Surname	Forename(s)	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/2

PAPER 2

SPECIMEN PAPER 2 hours 30 minutes

Candidates answer on the question paper.
Additional materials: Geometrical instruments
Mathematical tables/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 and your Centre number and Candidate number on the top right corner of every page of this paper.

Answer **all** questions in **Section A** and any **four** from **Section B**.
Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.
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. Answers in degrees should be given to one decimal place.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
Mathematical tables or electronic calculators may be used to evaluate explicit numerical expressions.

This question paper consists of 30 printed pages and 2 blank pages.

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Section A [52 marks]

*Answer **all** the questions in this section.*

1 **(a)** Find the value of $\left(1\frac{3}{4}+2\frac{1}{3}\right) \div \frac{5}{6}$.

Answer ***(a)*** _____ [3]

(b) **(i)** Factorise completely $y^2+10y-24$,

Answer ***(b)*** ***(i)*** _____ [2]

(b) **(ii)** Factorise completely $27-3x^2$.

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

1 **(c)** It is given that $f(x) = 10 + 3x - x^2$.

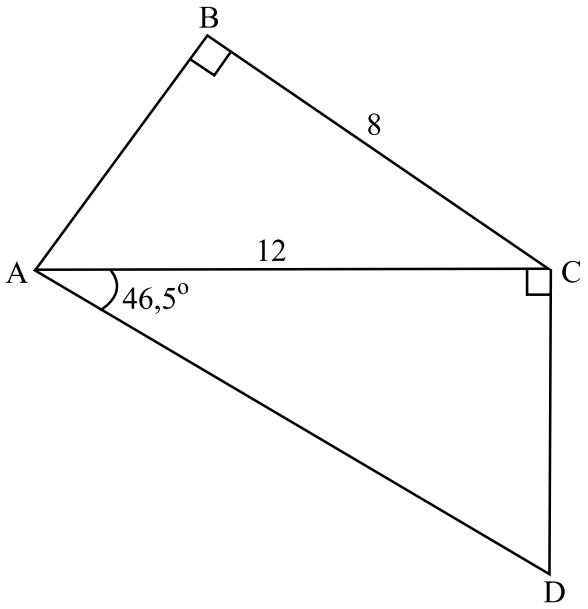
(i) Find, $f(2)$.

Answer (i) _____ [1]

(ii) Find the values of x when $f(x) = 0$.

Answer (ii) $x =$ _____ or _____ [3]

2 **(a)**



The diagram shows a quadrilateral ABCD with BC = 8 cm, AC = 12 cm $C\hat{A}D = 46{,}5°$ and $A\hat{B}C = A\hat{C}D = 90^{o}$.

(i) Calculate AB,

Answer ***(i)*** AB = _____cm [2]

2 **(a)** **(ii)** Calculate CD.

Answer ***(ii)*** CD = _____cm [2]

(a) **(iii)** Calculate the area of quadrilateral ABCD.

Answer ***(a)*** ***(iii)*** _____cm^2 [3]

2 **(b)** Four interior angles of a nonagon have a sum of 460°. The remaining interior angles are equal. Find the size of each of the remaining angles.

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

(c) A shop sells a refrigerator at $ 540. In the previous year the cost of the same type of a refrigerator was 8 % less.

Calculate the cost price of the same type of refrigerator in the previous year.

Answer ***(c)*** *$*_____ [2]

3 **(a)** It is given that $M = \begin{pmatrix} 8 & -4 \\ -5 & 3 \end{pmatrix}$ and $N = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$.

(i) Find MN.

Answer ***(a)*** ***(i)*** _____ [2]

(ii) Find M^{-1}, the inverse of M.

Answer ***(a)*** ***(ii)*** _____ [2]

(iii) Find M^2.

Answer ***(a)*** ***(iii)*** _____ [2]

3 **(b)** Express $\frac{2x - 1}{4} - \frac{3x - 5}{12}$ as a single fraction in its simplest form.

Answer ***(b)*** _____ [3]

(c) The area of a trapezium is 63 cm^2 and the sum of the lengths of its two parallel sides is 22,5 cm.

Calculate the perpendicular distance between the two parallel sides.

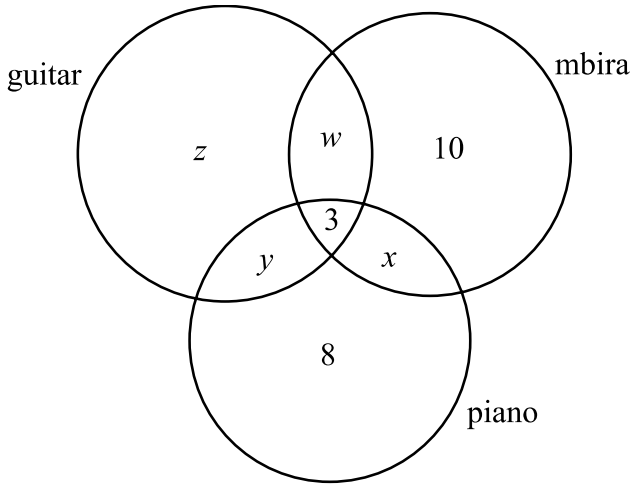
Answer ***(c)*** _____cm [2]

4 **(a)** In a survey, a class of 40 music students were taught to play mbira, piano and guitar. At the end of their course they were asked to state at least one of the three instruments they found enjoyable to play.

The table shows the students' choices.

type of instrument indicated as enjoyable	**number of students**
mbira	18
piano	14
guitar	20
mbira only	10
piano only	8
mbira and guitar	6
piano and mbira	5
guitar and piano	4
all the three	3

The Venn diagram shows some of the number of students in each subset.



4 **(a)** **(i)** Find the values of w, x, y and z.

Answer ***(a)*** *(i)* w = _____

x = _____

y = _____

z = _____ [4]

(i) If two students were selected at random from the class, find the probability that both enjoyed playing the guitar.

Answer ***(ii)*** _____ [2]

4 **(b)** Solve the equation $9^{m-1} = 27$.

Answer ***(b)*** m = _____ [3]

5 **Answer the whole of this question on page 13.**

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.

Line AB on page 13 is equal to 8 cm.

(a) Construct on a **single** diagram

(i) parallelogram ABCD with AB = 8 cm, BC = 10 cm, and $A\hat{B}C = 120°$.

(ii) the locus of points equidistant from B and C,

(iii) the bisector of $A\hat{B}C$.

[7]

(b) Mark and label the point X that lies on the bisector of $A\hat{B}C$ and is equidistant from B and C. [1]

(c) Describe the locus that the bisector of angle ABC represents. [2]

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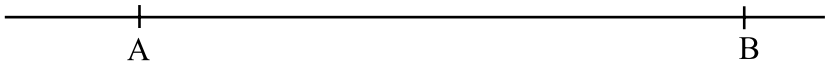


Answer ***(a)*** ***(i)*** on diagram [3]

(ii) on diagram [2]

(iii) on diagram [2]

(b) on diagram [1]

(c) _____

_____

_____ [2]

Section B [48 marks]

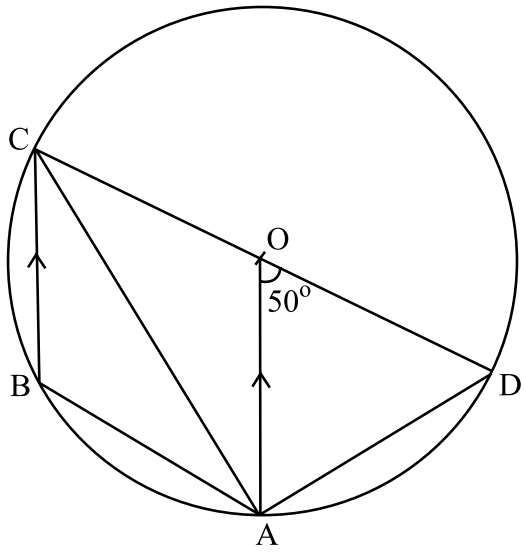
*Answer any **four** questions in this section*

Each question carries 12 marks.

6 **(a)** Make x the subject of the formula $y = \frac{p - 2x}{x}$.

Answer (a) $x =$ _____ [3]

(b)



In the diagram, A, B, C and D are points on the circumference of a circle with centre O. CD is a diameter of the circle, $A\hat{O}D = 50°$ and OA is parallel to CB.

(i) Find $O\hat{C}A$.

Answer (b) (i) $O\hat{C}A =$ _____ [2]

6 **(b)** **(ii)** Find $O\hat{A}D$.

Answer (ii) $O\hat{A}D =$ _____ [2]

(iii) Find $A\hat{B}C$.

Answer (iii) $A\hat{B}C =$ _____ [3]

(iv) Find $C\hat{A}B$.

Answer (iv) $C\hat{A}B =$ _____ [2]

7 The table shows of values for the function $y = \frac{1}{2}x(5 - x)$.

x	-1	0	1	2	3	4	5	6
y	-3	0	2	3	***p***	2	0	-3

(a) Calculate the value of ***p.***

Answer (a) $p =$ _____ [1]

Answer this part of the question on the grid on page 17.

(b) Draw the graph of $y = \frac{1}{2}x(5 - x)$ for $-1 \leq x \leq 6$ and $-4 \leq y \leq 4$. [4]

(c) Use the graph to estimate the

(i) maximum value of y,

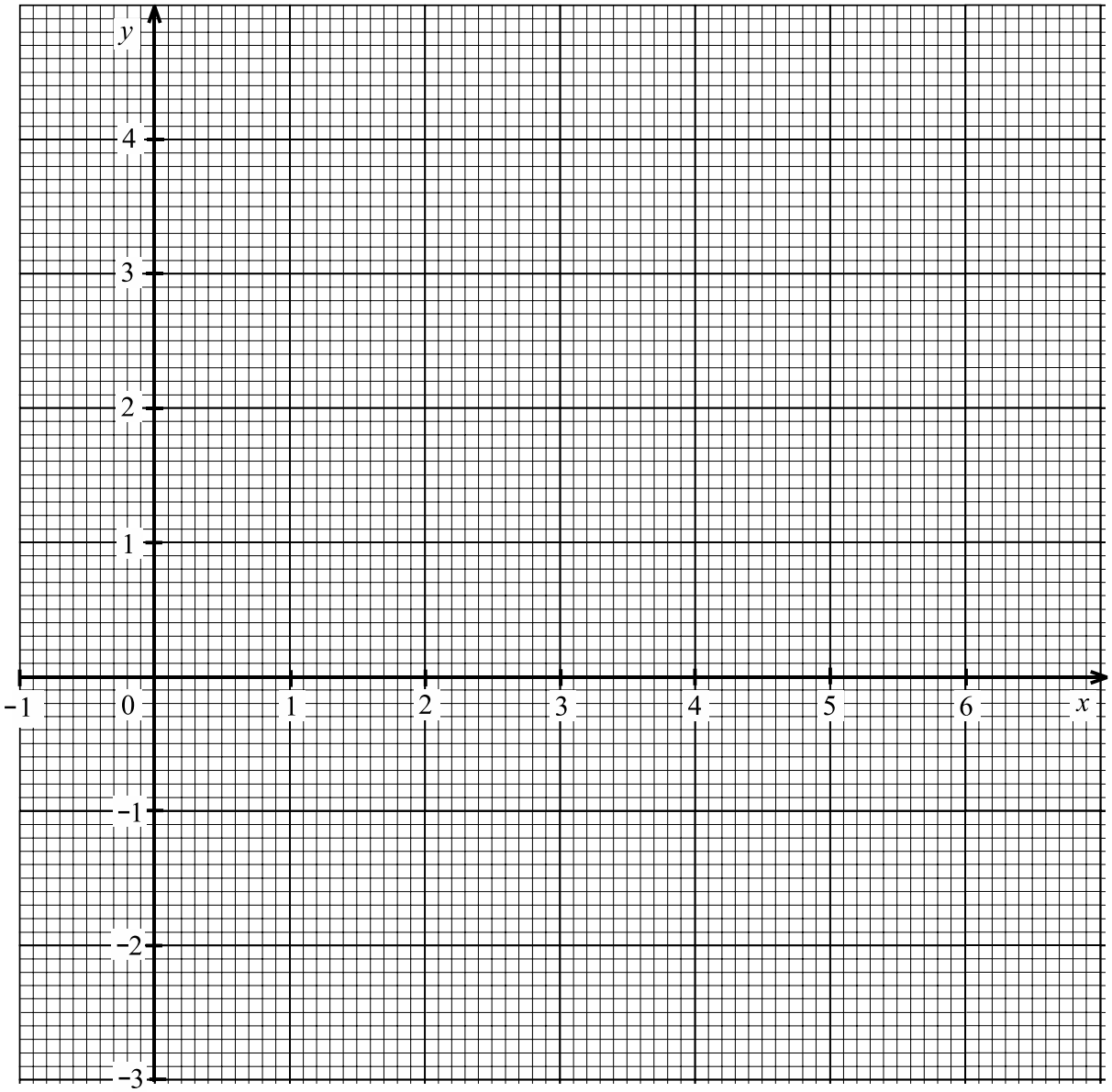
(ii) range of values of x for which y is positive. [2]

(d) By drawing a suitable straight line, solve the equation

$$\frac{1}{2}x(5 - x) = x - 1.$$ [3]

(e) Find the area bounded by the curve, the x-axis and the lines $x = 2$ and $x = 4$. [2]

7



(b) on diagram [4]

(c) ***(i)*** $y =$ _____ [1]

(ii) _____ [1]

(d) on diagram

_____ [3]

(e) _____ [2]

8 **(a)** **(i)** Show that $\frac{2}{1-x} - \frac{4}{x} = 3$ reduces to $3x^2 + 3x - 4 = 0$.

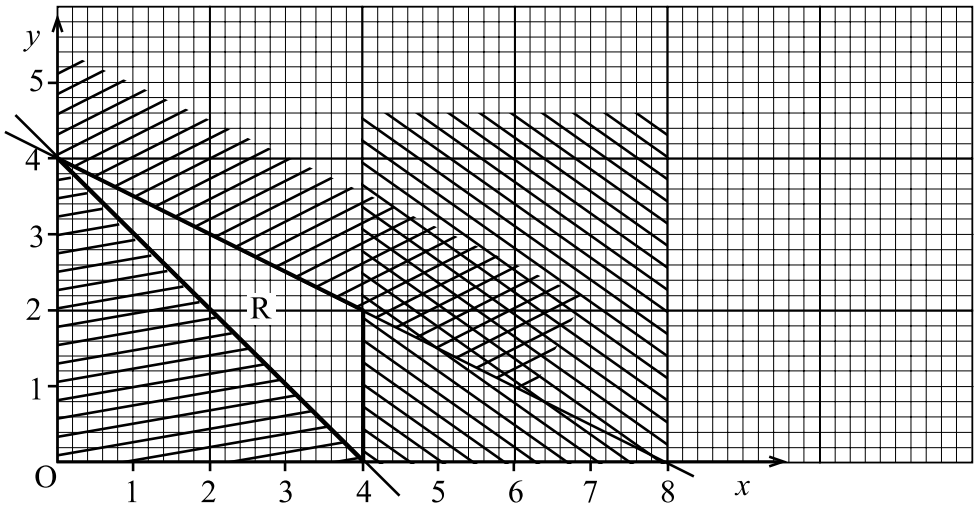
Answer ***(a)*** ***(i)***

[3]

(ii) Solve the equation $3x^2 + 3x - 4 = 0$, giving the answers correct to 3 significant figures.

Answer ***(a)*** ***(ii)*** $x =$ _____ or _____ [5]

8 (b)



The diagram shows the unshaded region R defined by three inequalities, one of which is $y \geq 4 - x$.

(i) Write down the other **two** inequalities.

Answer (b) (i) _____

_____ [2]

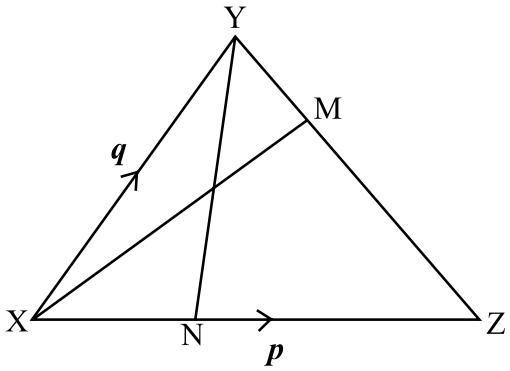
(ii) Find the maximum value of $3y + x$, given that x and y satisfy these three inequalities.

Answer (b) (ii) _____ [2]

9 **(a)** If $\boldsymbol{v} = \begin{pmatrix} 8 \\ u \end{pmatrix}$ and $|v| = 17$, find the **two** possible values of u.

Answer ***(a)*** u = _____ or _____ [3]

9 **(b)**



In the diagram, $\overrightarrow{XZ} = \boldsymbol{p}$, $\overrightarrow{XY} = \boldsymbol{q}$ and M is a point on YZ such that 3YM = YZ.

(i) 1. Express $\overrightarrow{YZ}$ as simply as possible in terms of $\boldsymbol{p}$ and /or $\boldsymbol{q}$.

Answer (b) ***(i)*** 1. $\overrightarrow{YZ}$ = _____ [1]

9 **(b)** 2. Express $\overrightarrow{YM}$ as simply as possible in terms of ***p*** and /or ***q***.

Answer (b) (i) 2. $\overrightarrow{YM} =$ _____ [1]

3. Express $\overrightarrow{XM}$ as simply as possible in terms of ***p*** and /or ***q***.

Answer (b) (i) 3. $\overrightarrow{XM} =$ _____ [2]

(ii) Given that N is the point such that $\overrightarrow{XN} = h\overrightarrow{XZ}$, express $\overrightarrow{XN}$ in terms of *h* and ***p***.

Answer (b) (ii) $\overrightarrow{XN} =$ _____ [1]

(iii) Given also that $\overrightarrow{XM} = h\boldsymbol{p} + k\boldsymbol{q}$, use the two expressions for $\overrightarrow{XM}$ to find the value of *h* and the value of k.

(iii) $h =$ _____

$k =$ _____ [2]

9 (b) (iv) 1. Write down the numerical value of $\frac{XN}{NZ}$,

Answer (b) (iv) 1. $\frac{XN}{NZ}$ = _____ [1]

2. Write the ratio of the area of ΔXYN : area of ΔXYZ in its simplest form.

Answer (b) (iv) 2. _____ [1]

10 Answer the whole of this question on page 24.

The triangle LMN has vertices at L (3; 1). M (2; 2) and N (0; 1).

(a) Draw and label triangle LMN. [1]

(b) Triangle LMN is mapped onto triangle $L_1M_1N_1$ by a reflection in the line $y = 1$.

(i) Draw and label line $y = 1$, [1]

(ii) Draw and label triangle $L_1M_1N_1$. [2]

(c) Triangle LMN is mapped onto triangle $L_2M_2N_2$ by a rotation through 180° about the point $(-1; 0)$.

Draw and label triangle $L_2M_2N_2$. [3]

(d) Triangle $L_3M_3N_3$ is the image of triangle LMN under a transformation P, represented by the matrix $\begin{pmatrix} -2 & 0 \\ 0 & 1 \end{pmatrix}$

(i) Draw and label triangle $L_3M_3N_3$.

(ii) Describe fully the single transformation P, which maps triangle LMN onto triangle $L_3M_3N_3$. [5]

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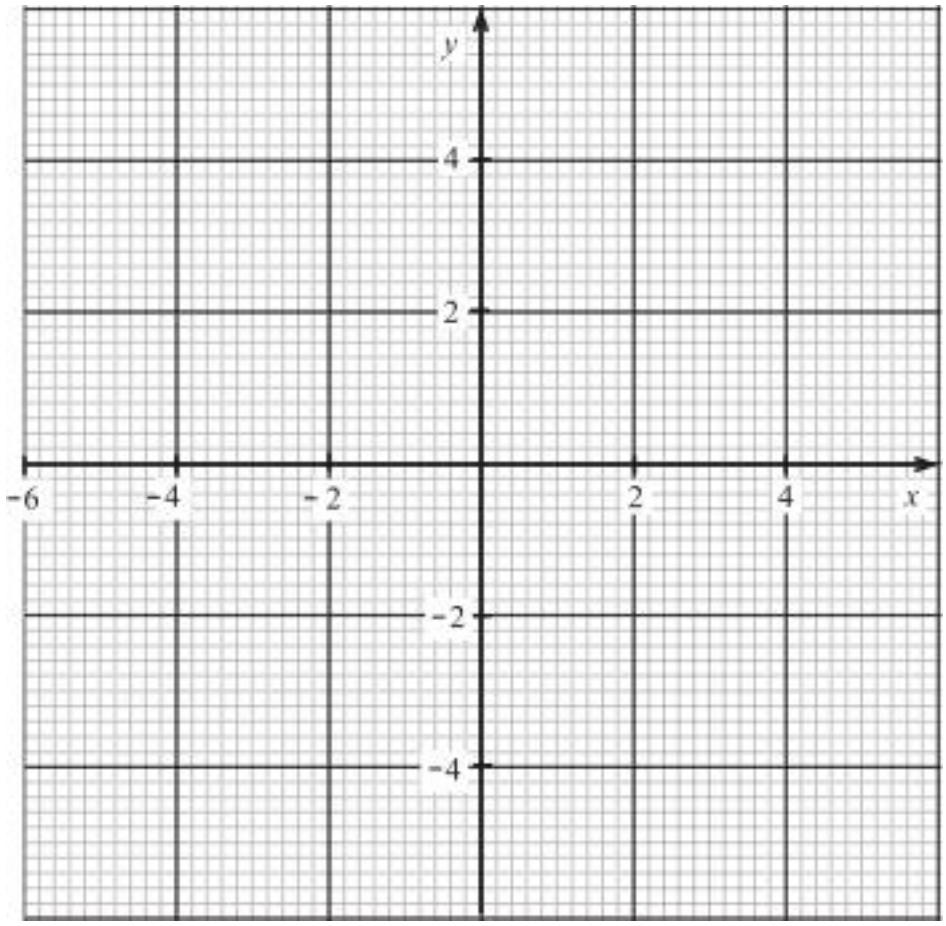


Answer ***(a)*** on diagram [1]

(b) ***(i)*** on the diagram [1]

(ii) on the diagram [2]

(c) on the diagram [3]

(d) ***(i)*** on the diagram [2]

(ii) _____

_____

_____ [3]

11 The marks obtained by 80 students in a Mathematics test are shown in the table.

mark *m* (%)	**frequency**
$0 < m \leq 20$	0
$20 < m \leq 30$	5
$30 < m \leq 40$	19
$40 < m \leq 50$	18
$50 < m \leq 60$	16
$60 < m \leq 70$	14
$70 < m \leq 80$	4
$80 < m \leq 90$	2
$90 < m \leq 100$	2

(a) Estimate the mean mark for the students' test marks.

Answer ***(a)*** _____ [3]

11 **(b)** The following is an incomplete cumulative frequency table for the distribution.

Mark (%)	$m \leq 20$	$m \leq 30$	$m \leq 40$	$m \leq 50$	$m \leq 60$	$m \leq 70$	$m \leq 80$	$m \leq 90$	$m \leq 100$
Cumulative frequency	0	5	24	42	58	72	q	78	80

(i) Find the value of q.

Answer (b) (i) $q =$ _____ [1]

Answer the whole of this part of the question on the grid on page 27.

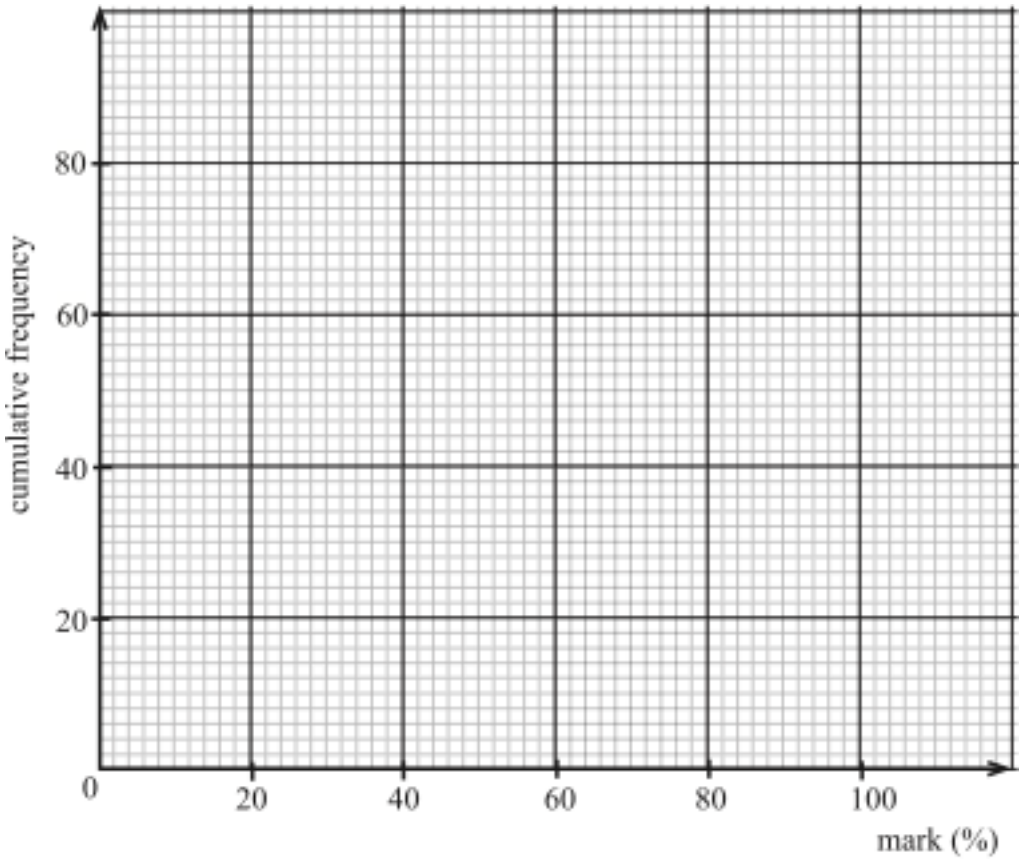
(ii) Draw a cumulative frequency curve to illustrate this information. [4]

(iii) Showing your method clearly on the graph, use your graph to estimate the

1. median mark,

2. number of students whose marks were more than 45 % but less than 75 %. [4]

11 (b) (ii)



Answer (b) **(ii)** on diagram [4]

(iii) 1. _____ [2]

2. _____ [2]

12 **In this question take π to be $\frac{22}{7}$.**

$$\begin{bmatrix} \text{curved surface of a cone} = \pi rl \\ \text{volume of a cone} = \frac{1}{3}\pi r^2 h \end{bmatrix}$$

(a) A right cone, made of paper, has a base radius of 8 cm and a slant height of 10 cm.

(i) Calculate the perpendicular height of the cone.

Answer (a) (i) _____cm [2]

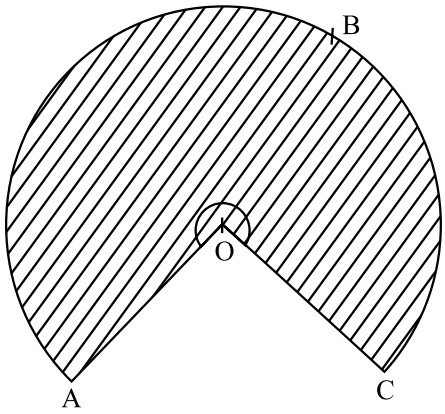
(ii) Calculate the curved surface area of the cone.

Answer (a) (ii) _____cm^2 [2]

12 **(a)** **(iii)** Calculate the volume of the cone.

Answer (a) (iii) _____ cm^3 [2]

(b) The cone is cut open to make a sector ABC of a circle centre O as shown in the diagram.



12 **(b)** Calculate reflex $A\hat{O}C$.

Answer ***(b)*** $A\hat{O}C =$ _____ [3]

(c) Another cone, PQR, which is similar to the right cone in (a) has a slant height of 18 cm.

Calculate the base area of the cone PQR.

(c) _____ [3]

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