

Write your name here

Surname

Other names

**Pearson Edexcel
International GCSE**

Centre Number

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Candidate Number

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Mathematics B

Paper 2



Tuesday 20 May 2014 – Afternoon
Time: 2 hours 30 minutes

Paper Reference

4MB0/02

You must have: Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Calculators may be used.**

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Without sufficient working, correct answers may be awarded no marks.

Turn over ►

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P 4 3 0 3 3 A 0 1 3 2

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Answer ALL ELEVEN questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 $\mathcal{E} = \{x : 2 \leq x \leq 10 \text{ and } x \text{ is an integer}\}$

$A = \{x : 3 \leq x \leq 8\}$

$B = \{x : x \text{ is prime}\}$

$C = \{x : x \text{ is an even integer}\}$

List the elements of

(a) B' (1)

(b) $A \cap C$ (1)

Find

(c) $n\left([A \cap C]' \cap B'\right)$ (2)

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(Total for Question 1 is 4 marks)

2 Given that $\begin{pmatrix} 1 & 3 \\ x & 0 \end{pmatrix} \begin{pmatrix} x \\ 2 \end{pmatrix} = \begin{pmatrix} y \\ 4 \end{pmatrix}$,

(a) find the values of x .

(3)

(b) Hence find the possible values of y .

(3)

(Total for Question 2 is 6 marks)



3 A particle is moving in a straight line through O .

The displacement, s metres, of the particle from O at time t seconds is given by

$$s = 3t^2 - 4t + 10 \quad t \geq 0$$

- (a) Find an expression, in terms of t , for the velocity, v m/s, of the particle at time t seconds.

(2)

- (b) Calculate the value of t when the particle is instantaneously at rest.

(2)

- (c) Calculate the distance, in metres, travelled by the particle in the fifth second.

(2)



(Total for Question 3 is 0 marks)



4 A total of 50 teachers and pupils from a school had planned to go on a school trip.

There were expected to be t teachers and p pupils on the trip.

(a) Write down an equation in t and p to represent this information.

(1)

The number of pupils on the trip was expected to be four times the number of teachers on the trip.

(b) Write down another equation in t and p to represent this information.

(1)

(c) Hence find the value of t and the value of p .

(3)

On the day of the trip, 1 teacher and 5 pupils were absent and did not go on the trip.

The school had to pay £10 for each teacher and £3 for each pupil who went on the trip.

(d) Calculate how much, in total, the school had to pay.

(3)



(Total for Question 4 is 6 marks)



5 (a) (i) Solve the inequality $3x - 7 < 3 - x$

(ii) Represent your solution on the number line on page 9.

(3)

(b) (i) Solve the inequality $x - 12 \leq 3(x - 3)$

(ii) Represent your solution on the same number line.

(4)

(c) Write down the range of values of x which satisfy both the inequalities

$$3x - 7 < 3 - x \quad \text{and} \quad x - 12 \leq 3(x - 3)$$

(2)

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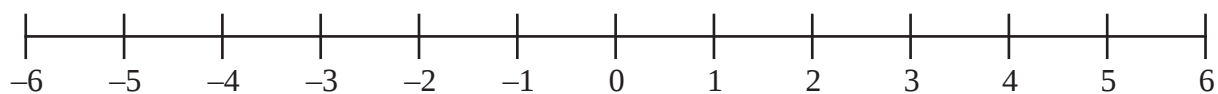
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Question 5 continued



(Total for Question 5 is 9 marks)

6 There are 159 people living in a street.

The table below shows information about the number of people living in each of 30 houses in the street.

Number (n) of people living in a house	Number of houses with n people living in the house
1	2
2	3
3	1
4	4
5	3
6	6
7	8
8	2
9	1

(a) Find

- (i) the modal number of people living in a house,
- (ii) the median number of people living in a house,
- (iii) the mean number of people living in a house.

(5)

Two houses in the street are chosen at random.

(b) Calculate the probability that 4 people live in one of the houses and 2 people live in the other of the houses.

(2)

One of the people living in the street is chosen at random.

(c) Find the probability that this person lives in a house in which at least 5 people live.

(2)

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(Total for Question 6 is 9 marks)



7 The points (2, 3), (4, 3) and (4, 4) are the vertices of a triangle *A*.

(a) On the grid, draw and label triangle *A*.

(1)

Triangle *A* is transformed to triangle *B* under the translation $\begin{pmatrix} 0 \\ -5 \end{pmatrix}$.

(b) On the grid, draw and label triangle *B*.

(1)

Triangle *B* is transformed to triangle *C* under the transformation with matrix **T** where

$$\mathbf{T} = \begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$$

(c) Find the coordinates of the vertices of triangle *C*.

(2)

(d) On the grid, draw and label triangle *C*.

(1)

Triangle *B* is mapped to triangle *C* under the transformation with matrix **T** by an anticlockwise rotation about the origin of 180° followed by an enlargement with centre the origin.

(e) Find the scale factor of this enlargement.

(1)

Triangle *C* is transformed to triangle *D* under the translation $\begin{pmatrix} 0 \\ 5 \end{pmatrix}$.

(f) On the grid, draw and label triangle *D*.

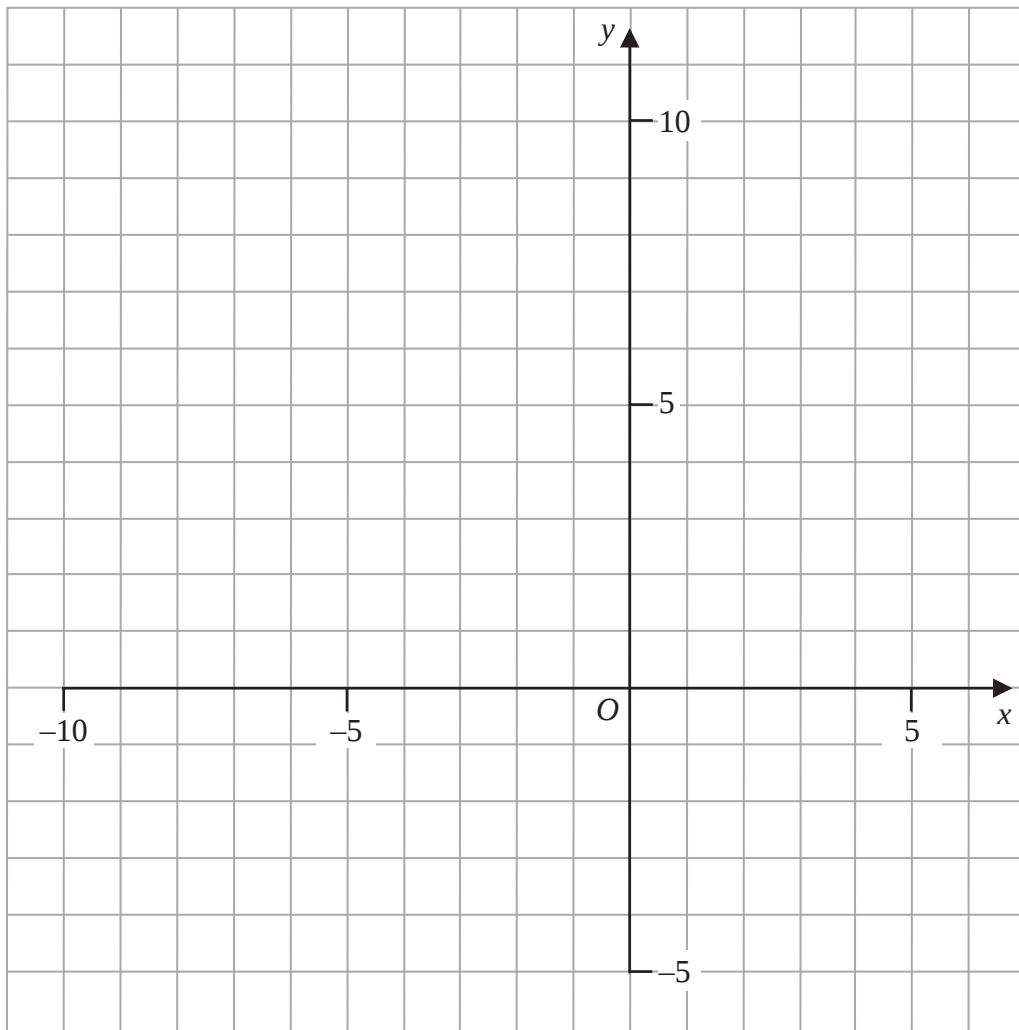
(1)

Triangle *A* is transformed to triangle *D* by a single enlargement.

(g) Describe fully this enlargement.

(2)

Question 7 continued



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(Total for Question 7 is 9 marks)



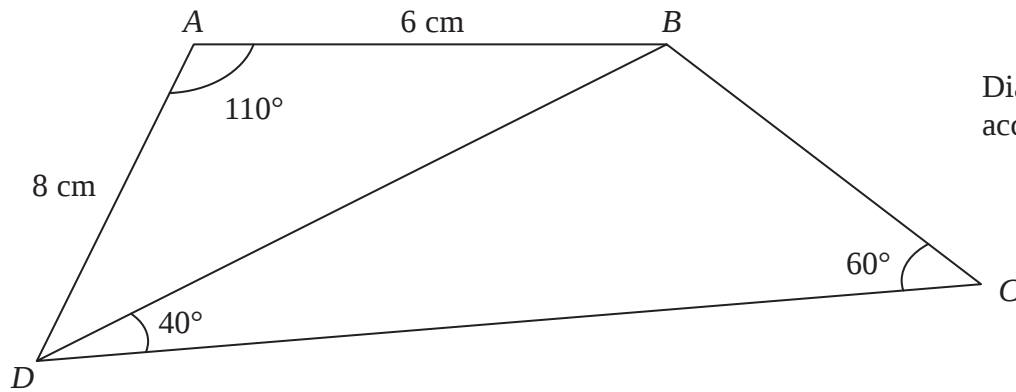


Figure 1

Figure 1 shows quadrilateral $ABCD$ with diagonal BD .

Given that $\angle BAD = 110^\circ$, $AB = 6$ cm and $AD = 8$ cm,

(a) calculate the length, in cm to 3 significant figures, of BD .

(3)

Given also that $\angle BDC = 40^\circ$ and $\angle BCD = 60^\circ$, calculate the length, in cm to 3 significant figures, of

(b) BC ,

(3)

(c) AC .

(5)

$$\left[\begin{array}{l} \text{Sine Rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \\ \text{Cosine Rule: } a^2 = b^2 + c^2 - 2bc \cos A \end{array} \right]$$



(Total for Question 6 is 11 marks)



9 Part of the curve with equation $y = x^2 - 6x + 5$ is drawn on the grid.

(a) For $y = -x^2 + 7x - 11$ complete the table, giving your answers to 2 decimal places where necessary.

x	1	1.5	2	2.5	3	3.5	4	5
y	-5		-1		1		1	-1

(3)

(b) On the grid, plot the points from your completed table and join them to form a smooth curve.

(3)

(c) Use the two curves on the grid to find estimates for the solutions of the equation $2x^2 - 13x + 16 = 0$

(2)

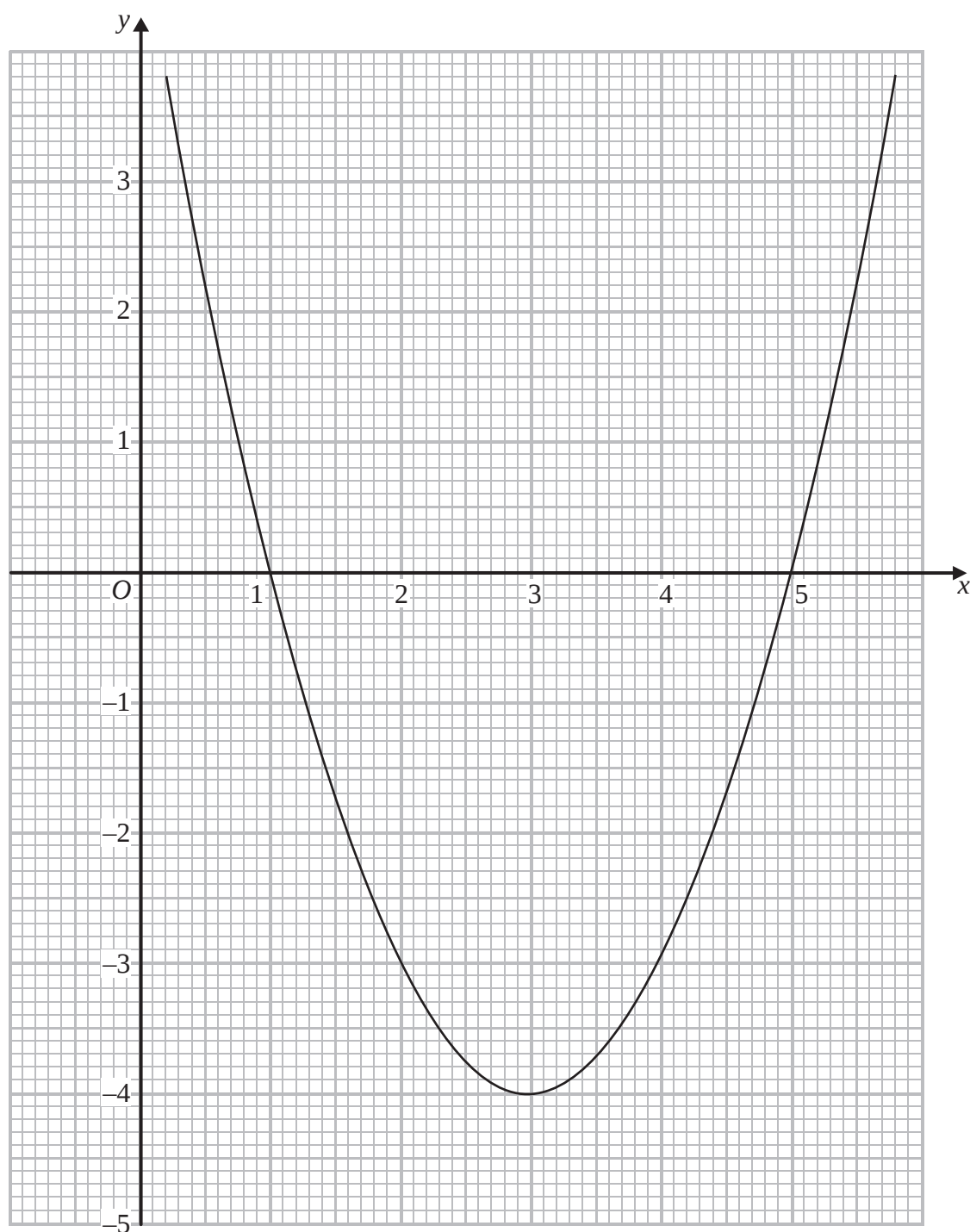
The curve with equation $y = x^2 - 6x + 5$ intersects the curve with equation $y = -x^2 + 7x - 11$ at the points A and B .

(d) Work out the gradient of the straight line through A and B.

(3)



Question 9 continued



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(Total for Question 5 is 11 marks)



10 f and g are the two functions such that

$$f(x) = \frac{2}{x-1} \quad x \neq 1$$

$$g(x) = x^2 - 3$$

- (a) Find the value of $gf(3)$ (1)
- (b) Find $f^{-1}(x)$ in terms of x . (2)
- (c) Show that $gf^{-1}(x) = \frac{4 + 4x - 2x^2}{x^2}$ (3)
- (d) State the value of x which must be excluded from any domain of gf^{-1} (1)
- (e) Find the values of x for which $gf^{-1}(x) = 1$ (5)





(Total for Question 10 is 12 marks)



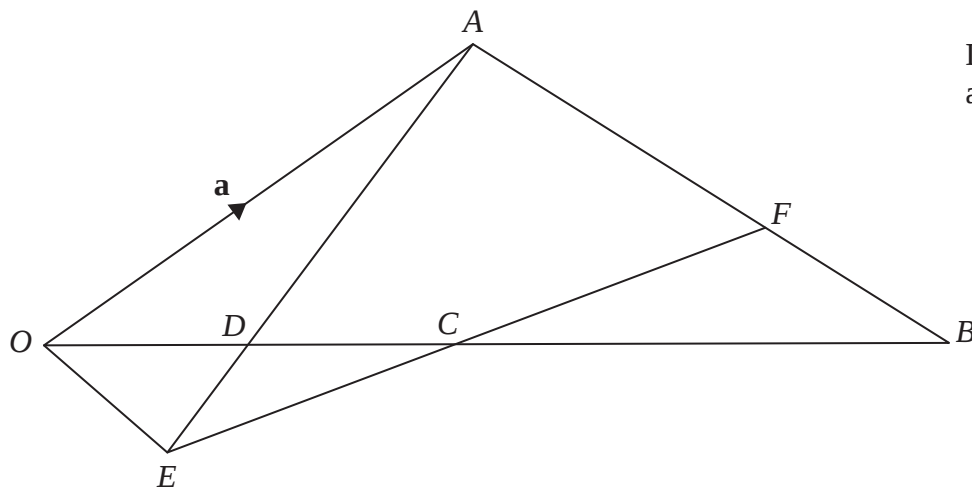


Diagram **NOT**
accurately drawn

Figure 2

In Figure 2, the points O , A and B are such that $\vec{OA} = \mathbf{a}$ and $\vec{OB} = 2\mathbf{b}$.

The point C is the midpoint of OB .

The point F is on the line AB such that $AF : FB = 2 : 1$

(a) Express in terms of $\mathbf{a}$ or $\mathbf{b}$ or $\mathbf{a}$ and $\mathbf{b}$, simplifying your answers where possible,

- (i) $\vec{AB}$, (ii) $\vec{BC}$, (iii) $\vec{FB}$, (iv) $\vec{FC}$.

(5)

The point D is on the line OB such that $OD : OB = 1 : 4$

(b) Express in terms of $\mathbf{a}$ or $\mathbf{b}$ or $\mathbf{a}$ and $\mathbf{b}$, simplifying your answers where possible,

- (i) $\vec{OD}$, (ii) $\vec{AD}$.

(3)

The point E is such that ADE and FCE are straight lines.

Given that $\vec{FE} = \lambda \vec{FC}$, where λ is a scalar,

(c) find an expression, in terms of $\mathbf{a}$, $\mathbf{b}$ and λ , for $\vec{FE}$.

(1)

Given that $AD : AE = 3 : 4$

(d) find and simplify an expression, in terms of $\mathbf{a}$ and $\mathbf{b}$, for $\vec{FE}$.

(3)

(e) Hence calculate the value of λ .

(3)



[illegible]

TOTAL FOR PAPER IS 100 MARKS



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