

Centre Number	Candidate Number

Candidate Name \_\_\_\_\_

**UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE**

**Joint Examination for the School Certificate  
and General Certificate of Education Ordinary Level**

**MATHEMATICS (SYLLABUS D)**

**4024/1**

**PAPER 1**

**OCTOBER/NOVEMBER SESSION 2001**

2 hours

Candidates answer on the question paper.

Additional materials:

Geometrical instruments

**TIME** 2 hours

**INSTRUCTIONS TO CANDIDATES**

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question, show it in the space below that question.

Omission of essential working will result in loss of marks.

**NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.**

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 80.

<b>FOR EXAMINER'S USE</b>

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**This question paper consists of 15 printed pages and 1 blank page.**

**NEITHER ELECTRONIC CALCULATORS NOT MATHEMATICAL TABLES MAY  
BE USED IN THIS PAPER**

**1** Find the value of

**(a)**  $0.2 \times 0.45$ ,

**(b)**  $1\frac{3}{5} \div 2\frac{1}{3}$ .

*Answer (a)* ..... [1]

*(b)* ..... [1]

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**2** Find the value of

**(a)**  $\sqrt{0.0081}$ ,

**(b)**  $7^3 \times 7^{-3}$ .

*Answer (a)* ..... [1]

*(b)* ..... [1]

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**3** On four occasions a bus takes the following times to complete a journey.

$1\frac{2}{3}$  hours, 1.7 hours, 1 hour 39 minutes,  $1\frac{3}{4}$  hours.

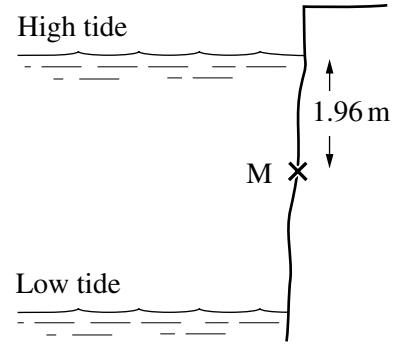
By first expressing these times in minutes, write them in order of size, starting with the smallest.

*Answer* ..... minutes < ..... minutes < ..... minutes < ..... minutes [2]

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- 4 A mark, M, on a cliff is 1.96 m below sea level at high tide.  
At low tide the sea level is 4.18 m lower than at high tide.

- (a) How far is M above sea level at low tide?
- (b) At a certain time the sea level is exactly half way between high tide and low tide.  
How far is the sea level below M at this time?



Answer (a)..... m [1]

(b)..... m [1]

- 5 Using the information given in the advertisement shown, find the **sale price** of the table.

**SALE**  
All prices reduced by 30%

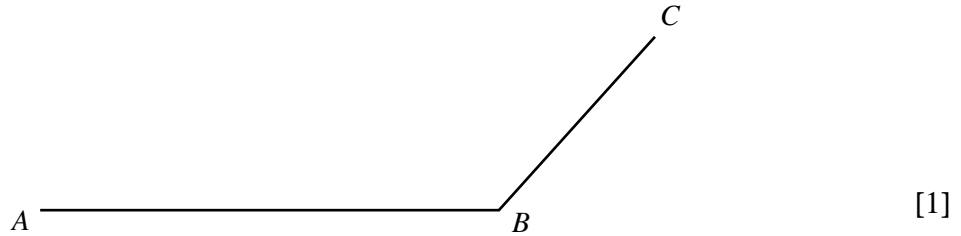


**Save \$180 on  
this table**

Answer \$ ..... [2]

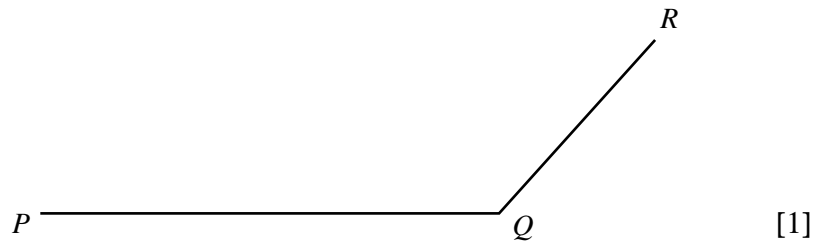
- 6 (a) Complete the diagram to make a quadrilateral  $ABCD$  which has rotational symmetry of order 2.

Answer (a)



- (b) Complete the diagram to make a quadrilateral  $PQRS$  which has  $PR$  as its line of symmetry.

Answer (b)



- 
- 7 (a) Express, correct to **two** significant figures,

(i) 386.71,

(ii) 0.02049.

- (b) **Hence** estimate, correct to **one** significant figure, the value of

$$386.71 \times 0.02049.$$

Answer (a) (i) ..... [1]

(ii) ..... [1]

(b) ..... [1]

**8** Factorise completely

(a)  $9a - 12a^2$ ,

(b)  $4y^2 - 1$ ,

(c)  $x^2 - 7x + 12$ .

Answer (a) ..... [1]

(b)..... [1]

(c)..... [1]

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**9** The population of a country was 13.1 million.

(a) Nine hundred thousand of the population were at least 2 metres tall.  
How many were less than 2 metres tall?

(b) 0.2% of the population were over 95 years old.  
How many were over 95?

Answer (a)..... [1]

(b)..... [2]

- 10 (a) Solve the inequality  $-5 < 2x + 3 < 1$ .
- (b) Write down the largest integer,  $x$ , which satisfies  $-5 < 2x + 3 < 1$ .

Answer (a) ..... $x$  < ..... [2]

(b) ..... [1]

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- 11 The numbers 168 and 324, written as the products of their prime factors, are

$$168 = 2^3 \times 3 \times 7, \quad 324 = 2^2 \times 3^4.$$

Find

- (a)  $\sqrt{324}$ ,
- (b) the largest integer which is a factor of both 168 and 324,
- (c) the smallest positive integer value of  $n$  for which  $168n$  is a multiple of 324.

Answer (a) ..... [1]

(b) ..... [1]

(c) ..... [1]

**12** The distance travelled by an object was 230 m, correct to the nearest 10 m.  
The time taken was 7 seconds, correct to the nearest second.

- (a) Complete the statements in the answer space.
- (b) What was the least possible average speed for the journey?

Answer (a) .....m  $\leq$  distance  $<$  ..... m [1]

.....s  $\leq$  time  $<$  ..... s [1]

(b) ..... m/s [1]

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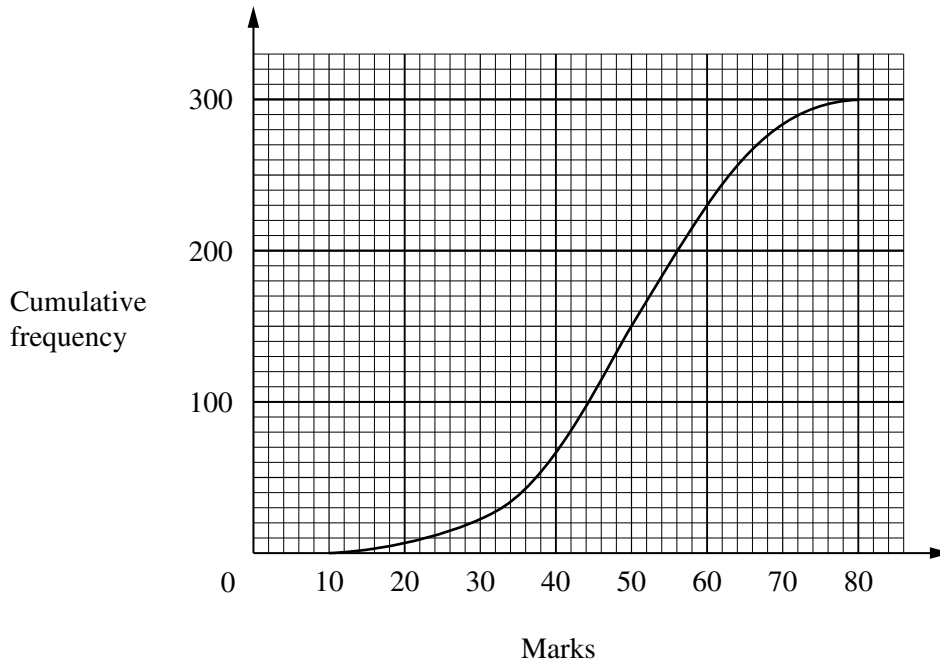
**13** Given that  $f(x) = \frac{2x + 5}{x}$ , find

- (a)  $f(2\frac{1}{2})$ ,
- (b)  $f^{-1}(x)$ .

Answer (a)  $f(2\frac{1}{2}) =$  ..... [1]

(b)  $f^{-1}(x) =$  ..... [2]

14



The graph is a cumulative frequency curve showing the marks gained by 300 candidates in an examination.

- (a) Use the curve to estimate
  - (i) the median mark,
  - (ii) the number of candidates who gained 33 marks or less.
- (b) It is given that 70 candidates achieved a grade A.  
Use the curve to estimate the smallest mark required for a grade A.

Answer (a) (i) ..... [1]

(ii) ..... [1]

(b) ..... [1]



**15**  $y$  is inversely proportional to  $(x + 2)$ .

(a) Write down an expression for  $y$  in terms of  $x$  and a constant  $k$ .

(b) It is given that  $y = 4$  when  $x = 3$ .  
Find  $y$  when  $x = 8$ .

Answer (a)  $y = \dots\dots\dots$  [1]

(b)  $y = \dots\dots\dots$  [2]

**16** (a) A car travels 144 km in  $h$  hours.

Write down, in its simplest form, an expression in terms of  $h$  for its average speed in metres per second.

(b) Solve the equation

$$3(2x - 7) = 6 - 4(2 - x).$$

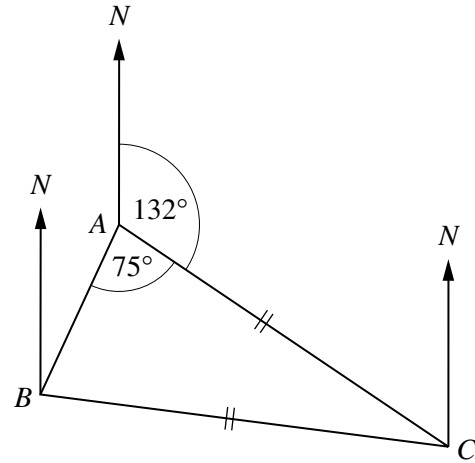
Answer (a)  $\dots\dots\dots$  m/s [2]

(b)  $x = \dots\dots\dots$  [2]

- 17  $A, B$  and  $C$  are three towns.  
 $C$  is equidistant from  $A$  and  $B$ .  
 The bearing of  $C$  from  $A$  is  $132^\circ$  and  $\hat{BAC} = 75^\circ$ .

Find

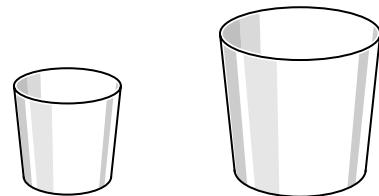
- (a) (i) the acute angle  $ACB$ ,  
 (ii) the reflex angle  $ACB$ ,  
 (b) the bearing of  $A$  from  $C$ ,  
 (c) the bearing of  $A$  from  $B$ .



- Answer (a) (i) ..... [1]  
 (ii) ..... [1]  
 (b) ..... [1]  
 (c) ..... [1]

- 18 The ratio of the **areas** of the bases of two geometrically similar buckets is  $4 : 9$ .

- (a) The **area** of the top of the smaller bucket is  $480 \text{ cm}^2$ .  
 What is the **area** of the top of the larger bucket?



- (b) **Write down** the ratio of the **heights** of the two buckets.
- (c) Both buckets are filled with sand.  
 The **mass** of sand in the larger bucket is  $36 \text{ kg}$ .  
 Find the **mass** of sand in the smaller bucket.

- Answer (a) .....  $\text{cm}^2$  [1]  
 (b) ..... : ..... [1]  
 (c) .....  $\text{kg}$  [2]

19 Given that  $A = \begin{pmatrix} 4 & 3 \\ 2 & 1 \end{pmatrix}$  and  $B = \begin{pmatrix} 2 & 0 \\ -2 & -1 \end{pmatrix}$ , find

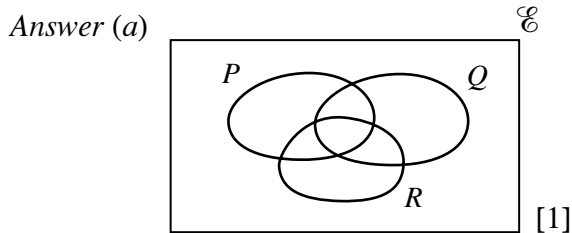
- (a)  $A - 2B$ ,
- (b) the determinant of  $A$ ,
- (c)  $A^{-1}$ .

Answer (a)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

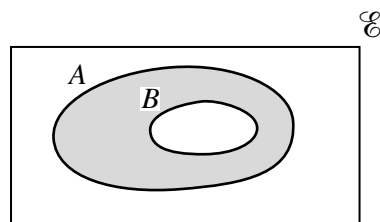
(b)..... [1]

(c)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [1]

20 (a) On the Venn Diagram shown in the answer space, shade the set  $(P \cap Q) \cup R$ .



(b) Express in set notation, as simply as possible, the set shaded in the Venn Diagram.



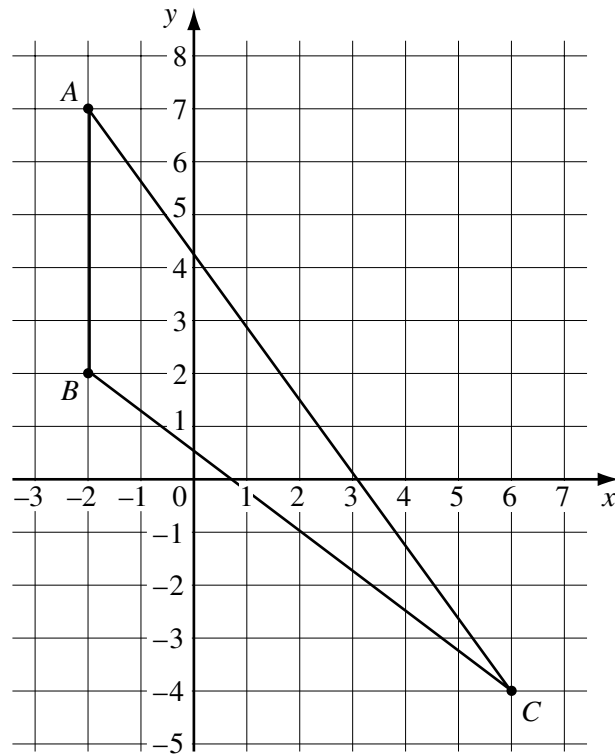
Answer (b) ..... [1]

(c) There are 34 children in a class. Of these, 22 take History, 19 take Geography and 5 take neither History nor Geography.

Using a Venn Diagram, or otherwise, find the number of children who take History but not Geography

Answer (c) ..... [2]

21



The diagram shows three points  $A(-2, 7)$ ,  $B(-2, 2)$  and  $C(6, -4)$ .

Find

- (a) the length  $BC$ ,
- (b) the area of triangle  $ABC$ ,
- (c) the value of  $\sin \hat{A}BC$ .

Answer (a) .....units [2]

(b) .....units<sup>2</sup> [2]

(c) ..... [1]

**22** A car starts from rest and accelerates at a constant rate to a speed of 20 m/s in 10 seconds.

**(a)** Find the acceleration.

It then travels at a constant speed of 20 m/s for the next 10 seconds.

**(b)** Find the total distance travelled in the 20 seconds.

**(c)** On the axes below, draw

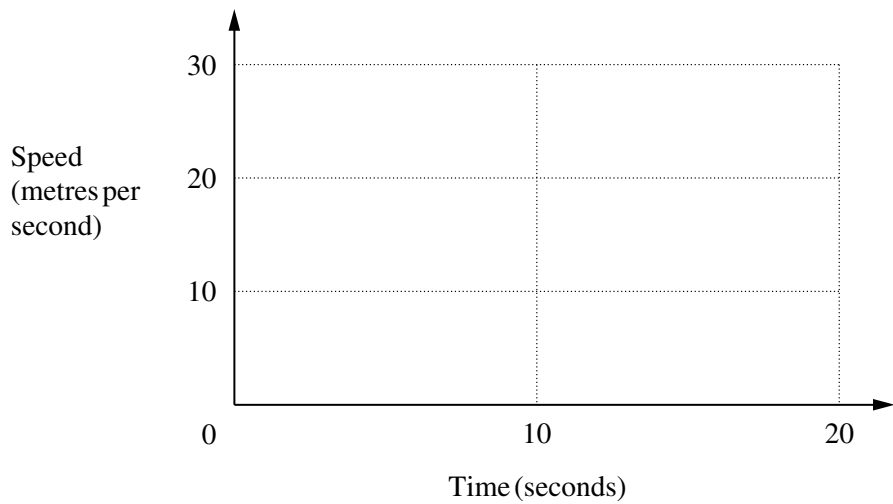
**(i)** the speed-time graph for the first 20 seconds of the car's journey,

**(ii)** the distance-time graph for the same 20 seconds.

Answer (a) ..... m/s<sup>2</sup> [1]

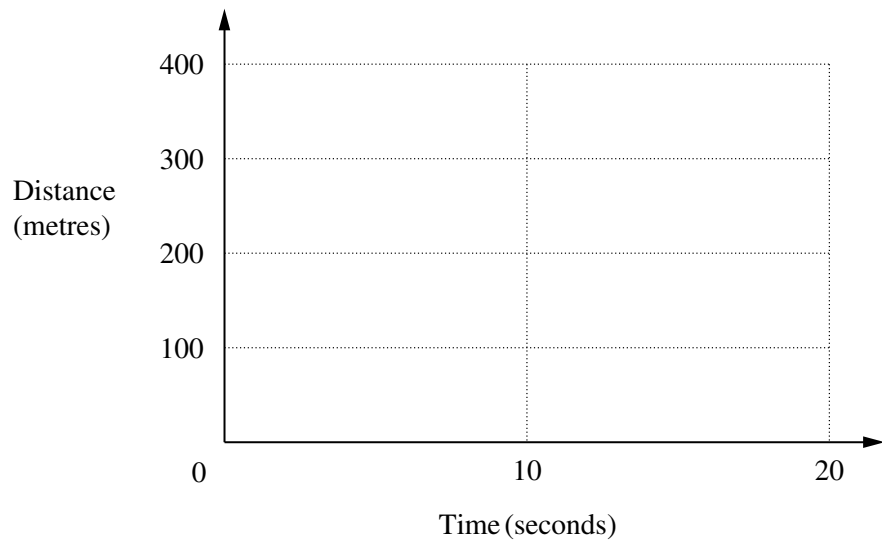
(b)..... m [1]

Answer (c) (i)



[1]

(ii)



[2]

**23** The diagram below is the scale drawing of a field.  
In the drawing, 1 cm represents 10 m.

(a) Express the scale in the form  $1 : n$ .

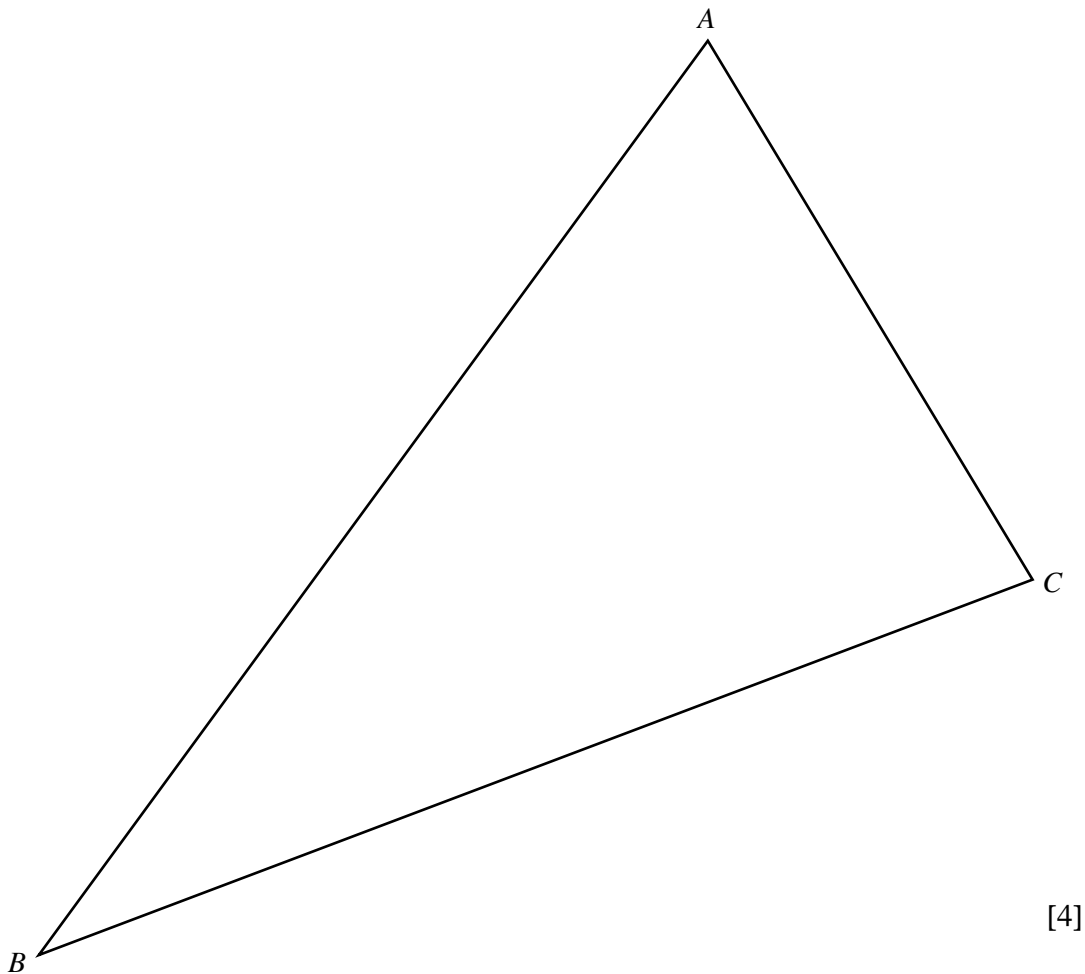
Answer (a)  $1 : \dots\dots\dots$  [1]

(b) Treasure is buried in the field.  
It is known that the treasure is

- I within 60 m of  $C$ ,
- II nearer to  $A$  than  $C$ ,
- III equidistant from  $AB$  and  $AC$ .

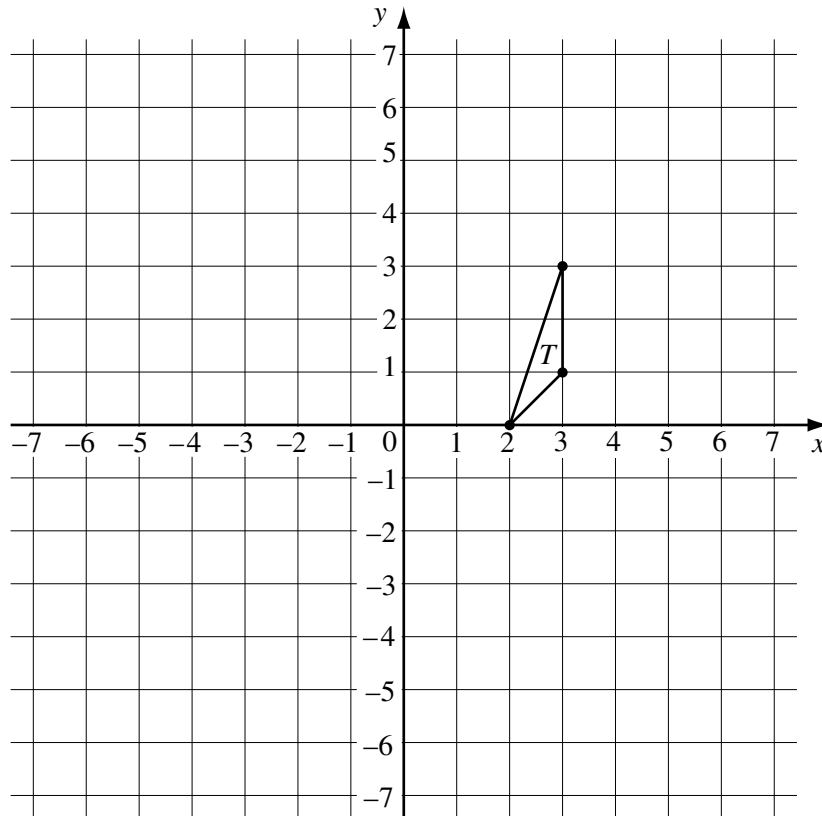
Use I, II and III to construct the locus of possible positions of the treasure.  
Find the extreme positions of this locus and label them  $T_1$  and  $T_2$ .

Answer (b)



[4]

24



The diagram shows triangle  $T$  with vertices  $(2, 0)$ ,  $(3, 1)$  and  $(3, 3)$ .

(a) Triangle  $A$  is the image of triangle  $T$  under the enlargement with centre  $(0, 0)$  and scale factor  $-2$ .

(i) Draw and label triangle  $A$  on the diagram. [1]

(ii) Describe fully the single transformation which maps  $A$  onto  $T$ .

Answer (a) (ii) .....

..... [1]

(b) Triangle  $B$  is the image of triangle  $T$  under the transformation represented by the matrix  $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ .

Draw and label triangle  $B$  on the diagram. [2]

(c) Find the matrix representing the transformation which maps  $A$  onto  $B$ .

Answer (c)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

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