

Candidate Name

Centre Number

Candidate Number



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS

4004/1

PAPER 1

JUNE 2023 SESSION 2 hours 30 minutes

Candidates answer on the question paper

Additional materials:
Mathematical 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.
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.

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 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 26 printed pages and 2 blank pages.

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Answer all questions.

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

1 Express

(a) 54,497 correct to the nearest tenth,

Answer (a)

[1]

(b) 0,000342 in standard form,

Answer (b)

[1]

(c) 478,367 correct to two significant figures.

Answer (c)

[1]

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3

2 Simplify, giving the answer as common fraction in its lowest terms

(a) $\frac{2}{7} + \frac{1}{3}$

Answer (a)

[1]

(b) $\frac{2}{5} \div 10$

Answer (b)

[1]

(c) $\frac{18}{35} \times \frac{14}{27}$

Answer (c)

[1]

3 (a) Evaluate giving the answers as exact decimals

(i) $0,024 \times 0,3$

Answer (a)(i)

[1]

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[Turn over



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(ii) $(0, -4)^3$.

Answer (a)(ii)

[1]

(b) Express 0, 224 as a percentage.

Answer (b)

[1]

4 The universal set $\xi = \{75; 76; 77; 78; 79; 80\}$

M and R are subsets ξ .

$M = \{\text{even numbers}\}$,

$R = \{\text{multiples of 4}\}$.

(a) (i) List elements of set M.

Answer (a)(i)

[1]



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- (ii) List elements of set R.

Answer (a)(ii)

[1]

- (b) Find $n(M^1 \cup R)$.

Answer (b)

[1]

- 5 (a) Simplify $2(a - 2) - 4(a + 3)$

Answer (a)

[1]

- (b) Express $\frac{3}{m-2} - \frac{2}{4m+3}$ as a single fraction.

Answer (b)

[2]

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[Turn over



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- 6 (a) State the special name of a quadrilateral with four lines of symmetry.

Answer (a)

[1]

- (b) A quadrilateral has interior angles of x° , $2x^\circ$, $(x + 10)^\circ$ and $(x + 50)^\circ$.
Calculate the value of x ,

Answer (b)

[2]

- 7 P varies directly as the cube of r . Given that $P = 2$ and $r = 4$,
Find the

- (a) formula connecting P and r ,

Answer (a)

[2]

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7

(b) value of P when $r = 8$.

Answer (b)

[1]

8 Given that:

$$m + 3n = 5$$

$$m^2 - 9n^2 = -15$$

find the numerical

(a) value of $m - 3n$,

Answer (a)

[1]

(b) values of m and n .

Answer (b)

[2]

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[Turn over



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9 Given that $p = \frac{q}{q+m}$,

(a) make m the subject of the formula,

Answer (a)

[2]

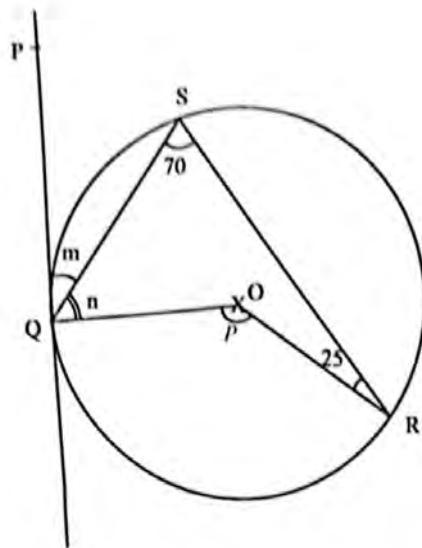
(b) Find m given that $q = 3$ and $p = 2$.

Answer (b)

[1]



10



In the diagram points Q, S and R are on the circumference of a circle centre O. Line PQT is a tangent to the circle at Q.

$\angle PQS = m^\circ$, $\angle QOS = n^\circ$, $\angle QOR = p^\circ$, $\angle QSR = 70^\circ$ and $\angle ORS = 25^\circ$.

Calculate the value of

(a) m ,

Answer (a)

[1]

(b) n ,

Answer (b)

[1]

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10

(c) p .

Answer (c)

[1]

11 (a) Evaluate $766_9 + 143_9$ giving the answer in base 9.

Answer (a)

[1]

(b) Convert 35_6 to a number in base 2.

Answer (b)

[2]

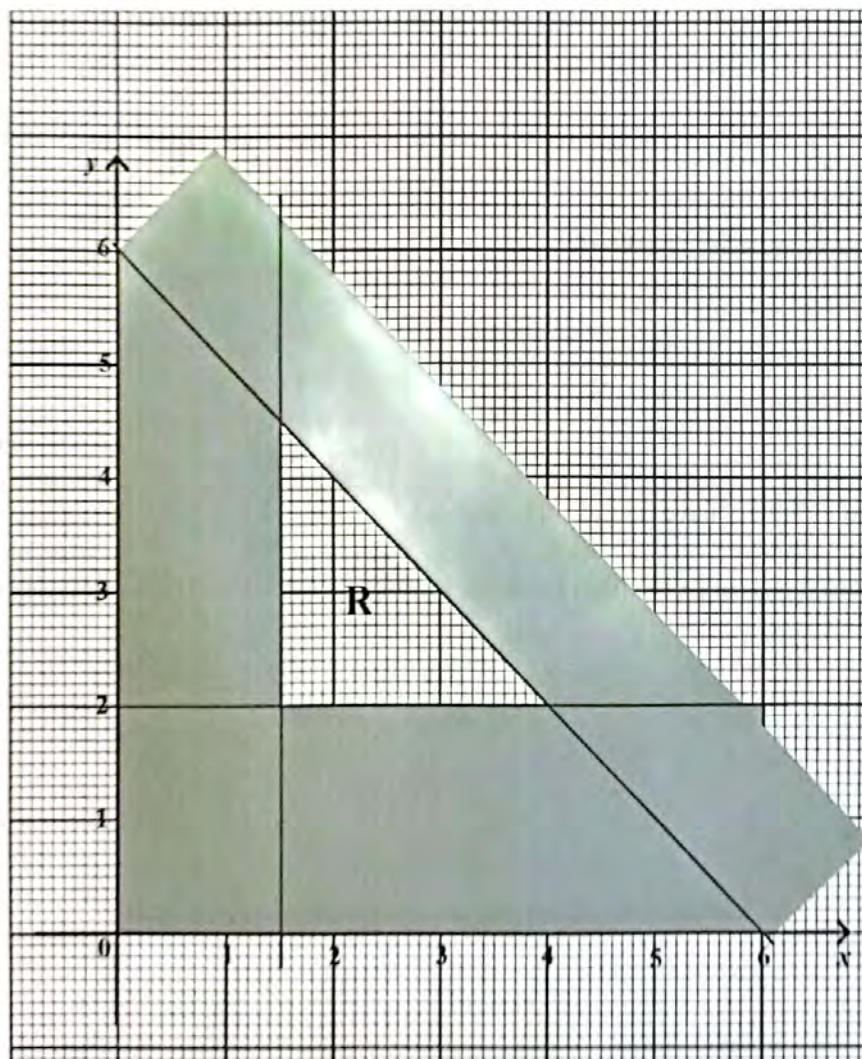


- (c) Given that $f(x) = (4 - x)(x - 0, 5)$,
find $f(0)$.

Answer (c)

[1]

12



In the diagram the unshaded region R is defined by three inequalities.

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Find the three inequalities

Answer

[4]

13 Two similar cylinders have heights of 16cm and 48cm.

(a) Write down, in its simplest form, the ratio of

(i) heights,

Answer (a)(i)

--

[1]



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13

(ii) volumes

Answer (a)(ii)

[1]

- (b) The curved surface area of the larger cylinder is 500 cm^2 .
Calculate the curved surface area of the smaller cylinder.

Answer (b)

[2]

- 14 (a) A sum of money is shared in the ratio 2: 3: 4. The smallest share is \$160, 00.
Calculate the total amount of money shared.

Answer (a)

[2]

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- (b) Find the time taken for \$4000, 00 to earn a simple interest of \$400, 00 at a rate of 5% per annum.

Answer (b)

.....
[2]

- 15 Solve the following equations:

(a) $3(x - 2) = 5x + 3$

Answer (a)

.....
[2]

(b) $\left(q - \frac{2}{9}\right)^2 = \frac{49}{81}$

Answer (b)

.....



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15

- 16 (a) Evaluate $\frac{0,0469 \times 2,13}{2,28 + 3,83 \times 2,06}$ by first estimating each number to one significant figure.

Answer (a)

[3]

- (b) Solve the equation $27 = 3^{2d+1}$.

Answer (b)

[2]



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- 17 Points E , F , and G have coordinates at $(4 ; 8)$, $(-4 ; 0)$ and $(-6 ; 4)$ respectively. O is the origin.

(a) Express as column vectors

(i) $\vec{EF}$,

Answer (a)(i)

[1]

(ii) $-\frac{1}{2}\vec{GF}$

Answer (a)(ii)

[1]

(iii) $\vec{EF} + \vec{FG}$

Answer (a)(iii)

[1]

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(b) Find $|\vec{OE}|$ leaving the answer in surd form.

Answer (b)

[2]

18 (a) Convert 2g/cm^3 to kg/m^3 .

Answer (a)

[2]

(b) A map of a town is drawn to a scale of 1cm to 9,5 km
Calculate the

(i) actual length of the road in km that is 3cm long on the map

Answer (b)(i)

[1]



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18

- (ii) area of a town on the map in cm^2 that has an actual area of 361 km^2 .

Answer (b)(ii)

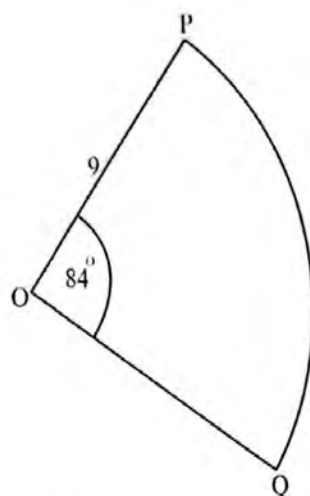
[2]

- 19 (a) Village A is on a bearing of 092° from a village B.
Calculate the 3 figure bearing of village B from village A.

Answer (a)

[1]

(b)



In the diagram, OPQ is a sector with centre O and radius 9 cm.

$\angle POQ = 84^\circ$. Take π to be $\frac{22}{7}$.

Calculate the

(i) length of arc PQ,

Answer (b)(i)

[2]

(ii) area of the sector OPQ.

Answer (b)(ii)

[2]

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Form	Enrollment
1	128
2	127
3	125
4	120

The table above shows enrollment at a certain school

(a) State the modal form.

Answer (a)

[1]

(b) Calculate the mean number of learners per form.

Answer (b)

[2]

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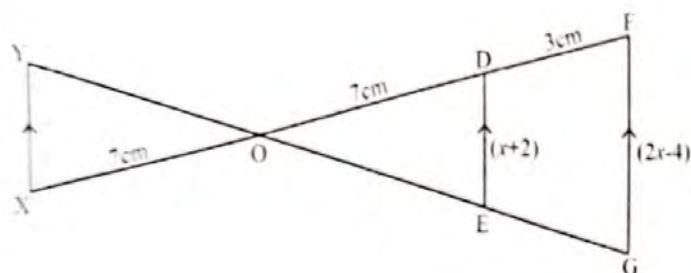
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- (c) Two learners are chosen at random from the school.
Calculate the probability that both learners are in form 3.

Answer (c)

[2]

21



In the diagram above XDF and YEG are two straight lines which intersect at O.

XY, ED and GF are parallel lines. $OX = OD = 7\text{cm}$,

$DF = 3\text{cm}$, $ED = (x + 2)\text{cm}$ and $GF = (2x - 4)\text{cm}$.

- (a) Name the triangle in correct order which is
(i) similar but not congruent to triangle XOY,

Answer (a)(i)

[1]



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(ii) congruent to triangle XOY.

Answer (a)(ii)

[1]

(b) Calculate length of FG.

Answer (b)

[3]

22 Matrix $M = \begin{pmatrix} 5 & -3 \\ -2 & 2 \end{pmatrix}$ and matrix $N = \begin{pmatrix} y^2 & 6 \\ 3 & 2 \end{pmatrix}$.

(a) Find M^{-1} the inverse of matrix M .

Answer (a)

[3]

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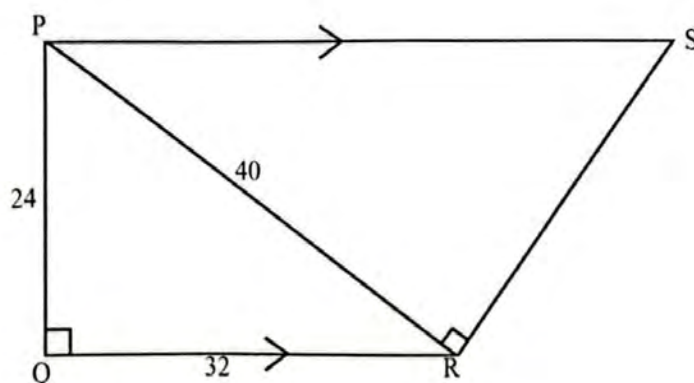
23

- (b) Matrix N is singular.
Find the possible values of y .

Answer (b)

[3]

23



In the diagram PQRS is a trapezium, PS and QR are parallel lines.

$\angle PQR = \angle PRS = 90^\circ$, $PQ = 24\text{cm}$, $QR = 32\text{cm}$ and $PR = 40\text{cm}$

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24

- (a) Express $\tan \hat{RPS}$ as a fraction its lowest terms.

Answer (a)(i)

[1]

- (b) Calculate the

- (i) length of RS,

Answer (b)(i)

[2]

- (ii) area of trapezium PQRS.

Answer (b)(ii)

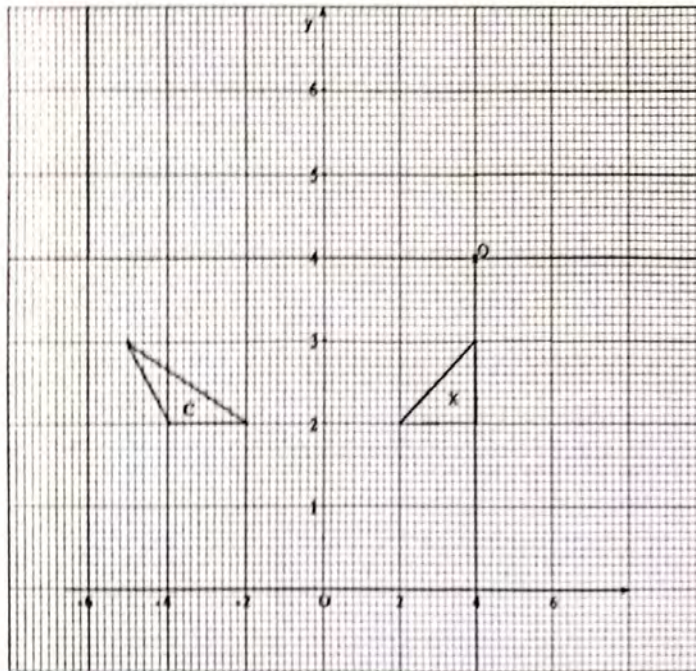
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The graph shows triangles X and C and a point Q.

(a) Draw and label on the graph

(i) triangle A the image of Triangle X under a translation of $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$,

Answer (a)(i)

[3]

(ii) triangle B the image of triangle X under a rotation of 180° with centre Q.

Answer (a)(ii)

[3]

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- (b) Describe fully the single transformation which maps triangle X onto triangle C.

Answer (b)

.....

.....

.....

[3]



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS

4004/2

PAPER 2

JUNE 2023 SESSION

2 hours 30 minutes

Additional materials:

Mathematical Instruments

Mathematical Tables

Non programmable Electronic Calculator

Plain Paper (1 sheet)

Graph Paper (4 sheets)

Answer Paper

Time 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions in Section A and **any four** questions from Section B.

Write your answers on the separate answer paper provided.

If you use more than one sheet of paper, fasten the sheets together.

All working must be clearly shown on the same sheet as the rest of the answer.

Omission of essential working will result in loss of marks.

If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given correct to three significant figures. Answers in degrees should be given correct to one decimal place.

Mathematical tables and Non-programmable 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 10 printed pages and 2 blank pages.

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SECTION A [52 MARKS]

Answer all questions in this section.

- 1 (a) Simplify $0,92 - 0,33 + 0,24$, giving the answer in standard form. [2]
- (b) Amos sold a radio for \$66,00 and made a profit of 10%.
Find the cost price of the radio. [2]
- (c) Share \$286,00 in the ratio $1 : 1\frac{1}{2} : 4$. [3]
- (d) Remove brackets and simplify $(d + 3)(6d - 1)$. [2]
- 2 (a) Given that $T = g + \sqrt{n^3 - m}$,
- (i) Find T when $g = -4$, $n = 3$ and $m = -9$, [2]
- (ii) Make m the subject of the formula. [3]
- (b) Find the rate of interest per year when \$144,00 earns \$22,68 simple interest in $3\frac{1}{2}$ years. [2]
- (c) Express $\frac{2-x}{x^2-4} - \frac{1+x}{x+2}$ as a single fraction in its simplest form. [3]
- 3 (a) Solve the following equations,
- (i) $\frac{3}{5}(f-1) = \frac{1}{5}f$ [2]
- (ii) $\left(2\frac{2}{3} - p\right)^2 = 1\frac{7}{9}$ [3]
- (b) Factorise completely,
- (i) $10m^2 - tr - 2mt + 5mr$, $R+T+1$ [2]
- (ii) $p^3 - 16p$. [2]
- (c) A carpenter's wage depends on the number of hours she works.
She is paid at a rate of \$3,65 per hour.
Calculate her wage for working a 38 hour week. $R=T$

4 Answer the whole of this question on a sheet of plain paper.

Use ruler and compasses only for your constructions.

Show all construction arcs and lines clearly.

All construction should be in a single diagram.

(a) Construct,

(i) a quadrilateral ABCD in which $\hat{ABC} = 135^\circ$, $\hat{BAD} = 60^\circ$,
 $BC = 6,6 \text{ cm}$, $AB = 4,8 \text{ cm}$ and $AD = 8,9 \text{ cm}$, [5]

(ii) the locus of points equidistant from AB and BC, [2]

(iii) the locus of points that are 3 cm from AB on the same side of AB
as DC, [2]

(b) Mark and label a point P, that is equidistant from AB and BC and 3 cm
from AB. [1]

(c) Measure and write down the length of PC. [1]

5 (a) Simplify

(i) $25,8 - 13 + 15,25$ [2]

(ii)

days	hrs	mins
3	15	40
+ 2	8	40

 [2]

(b) Tafadzwa borrows \$600 from his brother Tendai at the beginning of the year.
He invests the money and agrees that at the end of the year he will repay
Tendai and give him $\frac{2}{5}$ of any profit he will make. If the \$600 increases
to \$1250, calculate how much he should give Tendai at the end of year. [2]

(c) (i) Express 676 as a product of its prime factors in index notation. [1]

(ii) Hence or otherwise find the square root of 676. [1]

(d) Given that $f(x) = 3x + 5$, find

(i) $f(3)$.

[1]

(ii) the value of x for which $f(x) = 83$.

[2]

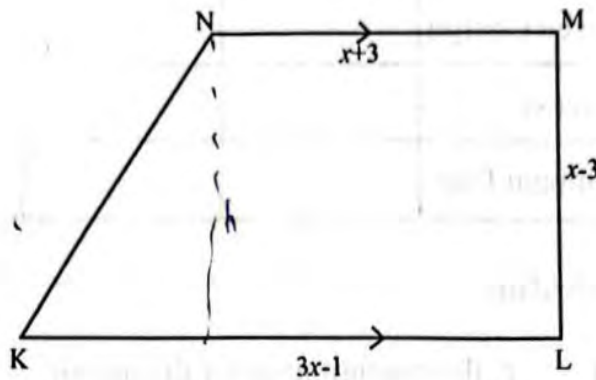
SECTION B [48 MARKS]

Answer any four questions from this section.

Each question carries 12 marks.

- 6 (a) The cost C , of printing a newspaper is partly constant and partly varies as n , the number of printed newspapers.
- (i) Express C in terms of n and constants k and h . [1]
- (ii) If the cost of printing 500 newspapers is \$320 and the cost of printing 1 000 newspapers is \$540, find the cost of printing 750 newspapers. [5]

(b)



In the diagram $KLMN$ is a trapezium in which KL is parallel to NM . $\angle KLM = 90^\circ$, $KL = (3x - 1)\text{cm}$, $NM = (x + 3)\text{cm}$ and $LM = (x - 3)\text{cm}$.

- (i) Find in terms of x an expression for the area of the trapezium. [1]
- (ii) Given that the area of the trapezium is 15cm^2 , form an equation in x and show that it reduces to $2x^2 - 5x - 18 = 0$. [2]
- (iii) Solve the equation $2x^2 - 5x - 18 = 0$. [2]
- (iv) Find the length of LM . [1]

- (a) The following is an extract of an incomplete water bill for a family.
 The family is allowed to use 11 kilolitres (KL) of water per month at a certain rate.
 If the family uses more than 11 kilolitres of water the rate increases to \$2,50 per kilolitre.

Description	Previous reading	Present reading	Consumption	Rate	Amount
	(KL)	KL	KL	\$/KL	\$
Water	762	776	c		
Permitted Consumption			11	r	17,05
Fixed Charge					7.30
Excess			s	2,50	t
Amount Due					w

Calculate

- (i) c , the consumption for the month, [1]
 - (ii) r , the rate of permitted consumption, [2]
 - (iii) s , the excess amount of water, [1]
 - (iv) t , the amount paid for excess, [2]
 - (v) w , the total amount due that month. [2]
- (b) N varies inversely as the square root of M .
- (i) Find a formula connecting N , M and a constant k . [1]
 - (ii) Given that $N = 17$ when $M = 20$, 25, find the value of M when $N = 34$. [3]

Answer the whole of this question on a sheet of graph paper.

Use a scale of 2cm to 2 units on both axes for

$$-8 \leq x \leq 8 \text{ and } -4 \leq y \leq 18.$$

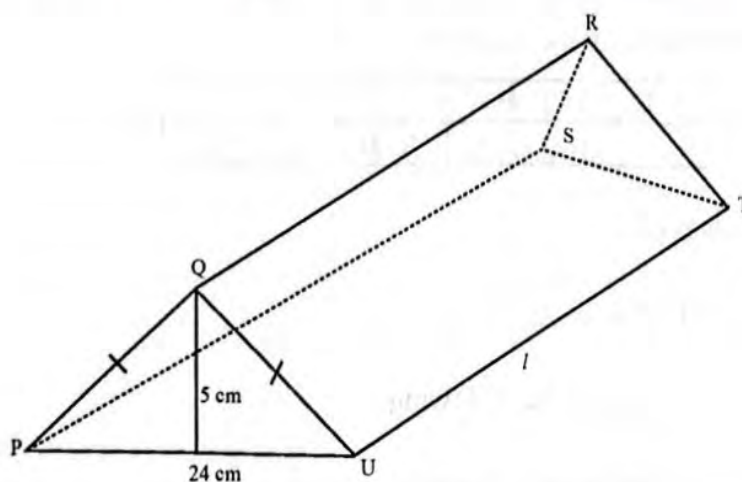
- (a) Triangle A has vertices at $(-6; 2)$, $(-2; 2)$ and $(-5; 6)$.

Draw and label triangle A.

[1]



- (b) Triangle B is the image of triangle A under a clockwise rotation of 90° about the point $(2; 2)$.
Draw and label triangle B. [3]
- (c) (i) Triangle C is the image of triangle A and has vertices at $(-6; 14)$, $(-5; 16)$ and $(-2; 6)$.
Draw and label triangle C. [1]
- (ii) Describe fully a single transformation which maps triangle A onto triangle C, [3]
- (d) (i) Triangle D is the image of triangle A and has vertices at $(-2; 2)$, $(-2; -2)$ and $(2; -1)$.
Draw and label triangle D. [1]
- (ii) Describe fully the single transformation that maps triangle A onto triangle D. [3]



The diagram above shows a solid triangular prism PQRSTU.
 $PU = 24 \text{ cm}$, $QP = QU$ and TU , the length of the prism is $l \text{ cm}$.
 The perpendicular from Q to PU is 5 cm .

- (a) Calculate, [2]
- (i) QU , [2]
- (ii) the area of triangular face PQU . [2]
- (b) The volume of the prism is 1728 cm^3 .
Find the length l , of the prism. [2]

- (c) The material used to make the prism has a density of 4 g/cm^3 and costs \$1, 93/kg.

Calculate the,

- (i) mass of the prism in kilogrammes, [2]
 (ii) cost of material used to make the prism. [2]

- (d) Find the length of a similar triangular solid prism of volume 512 cm^3 . [2]

- (a) A class has 16 boys and 10 girls.

Two learners are to be chosen one after the other to represent the school in a competition.

Calculate the probability that the learners chosen are both of the same sex. [3]

- (b) Answer the whole of this question on a sheet of graph paper.

Use a scale of 2cm to 1 unit for the x - axis in the range $-5 \leq x \leq 5$

and 2cm to 5 units on the y - axis for the range $-10 \leq y \leq 35$.

The table below is for the function $y = 2x^2 - x - 6$.

x	-4	-3	-2	-1	0	1	2	3	4
y	30	15	p	-3	-6	-5	0	q	22

Find the values of p and q . [2]

- (c) Draw the graph of $y = 2x^2 - x - 6$. [4]

- (d) Use the graph to answer the following :

- (i) State the minimum value of $y = 2x^2 - x - 6$. [1]
 (ii) Find the gradient of the curve at the point where $x = -3$. [2]

11 (a)

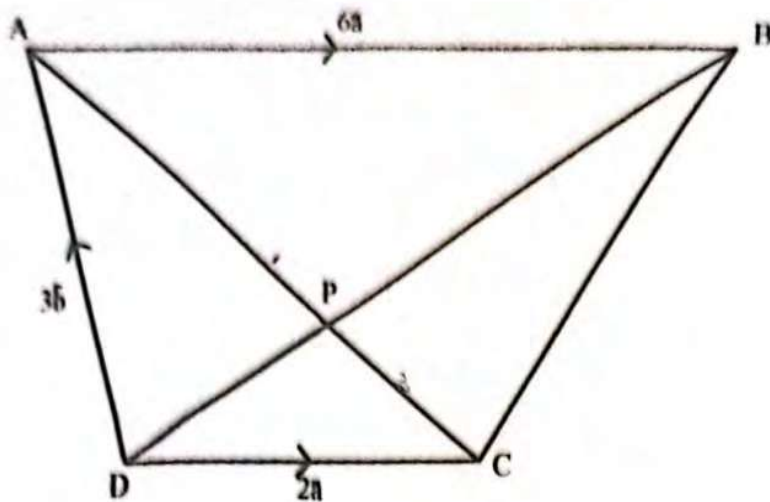


The pie chart above shows the choices made by 192 learners on their preferred favourite subject.

Find the

- (i) number of learners who said they preferred Shona, [2]
 - (ii) number of learners who said they preferred Accounts. [2]
- (b) 40 learners said they preferred Commerce.
Find the value of p . [2]
- (c) 32 learners said they preferred History.
Find the size of angle that represents other subjects. [2]

(d)



The diagram shows a trapezium ABCD.

AB is parallel to DC.

$$\vec{AB} = 6a, \quad \vec{DC} = 2a \text{ and } \vec{DA} = 3b$$

AC and BD intersect at P such that AP:PC = 3:1.

Express in terms of a and/or b ,

(i) $\vec{AC}$, [1]

(ii) $\vec{BC}$, [1]

(iii) $\vec{DP}$, [1]

(iv) $\vec{PA}$, [1]

12 (a) Given that $A = \begin{pmatrix} -2 & 3 \\ 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$,
evaluate AB. [2]

(b) If $f(x) = 3x^2 - 5x - 1$, solve the equation $f(x) = -3$. [4]

(c) The interior angles of a hexagon are $82^\circ, 94^\circ, 109^\circ, x^\circ, 2x^\circ$ and $3x^\circ$.
Find the value of x° . [3]

(d) Solve the inequality $5 - x > 3x + 2$. [3]



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS

4004/2

PAPER 2

NOVEMBER 2023 SESSION 2 hours 30 minutes

Additional materials:
Mathematical Instruments
Mathematical Tables
Non programmable Electronic Calculator
Plain Paper (1 sheet)
Graph Paper (4 sheets)
Answer Paper

Time 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

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SECTION A [52 Marks]

Answer **all** questions in this section

- 1** (a) (i) The price of a packet of sweets was \$1,20. The price increased to \$1,50. Calculate the percentage increase. [1]
- (ii) A new cereal packet contains 20% more cereal than the old packet. If the new packet now has a mass of 264g, calculate the mass of the cereal in the old packet. [2]
- (iii) A painter got a 7% discount after buying a large amount of paint. If the discount was \$91, find the value of paint he bought. [2]
- (b) AB is a diameter of a circle centre O and C is a point on the circumference such that $AC=7,5\text{cm}$ and $BC=5\text{cm}$. Calculate the length of AB . [3]
- 2** (a) Answer the whole of this question on a sheet of plain paper.
Use ruler and compasses only for all constructions and show clearly all the construction lines and arcs.
On a single diagram, construct
- (i) triangle ABC with $AB=6\text{cm}$, $AC = 5,8\text{cm}$ and $\hat{A}C=135^\circ$. [3]
- (ii) the perpendicular from C to BA produced. [2]
- (iii) a line parallel to AB passing through C . [2]
- (iv) the locus of points 4,5cm from B . [1]
- (b) The line parallel to AB passing through C represents a certain locus. Describe this locus fully. [2]
- 3** The universal set ξ has subsets P and Q such that:
 $\xi = \{x : x \text{ is an integer and } 30 \leq x \leq 40\}$
 $P = \{x : x \text{ is a prime number}\}$
 $Q = \{x : x \text{ is a multiple of 4}\}$
- (a) (i) Find $n(P)$. [1]
- (ii) List the members of $Q \cap P^1$, where P^1 is the complement of set P . [2]

- (b) In triangle XYZ, $XY = 17\text{cm}$, $XZ = 8\text{cm}$ and $\angle YXZ = 65^\circ 30'$. Calculate the area of triangle XYZ. [3]

- (c) There are 25 red sweets and x blue sweets in a box. One sweet is selected at random. Given that the probability that it is blue is $\frac{3}{8}$, find x . [2]

- (d) P varies directly as q and inversely as the square of r . Given that $P = 15$, $q = 9$ and $r = 6$, find P when $q = 7$ and $r = 2$. [3]

- 4 (a) Remove the brackets and simplify

(i) $4(3 - 2p) - 3(1 - p)$, [2]

(ii) $(3q - r)(q + 2r)$. [2]

- (b) Factorise completely

(i) $8ab + 6ab^2$ [1]

(ii) $18t^2 - 2$ [2]

- (c) Given that $y = 18 + 3x^2$

(i) Find the value of y when $x = -2$, [1]

(ii) Find the values of x when $y = 93$, [2]

(iii) Express x in terms of y . [2]

- 5 (a) Express $\frac{4}{y-3} - \frac{3}{y+4}$ as a single fraction in its simplest form. [3]

- (b) Solve the equation.

$$\frac{y-1}{8} = \frac{2}{y-1}$$
 [3]

- (c) Solve the inequality $21 < 4n - 3 \leq 27$. [2]

- (d) Points P , Q and R have coordinates at $(9, 8)$, $(12, 4)$ and $(4, -2)$ respectively.

Find the

(i) gradient of QP . [1]

(ii) equation of a line passing through R and parallel to PQ . [2]

SECTION B [48 Marks]Answer **any four** questions from this section.**Each question carries 12 marks.****6** The ages of 40 learners were recorded. The results are shown in the table below.

Age (x years)	$8 \leq x < 10$	$10 \leq x < 11$	$11 \leq x < 12$	$12 \leq x < 14$	$14 \leq x < 16$	$16 \leq x < 19$
Frequency	7	8	6	10	3	6
Frequency Density	3,5	8	6	5	1,5	2

- (a) State the modal class. [1]
- (b) Draw a histogram on a sheet of graph paper using a scale of 2cm to 2units on both axes. [4]
- (c) Calculate an estimate of the mean age of the learners. [3]
- (d) One learner is chosen at random from this group.
Calculate the probability that the learner is below the age of
- (i) 8 years, [1]
- (ii) 16 years. (1) [1]
- (e) If two learners are chosen at random, find the probability that they are both in the age group $14 \leq x < 16$. [2]

7 (a) The following table gives the values of $y = 6 - x - x^2$

x	-4	-3	-2	-1	0	1	2	3
y	p	0	4	6	q	4	0	-6

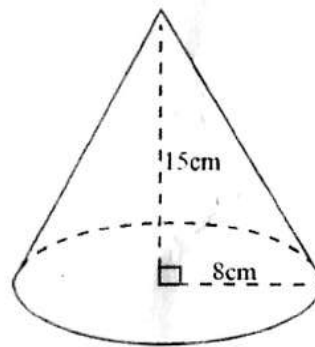
Find the value of p and the value of q . [2]

Answer the whole of this part of the question on graph paper. Use a scale of 2cm to 1 unit on the x -axis in the range $-4 \leq x \leq 3$ and 2cm to 2 units on the y -axis in the range $-6 \leq y \leq 7$.

- (b) Draw the graph of $y = 6 - x - x^2$. [4]
- (c) Use the graph to find the,
- (i) maximum value of $6 - x - x^2$, [1]
 - (ii) equation of the line of symmetry, (2) [1]
 - (iii) gradient of the graph when $x = -2$, [2]
 - (iv) area bounded by the graph, the x -axis, the y -axis and the line $x = -2$. [2]

8

(a)



The diagram shows a solid right cone with a base radius of 8cm and a height of 15cm.

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

Calculate the

- (i) slant height of the cone. [1]
 - (ii) volume of the cone. [2]
 - (iii) curved surface area of the cone. [2]
 - (iv) total surface area of the cone. [1]
- (b) A boy made several different objects from modelling clay. He used 50cm^3 of clay for each object.
- (i) He made a square based cuboid of height 2cm.
Find the length of the side of the square base. [2]

- (ii) He made a pyramid with a base area of 15cm^2 .

Find the height of the pyramid.

[2]

- (iii) He made a sphere. Calculate the radius of the sphere.

$$[\text{Volume of a sphere} = \frac{4}{3}\pi r^3]$$

[2]

- 9 Answer the whole of this question on a sheet of graph paper. Use a scale of 2cm to 2 units on both axis in the ranges $-8 \leq x \leq 10$ and $-10 \leq y \leq 6$.

Triangle A has vertices at (2;2), (4;2) and (4;5)

Triangle B has vertices at (-4; 3), (-2; 3) and (-2; 6)

- (a) Draw and label triangle A and triangle B. [2]
- (b) Triangle A is mapped onto triangle C by an enlargement centre (0;0) scale factor -2. [3]
Draw and label triangle C.
- (c) Triangle D is the image of triangle A under a clockwise rotation of 90° about the point (2; -2). [3]
Draw and label triangle D.
- (d) Describe fully the single transformation that maps triangle A onto triangle B. [2]
- (e) The matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$ represents the transformation that maps triangle A onto triangle E. [2]
Describe fully the single transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$

10 (a) Given that $A = \begin{pmatrix} -3 & 4 \\ -\frac{1}{2} & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -2 & 2 \\ 6 & 1 \end{pmatrix}$

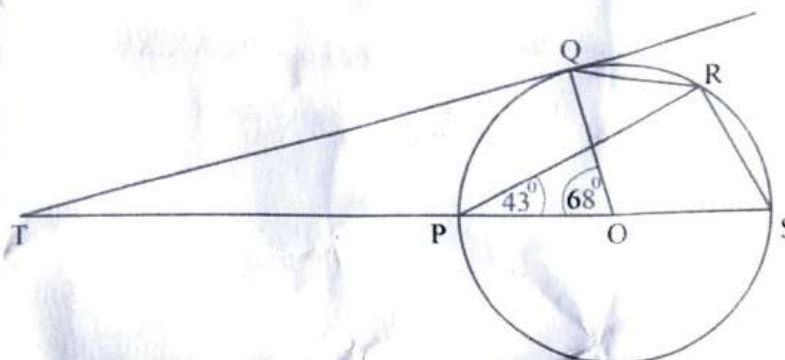
(i) Find $A + B$ [2]

(ii) Find A^{-1} , the inverse of matrix A . [2]

(b) The determinant of the matrix $\begin{pmatrix} k-1 & 4 \\ 1 & 3k \end{pmatrix}$ is 14.

Find the possible values of k . [4]

(c)



In the diagram P , Q , R and S lie on the circumference of a circle centre O . PS is a diameter. The tangent to the circle at Q meets the line SP produced at T . $\angle TQO = 68^\circ$ and $\angle S\hat{P}R = 43^\circ$.

Find

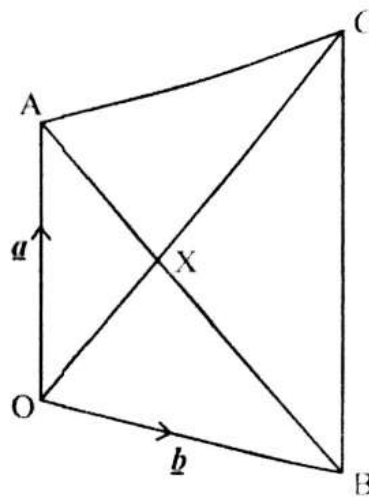
(i) $\angle \hat{S}R$ [1]

(ii) $\angle \hat{P}RQ$ [1]

(iii) $\angle \hat{P}TQ$ [1]

(iv) $\angle \hat{R}QO$ [1]

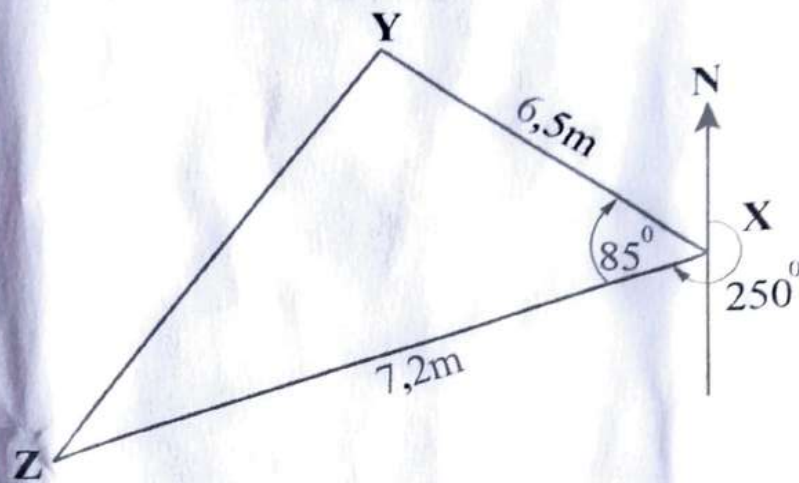
11 (a)



In the diagram $\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$, $AX:XB = 2:3$ and OA is parallel to BC .

Express in terms of $\mathbf{a}$ and/or $\mathbf{b}$

- (i) $\vec{AB}$ [1]
- (ii) $\vec{BX}$ [1]
- (iii) $\vec{OX}$ [2]
- (b) If $\vec{BC} = k\vec{OA}$, express $\vec{AC}$ in terms of k , $\mathbf{a}$ and $\mathbf{b}$. [2]
- (c) Express $\vec{OC}$ in terms of k , $\mathbf{a}$ and $\mathbf{b}$. [1]
- (d) Given also that $\vec{OC} = h\vec{OX}$, express $\vec{OC}$ in terms of h , $\mathbf{a}$ and $\mathbf{b}$. [1]
- (e) Hence find the values of k and h . [3]
- (f) Express $\vec{AC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. [1]



In the diagram points X, Y and Z lie on horizontal ground such that $\angle YXZ = 85^\circ$, $XY = 6,5 \text{ m}$, $XZ = 7,2 \text{ m}$ and the bearing of Z from X is 250° .

Calculate

- (a) YZ , [4]
- (b) $\angle XYZ$, [3]
- (c) the bearing of Z from Y correct to the nearest degree. [3]
- (d) the shortest distance from X to YZ. [2]