Write your name here

| Surname | Other names |
|---|---|
| | |

**Pearson Edexcel International GCSE**

Centre Number | Candidate Number

# 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*

P43033A

©2014 Pearson Education Ltd.

1/1/1/1/1/

P 4 3 0 3 3 A 0 1 3 2

PEARSON

**Answer ALL ELEVEN questions.**

**Write your answers in the spaces provided.**

**You must write down all stages in your working.**

**1** $\mathscr{E} = \{x : 2 \leqslant x \leqslant 10 \text{ and } x \text{ is an integer}\}$

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

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

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

List the elements of

(a) $B'$

**(1)**

(b) $A \cap C$

**(1)**

Find

(c) $\mathrm{n}\left(\left[A \cap C\right]' \cap B'\right)$

**(2)**

**(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

$$s = 3t^2 - 4t + 10 \qquad t \geqslant 0$$

(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)**

**Question 3 continued**

**(Total for Question 3 is 6 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)**

**Question 4 continued**

**(Total for Question 4 is 8 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 $x - 12 \leqslant 3(x - 3)$

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

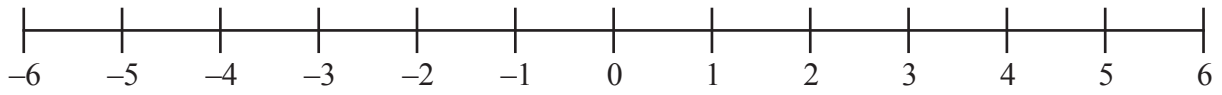
**(4)**

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

$3x - 7 < 3 - x$ and $x - 12 \leqslant 3(x - 3)$

**(2)**

**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)**

**Question 6 continued**

**(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 $D$.

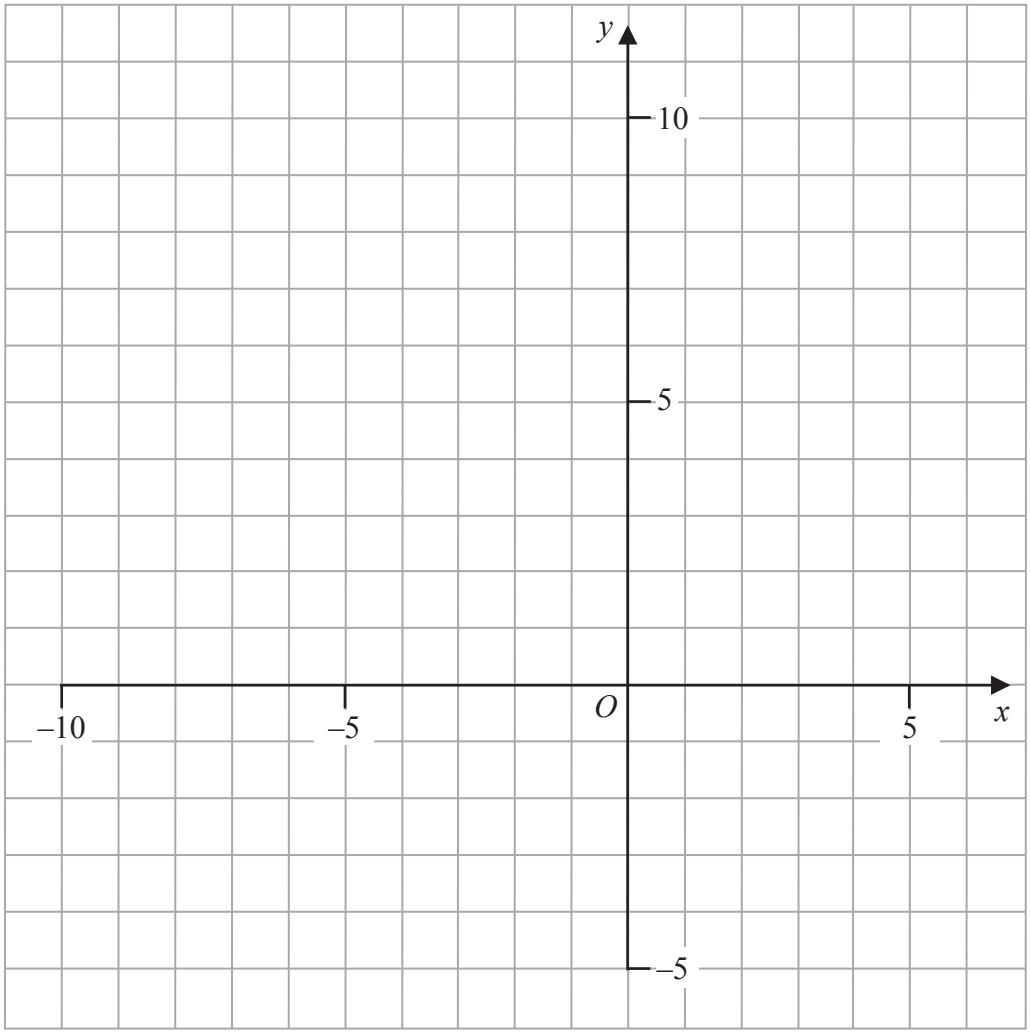
**(1)**

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

(g) Describe fully this enlargement.

**(2)**

**Question 7 continued**



**Question 7 continued**

**Question 7 continued**

**(Total for Question 7 is 9 marks)**

**8**

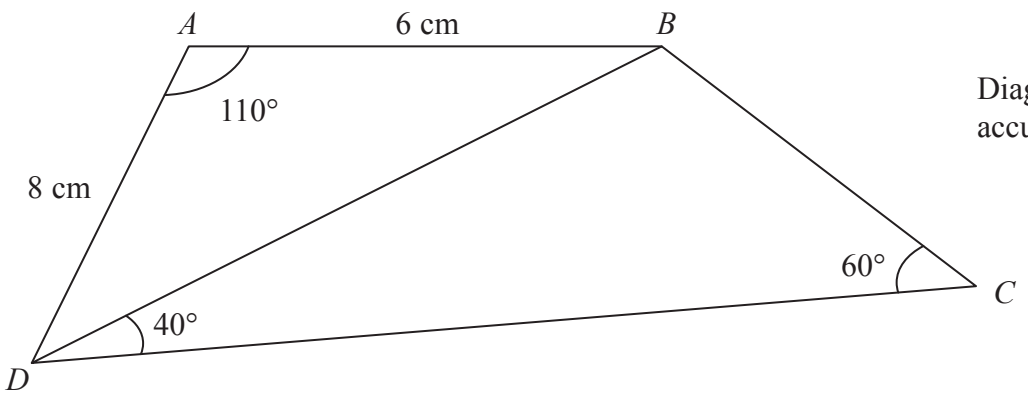



Diagram **NOT** accurately drawn

**Figure 1**

Figure 1 shows quadrilateral *ABCD* with diagonal *BD*.

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

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

**(3)**

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

(b) *BC*,

**(3)**

(c) *AC*.

**(5)**

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



P 4 3 0 3 3 A 0 1 6 3 2

**Question 8 continued**

**Question 8 continued**

**Question 8 continued**

**(Total for Question 8 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 $2x^2 - 13x + 16 = 0$

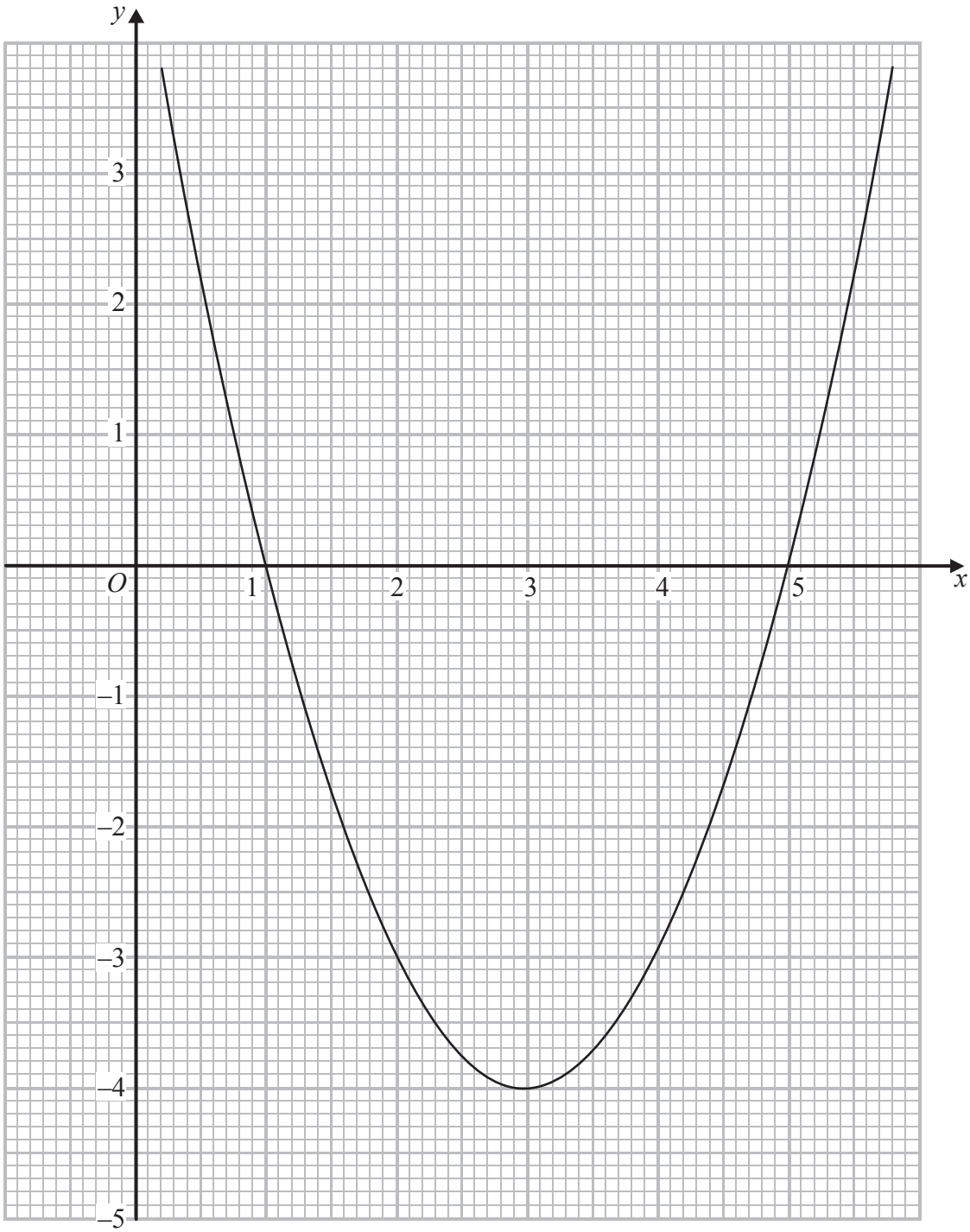
**(2)**

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**



**Question 9 continued**

**Question 9 continued**

**(Total for Question 9 is 11 marks)**

**10** f and g are the two functions such that

$$\mathrm{f}(x) = \frac{2}{x-1} \qquad x \neq 1$$
$$\mathrm{g}(x) = x^2 - 3$$

(a) Find the value of gf(3)

**(1)**

(b) Find $\mathrm{f}^{-1}(x)$ in terms of $x$.

**(2)**

(c) Show that $\mathrm{gf}^{-1}(x) = \dfrac{4 + 4x - 2x^2}{x^2}$

**(3)**

(d) State the value of $x$ which must be excluded from any domain of $\mathrm{gf}^{-1}$

**(1)**

(e) Find the values of $x$ for which $\mathrm{gf}^{-1}(x) = 1$

**(5)**

**Question 10 continued**

**Question 10 continued**

**Question 10 continued**

**(Total for Question 10 is 12 marks)**

**11**

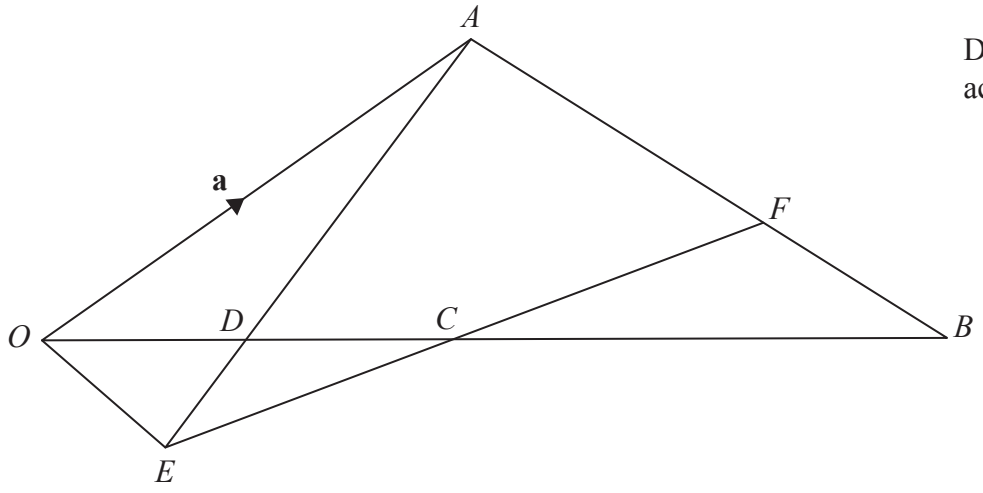



Diagram **NOT** accurately drawn

**Figure 2**

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

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 **a** or **b** or **a** and **b**, simplifying your answers where possible,

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

**(5)**

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

(b) Express in terms of **a** or **b** or **a** and **b**, simplifying your answers where possible,

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

**(3)**

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

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

(c) find an expression, in terms of **a**, **b** and $\lambda$, for $\overrightarrow{FE}$.

**(1)**

Given that $AD : AE = 3 : 4$

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

**(3)**

(e) Hence calculate the value of $\lambda$.

**(3)**

**Question 11 continued**

**Question 11 continued**

**Question 11 continued**

**(Total for Question 11 is 15 marks)**

**TOTAL FOR PAPER IS 100 MARKS**

**BLANK PAGE**





Downloaded from TopLevels.co.uk