UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0565991675

MATHEMATICS (SYLLABUS D) **4024/01**

Paper 1 **October/November 2009**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown 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.

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.

For Examiner's Use

This document consists of **23** printed pages and **1** blank page.

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

For Examiner's Use

1 **(a)** Evaluate $\frac{2}{3} - \frac{4}{7}$.

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

(b) Evaluate $1\frac{1}{3} \times \frac{5}{8}$, giving your answer in its simplest form.

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

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2 **(a)** Add brackets to the equation in the answer space to make it correct.

Answer (*a*) 4 + 6 × 7 – 5 = 16 [1]

(b) Find the value of 27×0.002.

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

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3 Arrange these values in order of size, starting with the smallest.

For Examiner's Use

$\frac{9}{20}$ 0.39 46% $\frac{2}{5}$

Answer ....[2]
smallest

---

4 The numbers 294 and 784, written as the product of their prime factors, are

$294 = 2 \times 3 \times 7^2$, $784 = 2^4 \times 7^2$.

Find

(a) the largest integer which is a factor of both 294 and 784,

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

(b) $\sqrt{784}$.

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

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5 **(a)** The local time in Singapore is 7 hours ahead of the local time in London.
A flight to London leaves Singapore at 0300 local time.
The flight takes 12 hours and 45 minutes.
What is the local time in London when it arrives?

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

(b) Mai changes £250 into dollars.
The exchange rate is £1 = $3.10.
How many dollars does she receive?

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

---

6 y is inversely proportional to x.
Given that $y = 250$ when $x = 4$, find y when $x = 80$.

Answer $y =$ .....[2]

---

7 Tom estimated the population of five countries in 2020.
The table below shows these estimates.

For Examiner's Use

Country	Population
Australia	2.35×10^7
Brazil	1.95×10^9
China	1.4×10^9
Japan	1.36×10^8
United Kingdom	6.9×10^7

(a) Which country did he estimate would have a population about 20 times that of the United Kingdom?

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

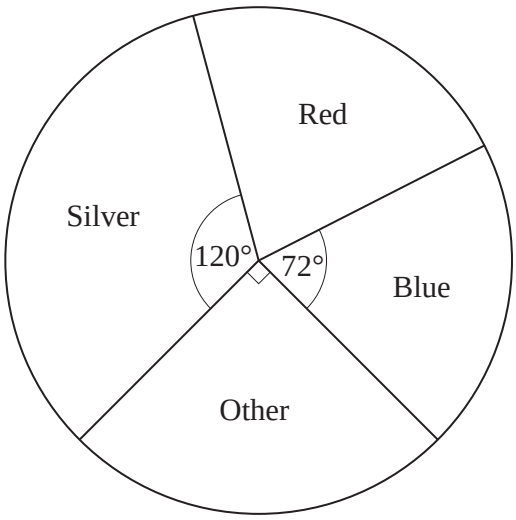
(b) How many more people did he estimate would be in Japan than in Australia?
Give your answer in standard form.

Answer (*b*) .....[2]

[Turn over

8 The colours of the cars which passed a house were noted.
The results are shown in the pie chart below.

For Examiner's Use



There were 12 blue cars.

How many cars

(a) passed the house,

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

(b) were red?

Answer (*b*) .....[2]

9 The force acting on an object during a collision is given by the formula

$$F = \frac{mv - mu}{t}.$$

For Examiner's Use

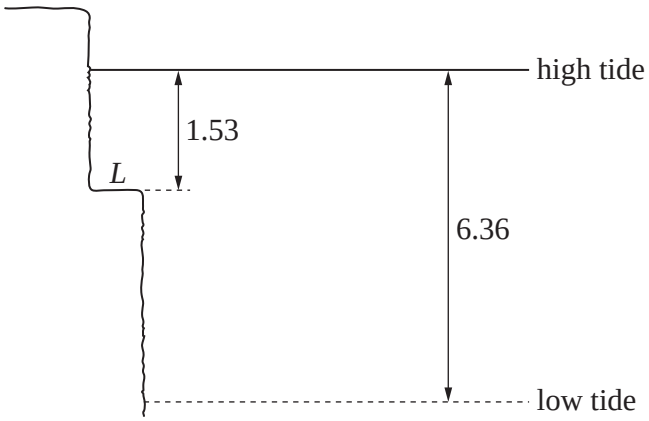
(a) Given that $m = 4$, $v = 5$, $u = 3$ and $t = 0.01$, find the value of F.

Answer (*a*) $F =$ .....[1]

(b) Rearrange the formula to make m the subject.

Answer (*b*) $m =$ .....[2]

10



For Examiner's Use

The sea level at high tide is 1.53 m above a ledge, *L*, on a cliff.
At low tide the sea level is 6.36 m below the sea level at high tide.

(a) How far below *L* is the sea level at low tide?

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

(b) On a certain day, high tide is at 07 32.
After 2 hours and 34 minutes, the sea level has dropped $\frac{1}{3}$ of the distance between high tide and low tide.

(i) At what time does the sea reach this level?

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

(ii) How far below *L* is the sea level at this time?

Answer (*b*)(ii) ..... m [1]

11 The table below shows the number of pets owned by 20 families.

For Examiner's Use

Number of pets	0	1	2	3	4	5	6	7
Number of families	2	5	3	2	4	1	1	2

Find

(a) the modal number of pets,

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

(b) the mean number of pets.

Answer (*b*) .....[2]

12 Given that $f(x) = 4x - 7$, find

For Examiner's Use

(a) $f\left(\frac{1}{2}\right)$,

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

(b) the value of p when $f(p) = p$.

Answer (*b*) p = ...[2]

---

13 **(a)** Express $\frac{2m}{5} + \frac{m}{4}$ as a single fraction in its simplest terms.

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

(b) Solve the inequality $5(x + 4) < 7x$.

Answer (*b*) x.....[2]

---

14 **(a)** Find the coordinates of the point where the line $2y = 3x + 15$ crosses the y-axis.

For Examiner's Use

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

(b) The coordinates of the points P and Q are $(-1, 10)$ and $(3, 4)$ respectively.

Find

(i) the gradient of PQ,

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

(ii) the midpoint of PQ.

Answer (*b*)(ii) (....., ...) [1]

[Turn over

For Examiner's Use

15 $\mathbf{a} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 7 \end{pmatrix}$

(a) Express $\mathbf{a} + 2\mathbf{b}$ as a column vector.

Answer (*a*) $\mathbf{a} + 2\mathbf{b} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) (i) Find $|\mathbf{a}|$.

Answer (*b*)(i) $|\mathbf{a}| =$ .....[1]

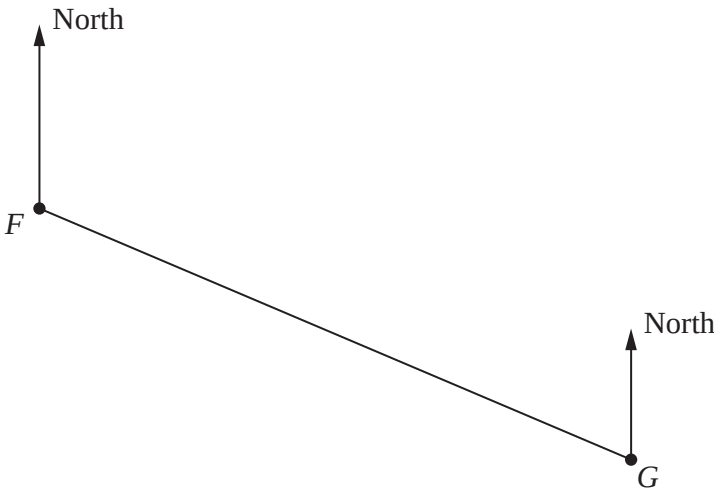
(ii) Given that $\dfrac{|\mathbf{b}|}{|\mathbf{a}|} = \sqrt{n}$, where n is an integer, find the value of n.

Answer (*b*)(ii) $n =$ .....[1]

16 The scale drawing below shows the positions of two towns, *F* and *G*.
It is drawn to a scale of 1 cm to 3 km.

For Examiner's Use

Answer (*b*)



(a) Find

(i) the distance, in kilometres, between towns *F* and *G*,

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

(ii) the bearing of *G* from *F*.

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

(b) Town *H* is to the North of the line *FG*.
It is 19.5 km from *F* and 15 km from *G*.
On the diagram above, find and label the position of *H*. [1]

[Turn over

17 The table below shows the distribution of the length, in metres, of cars in a car park.

For Examiner's Use

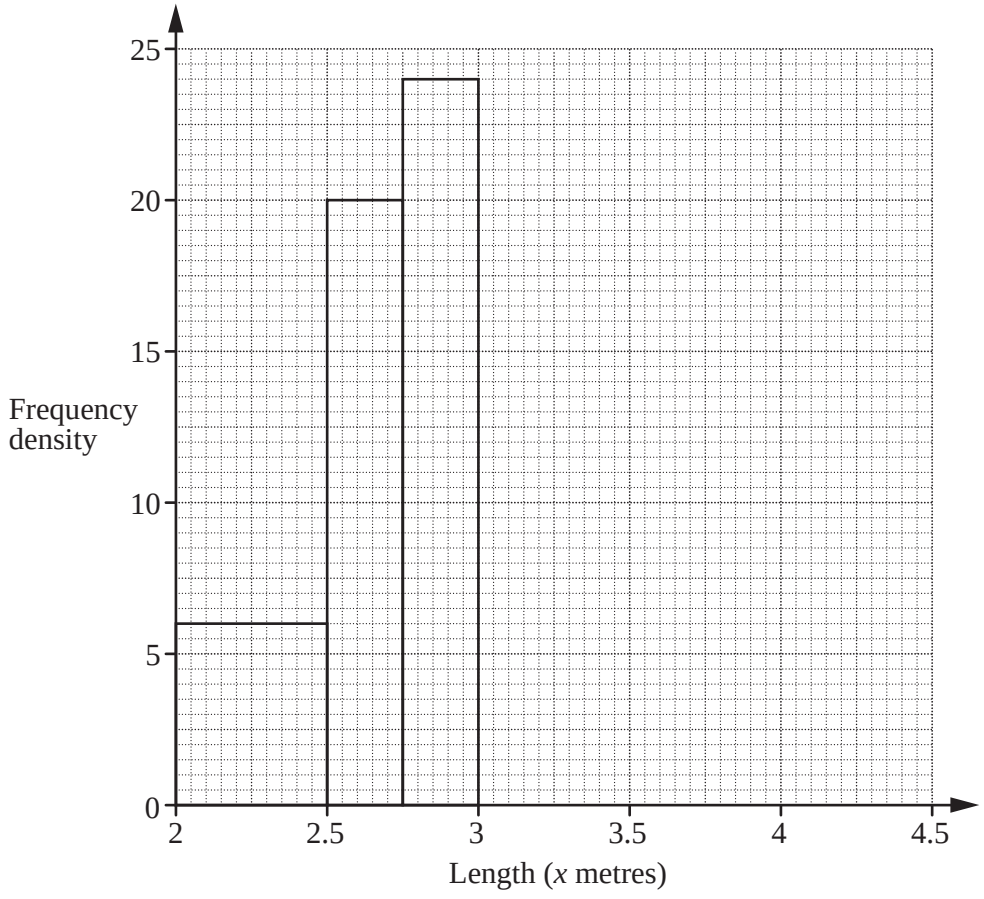
Length (x metres)	$2 \leqslant x < 2.5$	$2.5 \leqslant x < 2.75$	$2.75 \leqslant x < 3$	$3 \leqslant x < 3.5$	$3.5 \leqslant x < 4.5$
Number of cars	3	5	p	8	4

(a) Use the histogram in the answer space to find p.

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

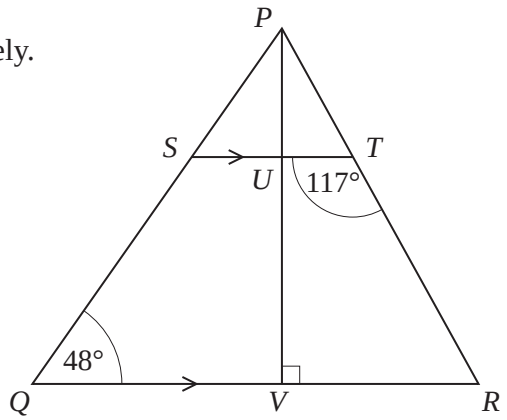
(b) Complete the histogram.

Answer (*b*)



[2]

18 The diagram shows the triangle PQR.
The points S and T lie on the lines PQ and PR respectively.
The line ST is parallel to the line QR.



For Examiner's Use

(a) $S\hat{T}R = 117°$ and $S\hat{Q}R = 48°$.
Find $Q\hat{P}R$.

Answer (*a*) $Q\hat{P}R$ = ...[1]

(b) U and V are points on ST and QR respectively.
PUV is a straight line with $2PU = UV$ and $P\hat{V}R = 90°$.

Find

(i) $PU : PV$,

Answer (*b*)(i) ..... : .....[1]

(ii) the ratio of the area of triangle PQR to the area of the trapezium $STRQ$.

Answer (*b*)(ii) ..... : .....[2]

19 **(a)** Factorise completely

For Examiner's Use

(i) $21a^2 - 14a$,

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

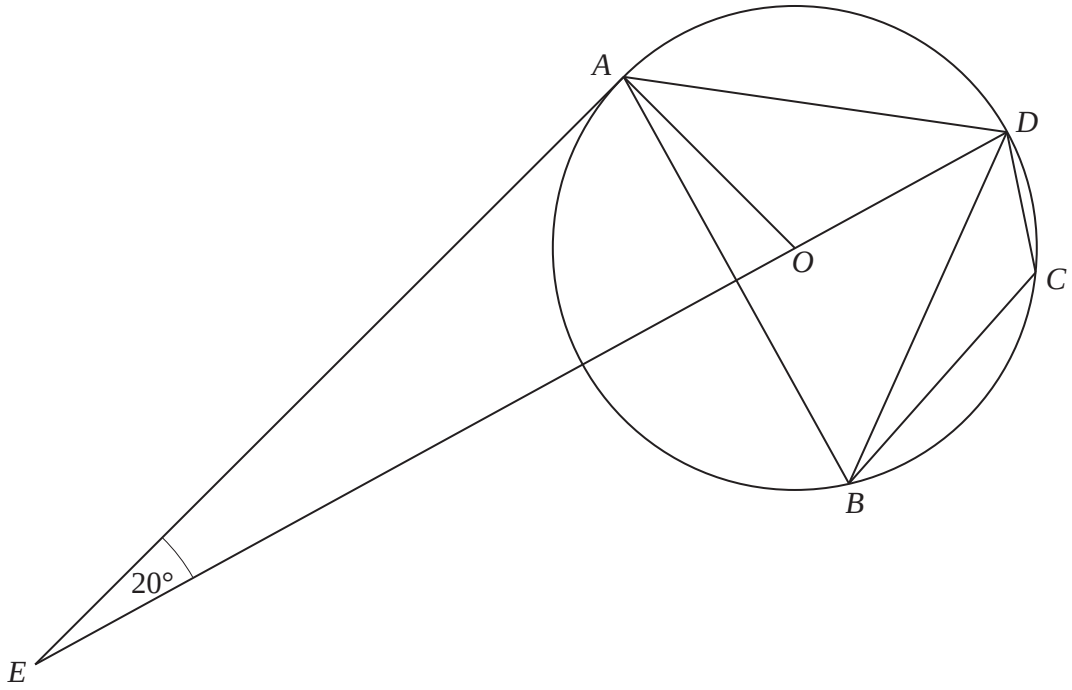
(ii) $x^2 - 3x - 40$.

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

(b) Given that $y = 3$ is a solution of the equation $2y^2 + ky - 27 = 0$, find the other solution.

Answer (*b*) y = ...[2]

20



The quadrilateral *ABCD* has its vertices on the circumference of a circle.
AE is a tangent to the circle and $A\hat{E}D = 20°$.
The centre of the circle, *O*, lies on the straight line *DE*.

(a) Find $A\hat{D}O$.

Answer (*a*) $A\hat{D}O$ = ...[2]

(b) Given that *DE* is the perpendicular bisector of *AB* and $D\hat{B}A = 55°$,

(i) write down $B\hat{A}D$,

Answer (*b*)(i) $B\hat{A}D$ = ...[1]

(ii) find $B\hat{C}D$.

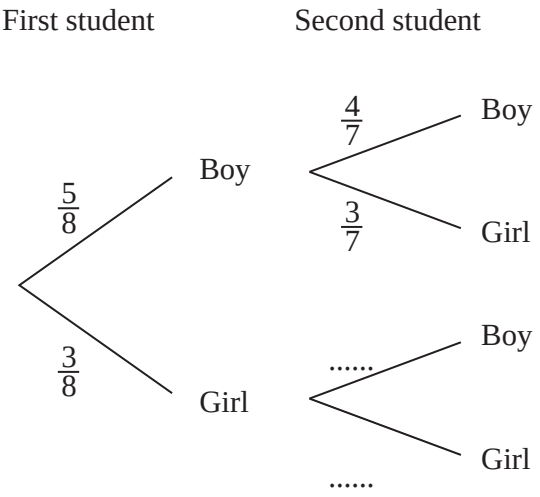
Answer (*b*)(ii) $B\hat{C}D$ = ...[1]

[Turn over

21 In a group of 8 students there are 5 boys and 3 girls.
Two students are chosen at random.
The tree diagram shows the possible outcomes and their probabilities.

For Examiner's Use

Answer (*a*)



(a) Complete the tree diagram. [1]

(b) Expressing each answer as a fraction in its lowest terms, find the probability that

(i) two boys are chosen,

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

(ii) at least one boy is chosen.

Answer (*b*)(ii) .....[2]

22 The diagrams below show small black, grey and white triangles forming a pattern.

For Examiner's Use

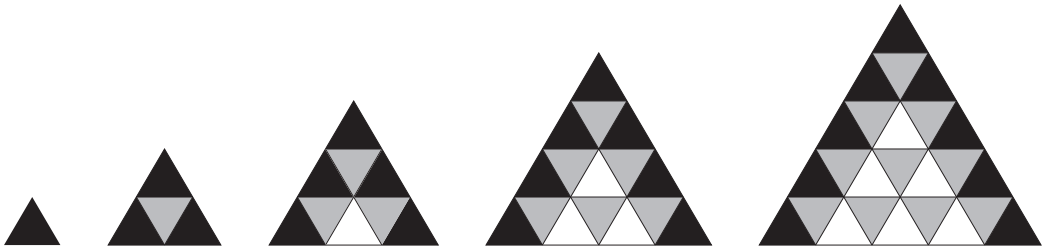


Diagram 1 2 3 4 5

The table below shows the number of triangles in each diagram.

Answer (*a*)

Diagram (*n*)	1	2	3	4	5	6
Small triangles	1	4	9	16	25	
Black triangles	1	3	5	7	9	
Grey triangles	0	1	3	6	10	
White triangles	0	0	1	3	6	10

(a) Complete the column for Diagram 6. [2]

(b) Write an expression, in terms of *n*, for the number of

(i) small triangles in Diagram *n*,

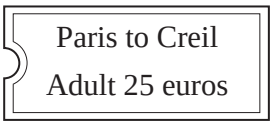
Answer (*b*)(i) .....[1]

(ii) black triangles in Diagram *n*.

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

[Turn over

23 (a)



For Examiner's Use

During a visit to France, a family took a train from Paris to Creil.
The cost of an adult ticket was 25 euros and the cost of a child ticket was 17.50 euros.

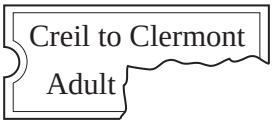
(i) How much did it cost for a family of 2 adults and 3 children?

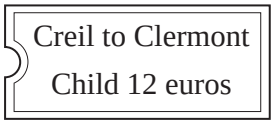
Answer (*a*)(i) ..... euros [1]

(ii) Express the cost of a child ticket as a percentage of the cost of an adult ticket.

Answer (*a*)(ii) ..... % [2]

(b)



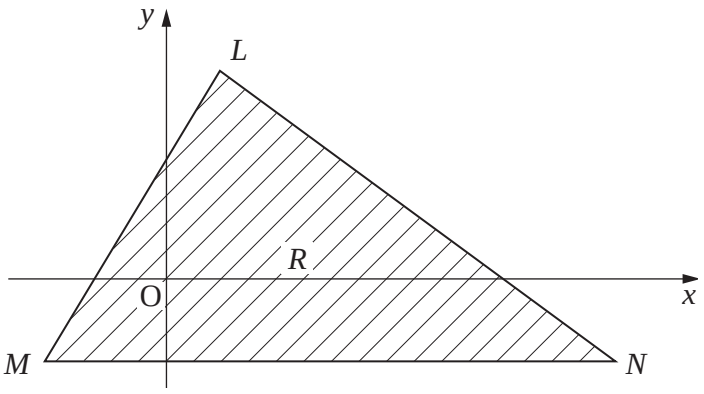


At Creil the family changed trains and travelled to Clermont.
The cost of a child ticket was 12 euros.
The cost of a child ticket was 60% of the cost of an adult ticket.
What was the cost of an adult ticket?

Answer (*b*) ..... euros [2]

24 The diagram below shows triangle *LMN*.

For Examiner's Use



The equations of the lines *LM* and *LN* are $2y = 3x + 5$ and $x + 4y = 24$ respectively.

(a) Solve the simultaneous equations $x + 4y = 24$,
$2y = 3x + 5$.

Hence write down the coordinates of *L*.

Answer (*a*) (....., ...) [3]

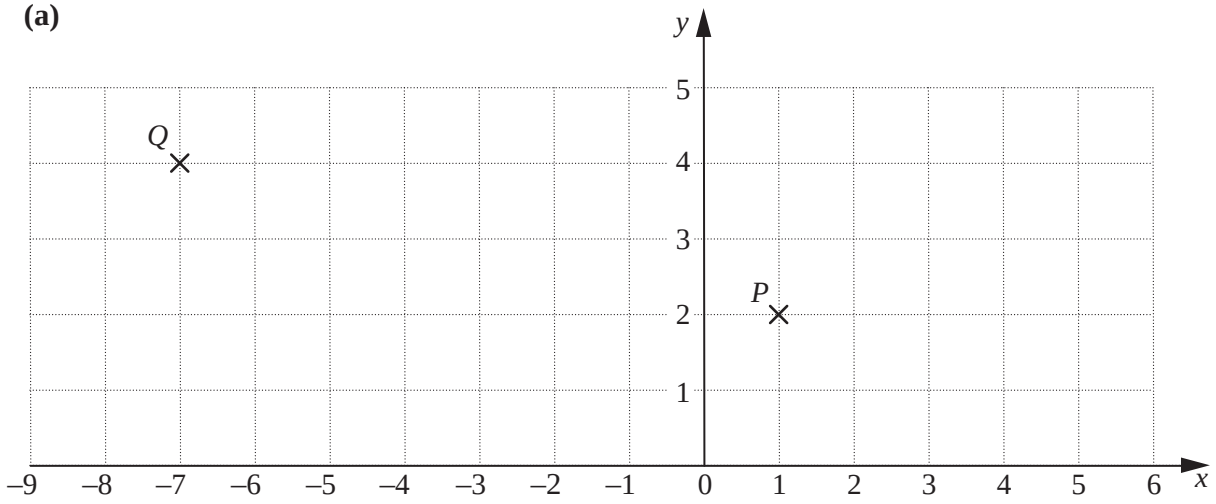
(b) *M* is (–3,–2) and *MN* is parallel to the *x*-axis.
The shaded region, *R*, **inside** triangle *LMN*, is defined by three inequalities.
One of these is $2y < 3x + 5$.
Write down the other two inequalities.

Answer (*b*) .....

.....[2]

[Turn over

25 (a)



The grid above shows the points P (1,2) and Q (–7,4).

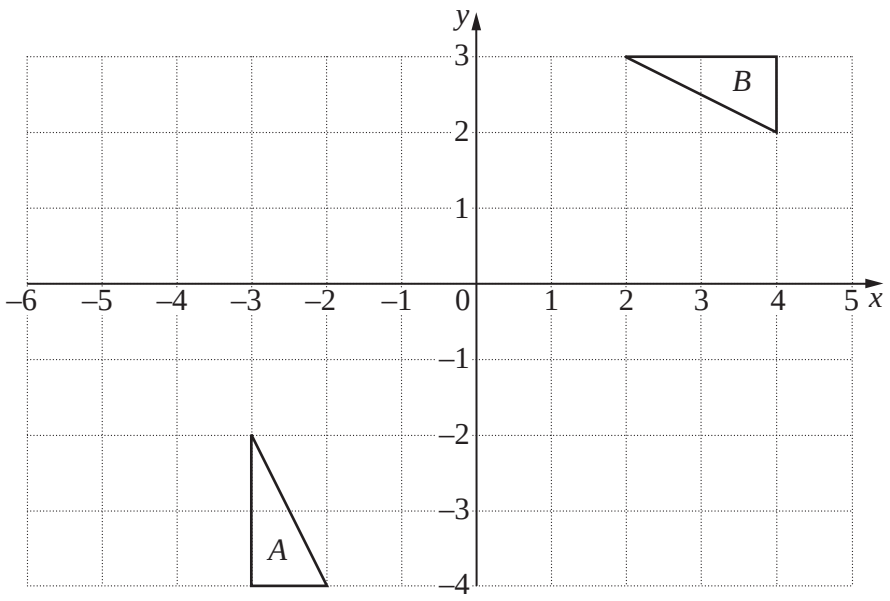
(i) P can be mapped onto Q by a translation. Write down its column vector.

Answer (*a*)(i) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) P can also be mapped onto Q by an enlargement, centre (5,1). Write down its scale factor.

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

(b)



For Examiner's Use

The diagram shows triangles *A* and *B*.

(i) Describe **fully** the **single** transformation that maps triangle *A* onto triangle *B*.

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

(ii) Triangle *A* can also be mapped onto triangle *B* by a reflection in the line $x = -1$ followed by a rotation.
Write down the centre of this rotation.

Answer (*b*)(ii) (....., ...) [2]

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