Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

MATHEMATICS **0580/04**

Paper 4 (Extended) **For Examination from 2015**

SPECIMEN PAPER

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator   Geometrical instruments
Tracing paper (optional)

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
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 130.

This document consists of **16** printed pages.

1 (a) Abdullah and Jasmine bought a car for $9000.
Abdullah paid 45% of the $9000 and Jasmine paid the rest.

(i) How much did Jasmine pay towards the cost of the car?

Answer(a)(i) $ .... [2]

(ii) Write down the ratio of the payments   Abdullah : Jasmine   in its simplest form.

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

(b) Last year it cost $2256 to run the car.
Abdullah, Jasmine and their son Henri share this cost in the ratio 8 : 3 : 1.
Calculate the amount each paid to run the car.

Answer(b) Abdullah $ ....

Jasmine $ ....

Henri $ .... [3]

(c) (i) A new truck costs $15 000 and loses 23% of its value **each year**.
Calculate the value of the truck after three years.

Answer(c)(i) $ .... [3]

(ii) Calculate the overall percentage loss of the truck's value after three years.

Answer(c)(ii) .... % [3]

2 **(a)** Find the integer values for x which satisfy the inequality $\qquad -3 < 2x - 1 \leqslant 6$.

Answer(a) .... [3]

(b) Simplify $\dfrac{x^2 + 3x - 10}{x^2 - 25}$.

Answer(b) .... [4]

(c) **(i)** Show that $\dfrac{5}{x-3} + \dfrac{2}{x+1} = 3$ can be simplified to $3x^2 - 13x - 8 = 0$.

Answer(c)(i)

[3]

(ii) Solve the equation $\qquad 3x^2 - 13x - 8 = 0$.

Show all your working and give your answers correct to two decimal places.

Answer(c)(ii) $x =$ .... or $x =$ .... [4]

3 The table shows information about the heights of 120 girls in a swimming club.

Height (h metres)	Frequency
$1.3 < h \leqslant 1.4$	4
$1.4 < h \leqslant 1.5$	13
$1.5 < h \leqslant 1.6$	33
$1.6 < h \leqslant 1.7$	45
$1.7 < h \leqslant 1.8$	19
$1.8 < h \leqslant 1.9$	6

(a) (i) Write down the modal class.

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

(ii) Calculate an estimate of the mean height. Show all of your working.

Answer(a)(ii) .... m [4]

(b) Girls from this swimming club are chosen at random to swim in a race.
Calculate the probability that

(i) the height of the first girl chosen is more than 1.8 metres,

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

(ii) the heights of **both** the first and second girl chosen are 1.8 metres or less.

Answer(b)(ii) .... [3]

(c) (i) Complete the cumulative frequency table for the heights.

Height (h metres)	Cumulative frequency
$h \leqslant 1.3$	0
$h \leqslant 1.4$	4
$h \leqslant 1.5$	17
$h \leqslant 1.6$	50
$h \leqslant 1.7$	
$h \leqslant 1.8$	114
$h \leqslant 1.9$	

[1]

(ii) Draw the cumulative frequency graph on the grid.

Cumulative frequency
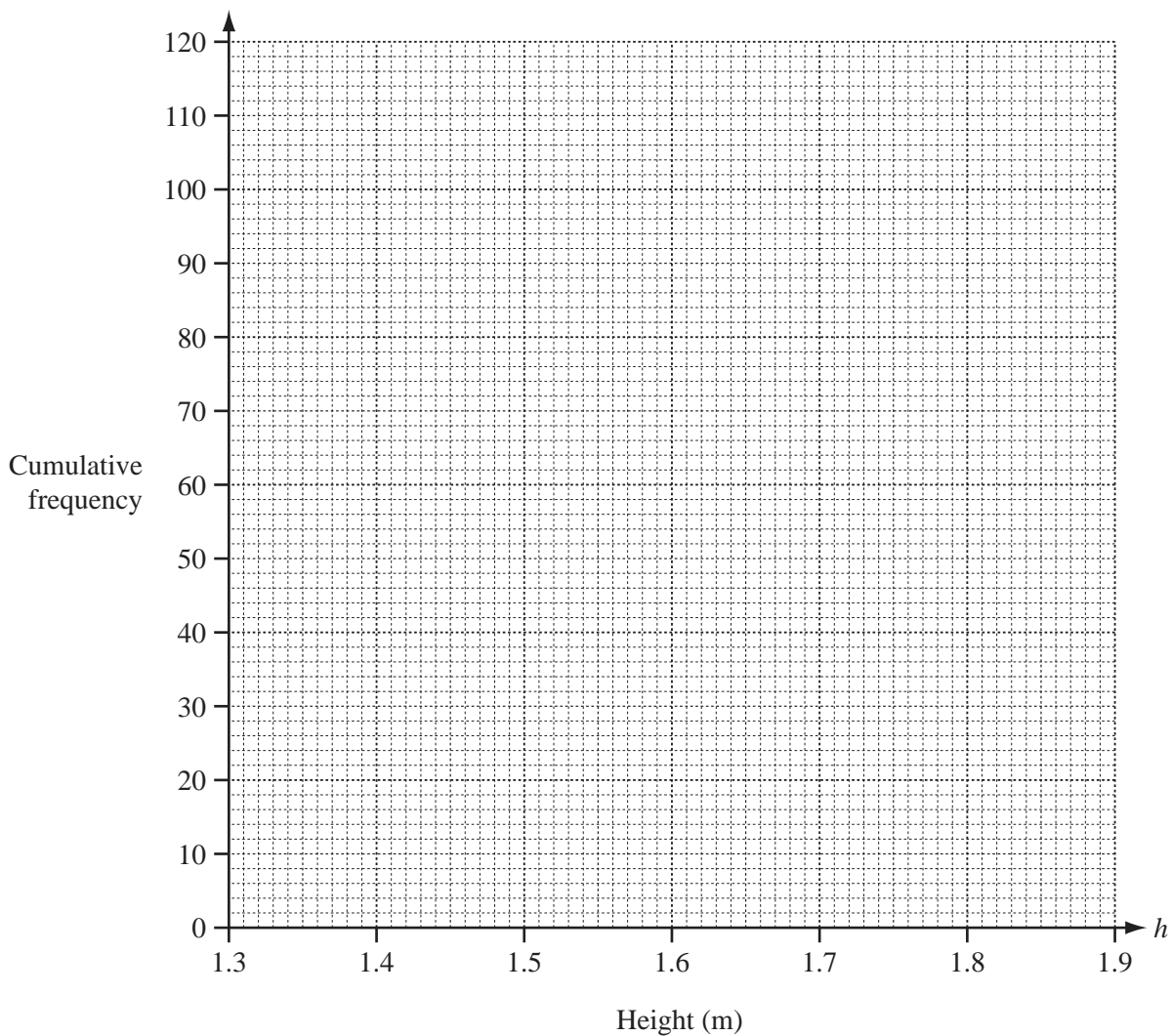
Height (m) [3]

(d) Use your graph to find

(i) the median height,

Answer(d)(i) .... m [1]

(ii) the 30th percentile.

Answer(d)(ii) .... m [1]

4

8 cm   *s*

r

2.7 cm

20 cm

NOT TO
SCALE
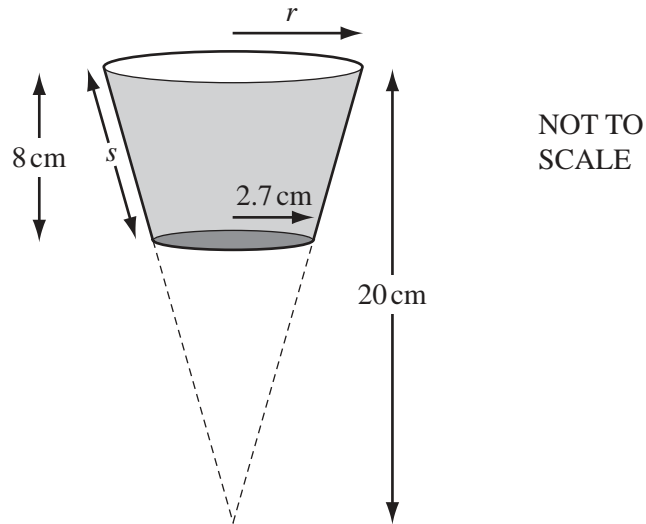
The diagram shows a plastic cup in the shape of a cone with the end removed.
The vertical height of the cone in the diagram is 20 cm.
The height of the cup is 8 cm.
The base of the cup has radius 2.7 cm.

(a) (i) Show that the radius, *r*, of the circular top of the cup is 4.5 cm.

Answer(a)(i)

[2]

(ii) Calculate the volume of water in the cup when it is full.

[The volume, *V*, of a cone with radius *r* and height *h* is $V = \dfrac{1}{3}\pi r^2 h$.]

Answer(a)(ii) .... cm³ [4]

(b) (i) Show that the slant height, *s*, of the cup is 8.2 cm.

Answer(b)(i)

[3]

(ii) Calculate the curved surface area of the outside of the cup.
[The curved surface area, *A*, of a cone with radius *r* and slant height *l* is $A = \pi rl$.]

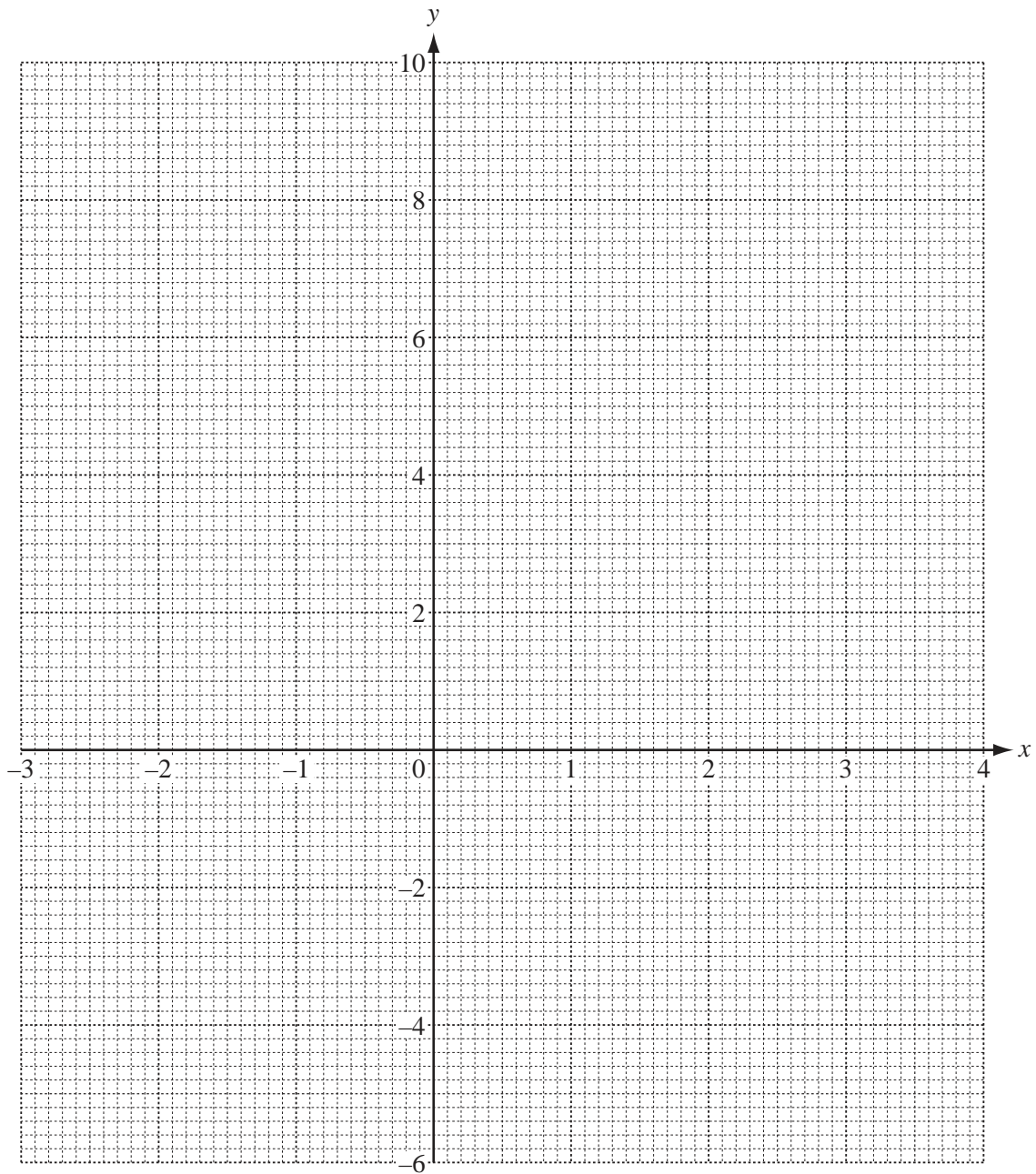*Answer(b)*(ii) .... cm^2 [5]

5 **(a)** Complete the table for the function $f(x) = \dfrac{x^3}{2} - 3x - 1$.

x	-3	-2	-1.5	-1	0	1	1.5	2	3	3.5
$f(x)$	-5.5		1.8	1.5		-3.5	-3.8	-3		9.9

[3]

(b) On the grid draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant 3.5$.

[4]

(c) Use your graph to

    (i) solve f(x) = 0.5,

$$Answer(c)\text{(i)} \ x = \ \text{..........} \quad \text{or} \ x = \ \text{...........} \quad \text{or} \ x = \ \text{..........} \quad \text{[3]}$$

    (ii) find the inequalities for k, so that f(x) = k has only 1 answer.

$$Answer(c)\text{(ii)} \ k < \ \text{.......................................}$$

$$k > \ \text{...................................} \quad \text{[2]}$$

(d) (i) On the same grid, draw the graph of $\ y = 3x - 2 \ $ for $\ -1 \leqslant x \leqslant 3.5$.   [3]

    (ii) The equation $\dfrac{x^3}{2} - 3x - 1 = 3x - 2$ can be written in the form $x^3 + ax + b = 0$.
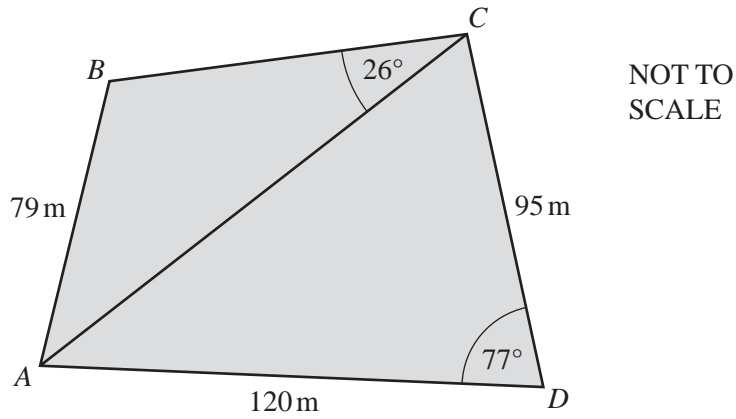
    Find the values of a and b.

$$Answer(d)\text{(ii)} \ a = \ \text{.............} \quad \text{and} \ b = \ \text{.............} \quad \text{[2]}$$

    (iii) Use your graph to find the **positive** answers to $\dfrac{x^3}{2} - 3x - 1 = 3x - 2$ for $-3 \leqslant x \leqslant 3.5$.

$$Answer(d)\text{(iii)} \ x = \ \text{............} \quad \text{or} \ x = \ \text{.............} \quad \text{[2]}$$

6

The quadrilateral *ABCD* represents an area of land.
There is a straight road from *A* to *C*.
AB = 79 m, *AD* = 120 m and *CD* = 95 m.
Angle *BCA* = 26° and angle *CDA* = 77°.

(a) Show that the length of the road, *AC*, is 135 m correct to the nearest metre.

Answer(a)

[4]

(b) Calculate the size of the **obtuse** angle *ABC*.

Answer(b) Angle *ABC* = ... [4]

(c) A straight path is to be built from *B* to the nearest point on the road *AC*.

Calculate the length of this path.

Answer(c) .... m [3]
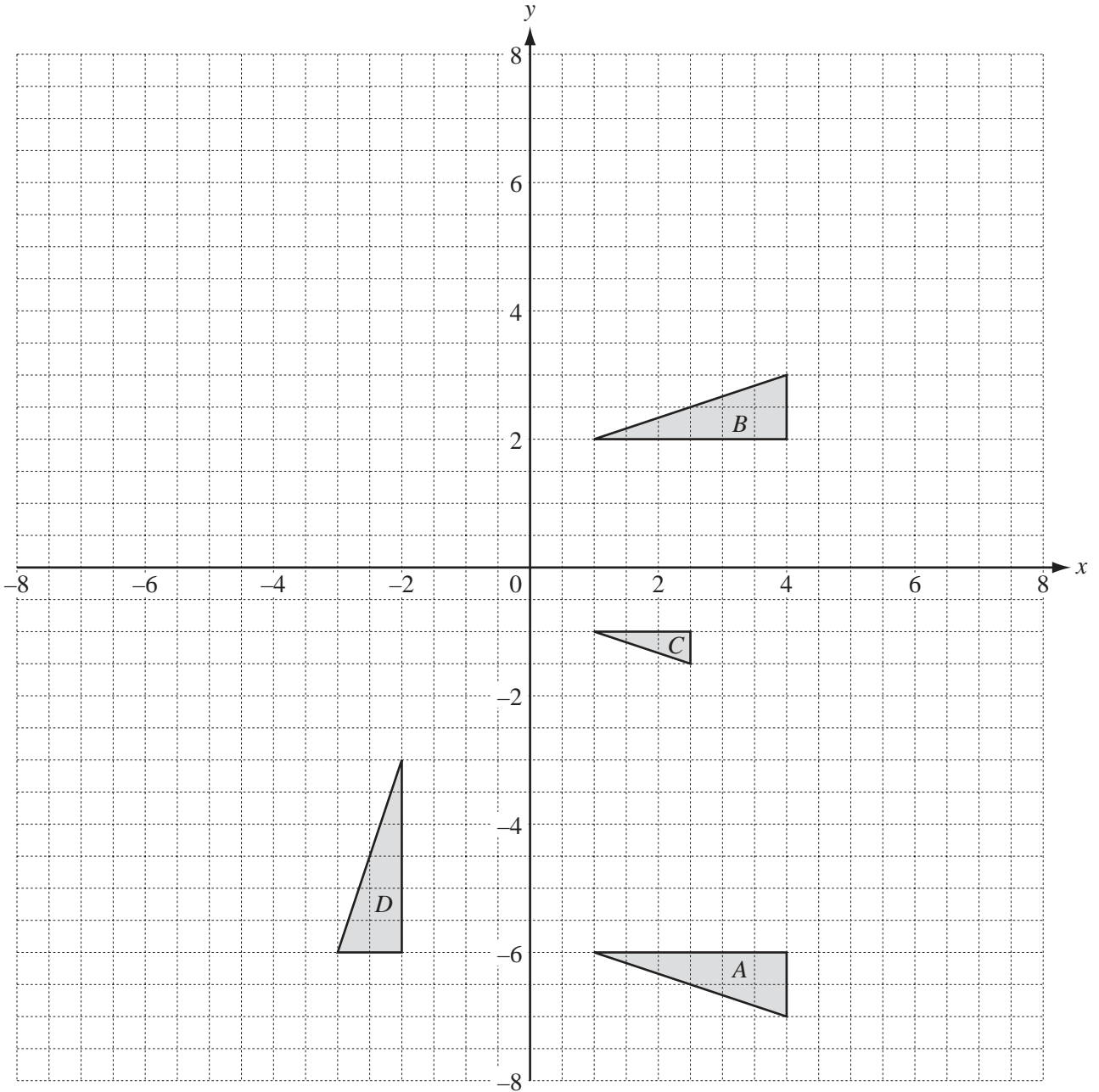
(d) Houses are to be built on the land in triangle *ACD*.
Each house needs at least $180\,\text{m}^2$ of land.

Calculate the maximum number of houses which can be built.
Show all of your working.

Answer(d) .... [4]

7

(a) Describe fully the **single** transformation which maps

   (i) triangle *A* onto triangle *B*,

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

   (ii) triangle *A* onto triangle *C*,

   Answer(a)(ii) .... [3]

   (iii) triangle *A* onto triangle *D*.

   Answer(a)(iii) .... [3]

(b) Draw the image of

    (i) triangle *B* after a translation of $\begin{pmatrix} -5 \\ 2 \end{pmatrix}$,   [2]

    (ii) triangle *B* after a transformation by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$.   [3]

(c) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$.

Answer(c) ....

.... [3]

8 Mr Chang hires x large coaches and y small coaches to take 300 students on a school trip.
Large coaches can carry 50 students and small coaches 30 students.
There is a maximum of 5 large coaches.

   (a) Explain clearly how the following two inequalities satisfy these conditions.
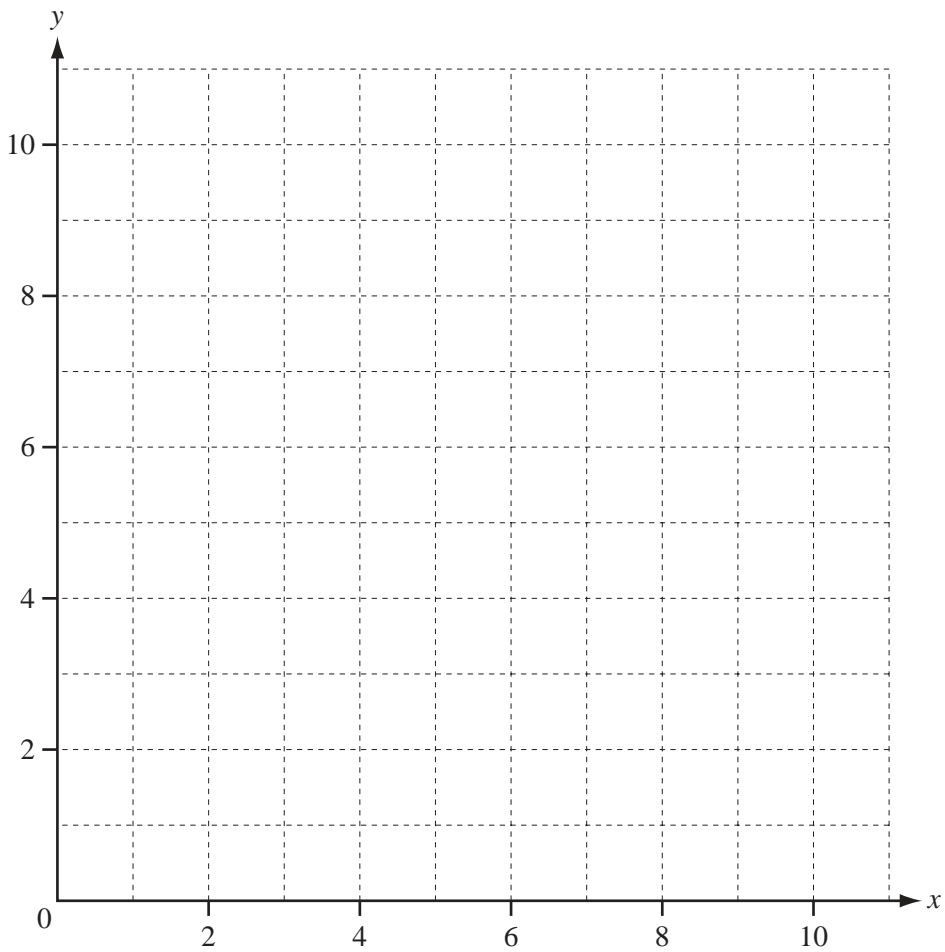
   (i) $x \leqslant 5$

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

   (ii) $5x + 3y \geqslant 30$

   Answer(a)(ii) ....

   .... [2]

Mr Chang also knows that $x + y \leqslant 10$.

   (b) On the grid, show the information above by drawing three straight lines and shading the **unwanted** regions.

[5]

(c) A large coach costs $450 to hire and a small coach costs $350.

    (i) Find the number of large coaches and the number of small coaches that would give the minimum hire cost for this school trip.

Answer(c)(i) Large coaches ....

Small coaches .... [2]

    (ii) Calculate this minimum cost.

Answer(c)(ii) $ .... [1]

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9 The number, *P*, of penguins in a colony, *t* years after the year 2000, is given by

$$P = 2500 \times 1.02^{t}.$$

(a) **(i)** How many penguins were in the colony in the year 2000?

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

    (ii) What information is given by 1.02 in the formula?

Answer(a)(ii) ....

.... [1]

(b) Using trial and improvement, or otherwise, find in which year the number of penguins in the colony will first be greater than 5000.

Answer(b) .... [3]

Question 10 is printed on the next page.

10 (a) John wants to estimate the value of π.
He measures the circumference of a circular pizza as 105 cm and its diameter as 34 cm, both correct to the nearest centimetre.

Calculate the lower bound of his estimate of the value of π.
Give your answer correct to 3 decimal places.

Answer (a) .... [4]

(b) The volume of a cylindrical can is 550 cm^3, correct to the nearest 10 cm^3.
The height of the can is 12 cm correct to the nearest centimetre.

Calculate the upper bound of the radius of the can.
Give your answer correct to 3 decimal places.

Answer (b) .... cm [5]