
|---|---|---|---|---|
| **14** | **(a)** | $2\sqrt{2}$ | 2 | M1 for $\frac{4}{\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}}$ or better |
| | **(b)** | $1 + 2\sqrt{2}$ | 2 | M1 for $3 - \sqrt{2} + 3\sqrt{2} - \sqrt{2}\sqrt{2}$ or better |
| **15** | | $\frac{6}{10}$ | 5 | B1 for each of $\frac{3}{5}\times\frac{2}{4}\times\frac{2}{3}$;<br>$\frac{3}{5}\times\frac{2}{4}\times\frac{2}{3}$; $\frac{2}{5}\times\frac{3}{4}\times\frac{2}{3}$<br>and M1 for adding the three possibilities |
| **16** | **(a)** | $\begin{bmatrix}0\\9\end{bmatrix}$ | 1 | |
| | **(b)** | **(i)** $3p$ | 1 | |
| | | **(ii)** $-4p$ | 1 | |
| | **(c)** | AM = NC = $1/2a$ | 1 | |
| | | AN = MC = $b + 1/2a$ | 1 | |
| | | Opposite sides parallel | 1 | |
| | | Opposite sides equal | 1 | |
| **17** | | 15 | 5 | B1 for 325 used<br>and B1 for 22.5 used<br>and M1 for their Max /their Min<br>and A1 for 14.4 |
| **18** | **(a)** | $\frac{x-1}{x-2}$ | 3 | B1 for $(x - 2)(x + 2)$<br>and B1 for $(x + 2)(x - 1)$ |
| | **(b)** | $x = 0$ or $-2$ | 6 | M1 for Attempt to cross multiply<br>and A1, A1 for $8x^2 - 2x - 3$ and $7x^2 - 4x - 3$<br>and M1 for collect terms and attempt to factorise oe<br>and A1 for $x(x + 2) = 0$ oe |
| | **(c)** | $x > 5$ | 1 | |
| | | $x < -1$ | 1 | |

| 1962 Analysis Paper 5 | | | | Year | | | | | Target Grades | | | | | | | | AO 1 | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Qn | NC ref | Syll ref | Topic/Context | Nu | Man Alg | Non Man Alg | S S | HD | C | B | A | A* | M/ S | Com F/I | Com I/H | Str 1 | Str 2 | Str 3 | |
| 1 | 3.1b, | 3.4e | | | | | 4 | | 4 | | | | 2 | | 4 | | 4 | | |
| 2 | 3.3b, | | | | | | 3 | | 3 | | | | | | 3 | | 2 | | |
| 3 | | 2.3a | | 5 | | | | | 5 | | | | | | 5 | | | 4 | |
| 4 | 4.4a, | 4.5b, | 4.5d | | | | | 4 | 4 | | | | | | | | | 2 | |
| 5 | 2.5d, | 2.5g, | 2.5j | | 6 | 3 | | | 9 | | | | | | 6 | | | | |
| 6 | 3.2g, | 3.3d | | | | | 7 | | | 5 | 2 | | | | 5 | | | | |
| 7 | 4.4a, | 4.4e, | 4.5b | | | | | 6 | | 6 | | | | | 6 | | | | |
| 8 | 2.3h, | | | 5 | | | | | | 5 | | | | | 3 | | | | |
| 9 | 2.1b, | 2.1c, | 2.1f, 2.6c | | | 4 | | | | 4 | | | | | 4 | | | | |
| 10 | 2.4a, | 2.5b | 2.5c | | 5 | | | | | 5 | | | 5 | | 5 | 5 | | | |
| 11 | 2.1g, | 2.5h | | | 5 | | | | | | 5 | | | | | | | | |
| 12 | 3.1d, | 3.1f, | 3.2h | | | | 5 | | | | 5 | | | | | | | 4 | |
| 13 | 3.1b, | 3.1f, | 3.2g, 2.6g | | | 4 | 3 | | | | 3 | 4 | | | | | 4 | | |
| 14 | 2.3n | | | 4 | | | | | | | | 4 | | | | | | | |
| 15 | 4.1b, | 4.4h | | | | | | 5 | | | 5 | | 5 | | | 5 | | | |
| 16 | 3.1d, | 3.1f, | 3.3f | | | | 6 | | | | | 6 | 4 | | | | | 4 | |
| 17 | 2.1a, | 2.1b, | 2.3q | 5 | | | | | | | 5 | | 4 | | | 4 | 1 | | |
| 18 | 2.1a, | 2.5b, | 2.5j, 2.5k | | 11 | | | | | | | 11 | | | | | | | |
| 25 | | | | 19 | 27 | 11 | 28 | 15 | 25 | 25 | 25 | 25 | 20 | | 41 | 14 | 11 | 14 | |