Write your name here Surname	Other n	ames
Pearson Edexcel International GCSE	Centre Number	Candidate Number
Mathema Paper 2	tics B	
Tuesday 20 May 2014 – Aft Time: 2 hours 30 minutes		Paper Reference 4MB0/02
<b>You must have:</b> Ruler graduate protractor, compasses, pen, HB paper may be used.		- 11 1

# **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.

P 4 3 0 3 3 A 0 1 3 2

Turn over ▶



# **Answer ALL ELEVEN questions.**

Write your answers in the spaces provided.

You must write down all stages in your working.

1	g _	${x:2 \leq}$	v < 10	and vic	an intac	(ar
I	6 -	$\{X : Z \geqslant$	$X \leq 10$	and $x$ is	an mies	3e1 }

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

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

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

List the elements of

(1)

(b) 
$$A \cap C$$

(1)

Find

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

(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)
	(5)
(Total for Question 2 is 6 i	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 $t$ second	s. 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 of the trip.	n
	(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.	(2)
		(3)

Question 4 continued	
	(Total for Question 4 is 8 marks)



5	<ul> <li>(a) (i) Solve the inequality 3x - 7 &lt; 3 - x</li> <li>(ii) Represent your solution on the number line on page 9.</li> </ul>	
	(b) (i) Solve the inequality $x - 12 \le 3(x - 3)$	(3)
	<ul><li>(ii) Represent your solution on the same number line.</li><li>(c) Write down the range of values of x which satisfy both the inequalities</li></ul>	(4)
	$3x - 7 < 3 - x  \text{and}  x - 12 \le 3(x - 3)$	(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 <i>n</i> people living in the house
1	2
2	3
3	1
4	4
5	3
6	6
7	8
8	2
9	1

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(a)	Fin	d
(4)	1 111	•

- (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  $180^{\circ}$  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.

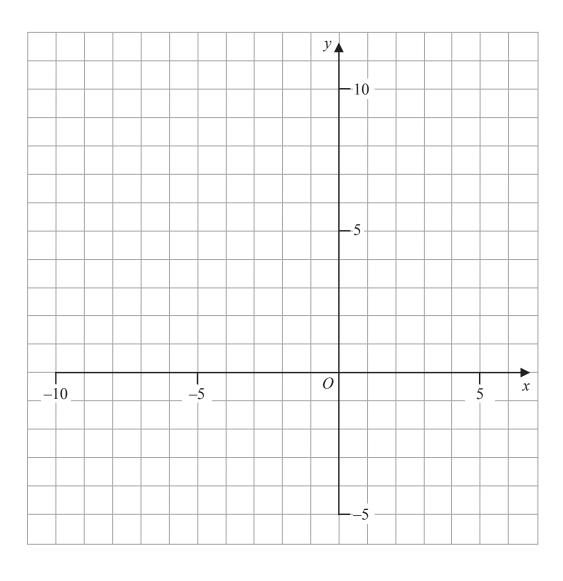
(1)

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

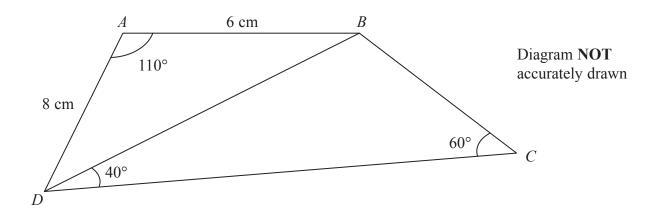


Figure 1

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)

Sine Rule: 
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
  
Cosine Rule:  $a^2 = b^2 + c^2 - 2bc \cos A$ 

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)

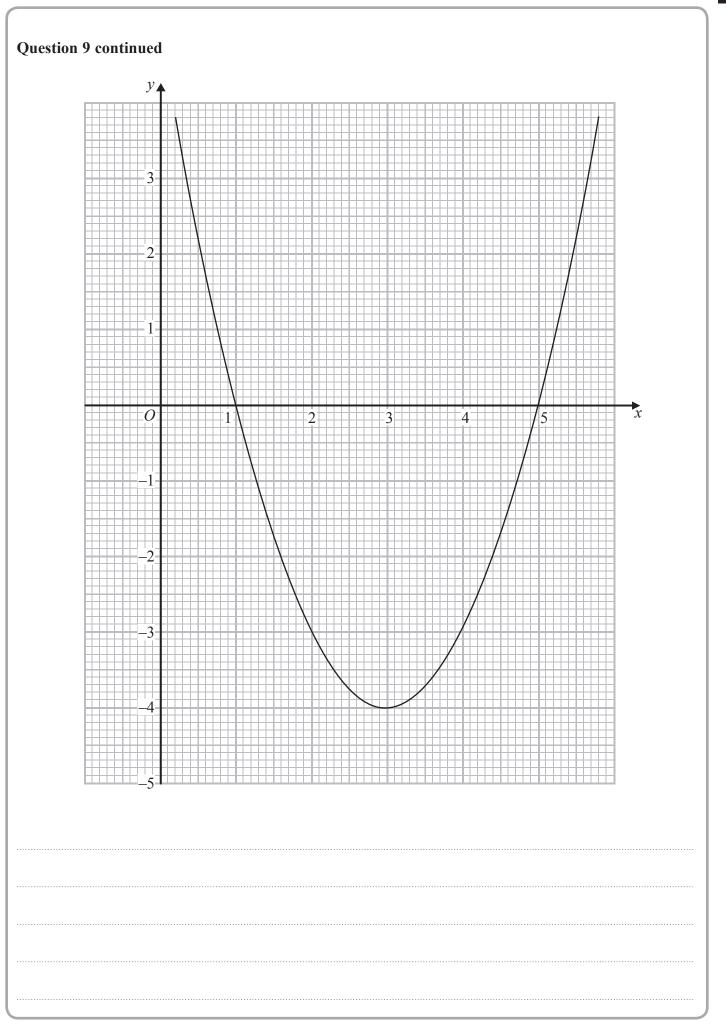
(c) Use the two curves on the grid to find estimates for the solutions of the equation  $2x^2 - 13x + 16 = 0$ 

(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	

(Total for Question 9 is 11 marks)	



10	f and	g	are	the	two	functions	such	that
IV	1 and	5	arc	uic	LVVO	Tunctions	Sucii	unu

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

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

(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)

Question 10 continued



Question 10 continued	

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



11

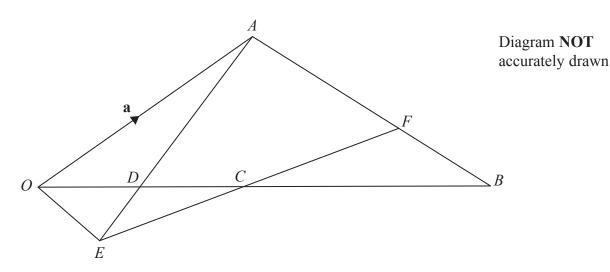


Figure 2

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)  $\overrightarrow{FC}$ .

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)  $\overrightarrow{AD}$ .

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  $\overrightarrow{FE}$ .

Given that AD : AE = 3 : 4

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

(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



