Candidate Name | Centre Number | Candidate Number

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ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/2

PAPER 2

JUNE 2020 SESSION 2 hours 30 minutes

Candidates answer on the question paper

Additional materials:
Mathematical Instruments
Mathematical Tables
Non programmable Electronic Calculator

Allow candidates 5 minutes to count pages before the examination.
This booklet should not be punched or stapled and pages should not be removed.
Time 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and candidate number in the spaces at the top of this page.
Write your Centre and Candidate number in the box on the top right corner of every page of this paper.
Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.
Answer **all questions** in Section A and **any four questions** from Section B.
Write your answers in the spaces provided on the question paper using **black** or **blue** pens.
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.
Decimal answers which are not exact should be given correct to three significant figures unless stated otherwise.
Decimal answers in degrees should be given correct to one decimal place.
Mathematical tables and Electronic calculators may be used to evaluate explicit numerical expressions.

INFORMATION FOR CANDIDATES

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

This question paper consists of 26 printed pages and 2 blank page(s).

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SECTION A (52 Marks)

Answer **all** questions in this section

1 **(a)** The difference between two fractions is $3\frac{2}{3}$. The smaller fraction is $2\frac{1}{4}$.

Find the other fraction.

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

(b) The population of a certain country is 24,9 million.
Express this population in standard form.

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

(c) Increase $40,00 in the ratio 8:5.

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

(d) Evaluate $(7\sqrt{5})^2$.

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

(e) Simplify $11011_2 + 243_5$, giving the answer in base five.

Answer (e) ..... [3]

2 **(a)** Two similar cups have diameters of 6 cm and 10 cm.

(i) Write down the ratio of their volumes.

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

(ii) Given that the volume of the smaller cup is 100 cm^3, calculate the volume of the larger cup.

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

(b) A wooden block is in the form of a prism whose cross-section is a parallelogram with base 35 cm, perpendicular height 20 cm and length 1,2 m.
Calculate the

(i) surface area of the cross-section of the block.

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

(ii) volume of the block,

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

(iii) mass of the block if 3 cm^3 of the block weigh 2,5 g.

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

3 **(a)** Find the value of y for which $\begin{pmatrix} y & 4 \end{pmatrix} \begin{pmatrix} -2 \\ 3 \end{pmatrix} = (-2)$

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

(b) Find the matrix **P** such that $P\begin{pmatrix} 3 & -4 \\ 2 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

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

(c) The equation of a straight line is $y + 3x = -4$
Find the

(i) coordinates of the point where the line crosses the y-axis.

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

(ii) gradient of the line.

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

(iii) equation of a line parallel to the line $y + 3x = -4$ and passing through the point (3; 5).

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

4 **Answer the whole of this question on the blank space below.**

Use ruler and compasses only for all constructions and show clearly all construction lines and arcs.

All constructions should be done on a single diagram.

(a) Construct

(i) triangle ABC in which AB = 7 cm, $B\hat{A}C = 45°$, BC = 8 cm,
Answer (a)(i) on the diagram ..... [4]

(ii) the locus of points equidistant from B and C,
Answer (a)(ii) on the diagram ..... [2]

.....

(iii) the locus of points 5 cm from C.

Answer (a)(iii) on the diagram ..... [1]

.....

(b) A point R in triangle ABC is such that it is nearer B than C and is less than 5 cm from C.
Show by shading, the region in which R must lie.

Answer (b) on the diagram ..... [2]

.....

(c) Measure and write down the size of $A\hat{B}C$.

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

.....

5 **(a)** Show that the equation $x - 3 = \frac{5}{3x}$ reduces to $3x^2 - 9x - 5 = 0$.
Answer (a).

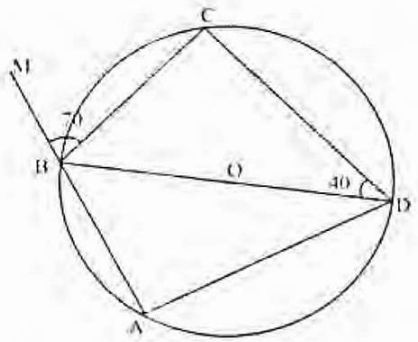
..... [2]

(b) Solve the equation $3x^2 - 9x - 5 = 0$.
Give the answers correct to 2 decimal places.

Answer (b) .....

..... [5]

(c)



In the diagram, ABCD is a cyclic quadrilateral with centre O. AB is produced to M.

$M\hat{B}C = 70°$ and $B\hat{D}C = 40°$.

Find

(i) $B\hat{C}D$.

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

(ii) $A\hat{B}D$.

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

(iii) $A\hat{D}O$

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

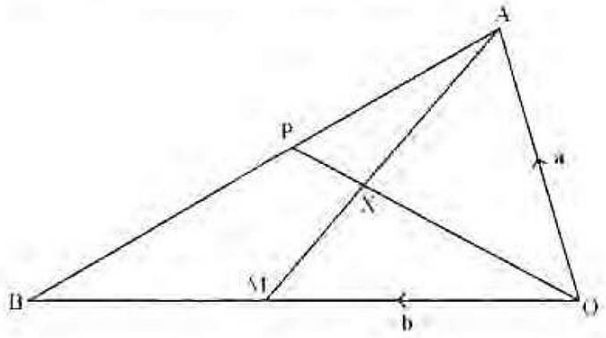
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SECTION B (48 Marks)

Answer **any four** questions from this section.

Each question carries 12 marks

6



In the diagram, ABO is a triangle in which M is the mid-point of OB and N lies on AB such that $AN = \frac{1}{5}AB$. ON and AM intersect at X.

$\vec{OA} = a$ and $\vec{OB} = b$.

(a) Express, in terms of a and/or b

(i) $\vec{OX}$.

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

(ii) $\vec{AN}$.

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

(iii) $\vec{ON}$.

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

(iv) $\vec{AM}$.

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

(b) Given that $\vec{AX} = h\ \vec{AM}$, show that $\vec{OX} = (1-h)\,a + \frac{1}{2}hb$.

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

.....

.....

(c) If $\vec{OX} = k\ \vec{ON}$, express $\vec{OX}$ in terms of a, b and k.

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

(d) Use the results of (b) and (c) to find the numerical values of h and k.

Answer (d) .....

..... [3]

(e) Hence, or otherwise find the ratio of area of triangle OAX to area of triangle OAM.

Answer (e) ..... [1]

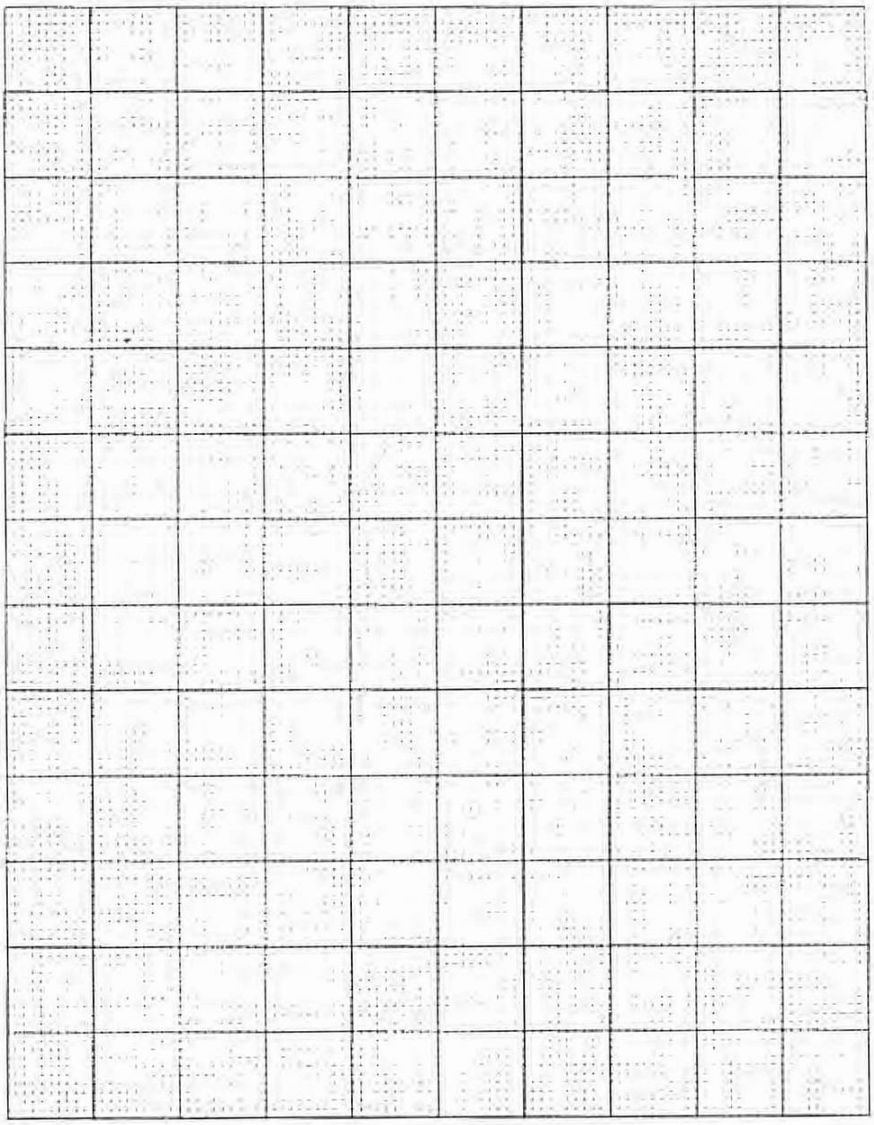
(d) Use the results of (b) and (c) to find the numerical values of h and k.

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

(e) Hence, or otherwise find the ratio of area of triangle OAX to area of triangle OAM.

Answer (e) ..... [1]

7 Answer the whole of this question on the grid below. Use a scale of 2 cm to 1 unit on both axes.



(a) Triangle PQR has vertices at P(1; 3), Q(2; 1) and R(4; 3).
Draw and label triangle PQR.

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

.....

(b) Triangle $P_1Q_1R_1$ is the image of triangle PQR under a reflection in the line $y = -x$.

(i) Draw the line $y = -x$.

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

(ii) Draw and label triangle $P_1Q_1R_1$.

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

(iii) A transformation, G, maps triangle PQR onto triangle $P_2Q_2R_2$ with vertices at P_2 (1; –6), Q_2 (2; –2) and R_2 (4; –6).

Draw and label triangle $P_2Q_2R_2$.

Answer(b)(iii) on diagram ..... [1]

(iv) Describe **fully** the single transformation, G, which maps triangle PQR onto triangle $P_2Q_2R_2$.

Answer(b)(iv) .....

.....

..... [3]

(c) The point R_3 (–1; 2) is the image of R under a translation.

(i) Find the translation vector.

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

(ii) Write down the coordinates of P_3 and Q_3 the images of P and Q respectively, under the same translation.

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

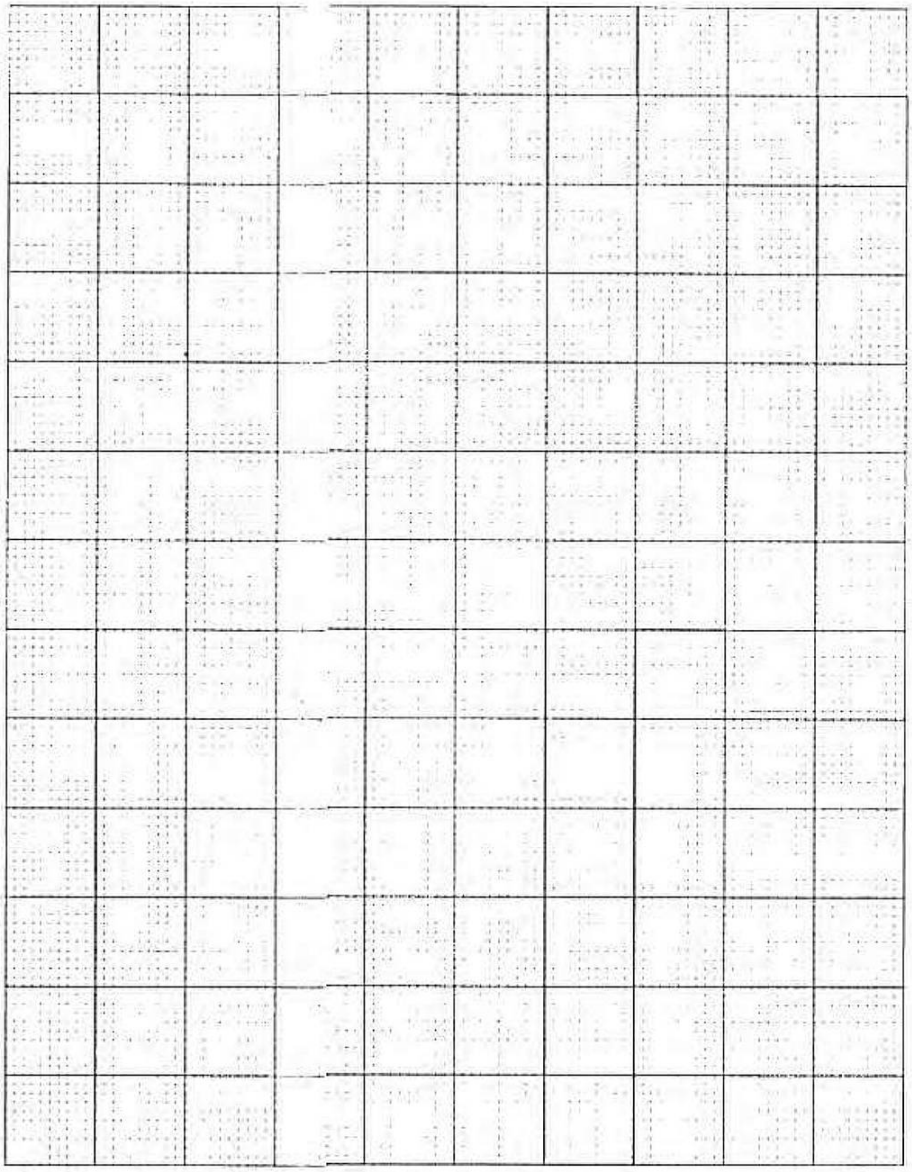
8 The following is a table of values for the function $y = x^3 - 3x^2$.

x	−2	−1	0	1	2	3	4
y	−20	m	0	−2	−4	0	16

(a) Find the value of m.

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

Answer this part of the question on the grid below. Use a scale of 2 cm to 1 unit on the x axis and 2 cm to 5 units on the y axis.



(b) Draw the graph of $y = x^3 - 3x^2$.

Answer (b) on the diagram ..... [4]

(c) Use the graph to find an estimate the

(i) gradient of the curve at the point where $x = 3$.

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

(ii) area bounded by the curve, the y-axis and the line $y = -12$.

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

.....

(d) Write down, from the graph, the range of values of x when the curve has a negative gradient.

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

(e) Use the graph to solve the equation $x^3 - 3x^2 = 2$, for positive values of x.

Answer (e) .....

..... [2]

9 **(a)** Factorise completely

(i) $x^2 - 4$.

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

(ii) $x^2 - 5x + 6$.

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

(iii) Hence or otherwise find the Highest Common Factor (H.C.F.) of $x^2 - 4$ and $x^2 - 5x + 6$.

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

(b) It is given that $S = \frac{a}{1 - r}$.

(i) Find the value of S when $a = 81$ and $r = \frac{1}{3}$.

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

(ii) Make T the subject of the formula.

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

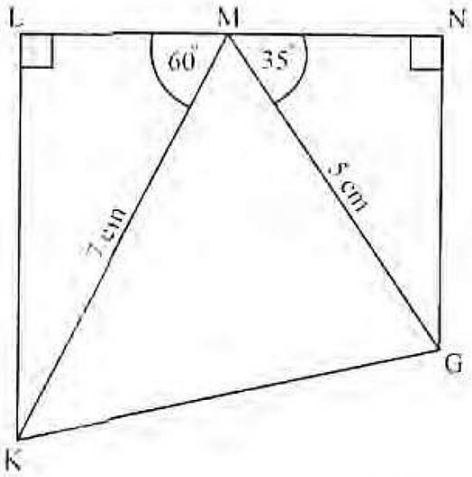
(c) From a group of 30 people at a party, it was observed that 17 people ate beef, 16 people ate pork, x people ate both beef and pork and 6 people ate neither beef nor pork.
Calculate x, the number of people who ate both beef and pork.

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

Candidate Name | Centre Number | Candidate Number

20

10



In the diagram KLNG is a trapezium in which LMN is a straight line and $K\hat{L}M = M\hat{N}G = 90°$. MK = 7 cm, MG = 5 cm, $L\hat{M}K = 60°$ and $N\hat{M}G = 35°$. Calculate the

(a) length of NG.

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

(b) size of $K\hat{M}G$.

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

(c) area of triangle KMG,

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

(d) length of KG,

Answer (d) ..... [4]

(e) size of $\hat{MKG}$.

Answer (e) ..... [3]

11 A group of youths wishes to make and paint chairs and tables for sale.
Let x be the number of chairs and y the number of tables to be produced.

(a) The group wishes to produce at least 5 chairs and not less than 5 tables.
Write down two inequalities, one in x and the other in y, that satisfy these conditions.

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

(b) The group has 48 hours to make the chairs and tables.
If it takes 4 hours to make a chair and 3 hours to make a table, write down on inequality in x and y that satisfies this condition.

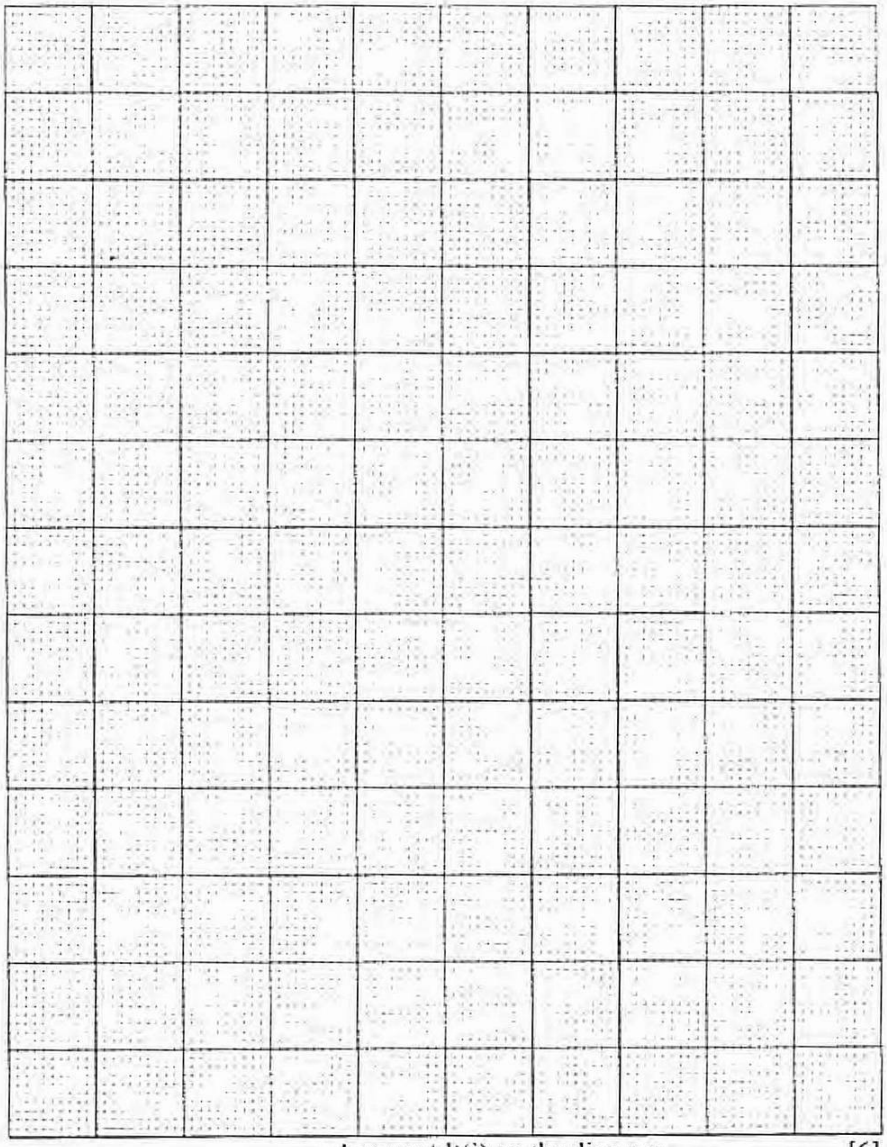
Answer (b) ..... [1]

(c) The group hired a compressor for 14 hours to paint the chairs and tables.
Given that it takes 1 hour to paint a chair and 1 hour to paint a table, form an inequality in x and y that satisfies this condition.

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

(d) The point $(x;\ y)$ represents x chairs and y tables.

(i) Construct and show by shading the **unwanted regions**, the region in which $(x\ ;\ y)$ must lie. Use a scale of 2 cm to 2 units on both axes.



Answer (d)(i) on the diagram ..... [6]

(ii) The profit on a chair is $10 and the profit on a table is $20.
Use the graph to find the greatest possible profit that can be made.

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

12 The table below shows the heights, $h$cm, of a group of 200 children.

Height (hcm)	$50 < h \leq 60$	$60 < h \leq 70$	$70 < h \leq 75$	$75 < h \leq 80$	$80 < h \leq 100$
Frequency	24	38	53	45	40
Frequency Density	2.4	3.8	10.6	p	q

(a) Find the value of

(i) p

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

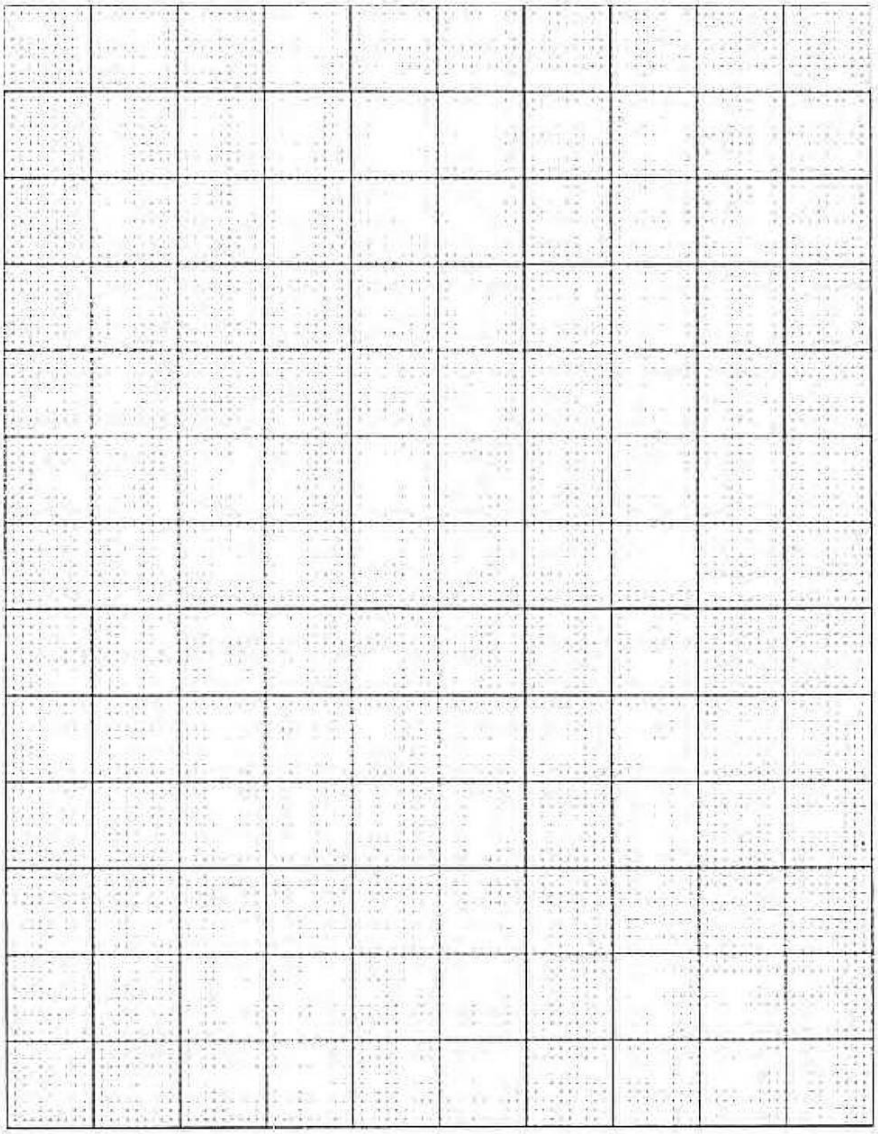
(ii) q

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

(b) Calculate an estimate of the mean height of the children.

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

(c) Draw a histogram to show the information in the table.
Use a scale of 2 cm to represent 10 units on the h axis and 2 cm to represent 2 units on the Frequency Density axis.



Answer (b) on the graph ..... [5]

(d) Two children are chosen at random from the group.
Find the probability that each has a height which is greater than 75 cm.

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

Candidate Name	Centre Number	Candidate Number

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