Surname	Forename(s)	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/1

PAPER 1

NOVEMBER 2023 SESSION 2 hours 30 minutes

Candidates answer on the question paper.
Additional materials:
Geometrical instruments

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.
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.

Mathematical tables, slide rules and calculators should not be brought into the examination room.

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 28 printed pages.

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

1 Express as a single fraction

(a) $\frac{5}{7} - \frac{2}{5}$.

Answer _____ [1]

(b) $1\frac{1}{5} \div 2\frac{1}{3}$.

Answer _____ [1]

2 The temperature in a freezer is −18 °C.
The outside temperature is 24 °C.

(a) Find the difference between the outside temperature and the freezer temperature.

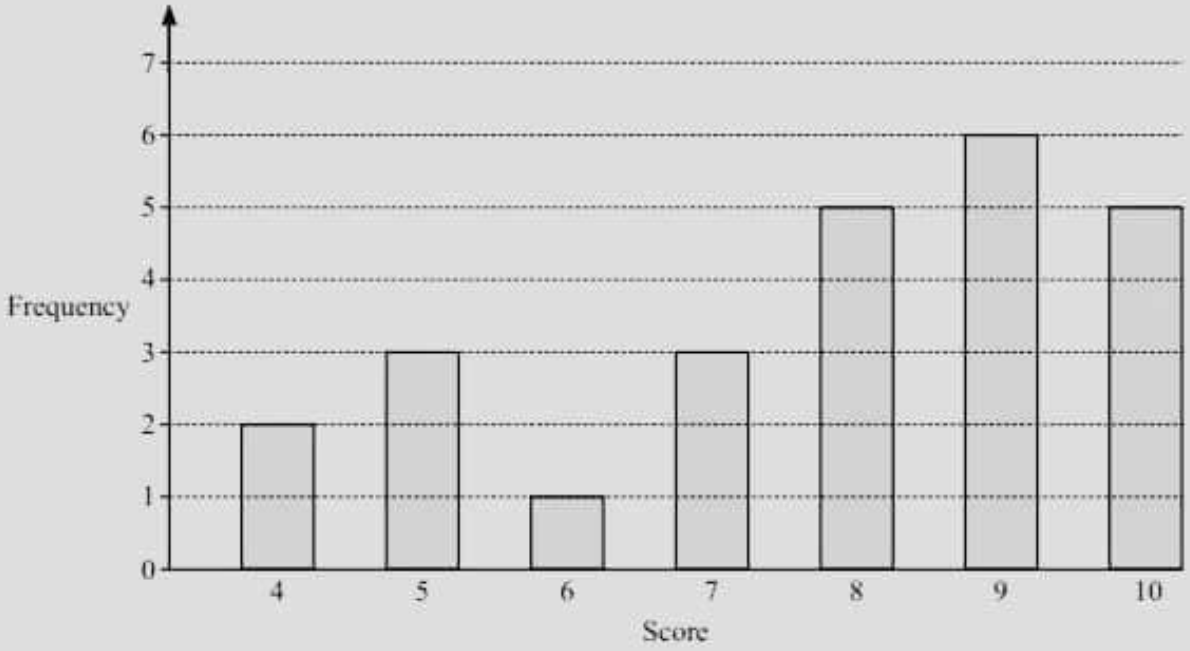
Answer _____ °C [1]

(b) The temperature in a fridge is 22 °C warmer than the freezer temperature.

Find the temperature in the fridge.

Answer _____ °C [1]

3 The bar chart shows the marks scored by a group of students in a test.



(a) Write down the mode.

..... [1]

(b) Work out the total number of students in the group.

..... [1]

(c) Find the median score.

..... [1]

4 It is given that $\overrightarrow{OP} = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$ and $\overrightarrow{OQ} = \begin{pmatrix} 12 \\ -5 \end{pmatrix}$ where O is the origin.

(a) Express $\overrightarrow{PQ}$ as a column vector.

(b) Find

(i) $|\overrightarrow{OQ}|$,

(ii) the co-ordinates of M, the midpoint of PQ.

Answer (a) [1]

(b) (i) _____ [1]

(ii) (;) [1]

[Turnover

5 Factorise completely

(a) $16p + 4p^2$.

Answer ..... [1]

(b) $xy + 2ay + 3ax + 6a^2$.

Answer ..... [2]

(c) $2x^2 + 3x - 20$.

Answer ..... [2]

6 **(a)** The ratio of boys to girls in a class is 4 : 5 .

What fraction of the class are boys?

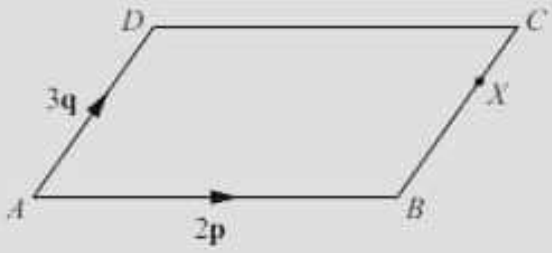
Answer ..... [1]

(b) The ratio of boys to girls in a school is 3 : 4 .
There are 120 more girls than boys.

How many students are in the school?

Answer ..... [1]

7



$ABCD$ is a parallelogram.
X is the point on BC such that $BX : XC = 2 : 1$.

$\overrightarrow{AB} = 2\mathbf{p}$ and $\overrightarrow{AD} = 3\mathbf{q}$.

Find, in terms of $\mathbf{p}$ and $\mathbf{q}$.

(a) $\overrightarrow{AC}$.

Answer $\overrightarrow{AC} =$ ..... [1]

(b) $\overrightarrow{AX}$.

Answer $\overrightarrow{AX} =$ ..... [1]

(c) $\overrightarrow{XD}$.

Answer $\overrightarrow{XD} =$ ..... [1]

8 A group of 80 students took a physics test.
This table shows the distribution of their marks.

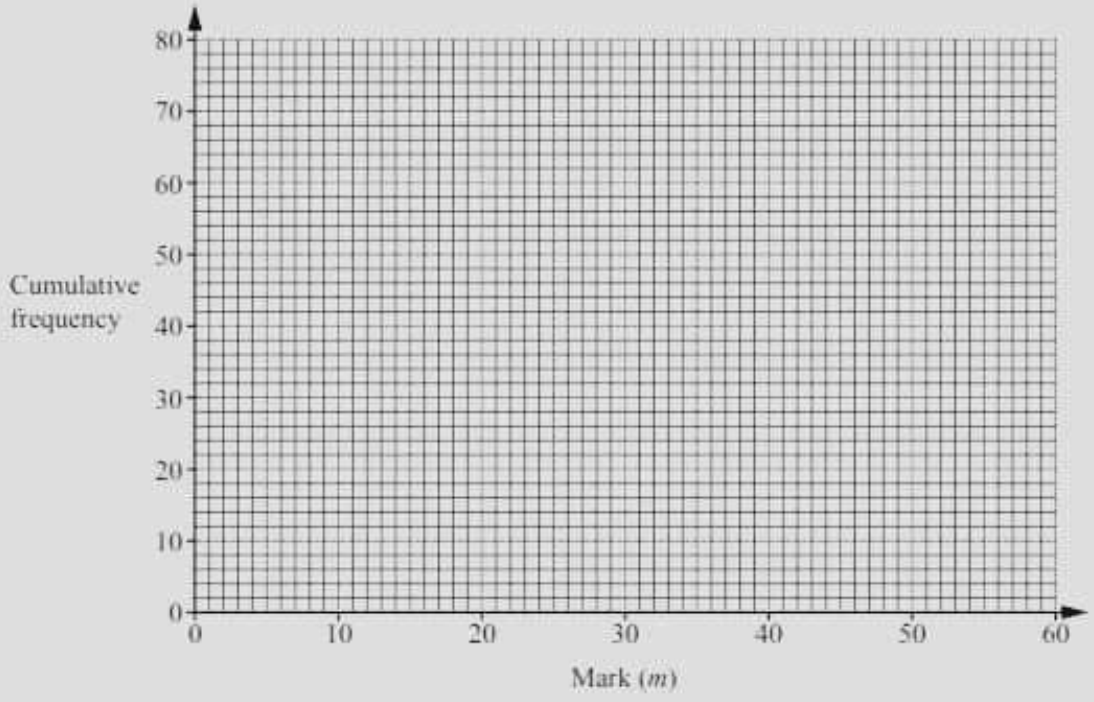
Mark (m)	$0 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 40$	$40 < m \leqslant 50$	$50 < m \leqslant 60$
Frequency	4	12	14	22	18	10

(a) Complete the cumulative frequency table.

Mark (m)	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 30$	$m \leqslant 40$	$m \leqslant 50$	$m \leqslant 60$
Cumulative frequency						

[1]

(b) Draw a cumulative frequency curve for this information.



[2]

(c) The pass mark for the test is 45.
Use your cumulative frequency curve to estimate the number of students who passed.

Answer ..... [2]

9

0.2	2	$\sqrt{2}$	$\frac{1}{3}$	0.83	8	81

From the numbers listed above, write down

(a) a square number.

Answer ..... [1]

(b) a cube number.

Answer ..... [1]

(c) an irrational number.

Answer ..... [1]

10 $\mathbf{A} = \begin{pmatrix} 4 & -2 \\ -1 & 1 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} -3 & 2 \\ -1 & 4 \end{pmatrix}$

(a) Find $2\mathbf{A} - \mathbf{B}$.

Answer ( ) [2]

(b) Find $\mathbf{A}^{-1}$.

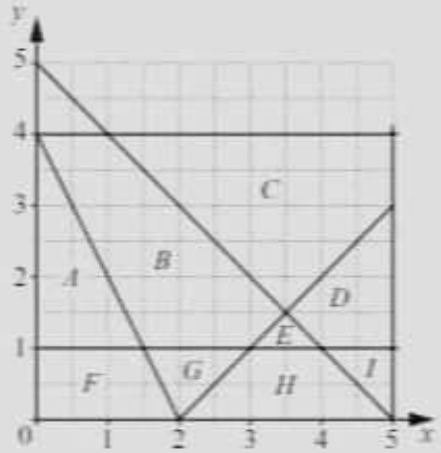
Answer ( ) [2]

11 Write these numbers in order, starting with the smallest.

$$\frac{3}{4} \qquad 0 \qquad -1 \qquad -\frac{17}{20} \qquad -\frac{4}{5}$$

Answer _____, _____, _____, _____, _____ [2]
smallest

12 The diagram shows the regions *A* to *I*.



Give the letter of the region defined by each set of inequalities.

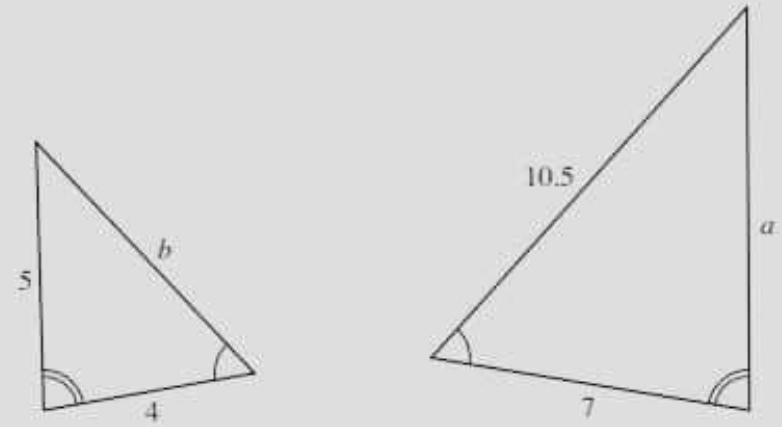
(a) $x > 0, y > 0, y < 1$ and $y < 4 - 2x$

Answer _____ [1]

(b) $y > 1, y < x - 2$ and $y < 5 - x$

Answer _____ [1]

13 The two triangles below are similar.
The lengths are in centimetres.



Calculate a and b.

Answer $a =$ .....

$b =$ ..... [3]

14 $f(x) = \dfrac{7-3x}{2x}$

(a) Find $f(4)$.

Answer ..... [1]

(b) Find $f^{-1}(x)$.

Answer $f^{-1}(x) =$ ..... [2]

15 The table shows part of Ms Dube's payslip for a particular month.

Earnings	$	Deductions	$
transport allowance	100,00	pension contribution	6,00
housing allowance	129,00	union subscription	10,00
		medical aid	8,00
		Insurance	17,50
basic salary	275,00	total deductions	_____
net salary	_____		

(a) Calculate the

(i) total deductions,

(ii) net salary.

(b) Express the pension contribution as a percentage of her basic salary.

Answer *(a)* *(i)* $_____ [1]

(ii) $_____ [1]

(b) _____ % [2]

16 The times of buses from Aytown to Deetown are shown.

Aytown	07 04	08 04	08 56	09 00	09 32	10 56
Beetown	–	–	09 05	–	09 41	11 05
Ceetown	07 18	08 18	09 14	–	–	11 14
Deetown	07 35	08 35	09 31	09 28	10 05	11 31

(a) Maryam lives in Ceetown and has to be in Deetown by 09 30.

What time is the latest bus from Ceetown that she can catch?

Answer ..... [1]

(b) Aadil catches the 09 32 from Aytown to Deetown.

How long does his journey take?

Answer ..... minutes [1]

17 The first four terms u_1, u_2, u_3 and u_4 in a sequence of numbers are given by

$$u_1 = \mathbf{1} \times 2 + 3^2 = 11$$
$$u_2 = \mathbf{2} \times 3 + 4^2 = 22$$
$$u_3 = \mathbf{3} \times 4 + 5^2 = 37$$
$$u_4 = \mathbf{4} \times 5 + 6^2 = 56.$$

(a) Evaluate u_5.

Answer _____ [1]

(b) The nth term of the sequence is u_n.
Write down an expression for u_n in terms of n.

Answer _____ [1]

(c) Given that $u_n = An^2 + Bn + C$, find the values of A, B and C.

Answer $A =$ _____

$B =$ _____

$C =$ _____ [2]

18 **(a)** Evaluate $\left(\frac{5}{3}\right)^{-2}$.

Answer ..... [1]

(b) Simplify $\left(\frac{9}{t^6}\right)^{\frac{1}{2}}$.

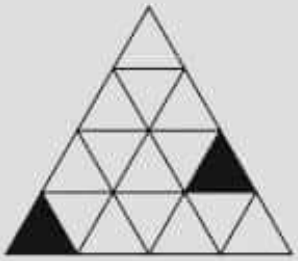
Answer ..... [1]

(c) Simplify $\frac{2x^3y}{6xy^2}$.

Answer ..... [1]

19 **(a)** In the diagram, two small triangles are shaded.

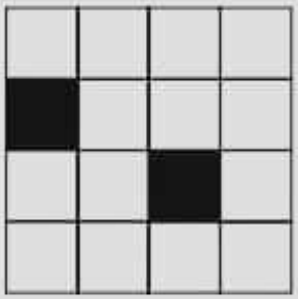
Shade **one** more small triangle, so that the diagram will then have one line of symmetry.



[1]

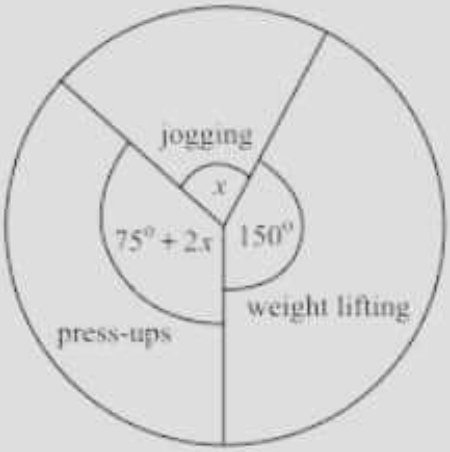
(b) In the diagram, two small squares are shaded.

Shade **two** more small squares, so that the diagram will then have rotational symmetry of order 2.



[1]

20



The pie chart shows the distribution of an athlete's daily exercise programme.

(a) Calculate the value of x.

(b) If the athlete spent 18 minutes jogging, calculate the

(i) time she spent on weight lifting,

(ii) total time spent exercising.

Answer *(a)* $x =$ _____ [1]

(b) *(i)* _____ [1]

(ii) _____ [2]

21 A machine puts beads of different colours and sizes into packets.
The beads are selected at random from a large container and the selection of each bead for a packet is independent of all others.
The table shows information on the contents of six packets.

Packet	1	2	3	4	5	6	Total
Total number of beads	15	14	19	18	16	18	100
Number of blue beads	6	5	8	6	8	7	

(a) Calculate the relative frequency of the machine selecting a blue bead.

Answer ..... [1]

(b) Calculate how many blue beads you would expect in a packet of 30 beads.

Answer ..... [1]

(c) The probability that the machine selects a red bead is 0.17.

Calculate the probability that the machine does **not** select a red bead.

Answer ..... [1]

22 The diagram at the bottom of the page shows the lines AB and BC.

(a) By measuring an angle, find reflex angle ABC.

Answer $A\hat{B}C$ = ... [1]

(b) The point D is on the opposite side of AC to B.
$CD = CB$ and $AD = 10\,\text{cm}$.

On the diagram, construct quadrilateral $ABCD$. [1]

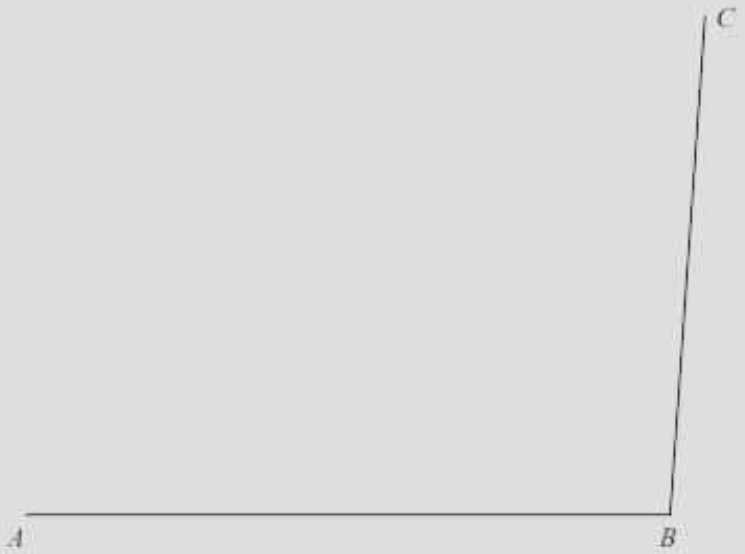
(c) On the diagram, construct the locus of points, **inside** the quadrilateral $ABCD$, that are

(i) equidistant from A and B. [1]

(ii) equidistant from BC and BA. [1]

(d) On the diagram, shade the region **inside** the quadrilateral $ABCD$ containing the points that are

- nearer to A than to B
- **and** nearer to BC than to BA.



[1]

23 Find **one** value of x that satisfies **both** $x > 4$ **and** $17 - 4x > 2 - x$.

Answer ..... [2]

24 **(a)** Find the Highest Common Factor (HCF) of 36 and 54.

Answer ..... [1]

(b) **Estimate**, correct to the nearest whole number, the value of $\sqrt{97} - \sqrt{35}$.
Show clearly the approximate values you use.

Answer ..... [1]