Centre Number	Candidate Number	Name	

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

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

Paper 1

October/November 2005

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 in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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

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.
The total of the marks for this paper is 80.

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

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NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABL
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1 Evaluate

(a) $10 - 7.56$,

(b) 0.105×0.2 .

Answer (a) .... [1]

(b) .... [1]

2 (a) Evaluate $3\frac{1}{5} - 2\frac{3}{4}$.

(b) $\frac{2}{3}$ of a plot of land is garden.

$\frac{1}{5}$ of the garden is lawn.
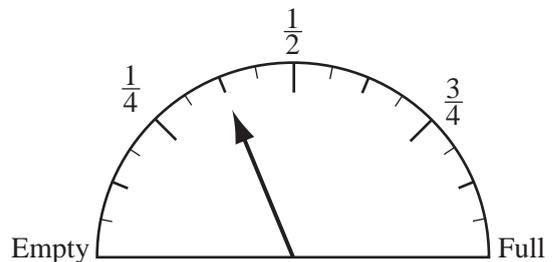
Find the fraction of the plot of land which is lawn.

Answer (a) .... [1]

(b) .... [1]
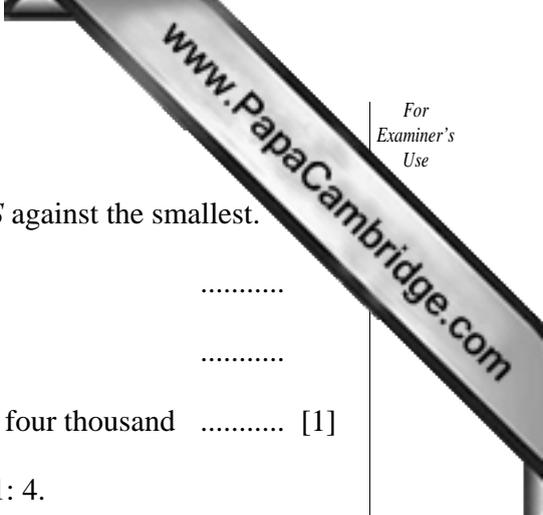
3 The diagram shows a fuel gauge in a car.

(a) What fraction does the gauge show?

(b) The fuel tank holds 48 litres when it is full.
How many litres must be added to fill the tank?

Answer (a) .... [1]

(b) ....litres [1]

4 **(a)** Three numbers are given in the answer space.
Write *L* against the largest, *M* against the next largest and *S* against the smallest.

Answer (a) 0.7 million   ....

687 000   ....

eight hundred and four thousand   .... [1]

(b) An amount of money is divided into two parts in the ratio 1: 4.
Find the smaller part as a percentage of the whole amount.

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

5 The population of a country is 3.2×10^6.
There are 8×10^5 children.

(a) What fraction of the whole population are children?
Give your answer in its simplest form.

(b) Find the number of adults.
Give your answer in standard form.

Answer (a) ....[1]

(b) .... [1]

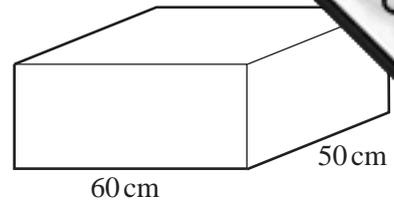**6** **(a)** The first five terms of a sequence are 1, 3, 6, 10, 15.
The *n*th term of this sequence is $\frac{1}{2}n(n + 1)$.
Find the 19th term.

(b) Write down an expression, in terms of *n*, for the *n*th term of the sequence

3, 6, 10, 15, 21, ...

Answer (a) .... [1]

(b) .... [1]

4

7 A cuboid is shown in the diagram.
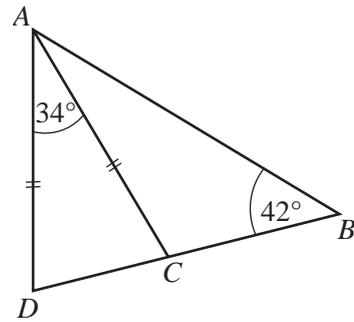The volume of the cuboid is $90\,000\,\text{cm}^3$.
Find the height of the cuboid.

50 cm

60 cm

Answer ....cm [2]

8 In the diagram, *BCD* is a straight line.
$AD = AC$, $D\hat{A}C = 34°$ and $A\hat{B}C = 42°$.

Find

(a) $A\hat{D}C$,

(b) $B\hat{A}C$,

(c) the reflex angle *ABC*.

A

34°

42°
B

C

D

Answer (a) $A\hat{D}C =$ ....[1]

(b) $B\hat{A}C =$ ....[1]

(c) reflex $A\hat{B}C =$ ....[1]

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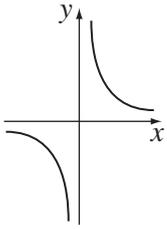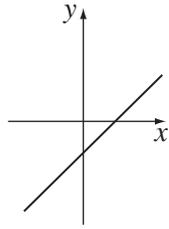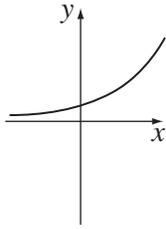
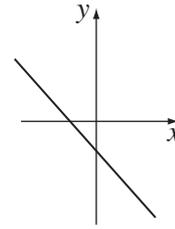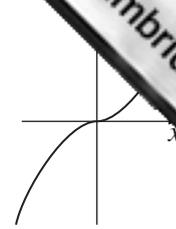| Figure 1	Figure 2	Figure 3	Figure 4	Figure 5	Figure 6
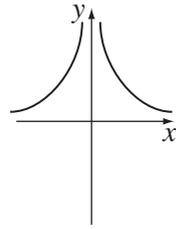
Which of the graphs shown above could be the graph of

(a) $y = x^3$,

(b) $y = \dfrac{1}{x^2}$,

(c) $y = x - 1$?

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

(b) Figure .... [1]

(c) Figure .... [1]

10 (a) Three of the angles of a quadrilateral are each 95°.
Find the fourth angle.

(b) Each interior angle of a regular polygon is 165°.
How many sides has the polygon?

Answer (a) .... [1]

(b) .... [2]

11 **(a)** Factorise fully $5x^2 - 10x$.

(b) Solve $3y + 6 = 7y - 10$.

(c) Solve $3p(p + 2) = 0$.

Answer (a) .... [1]

(b) y = ... [1]

(c) p = ... or .... [1]

12 In the diagram, AB is parallel to DC and $A\hat{C}B = C\hat{D}A$.

(a) Explain why triangles ABC and CAD are similar.

(b) Given that $AB = 4\,\text{cm}$, $BC = 7\,\text{cm}$, $AC = 6\,\text{cm}$ and $CD = 9\,\text{cm}$, calculate AD.
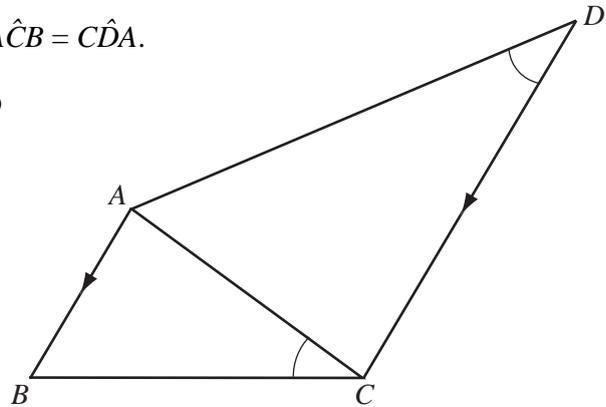
Answer (a) ....

....

.... [1]

(b) AD = ...cm [2]

13 (a) On the Venn Diagram in the answer space, shade the region $A \cup B'$.

Answer (a)

[1]
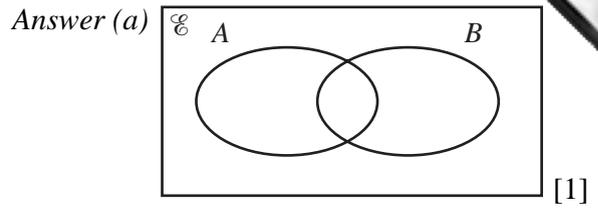
(b) $\mathscr{E}$ = {all polygons}, Q = {all quadrilaterals}, R = {all regular polygons}.

    (i) What is the special name of the polygons which belong to $Q \cap R$?

    (ii) On the Venn Diagram in the answer space, show the set
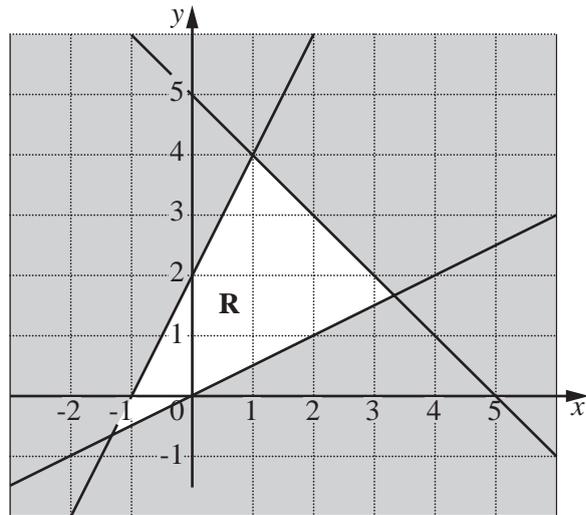 T = {all equilateral triangles}.

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

(ii)

[1]
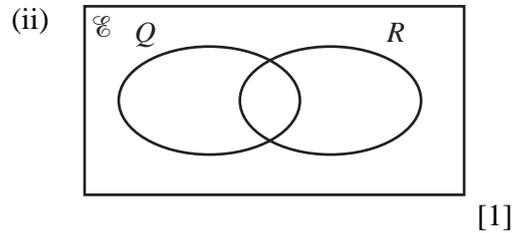
14 (a) In the diagram, the unshaded region, **R**, is defined by three inequalities.

Two of these are

$y \leqslant 2x + 2$ and $y \leqslant 5 - x$.

Write down the third inequality.

Answer (a).. [1]

(b) Find the integer values of x which satisfy the following.

$$4 \leqslant 2x + 13 < 9$$

Answer (b).. [2]

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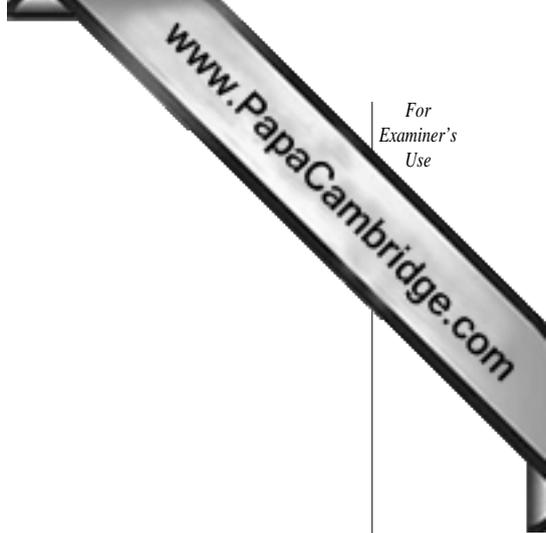
15 $\mathbf{A} = (1 \quad 2 \quad 3)$ $\mathbf{B} = \begin{pmatrix} 2 & 0 \\ 1 & 4 \\ -1 & -3 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} 2 & -1 \\ 2 & 2 \\ -1 & 0 \end{pmatrix}$

Find

(a) $\mathbf{B} - \mathbf{C}$,

(b) $\mathbf{AB}$.

Answer (a) .... [2]

(b) .... [2]
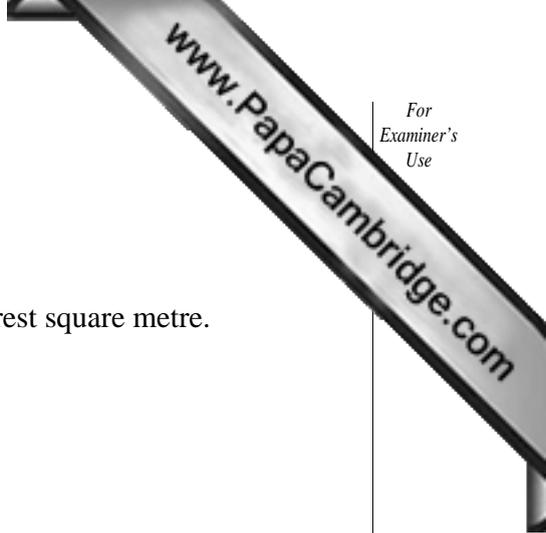
16 It is given that $f(x) = 3x - 5$.

Find

(a) $f(-4)$,

(b) the value of t, given that $f(t) = 10$,

(c) $f^{-1}(x)$,

(d) $f^{-1}(4)$.

Answer (a) $f(-4)$ = ...[1]

(b) $t =$ .... [1]

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

(d) $f^{-1}(4) =$ .... [1]

17 **(a)** A rectangular table top is 100 cm long and 75 cm wide.
Both lengths are correct to the nearest 5 cm.
Find the least possible perimeter of the table.

(b) The area of a rectangular room is 22 m^2, correct to the nearest square metre.
The width is 3 m, correct to the nearest metre.
Find the greatest possible length of the room.

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

(b) ....m [2]

18 **(a)** The number 3002.05 can be written as $3 \times 10^3 + 2 \times 10^x + 5 \times 10^y$.
Given that x and y are integers, find the values of x and y.

(b) A bank exchanged Japanese yen and Singapore dollars ($) at a rate of 66 yen = $1.

(i) Calculate, in yen, the amount received for $200.

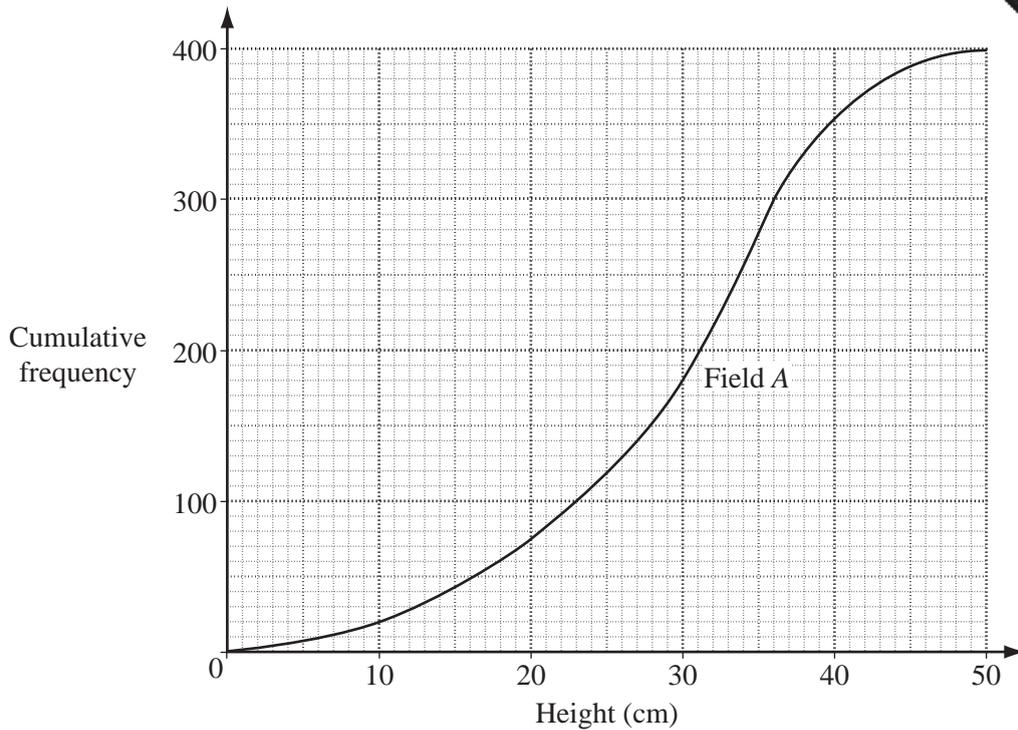**(ii)** Calculate, in dollars, the amount received for 33 000 yen.

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

y = ...[1]

(b)(i) ....yen [1]

(ii) $ .... [1]

19

The diagram above is the cumulative frequency curve for the heights of 400 plants which were grown in Field *A*.

Use the graph to find

(a) the number of plants that grew to a height of **more** than 30 cm,

(b) the interquartile range.

Answer (a) .... [1]

(b) .... [1]

(c) Another 400 plants were grown in Field *B*.
The cumulative frequency distribution of the heights of these plants is shown in the table.

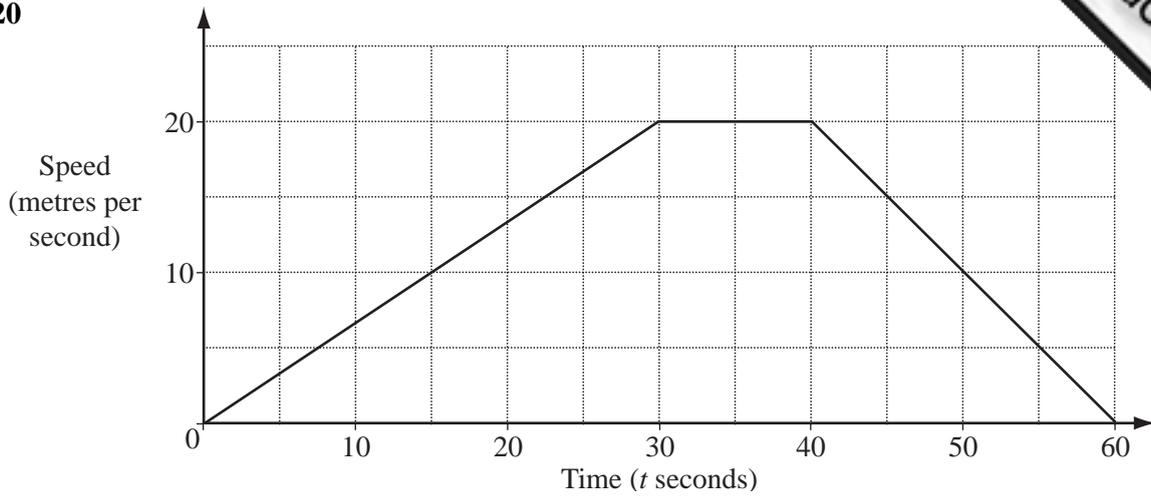| Height (h cm)	$h \leqslant 10$	$h \leqslant 15$	$h \leqslant 20$	$h \leqslant 25$	$h \leqslant 30$	$h \leqslant 35$	$h \leqslant 40$	$h \leqslant 50$
Cumulative frequency	35	75	130	200	280	330	370	400

On the same axes as for Field *A*, draw the cumulative frequency curve for the plants grown in Field *B*. [2]

(d) By comparing the two curves, state, with a reason, which Field produced the taller plants.

*Answer (d)* Field .... produced the taller plants because ....

.... [1]

20

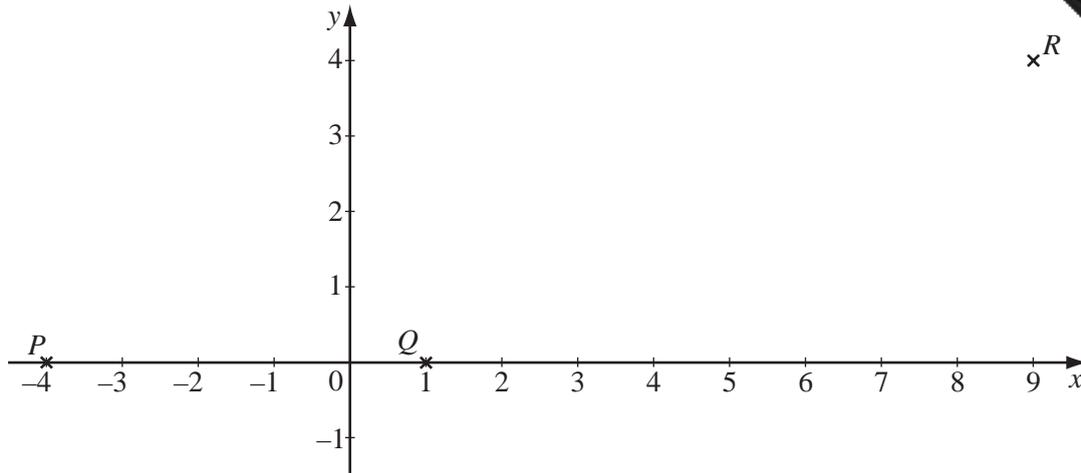The diagram shows the speed–time graph of a car's journey.

(a) Find the speed when $t = 20$.

(b) Find the acceleration when $t = 20$.

(c) Find the distance travelled in

　　(i) the first 40 seconds,

　　(ii) the first 60 seconds.

(d) Part of the distance–time graph for the same journey is shown in the answer space.
　　Complete this graph.

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

(b) ....m/s² [1]

(c)(i) ....m [1]

(ii) ....m [1]

(d)

[2]

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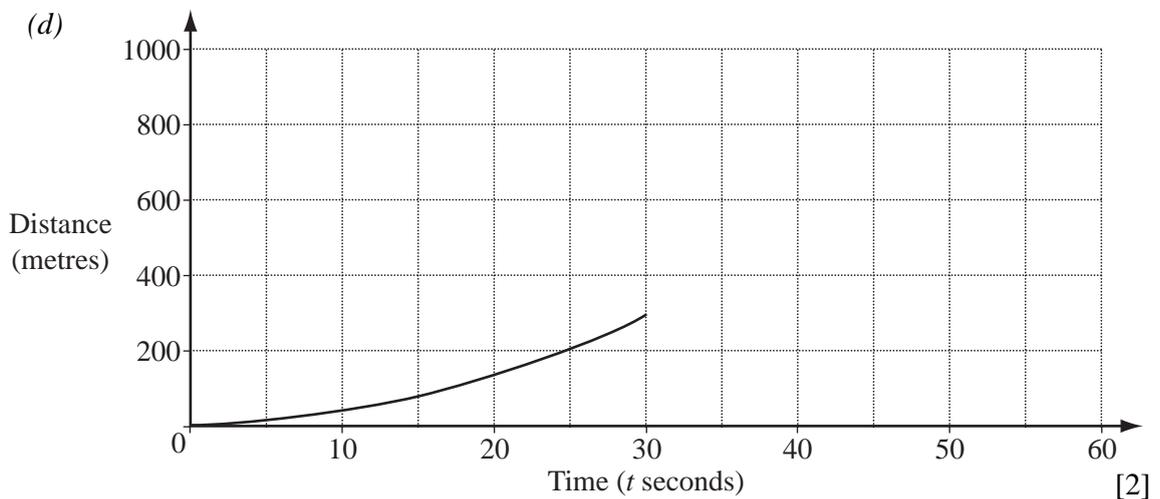
21

PQRS is a parallelogram.
P is (–4, 0), *Q* is (1, 0) and *R* is (9, 4).

(a) Find the coordinates of *S*.

(b) Find the coordinates of the midpoint of *PR*.

(c) Find the equation of the line *RS*.

(d) Find the equation of the line *QR*.

(e) Calculate the area of the parallelogram *PQRS*.

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

(b)   (............ , ...)   [1]

(c) .... [1]

(d) .... [2]

(e) ....unit^2 [1]
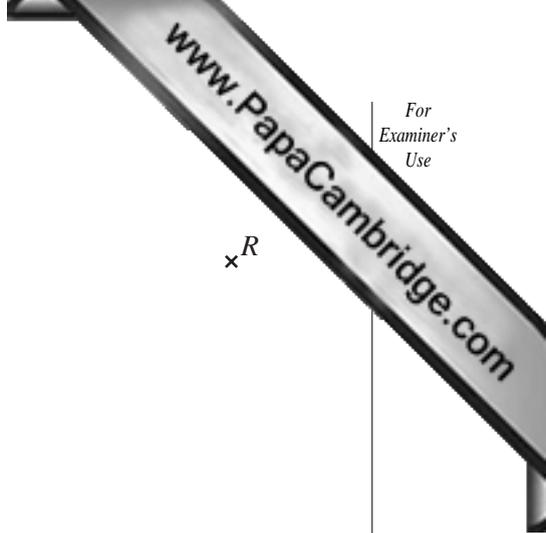
22 The diagram below shows the point *P* and triangles *A*, *B* and *C*.

(a) The reflection, M, maps ΔA onto ΔB.
Given that M(*P*) = *Q*, write down the coordinates of *Q*.

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

(b) The rotation, R, maps ΔA onto ΔC.

Find

(i) the coordinates of the centre of this rotation,

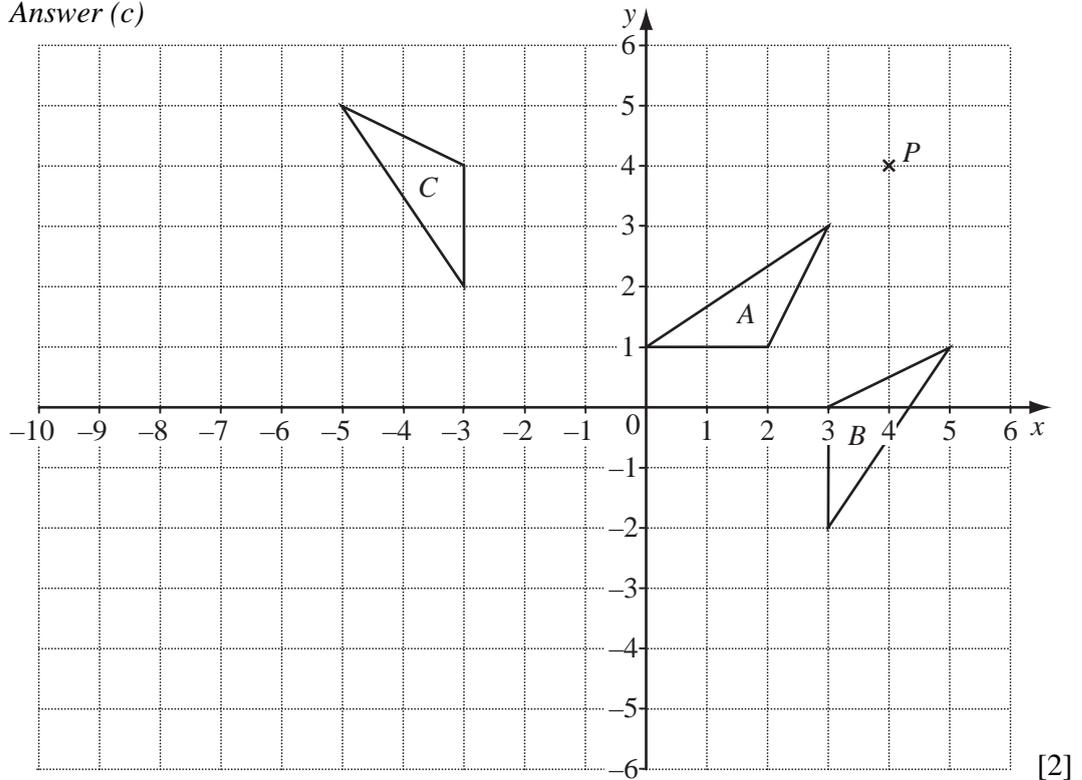**(ii)** the angle and direction of this rotation.

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

(ii) .... [1]

(c) The matrix $\begin{pmatrix} -2 & 0 \\ 0 & -2 \end{pmatrix}$ represents the transformation T.

Given that T(*A*) = *D*, draw and label ΔD on the diagram.

Answer (c)

[2]

(d) Given that FT (*A*) = *A*, find the matrix representing the transformation F.

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

23 The diagram below is a scale drawing representing three coastguard stations, *A*, *B* a
In the drawing, 1 cm represents 20 km.

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

    (ii) Find the distance between the coastguard stations *A* and *B*.
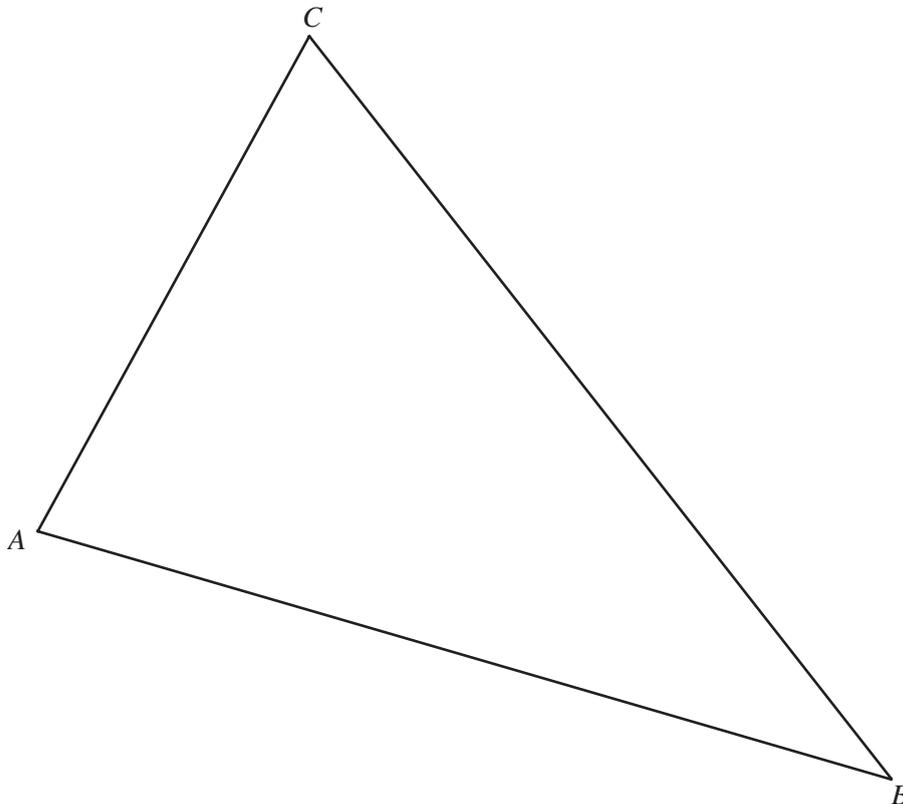
Answer (a)(i) 1 : .... [1]

        (ii) ....km [1]

(b) It is known that a ship is

    I   equidistant from *CA* and *CB*,
    II   nearer to *C* than *A*,
    III less than 200 km from *B*.

By constructing 3 loci corresponding to **I**, **II** and **III**, find the possible positions of the ship and label the extreme positions *S* and *P*.

Answer (b)

[4]

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