

Write your name here

Surname	Other names
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**Edexcel**  
**International GCSE**

Centre Number

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Candidate Number

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# Mathematics B

## Paper 2



Tuesday 15 January 2013 – Morning  
**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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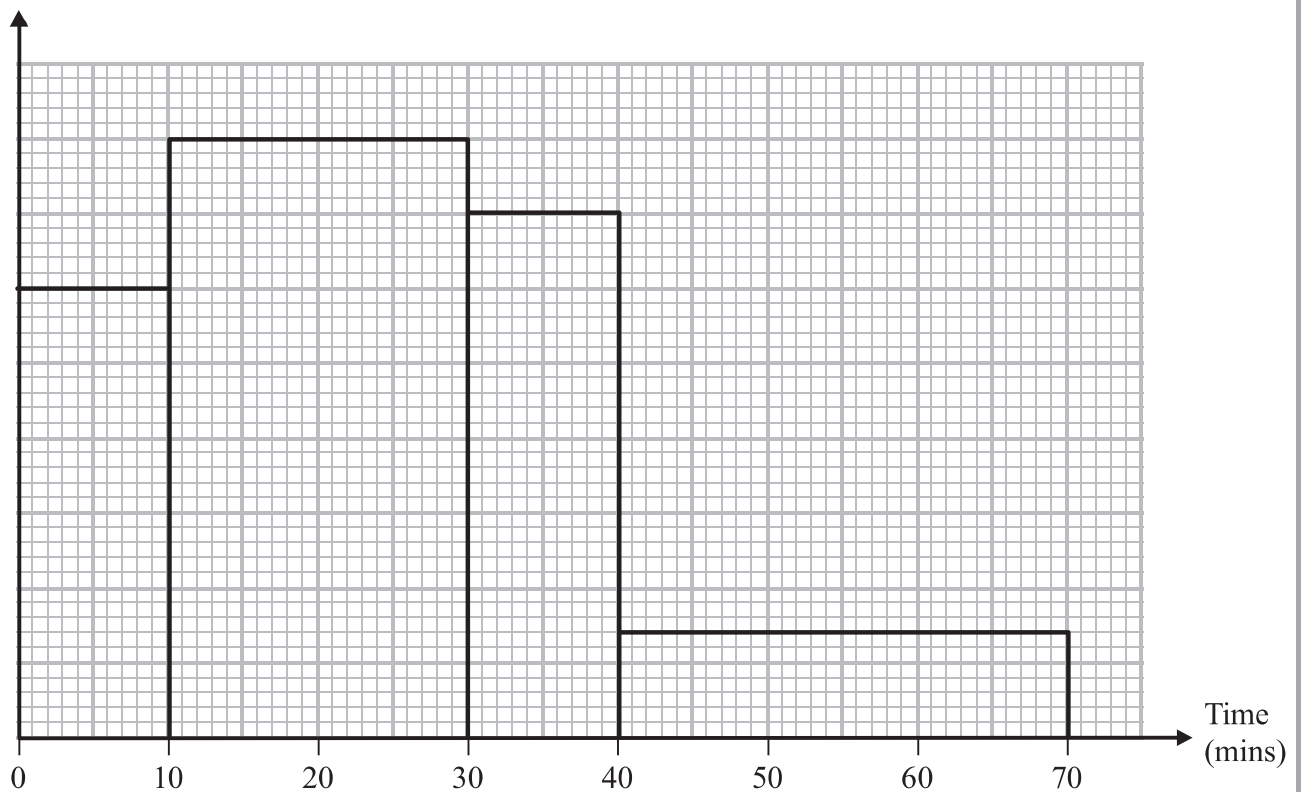








6 Frequency density



**Figure 2**

A survey was carried out into the time it took students to travel to school on Monday. Information about the results of this survey is shown in the histogram in Figure 2.

No student took more than 70 minutes to travel to school.

35 students took between 30 minutes and 40 minutes to travel to school.

(a) Calculate how many students took part in the survey.

(4)

One of these students is to be chosen at random.

(b) Calculate the probability that this student took more than 30 minutes to travel to school.

(2)

A similar survey was carried out on Tuesday and the results were compared with those of Monday's survey.

On Tuesday, 8 fewer students took less than 10 minutes to travel to school.

The number of students that took between 10 minutes and 30 minutes to travel to school was the same on both Monday and Tuesday.

3 more students took between 30 minutes and 40 minutes to travel to school,

5 fewer students took more than 40 minutes to travel to school.

No student took more than 70 minutes to travel to school.

One of the students from Tuesday's survey is to be chosen at random.

(c) Calculate the probability that this student took more than 30 minutes to travel to school.

(3)

















8

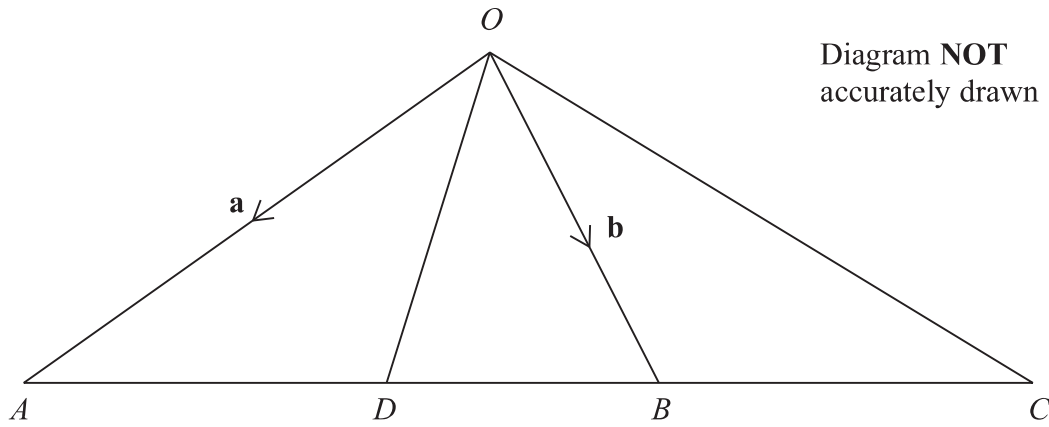


Diagram **NOT**  
accurately drawn

**Figure 3**

In Figure 3,  $OAC$  is a triangle and  $ADBC$  is a straight line with  $\vec{OA} = \mathbf{a}$  and  $\vec{OB} = \mathbf{b}$

The point  $D$  on  $AB$  is such that  $AD : DB = 3 : 1$

(a) Express, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , simplifying each answer where possible,

(i)  $\vec{AB}$

(ii)  $\vec{OD}$

(4)

$C$  is the point on  $AB$  produced such that  $\vec{OC} = \frac{9}{4}\mathbf{b} - \frac{5}{4}\mathbf{a}$

(b) Express  $\vec{AC}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , simplifying your answer.

(2)

(c) Find the ratio  $AB : BC$  in the form  $m : n$  where  $m$  and  $n$  are integers.

(2)

The point  $E$  on  $OC$  is such that  $OE : EC = 1 : 2$

(d) Show that  $\vec{ED}$  is parallel to  $\vec{OA}$ .

(4)

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**Question 8 continued**

A large rectangular area with rounded corners, containing 25 horizontal dotted lines for writing.



P 4 1 9 8 6 A 0 1 9 3 6

**Question 8 continued**

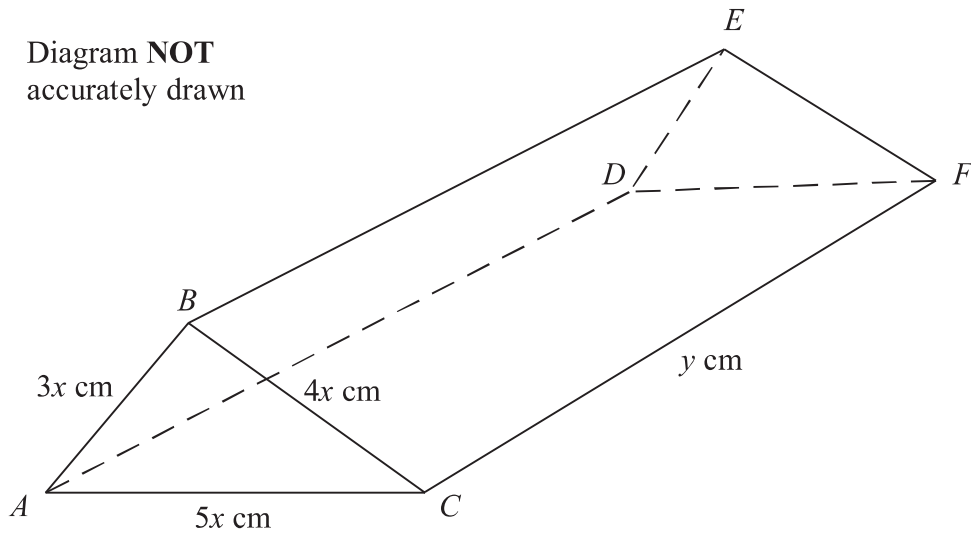
A large rectangular area with rounded corners, containing 25 horizontal dotted lines for writing.





9

Diagram **NOT**  
accurately drawn



**Figure 4**

In Figure 4,  $ABCFED$  is a prism with triangular cross section in which  $CF = AD = BE = y$  cm,  $AB = DE = 3x$  cm,  $BC = EF = 4x$  cm and  $AC = DF = 5x$  cm.

Given that the total surface area of the prism is  $S$  cm<sup>2</sup>,

- (a) (i) write down the size, in degrees, of  $\angle ABC$ ,  
 (ii) show that the area of  $\triangle ABC$  is  $6x^2$  cm<sup>2</sup>,  
 (iii) find an expression for  $S$  in terms of  $x$  and  $y$ .

(4)

Given also that  $S = 144$

(b) show that  $y = \frac{12 - x^2}{x}$

(2)

The volume of the prism is  $V$  cm<sup>3</sup>.

(c) Show that  $V = 6x(12 - x^2)$

(2)

**(Parts (d), (e) and (f) follow on page 24)**

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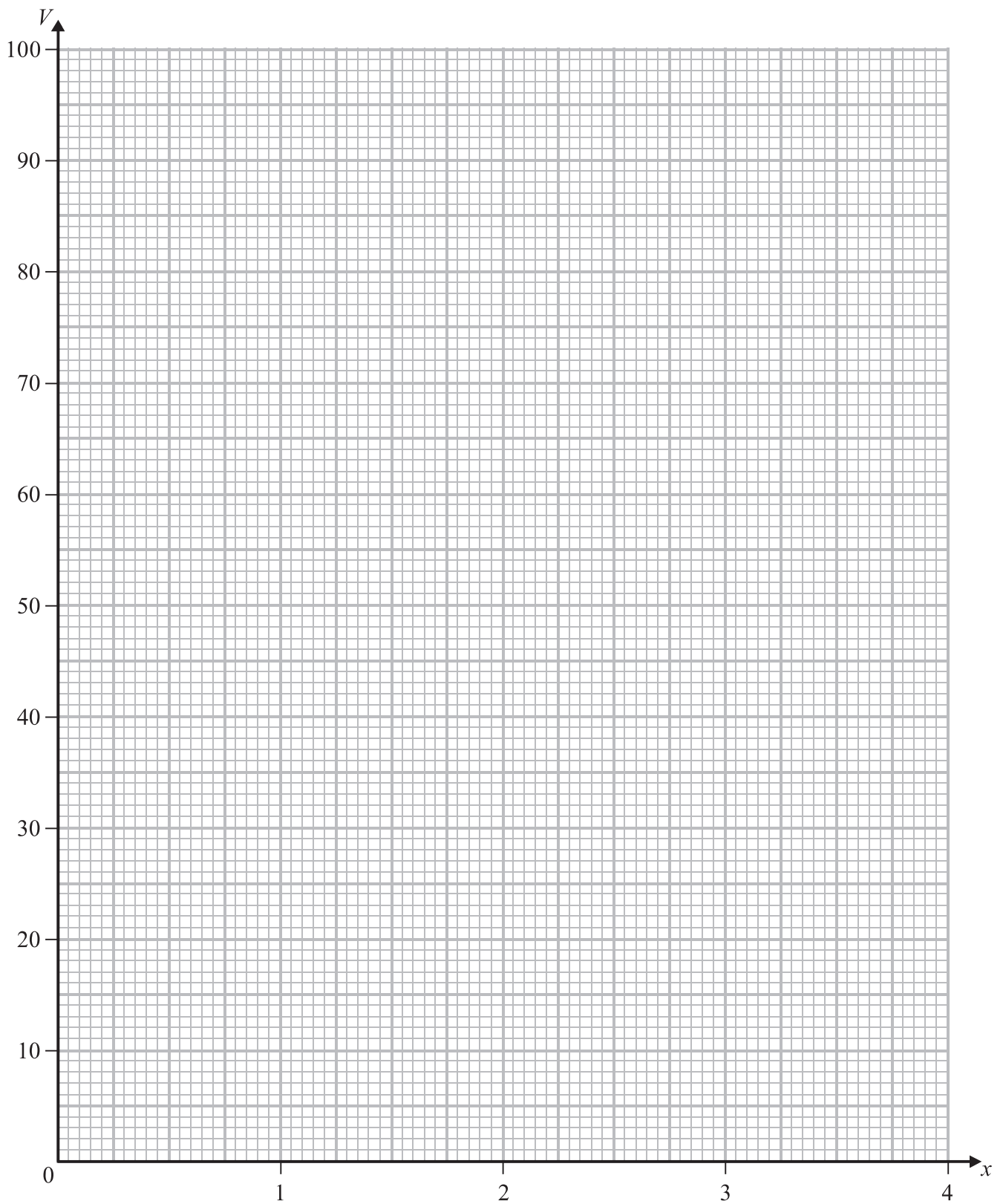
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**Question 9 continued**



**(Total for Question 9 is 15 marks)**



10

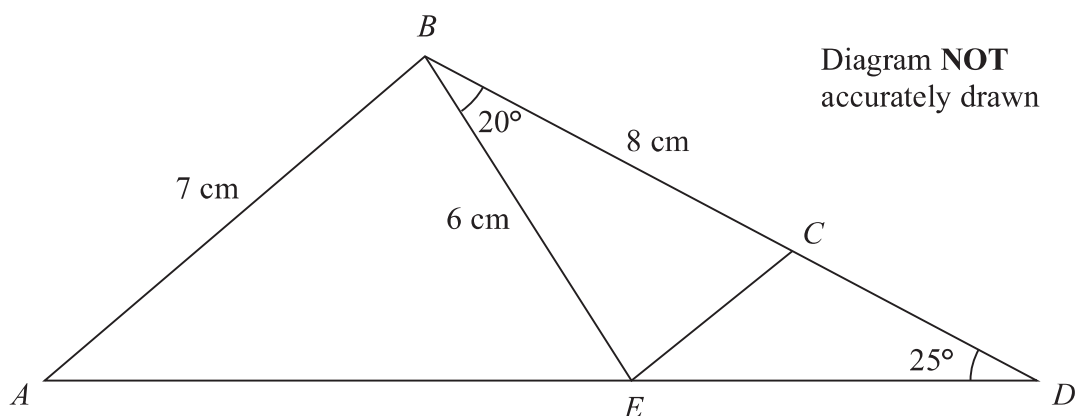


Figure 5

In Figure 5,  $ABD$  is a triangle in which  $AB = 7$  cm and  $\angle BDA = 25^\circ$

The point  $E$  on  $AD$  and the point  $C$  on  $BD$  are such that  $BE = 6$  cm,  $BC = 8$  cm and  $\angle CBE = 20^\circ$

Calculate to 3 significant figures,

- (a) the length, in cm, of  $CE$ , (3)
- (b) the size, in degrees, of  $\angle BCE$ , (3)
- (c) the length, in cm, of  $ED$ , (3)
- (d) the size, in degrees, of  $\angle ABE$ , (4)
- (e) the area, in  $\text{cm}^2$ , of  $\triangle ABD$ . (3)

$$\left[ \begin{array}{l} \text{Sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \\ \text{Cosine rule: } a^2 = b^2 + c^2 - 2bc \cos A \\ \text{Area of a triangle} = \frac{1}{2} bc \sin A \end{array} \right]$$

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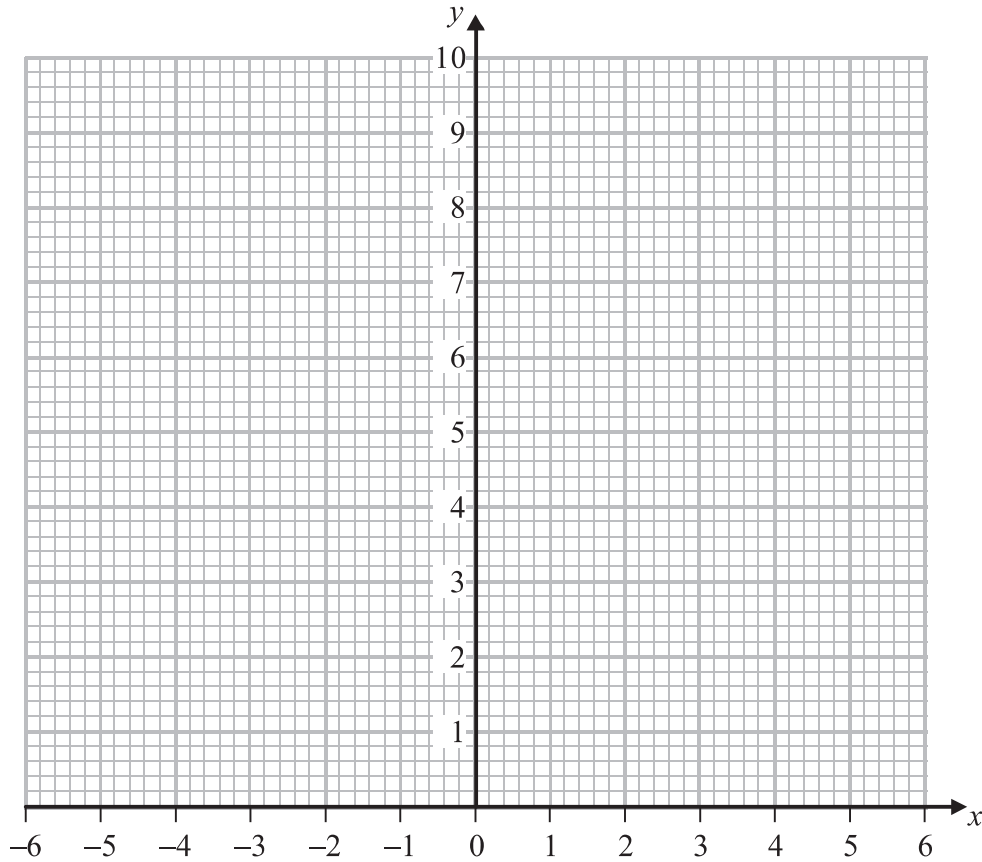




11 The points  $A(-1, 1)$ ,  $B(-5, 1)$  and  $C(-3, 3)$  are the vertices of a triangle.

(a) On the graph paper, draw and label  $\triangle ABC$ .

(1)



$$\mathbf{P} = \begin{pmatrix} 1 & 0 \\ 0 & 3 \end{pmatrix}$$

(b) Calculate the matrix product

$$\mathbf{P} \begin{pmatrix} -1 & -5 & -3 \\ 1 & 1 & 3 \end{pmatrix}$$

(2)

(c) Draw and label  $\triangle A'B'C'$  where  $A'$ ,  $B'$  and  $C'$  are respectively the images of the points  $A$ ,  $B$  and  $C$  under the transformation represented by the matrix  $\mathbf{P}$ .

(1)

$$\mathbf{Q} = \begin{pmatrix} 0 & \frac{1}{3} \\ -1 & 0 \end{pmatrix}$$

(d) Draw and label  $\triangle A''B''C''$  where  $A''$ ,  $B''$  and  $C''$  are respectively the images of the points  $A'$ ,  $B'$  and  $C'$  under the transformation represented by the matrix  $\mathbf{Q}$ .

(3)

(e) Describe fully the single transformation which maps  $\triangle ABC$  onto  $\triangle A''B''C''$ .

(2)

(f) Find the matrix which represents this transformation.

(2)









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