* 6293687201 *

Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

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MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO NOT WRITE IN ANY BARCODES.

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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **20** printed pages.

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1 **(a)** Last year a golf club charged \$1650 for a family membership.
This year the cost increased by 12%.

Calculate the cost of a family membership this year.

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

(b) The golf club runs a competition.
The total prize money is shared in the ratio 1st prize : 2nd prize = 9 : 5.
The 1st prize is \$500 more than the 2nd prize.

(i) Calculate the total prize money for the competition.

Answer(b)(i) \$ ..... [2]

(ii) What percentage of the total prize money is given as the 1st prize?

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

(c) For the members of the golf club the ratio men : children = 11 : 2.
The ratio women : children = 10 : 3.

(i) Find the ratio men : women.

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

(ii) The golf club has 24 members who are children.

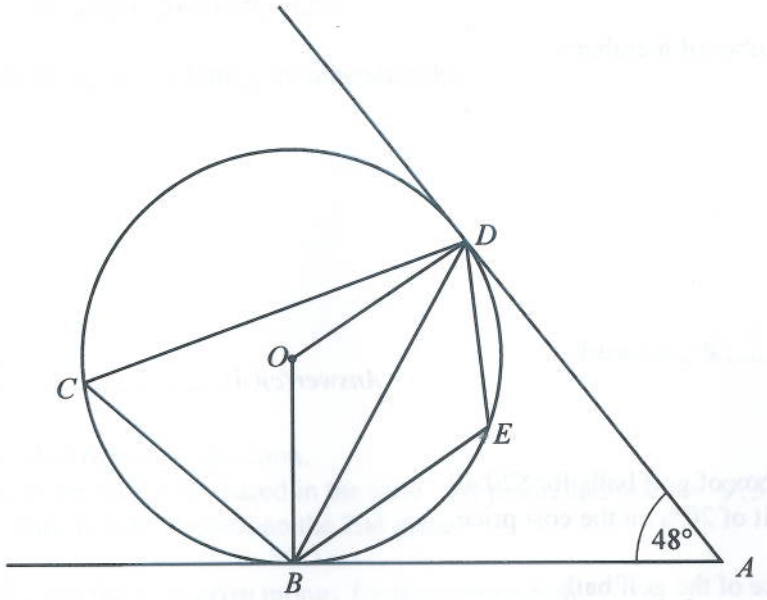
Find the total number of members.

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

(d) The club shop sold a box of golf balls for \$20.40 .
The shop made a profit of 20% on the cost price.

Calculate the cost price of the golf balls.

Answer(d) \$ ..... [3]



NOT TO SCALE

In the diagram, B, C, D and E lie on the circle, centre O.
AB and AD are tangents to the circle.
Angle $BAD = 48°$.

(a) Find

(i) angle ABD,

Answer(a)(i) Angle ABD = ... [1]

(ii) angle OBD,

Answer(a)(ii) Angle OBD = ... [1]

(iii) angle BCD,

Answer(a)(iii) Angle BCD = ... [2]

(iv) angle BED.

Answer(a)(iv) Angle BED = ... [1]

(b) The radius of the circle is 15 cm.

Calculate the area of triangle BOD.

Answer(b) ..... cm^2 [2]

(c) Give a reason why $ABOD$ is a cyclic quadrilateral.

Answer(c) .....

..... [1]

3 On the first part of a journey, Alan drove a distance of x km and his car used 6 litres of fuel.

The rate of fuel used by his car was $\frac{600}{x}$ litres per 100 km.

(a) Alan then drove another $(x + 20)$ km and his car used another 6 litres of fuel.

(i) Write down an expression, in terms of x, for the rate of fuel used by his car on this part of the journey.
Give your answer in litres per 100 km.

Answer(a)(i) ..... litres per 100 km [1]

(ii) On this part of the journey the rate of fuel used by the car **decreased** by 1.5 litres per 100 km.

Show that $x^2 + 20x - 8000 = 0$.

Answer(a)(ii)

[4]

(b) Solve the equation $x^2 + 20x - 8000 = 0$.

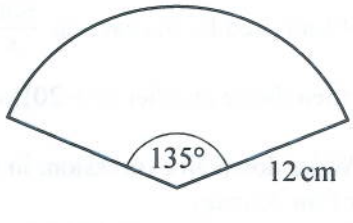
Answer(b) $x =$ ..... or $x =$ ..... [3]

(c) Find the rate of fuel used by Alan's car for the complete journey.
Give your answer in litres per 100 km.

Answer(c) ..... litres per 100 km [2]

4 **(a)** A sector of a circle has radius 12 cm and an angle of 135°.

(i) Calculate the length of the arc of this sector.
Give your answer as a multiple of π.

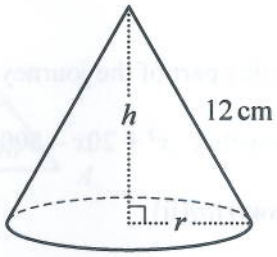


NOT TO SCALE

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

(ii) The sector is used to make a cone.

(a) Calculate the base radius, r.



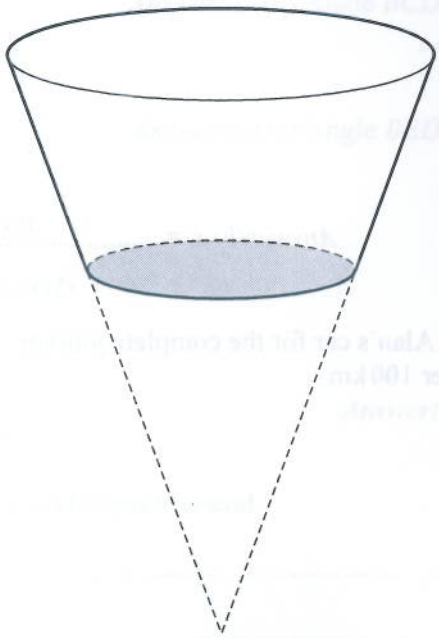
NOT TO SCALE

Answer(a)(ii)(a) r = ... cm [2]

(b) Calculate the height of the cone, h.

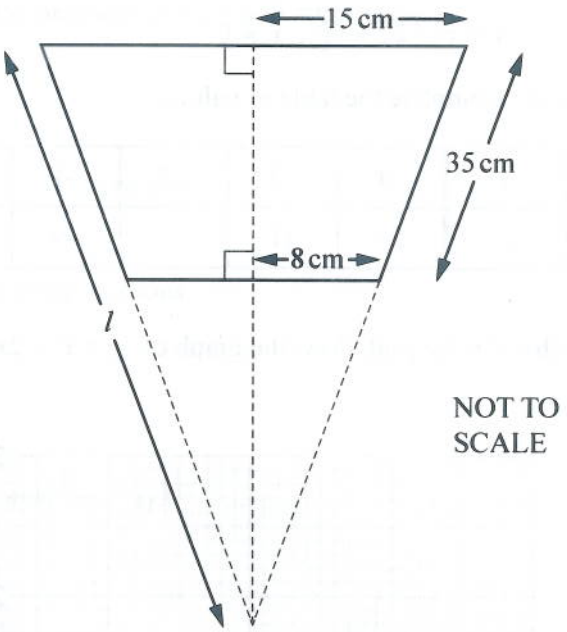
Answer(a)(ii)(b) h = ... cm [3]

(b) The diagram shows a plant pot.
It is made by removing a small cone from a larger cone and adding a circular base.



NOT TO SCALE

This is the cross section of the plant pot.



(i) Find l.

Answer(b)(i) l = ... cm [3]

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

Answer(b)(ii) ..... cm^2 [3]

(c) Some cones are mathematically similar.
For these cones, the mass, M grams, is proportional to the cube of the base radius, r cm.
One of the cones has mass 1458 grams and base radius 4.5 cm.

(i) Find an expression for M in terms of r.

Answer(c)(i) M = ... [2]

(ii) Two of the cones have radii in the ratio 2 : 3.

Write down the ratio of their masses.

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

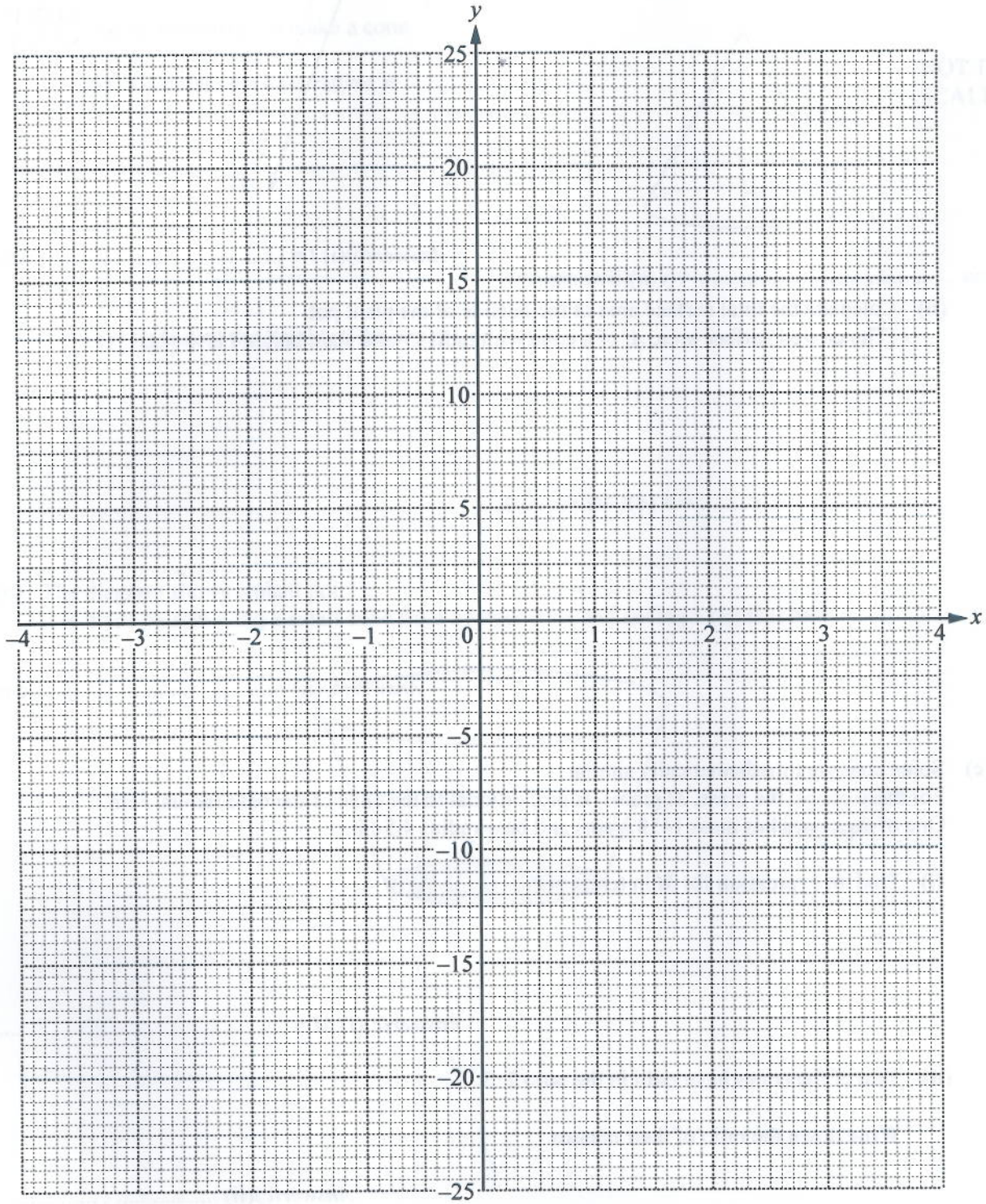
5 $y = x^2 - 2x + \frac{12}{x}$, $x \neq 0$

(a) Complete the table of values.

x	–4	–3	–2	–1	–0.5	0.5	1	2	3	4
y	21	11		–9	–22.75	23.25	11	6		11

[2]

(b) On the grid, draw the graph of $y = x^2 - 2x + \frac{12}{x}$ for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.



[5]

(c) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point (1, 11).

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

(d) The equation $x^2 - 2x + \frac{12}{x} = k$ has exactly two distinct solutions.

Use the graph to find

(i) the value of k,

Answer(d)(i) k = ... [1]

(ii) the solutions of $x^2 - 2x + \frac{12}{x} = k$.

Answer(d)(ii) x = ... or x = ... [2]

(e) The equation $x^3 + ax^2 + bx + c = 0$ can be solved by drawing the line $y = 3x + 1$ on the grid.

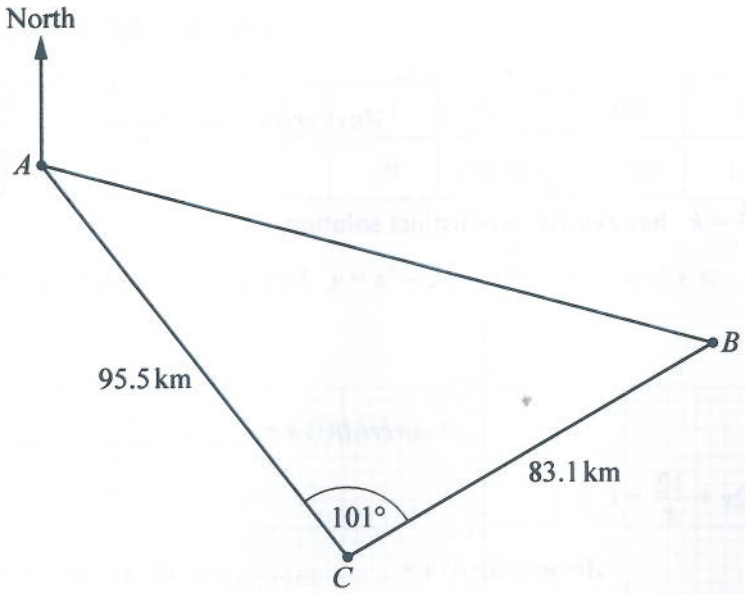
Find the value of a, the value of b and the value of c.

Answer(e) a = ...

b = ...

c = ... [3]

6 The diagram shows the positions of two ships, A and B, and a coastguard station, C.



NOT TO SCALE

(a) Calculate the distance, AB, between the two ships.
Show that it rounds to 138 km, correct to the nearest kilometre.

Answer(a)

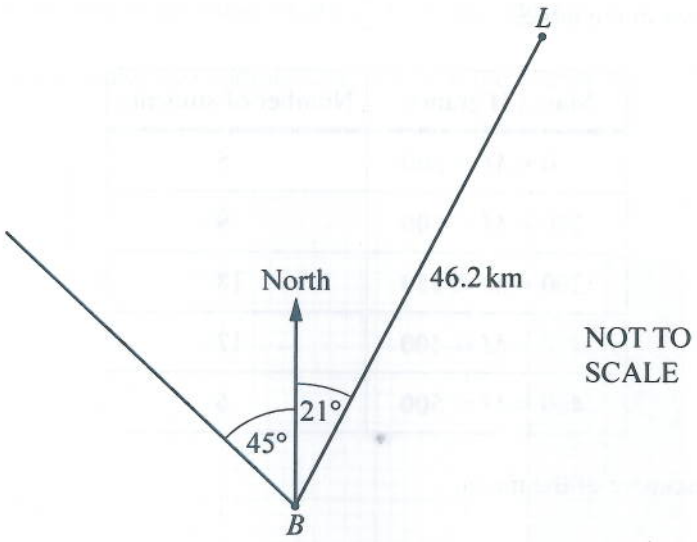
[4]

(b) The bearing of the coastguard station C from ship A is 146°.

Calculate the bearing of ship B from ship A.

Answer(b) ..... [4]

(c)



At noon, a lighthouse, L, is 46.2 km from ship B on the bearing 021°.
Ship B sails north west.

Calculate the distance ship B must sail from its position at noon to be at its closest distance to the lighthouse.

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

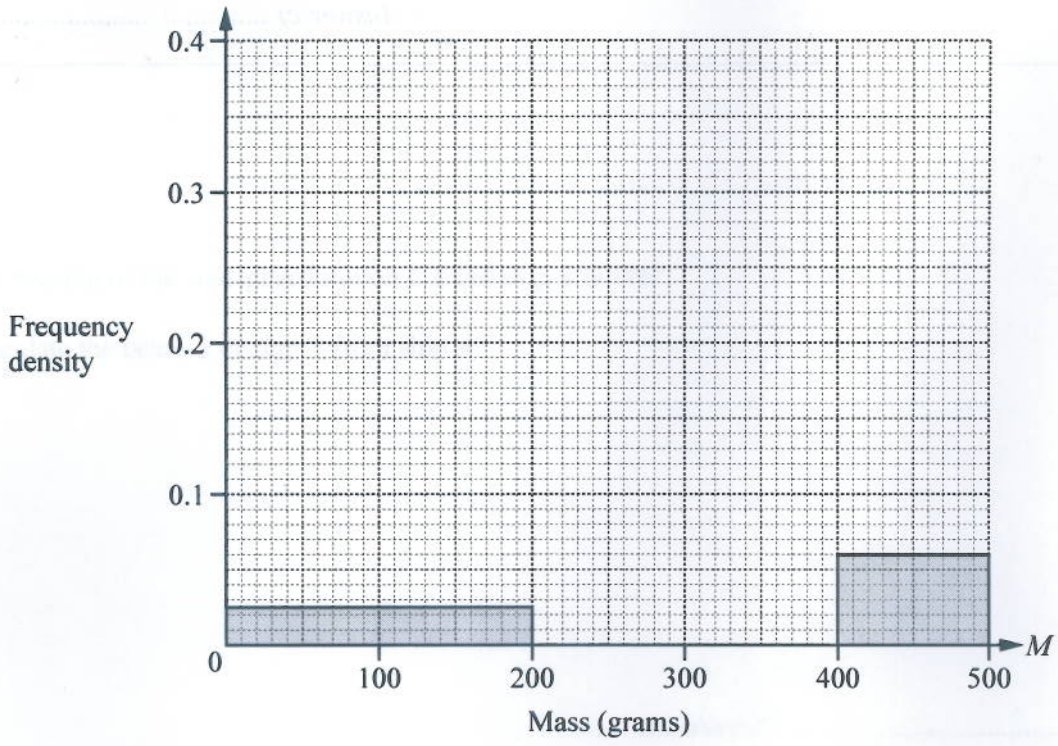
7 **(a)** A group of 50 students estimated the mass, M grams, of sweets in a jar.
The results are shown in the table.

Mass (M grams)	Number of students
$0 < M \leqslant 200$	5
$200 < M \leqslant 300$	9
$300 < M \leqslant 350$	18
$350 < M \leqslant 400$	12
$400 < M \leqslant 500$	6

(i) Calculate an estimate of the mean.

Answer(a)(i) ..... grams [4]

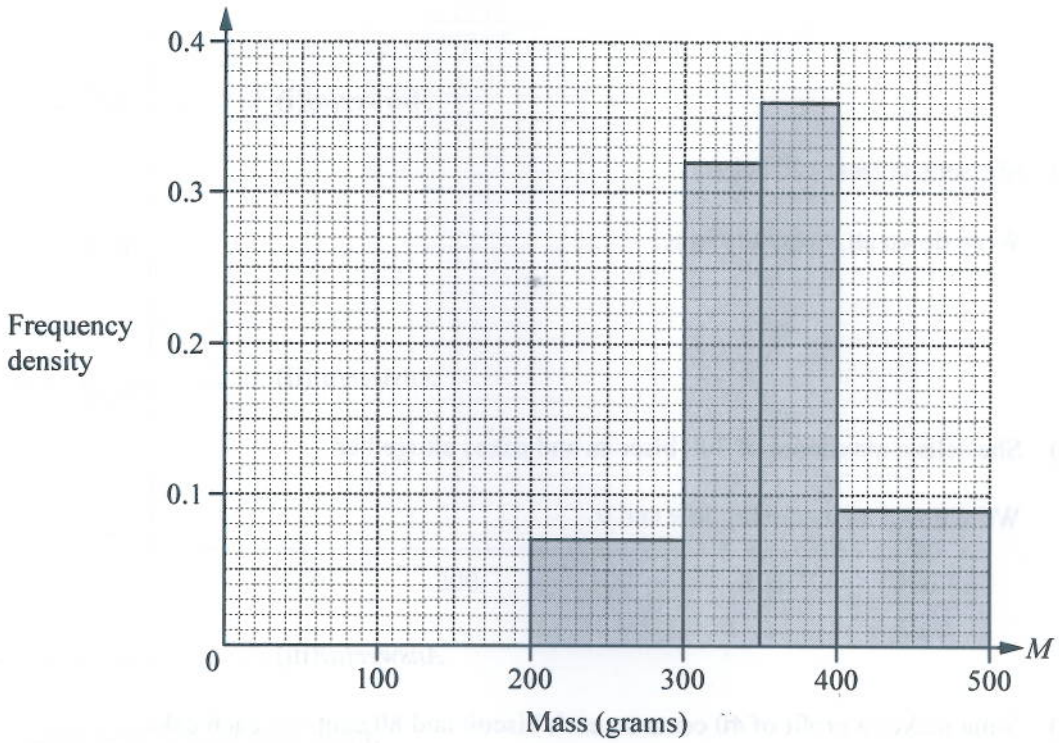
(ii) Complete this histogram to show the information in the table.



[3]

(b) A group of 50 adults also estimated the mass, M grams, of the sweets in the jar.
The histogram below shows information about their estimates.

Use the histograms to make two comparisons between the distributions of the estimates of the students and the adults.



Answer(b)

1 .....

.....

2 .....

..... [2]

8 Sima sells x biscuits and y cakes.

(a) (i) She sells at least 100 biscuits.

Write down an inequality in x.

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

(ii) She sells at least 120 cakes.

Write down an inequality in y.

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

(iii) She sells a maximum of 300 biscuits and cakes altogether.

Write down an inequality in x and y.

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

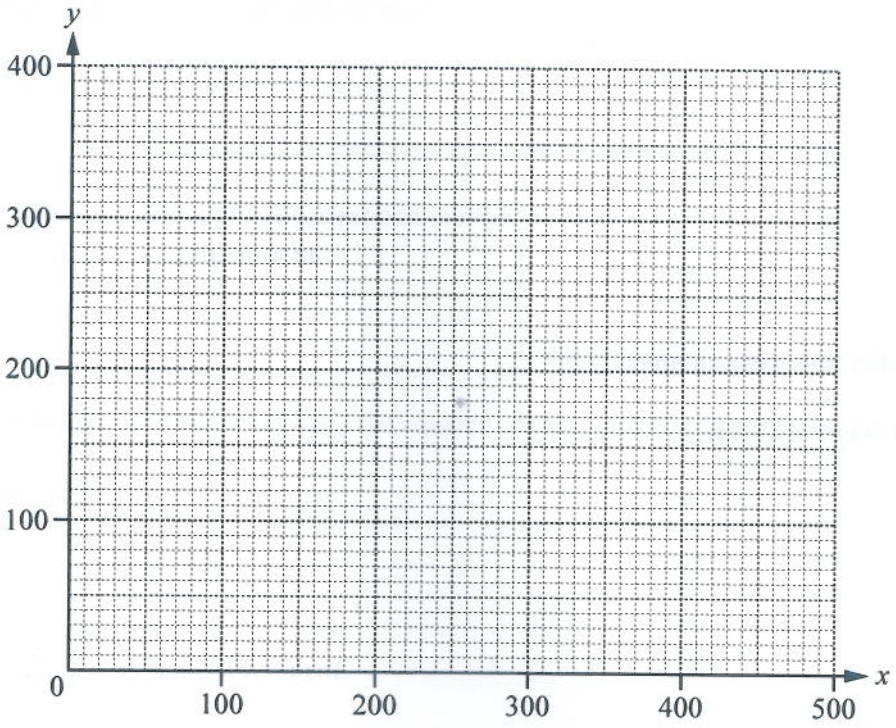
(iv) Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake.
Her total profit is at least \$160.

Show that $x + 2y \geqslant 400$.

Answer(a)(iv)

[1]

(b) On the grid, draw four lines to show the four inequalities and shade the unwanted regions.



[6]

(c) Calculate Sima's maximum profit.
Give your answer in dollars.

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

9 **(a)** Expand and simplify.

$$3x(x-2)-2x(3x-5)$$

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

(b) Factorise the following completely.

(i) $6w+3wy-4x-2xy$

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

(ii) $4x^2-25y^2$

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

(c) Simplify.

$$\left(\frac{16}{9x^4}\right)^{-\frac{3}{2}}$$

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

(d) n is an integer.

(i) Explain why $2n - 1$ is an odd number.

Answer(d)(i) .....

..... [1]

(ii) Write down, in terms of n, the next odd number after $2n - 1$.

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

(iii) Show that the difference between the squares of two consecutive odd numbers is a multiple of 8.

Answer(d)(iii)

[3]

10 (a) $\overrightarrow{PQ} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$

(i) Find the value of $|\overrightarrow{PQ}|$.

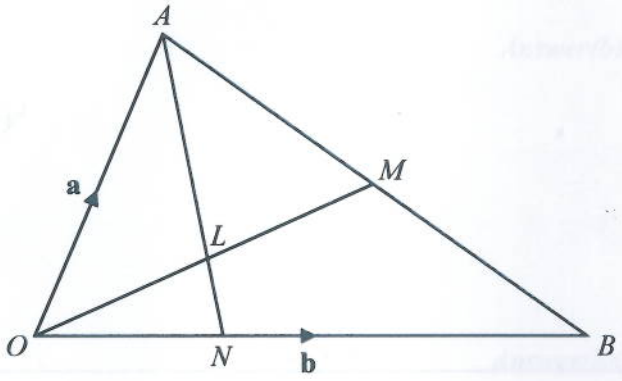
Answer(a)(i) $|\overrightarrow{PQ}|$ = ... [2]

(ii) Q is the point (2, –3).

Find the co-ordinates of the point P.

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

(b)



NOT TO SCALE

In the diagram, M is the midpoint of AB and L is the midpoint of OM.
The lines OM and AN intersect at L and $ON = \frac{1}{3}OB$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(i) Find, in terms of **a** and **b**, in its simplest form,

(a) $\overrightarrow{OM}$,

Answer(b)(i)(a) $\overrightarrow{OM}$ = ... [2]

(b) $\overrightarrow{OL}$,

Answer(b)(i)(b) $\overrightarrow{OL}$ = ... [1]

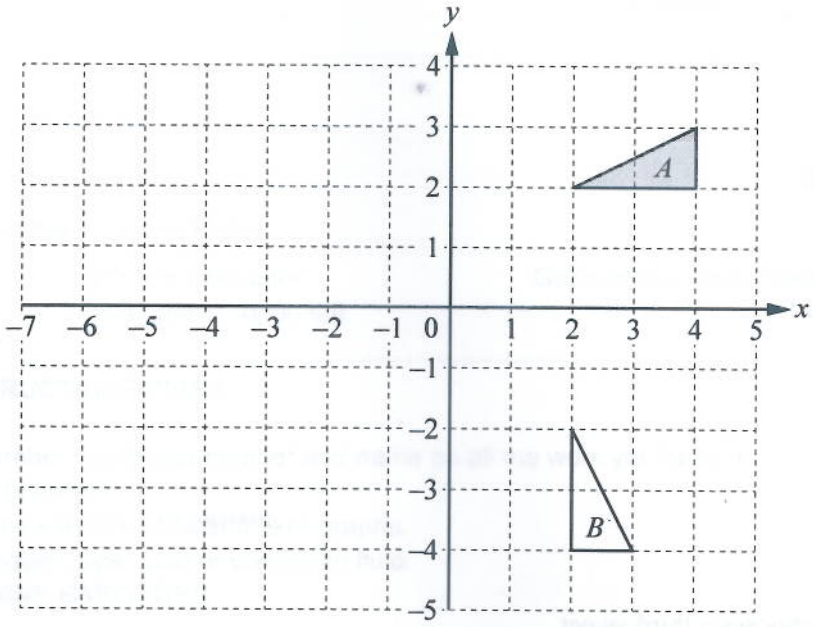
(c) $\overrightarrow{AL}$.

Answer(b)(i)(c) $\overrightarrow{AL}$ = ... [2]

(ii) Find the ratio $AL : AN$ in its simplest form.

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

(c)



(i) On the grid, draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix}$. [3]

(ii) Find the 2×2 matrix which represents the transformation that maps triangle A onto triangle B.

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

Question 11 is printed on the next page.

11 Gareth has 8 sweets in a bag.
4 sweets are orange flavoured, 3 are lemon flavoured and 1 is strawberry flavoured.

(a) He chooses two of the sweets at random.

Find the probability that the two sweets have different flavours.

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

(b) Gareth now chooses a third sweet.

Find the probability that **none** of the three sweets is lemon flavoured.

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