Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						7	3	6	1	/	0	2	Signature	

Paper Reference(s)

7361/02

London Examinations GCE

Mathematics Syllabus B

Ordinary Level

Paper 2

Wednesday 9 May 2007 – Morning

Time: 2 hours 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Candidates are expected to have an electronic calculator when answering this paper.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
You must write your answer for each question in the space following the question.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 100.
There are 36 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and legibly.

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1. The operation * on the set $S = \{1, 3, 5, 7, 9\}$ is defined as shown in Figure 1.

Figure 1

*	1	3	5	7	9
1	5	7	9	1	3
3	7	9	1	3	5
5	9	1	3	5	7
7	1	3	5	7	9
9	3	5	7	9	1

(a) Write down the identity element.

(1)

(b) Write down the inverse of 9.

(1)

(c) Find the value of (7 * 5) * 1.

(1)

Leave blank

Question 1 continued

Q1

(Total 3 marks)

Leave blank

2. Munir travelled from Avalon to Carlton in $4\frac{1}{2}$ hours at an average speed of 30 km/h.

(a) Calculate the distance, in km, from Avalon to Carlton.

(2)

The return journey from Carlton to Avalon, along the same route, took $7\frac{1}{2}$ hours.

(b) Calculate Munir's average speed, in km/h, for the complete journey from Avalon to Carlton and back to Avalon.

(2)

Leave blank

Question 2 continued

Q2

(Total 4 marks)

Leave blank

3. (a) Expand and simplify $(x - 1)(x - 2)(x + 3)$.

(3)

Given that $(x - 1)(x - 2)(x + 3) = 349 - 7x$,

(b) calculate the value of x.

(2)

Leave blank

Question 3 continued

(Total 5 marks)

Q3

Leave blank

4.

$$\mathbf{A} = \begin{pmatrix} 4 & -1 \\ 2 & 3 \end{pmatrix}, \ \mathbf{B} = \begin{pmatrix} p & -2 \\ 4 & 7 \end{pmatrix}.$$

(a) Calculate, in terms of p, (i) **AB**, (ii) **BA**.

(4)

Given that **AB** = **BA**,

(b) find the value of p.

(2)

Leave blank

Question 4 continued

Q4

(Total 6 marks)

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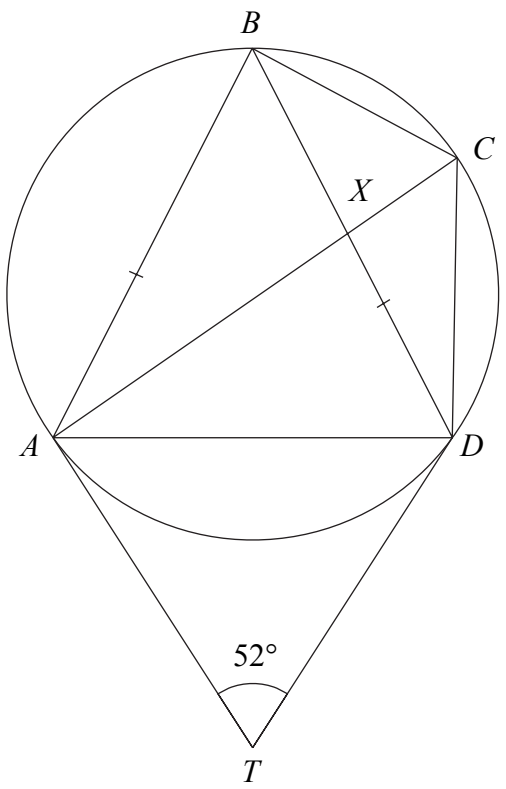
5. **Figure 2**



In Figure 2, the points A, B, C and D lie on a circle with AC as a diameter and $AB = BD$. The diameter AC and the chord BD intersect at the point X. The tangents to the circle at the points A and D meet at the point T and $\angle ATD = 52°$. Calculate, giving reasons, the size in degrees, of

(a) $\angle CAD$,

(4)

(b) $\angle BAC$,

(3)

(c) $\angle CXD$.

(2)

Question 5 continued

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Question 5 continued

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Question 5 continued

Leave blank

Q5

(Total 9 marks)

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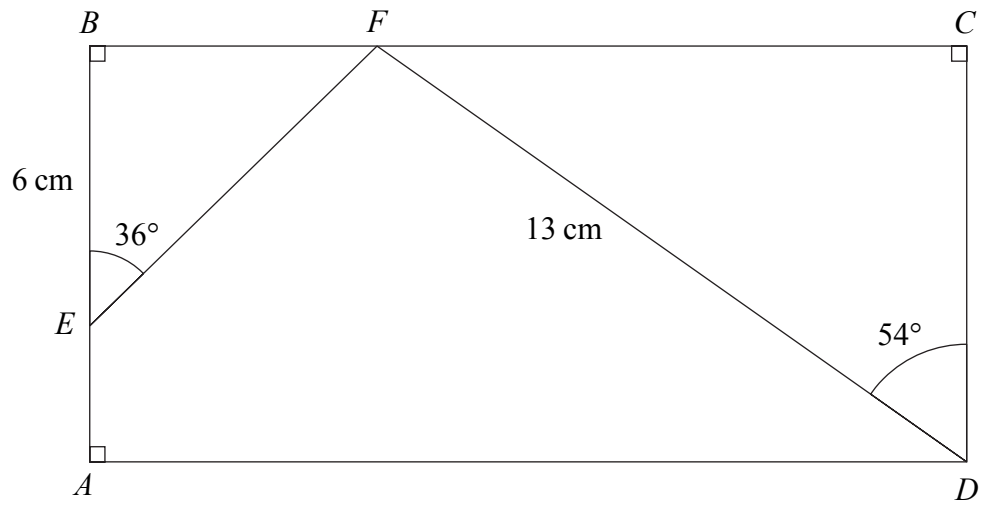
6. **Figure 3**



In Figure 3, $ABCD$ is a rectangle. The point E on BA is such that $BE = 6$ cm. The point F on BC is such that $\angle BEF = 36°$, $\angle FDC = 54°$ and $FD = 13$ cm.

Calculate, giving your answer to 2 decimal places,

(a) the length, in cm, of BF,

(2)

(b) the length, in cm, of FC,

(2)

(c) the length, in cm, of AE,

(3)

(d) the area, in cm^2, of the quadrilateral $AEFD$.

(3)

Leave blank

Question 6 continued

Question 6 continued

Leave blank

Question 6 continued

Leave blank

(Total 10 marks)

Q6

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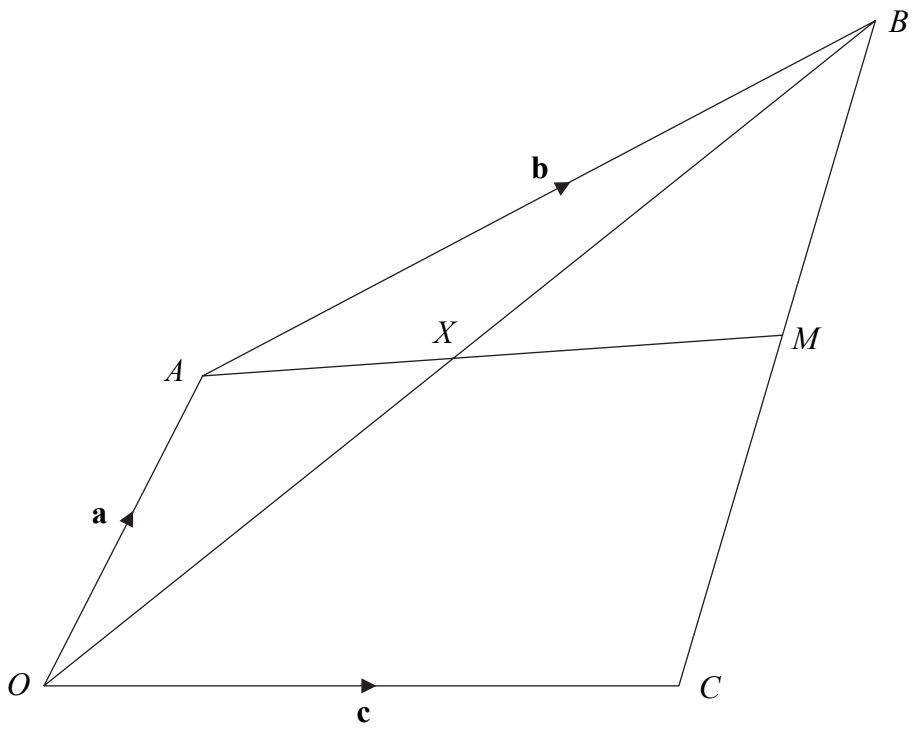
7. **Figure 4**



In Figure 4, $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{AB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$. The midpoint of CB is M and the point X lies on AM such that $AX : AM = 2 : 5$.

(a) Find, in terms of **a**, **b** and **c**, simplifying your answers,

(i) $\overrightarrow{CB}$, (ii) $\overrightarrow{AM}$, (iii) $\overrightarrow{AX}$.

(4)

Given also that X lies on the line OB and $OX : OB = 2 : 5$

(b) find, in terms of **a** and **b** only, simplifying your answer, a second expression for $\overrightarrow{AX}$.

(2)

(c) Show that $\mathbf{b} = 2\mathbf{a} + \mathbf{c}$.

(2)

(d) Hence show that CB is parallel to OA.

(2)

Question 7 continued

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Question 7 continued

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Question 7 continued

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(Total 10 marks)

Q7

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8. $$f: x \mapsto x^2 - 4,$$

$$g: x \mapsto 2x - 3,$$

$$h: x \mapsto \frac{1}{x-2}, \quad x \neq 2.$$

(a) Find the value of

(i) g(–3),

(ii) $h(\frac{1}{2})$,

(iii) gf(6).

(3)

(b) Find the inverse function h^{-1} in the form $h^{-1}: x \mapsto ....$

(2)

(c) Write down the value of x which must be excluded from the domain of h^{-1}.

(1)

(d) Solve the equation $fg(x) = 0$.

(5)

Question 8 continued

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Question 8 continued

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Question 8 continued

Leave blank

(Total 11 marks)

Q8

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9. Captain Ahab sails *The Laertes* along the south coast of Madeira. On any day, the probability of Captain Ahab seeing a dolphin is $\frac{9}{10}$, the probability of him seeing a whale is $\frac{2}{3}$ and the probability of him seeing a turtle is $\frac{1}{5}$.

Calculate the probability that on any day Captain Ahab will see

(a) a dolphin and a whale,

(2)

(b) either a dolphin or a whale,

(3)

(c) a turtle but no dolphins or whales,

(2)

(d) no whales, dolphins or turtles.

(2)

The Laertes sails on 300 days of the year.

(e) Calculate an estimate of the number of days on which Captain Ahab sees no whales, dolphins or turtles.

(2)

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Question 9 continued

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Question 9 continued

Question 9 continued

Leave blank

(Total 11 marks)

Q9

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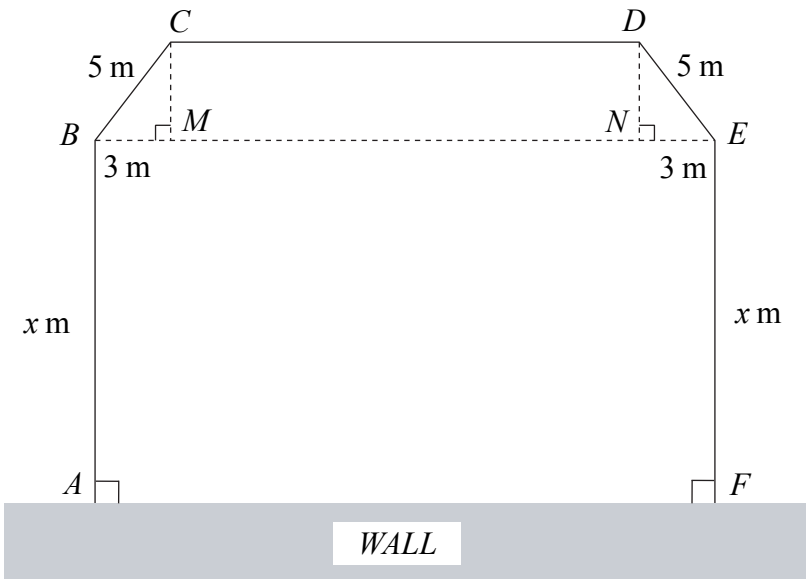
10. **Figure 5**



A farmer needs to fence off a region *ABCDEF* of his land as shown in Figure 5. He uses a straight wall, *AF*, as one side of the region. The remaining five sides, *AB*, *BC*, *CD*, *DE* and *EF* are made from wooden fencing, where $AB = EF = x$ metres and $BC = DE = 5$ m. The sides *AB* and *EF* are at right angles to the wall. The total length of wooden fencing is 80 m.

(a) Calculate and simplify an expression, in terms of x, for the length *CD*.

(2)

Given that $BM = NE = 3$ m, and $\angle CMB = \angle DNE = 90°$,

(b) find the length, in m, of *CM*.

(1)

The total area of the region *ABCDEF* is y m^2.

(c) Show that $y = 292 + 68x - 2x^2$.

(4)

(d) Calculate the value of x for which y is a maximum.

(3)

(e) Calculate the maximum area, in m^2, of *ABCDEF*.

(2)

The farmer constructs his fence to maximize the area of *ABCDEF*. He now needs to construct a path to run in a straight line from *C* to *F*.

(f) Calculate the length, in metres to the nearest metre, of the path *CF*.

(3)

Question 10 continued

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Question 10 continued

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Question 10 continued

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Q10

(Total 15 marks)

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11. (a) For $y = 2x^3 - 11x^2 + 40$, complete the table.

x	–2	–1.5	–1	0	1	2	3	4	5
$2x^3$	–16			0	2	16			250
$-11x^2$	–44			0	–11	–44			–275
+40	40	40	40	40	40	40	40	40	40
y	–20			40	31	12			15

(3)

(b) On the graph paper on page 35, using a scale of 2 cm to represent 1 unit on the x-axis and 2 cm to represent 10 units on the y-axis, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) By drawing a tangent, calculate an estimate of the gradient of the curve with equation $y = 2x^3 - 11x^2 + 40$ at the point where $x = 2$.

(2)

(d) From your graph obtain, to 1 decimal place, the ranges of values of x for which $2x^3 - 11x^2 + 40 < 0$.

(4)

(e) By drawing a straight line on your graph, obtain to 1 decimal place the three roots of the equation $2x^3 - 11x^2 + 4x + 20 = 0$.

(4)

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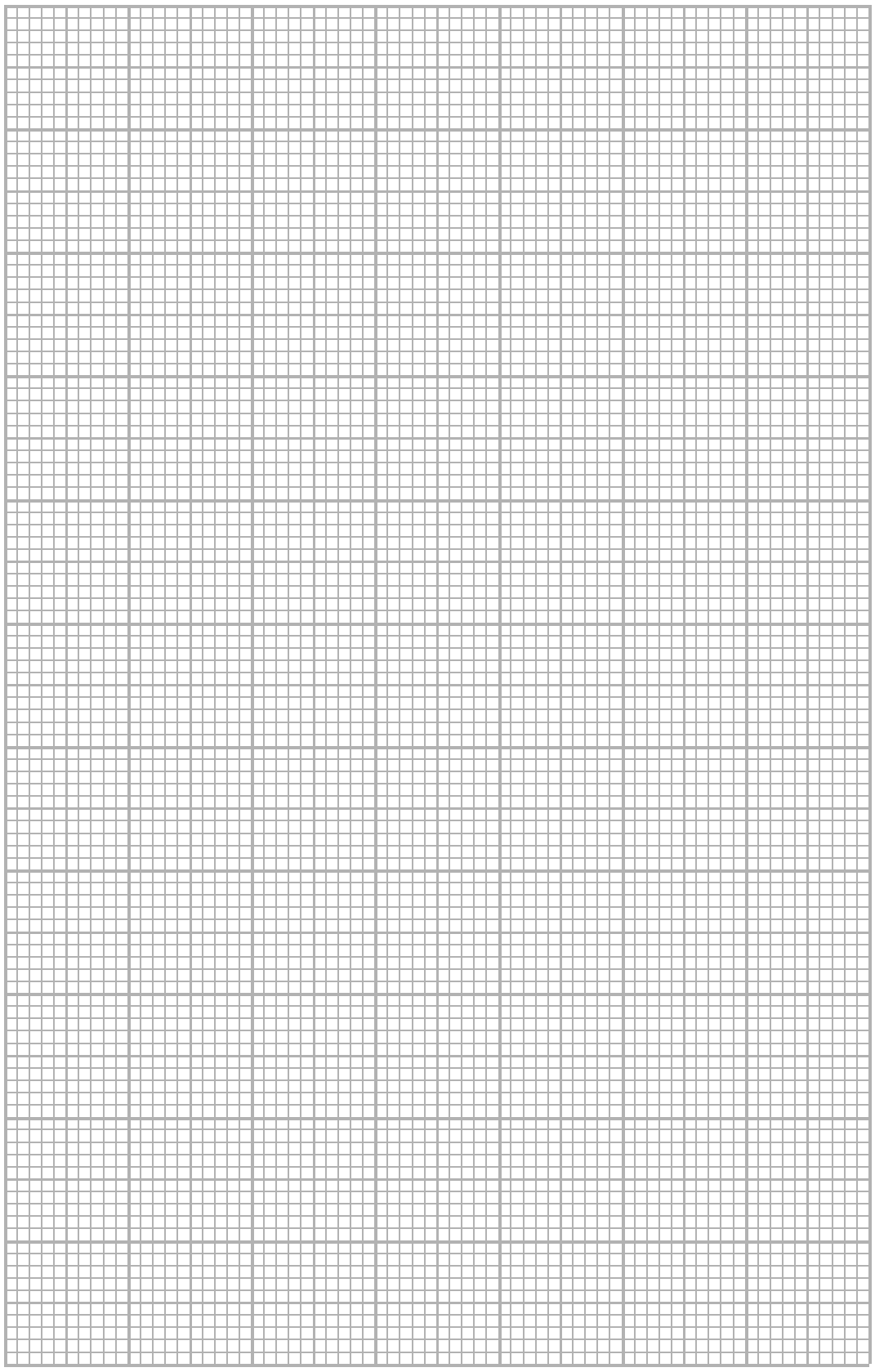
Question 11 continued



Question 11 continued

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Q11

(Total 16 marks)

TOTAL FOR PAPER: 100 MARKS

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