

Candidate Name

Centre Number

Candidate Number



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

MATHEMATICS

PAPER 1

4004/1
2 hours 30 minutes

JUNE 2024 SESSION

Additional materials:
Mathematical Instruments

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces at the top of each page. Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

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.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question. This paper is marked out of 100.

This question paper consists of 28 printed pages.

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Answer all questions.

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

- 1 (a) Simplify $0 - (-3)$

Answer (a)

[1]

- (b) Express $\frac{8}{3}$ as a recurring decimal.

Answer (b)

[1]

- (c) Find $\sqrt{1\frac{11}{25}}$.

Answer (c)

[1]

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2 (a) Simplify $2\frac{2}{3} \div 2$.

Answer (a)

[1]

(b) Find the value of $9 + 6 \div 3$.

Answer (b)

[1]

(c) Evaluate $0,032 \div 0,4$.

Answer (c)

[1]

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- 3 Three learners A, B and C contributed \$20, \$30 and \$50 respectively. They bought a packet of sweets with 150 sweets worth \$100.

- (a) Write down the ratio of the money they contributed in an ascending order in its simplest form.

Answer (a)

[1]

- (b) If the three learners shared the sweets in the ratio of the money they contributed.

Calculate the number of sweets C got.

Answer (b)

[2]



- 4 Two hills A and B are 3 km apart.

Hill A is 150 metres above sea level.

The person on top of the hill A sees the peak of hill B at an angle of elevation of 15° .

Use as much information given below as is necessary:

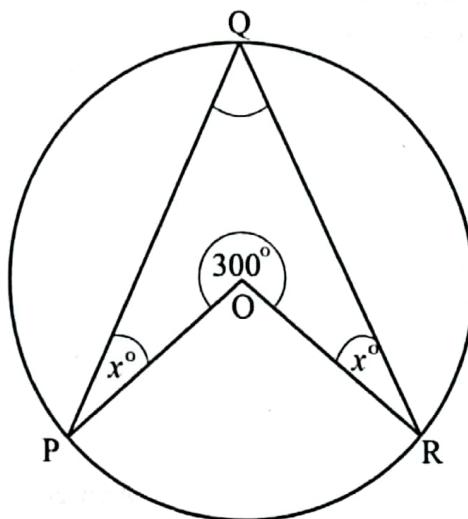
[$\sin 15^\circ = 0,2588$; $\cos 15^\circ = 0,9659$ $\tan 15^\circ = 0,0875$]

Find the height of hill B above sea level.

Answer

[3]

5



In the diagram points P, Q and R are on the circumference of a circle, centre O.

$$\angle POR = 300^\circ, \angle QPO = \angle QRO = x^\circ,$$



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Find

(a) $P\hat{Q}R$

Answer (a)

[1]

(b) x .

Answer (b)

[2]

6 Solve the simultaneous equations:

$$x = 3 - 3y$$

$$2y = x - 8$$

Answer

[3]



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- 7 A rectangular wall measuring 6m by 5m has a window measuring 1,5m by 1,2 m.
The wall needs to be painted.
Calculate the area of the wall to be painted.

Answer

[3]

- 8 The Universal set ξ has subsets A and B, such that ,
 $\xi = \{x : 1 \leq x \leq 20, x \text{ is an integer}\}$,
 $A = \{x : x < 10\}$,
 $B = \{x : x \text{ is a perfect cube}\}$.

(a) List all elements of,

(i) B,

Answer (a)(i)

[1]

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(ii) $A \cap B$,

Answer (a)(ii)

[1]

(b) Hence or otherwise state the relationship between sets A and B.

Answer (b)

[1]

9 (a) Express 732×10^{-1} in standard form.

Answer (a)

[1]

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- (b) Three towns A, B and C are situated along a straight road, such that town C is (4×10^2) km from town A and town B is $(1,88 \times 10^2)$ km from town A.
Find the distance of town B from town C.
Give the answer in standard form.

Answer (b)

[2]

10 (a) Round off,

- (i) \$9 995,85 correct to the nearest \$10.

Answer (a)(i)

[1]

- (ii) $3\frac{1}{5} \text{ cm}$ correct to the nearest centimetre.

Answer (a)(ii)

[1]



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- (b) (i) Express 432 as a product of its prime factors.

Answer (b)(i)

[1]

- (ii) Hence find the smallest number by which 432 must be multiplied to get a result which is a perfect square.

Answer (b)(ii)

[1]

- 11 (a) A greengrocer bought 80 oranges for \$640 and sold them at \$15 each. Find the percentage profit made.

Answer (a)

[2]

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- (b) A woman invested \$4 000 in a bank at 3% simple interest.

The money earned an interest of \$240.

Find the time her money was in the bank.

Answer (b)

[2]

- 12 Learner P walks to school every day which is 5km from the learner's home. In order for the learner to reach the school at 0715, the time at which the lessons commence, the learner leaves home at 0545.

- (a) Write 0545 as a time in 12-hour notation.

Answer (a)

[1]

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(b) On one of the days, learner P arrived at school at 0725.

(i) Find the time by which learner P was late for the lessons.

Answer (b)(i)

[1]

(ii) Calculate the average speed, in km/h, at which learner P was walking on the day that the learner was late.

Answer (b)(ii)

[2]



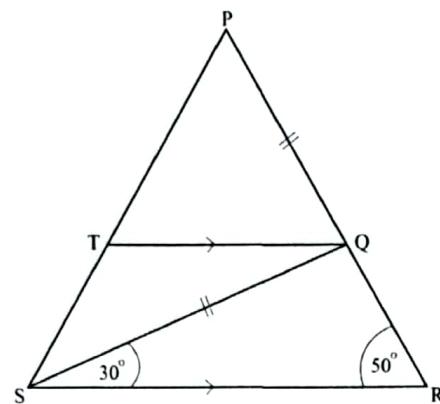
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13



In the diagram triangle PSR is such that

QT is parallel to RS, $\hat{QRS} = 50^\circ$, $\hat{QSR} = 30^\circ$ and $PQ = QS$.

Find

(a) \hat{SQT} ,

Answer (a)

[1]

(b) \hat{TQP} ,

Answer (b)

[1]

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(c) \hat{PTQ} ,

Answer (c)

[2]

- 14** Two learners P and Q write a Mathematics test.

The probability that P passes the test is 3.

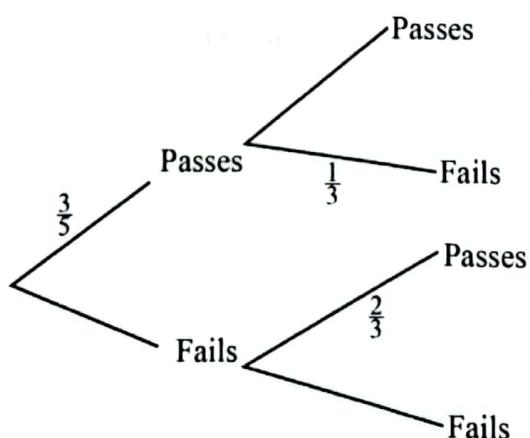
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The probability that Q passes the test is 2.

3

- (a) Complete the tree diagram below by inserting the probabilities not given.

P O



Answer (a) on the diagram

[2]



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- (b) Find the probability that only one of the learners passes the test

Answer (b)

[2]

15 (a) Factorise completely,

(i) $4x - 2y$,

Answer (a)(i)

[1]

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

Answer (a)(ii)

[2]



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- (b) Hence or otherwise, find L.C.M of $4x - 2y$ and $4x^2 - y^2$.

Answer (b)

[1]

- 16 The table below, contains distance covered, in km, per given litres of fuel.

Number of litres (l)	0,5	10	30	50
Distance (D) in km	7,5	150	450	750

- (a) State the type of variation connecting the two quantities

Answer (a)

[1]

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- (b) Express D in terms of l ,

Answer (b)

[2]

- (c) Calculate amount of fuel in litres, that will be required for a distance of 480 km.

Answer (c)

[2]

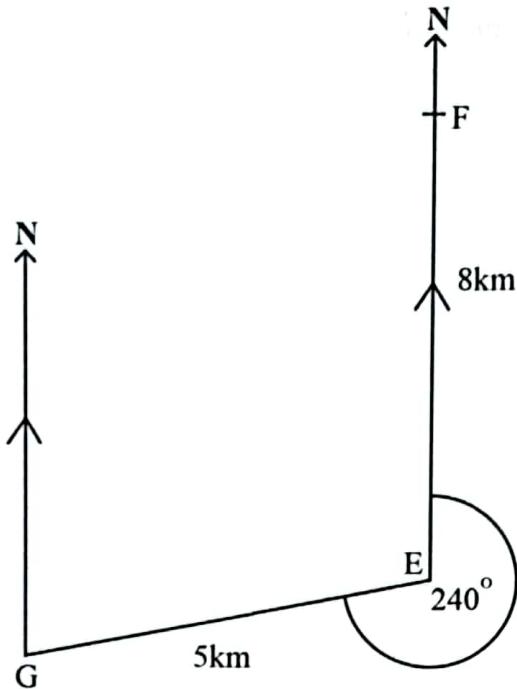
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18

17



In the diagram above, school F is **8km** due north of school E.
School G is **5km** from school E on a bearing of 240° .

- (a) Find the compass bearing of school E from school G.

Answer (a)

[2]



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- (b) Calculate the distance of school F from school G, leaving the answer in surd form.

Answer (b)

[3]

18 (a) Given that, $\begin{pmatrix} 1 & 2 \\ 6 & 3 \end{pmatrix} - \begin{pmatrix} 4 & 7 \\ 3y & 10 \end{pmatrix} = \begin{pmatrix} -3 & -5 \\ 9 & -7 \end{pmatrix}$

find the value of y .

Answer (a)

[1]



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(b) Simplify $\begin{pmatrix} 2 \\ 3 \end{pmatrix} (1 \ -3)$

Answer (b)

[2]

(c) Given that $\begin{pmatrix} 1 & -x \\ -2 & 9 \end{pmatrix}$ is the inverse of $\begin{pmatrix} 9 & x \\ 2 & 1 \end{pmatrix}$,
find the value of x .

Answer (c)

[2]

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- 19 (a) Write down the value of 1 in the number 610_7 .

Answer (a)

[1]

- (b) Evaluate $1\ 016_9 + 881_9$, giving the answer in base 9.

Answer (b)

[1]

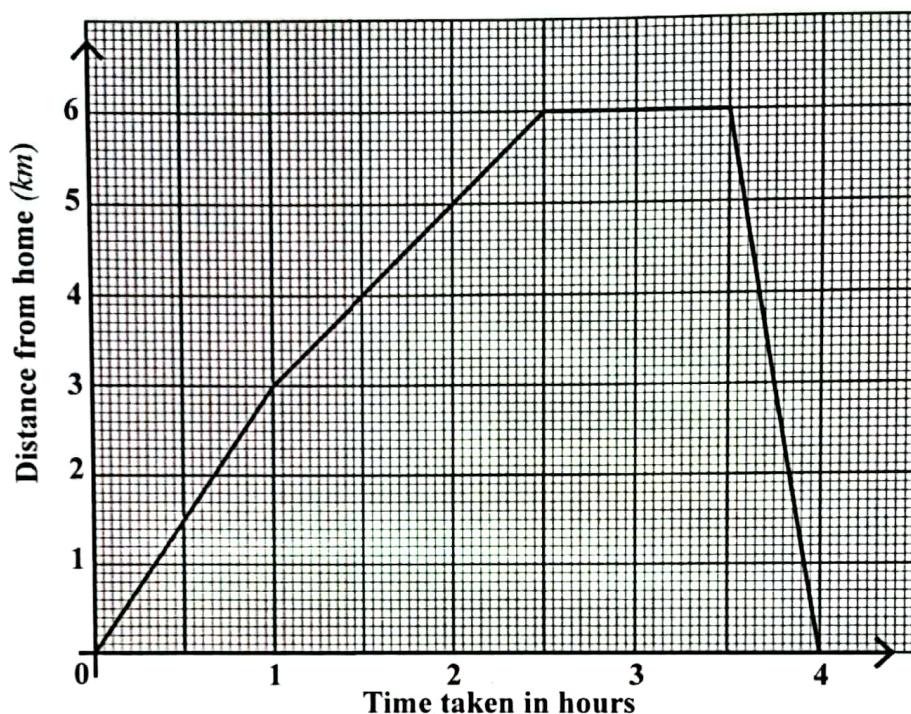
- (c) Evaluate $140_5 - 123_5$, giving the answer in base 2.

Answer (c)

[3]



20



A man went for a walk. He left home at 9.30 am. His displacement - time graph is given in the graph above.

Find the

- (a) time he arrived back home,

Answer (a)

[1]



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- (b) total distance he walked,

Answer (b)

[1]

- (c) average speed for the whole journey in km/h,

Answer (c)

[2]

- (d) amount of time the man rested.

Answer (d)

[1]

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21 (a) Evaluate,

(i) $2^3 + 2^2$,

Answer (a)(i)

[1]

(ii) $-(7x^2)^0$,

Answer (a)(ii)

[1]

(iii) $(2^3)^{-\frac{2}{3}}$.

Answer (a)(iii)

[1]

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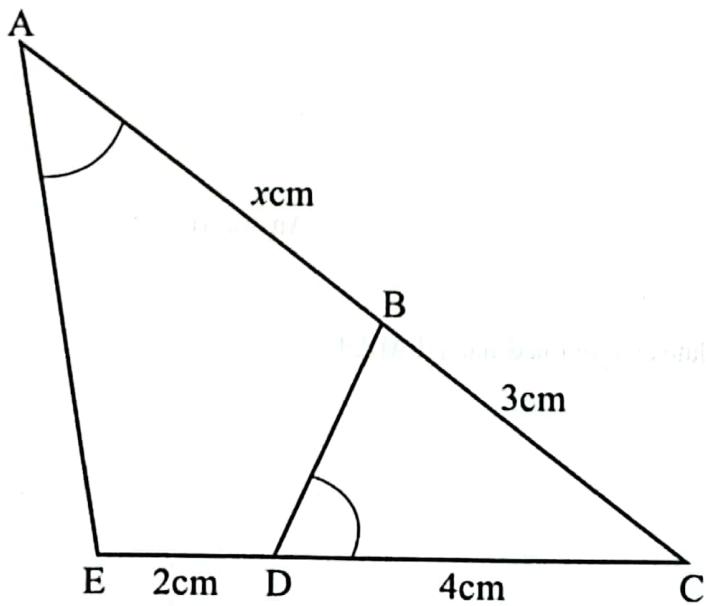
25

- (b) Solve the equation $3^x \times 3^{2x} = 27$.

Answer (b)

[3]

22



In the diagram above, $E\hat{A}C = B\hat{D}C$, $AB = x\text{cm}$,
 $BC = 3\text{cm}$, $DC = 4\text{cm}$ and $ED = 2\text{cm}$. Area of
triangle $ACE = 24\text{cm}^2$.

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- (a) Name a triangle which is similar to triangle ACE.

Answer (a)

[1]

- (b) Find x

Answer (b)

[2]

- (c) Calculate area of quadrilateral ABDE.

Answer (c)

[3]

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- 23 An 11 sided polygon has 9 of its exterior angles which are each x° and 2 which are each y° . The sum of 9 interior angles adjacent to angle x° of the polygon is 1152° more than the sum of the 2 interior angles adjacent to angle y° of the polygon.

- (a) Form two simultaneous equations in x and y using the given information above.

Answer (a)

[3]

- (b) Solve the simultaneous equations in (a).

Answer (b)

[3]



24 A straight line l , passes through the point $(2 ; -3)$ and has gradient of 3.

- (a) (i) Find the equation of line l in the form $y = mx + c$.

Answer (a)(i)

[2]

- (ii) State the relationship between line l and the line whose equation is $y = 3x - 1$.

Answer (a)(ii)

[1]

- (b) Given that $f(x) = 2x + k^2$ and that $f(2) = 29$, find the two possible values of k .



Answer (b)

[3] **4521**





For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
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MATHEMATICS
PAPER 2

4004/2

2 hours 30 minutes

JUNE 2024 SESSION

Additional materials:

Mathematical Instruments

Mathematical Tables

Non programmable Electronic Calculator

Answer booklet

INSTRUCTIONS TO CANDIDATES

ZC

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

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

If you use more than one booklet, fasten them 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) Mr Moyo's basic monthly salary is \$205. He receives a commission of 2% for any sales above \$500.
- (i) Calculate his gross salary for the month if his sales were \$1550. [3]
- (ii) In a certain month the following deductions were made
- | | |
|-------------|--------|
| Pension | \$3,90 |
| Medical aid | \$1,65 |
| Income tax | \$4,50 |
- Calculate his net salary for the month he made sales of \$1550. [3]
- (b) The sum of the interior angles of a polygon is double the sum of the exterior angles.
- Find the number of sides of the polygon. [2]
- 2 (a) Solve the equation $6x - 2 = 2x + 8$. [2]
- (b) Factorise completely
- (i) $5h^2 - 20k^2$ [3]
- (ii) $2mp - m - 6np + 3n$ [2]
- (c) Express $\frac{3}{x-y} - \frac{2}{x+y}$ as a single fraction in its simplest form. [3]
- 3 (a) Mr Dube had an appointment with a doctor at 1400. Mr Dube arrived 14 minutes earlier and the doctor was 15 minutes late.
- Find how long Mr Dube had to wait before the doctor arrived. [2]
- (b) Find the difference between 4 weeks 3 days and 2 weeks 5 days, giving the answer in weeks and days. [1]
- (c) Mary cycles to and from a school 5 times. The school is 5km away, to the nearest km.
- Calculate the smallest possible distance she cycles. [3]
- (d) The population of a town A is $4,52 \times 10^7$ and that of town B is $8,7 \times 10^6$.



- (i) Calculate the difference between the populations of town A and town B, giving the answer in standard form. [2]
- (ii) Given that 40% of the population of town B are adults, calculate the number of adults in town B. Give the answer in ordinary form. [2]
- 4 (a) Simplify $\frac{0,35 + 0,25}{0,3 \times 0,04}$ [2]
- (b) Evaluate $43_5 + 1001_2$, giving the answer in base two. [3]
- (c) A rectangular garden measures 15m by 12m to the nearest metre. Calculate the least possible area of the garden. [3]
- (d) Given that $a = 3,12 \times 10^{-3}$ and $b = 4,5 \times 10^{-4}$ find, giving the answer in standard form, the value of
- (i) $a + b$, [2]
- (ii) ab . [2]
- 5 Answer the whole of this question on sheet of plain paper.
Use ruler and compasses only for all constructions and show all construction lines and arcs.
- (a) On a single diagram, construct.
- (i) a quadrilateral $ABCD$ with AD parallel to BC , $AB = 8\text{cm}$, $BC = 10\text{cm}$, $\hat{A}B\hat{C} = 90^\circ$ and $\hat{B}\hat{C}D = 60^\circ$. [5]
- (ii) the locus of points equidistant from A and B . [1]
- (iii) the locus of points equidistant from B and C . [1]
- (b) (i) Mark and label point P , which is equidistant from A and B , and also equidistant from B and C . [1]
- (ii) Construct a circle passing through A , B and C . [1]



- (c) Region T is such that it is nearer B than C and nearer B than A and lies inside the quadrilateral $ABCD$.

Shade region T . [2]

- (d) Measure and write down the radius of the circle (b)(ii). [1]

$$\text{Radius} = 5.0 \text{ cm}$$

10. A right-angled triangle PQR has a hypotenuse $PQ = 10\sqrt{2}$ cm.

The angle at vertex P is 45° . The angle at vertex Q is 30° .

Find the area of triangle PQR correct to two significant figures.

11. The diagram shows a rectangle $ABCD$ with vertices A , B , C and D in clockwise direction starting from the top-left vertex.

$\angle A = 30^\circ$, $\angle B = 60^\circ$, $\angle C = 90^\circ$ and $\angle D = 90^\circ$.

$AB = 10\sqrt{3}$ cm and $BC = 10\sqrt{2}$ cm.

Find the area of the rectangle $ABCD$ correct to two significant figures.

12. The diagram shows a rectangle $ABCD$ with vertices A , B , C and D in clockwise direction starting from the top-left vertex.

$\angle A = 30^\circ$, $\angle B = 60^\circ$, $\angle C = 90^\circ$ and $\angle D = 90^\circ$.

$AB = 10\sqrt{3}$ cm and $BC = 10\sqrt{2}$ cm.

Find the area of the rectangle $ABCD$ correct to two significant figures.

13. The diagram shows a rectangle $ABCD$ with vertices A , B , C and D in clockwise direction starting from the top-left vertex.

$\angle A = 30^\circ$, $\angle B = 60^\circ$, $\angle C = 90^\circ$ and $\angle D = 90^\circ$.

$AB = 10\sqrt{3}$ cm and $BC = 10\sqrt{2}$ cm.

Find the area of the rectangle $ABCD$ correct to two significant figures.



Section B [48 Marks]

Answer any four questions from this section.

Each question carries 12 marks.

6 (a) $\xi = \{x : 1 < x \leq 20, x \text{ is an integer}\}$

$$X = \{x : x \text{ is a prime number}\}$$

$$Y = \{x : x \text{ is an even number}\}$$

$$Z = \{x : x \text{ is a multiple of } 5\}$$

- (i) List all the elements of set X . [2]

- (ii) Find $n(Z)$. [1]

- (iii) Find $n(Y \cup Z)$. [1]

- (iv) Set P is a subset of ξ such that $P = \{10; 20\}$.

Express set P in set notation, using the sets X , Y and Z . [2]

- (b) (i) Solve the inequality $-3 < 2x + 1 \leq 7$. [4]

- (ii) Give the integral values which satisfy the inequality in (i). [2]

7 (a) Given that $A = \begin{pmatrix} x & 3 \\ 1 & 2 \end{pmatrix}$,

- (i) find the value of x if the determinant of A is 5. [2]

- (ii) find the inverse of A . [2]

- (b) Solve the following simultaneous equations:

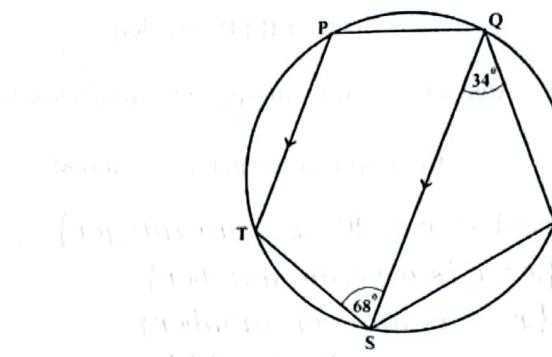
$$4x + 3y = 6$$

$$x + 2y = -1$$

[3]



(c)



In the diagram points P, Q, R, S and T lie on the circumference of a circle.
QS is the diameter of the circle. PT is parallel to QS.

$$Q\hat{S}T = 68^\circ \text{ and } S\hat{Q}R = 34^\circ.$$

- (i) State briefly why $Q\hat{R}S = 90^\circ$. [1]
- (ii) Find $Q\hat{S}R$. [2]
- (iii) Find $S\hat{T}P$. [2]

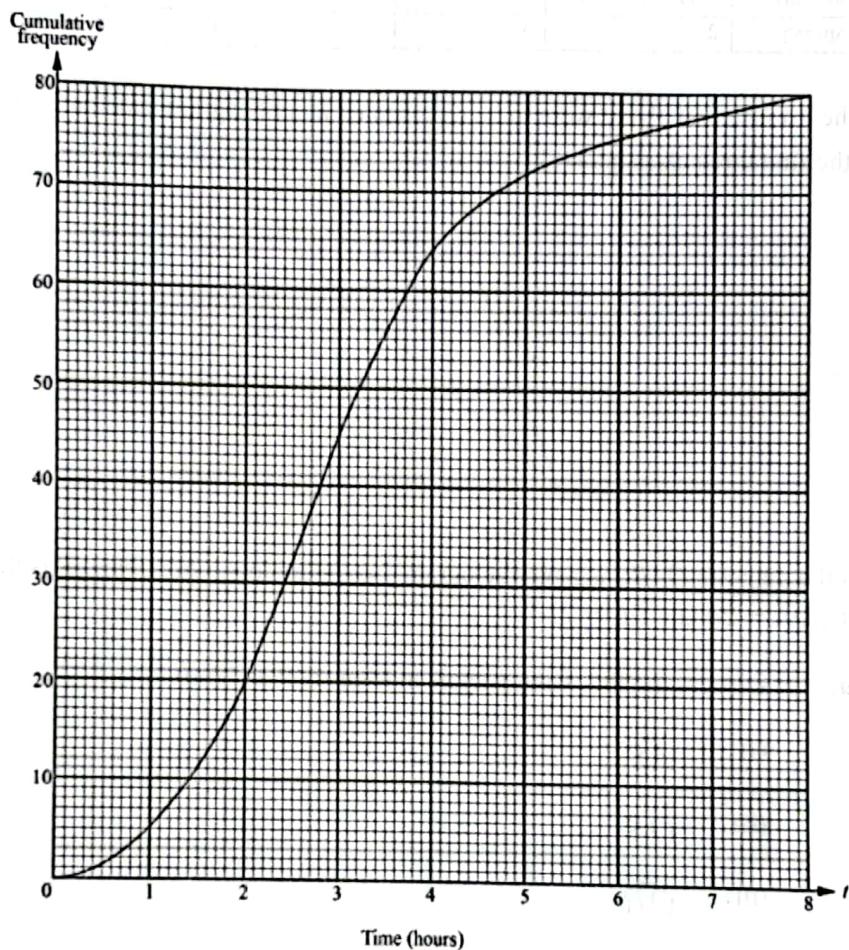
- 8 The following is an incomplete table of values for the function $y = x^2 + x - 3$

x	-4	-3	-2	-1	0	1	2	3
y	9	p	-1	-3	q	-1	3	9

- (a)
 - (i) Find the value of p . [1]
 - (ii) Find the value of q . [1]
- (b)
 - (i) Draw the graph of $y = x^2 + x - 3$ on the a sheet of graph paper. Use a scale of 2cm to 1 unit on the x axis and 2cm to 2 units on the y axis. [4]
 - (ii) Draw the line of symmetry of the curve. [1]
- (c) Use the graph to
 - (i) find the equation of the line of symmetry, [1]
 - (ii) find the coordinates of the minimum point of the curve, [2]
 - (iii) solve the equation $x^2 + x - 3 = -2$. [2]



- 9 In a survey 80 motorists were each asked the number of hours their journey took. The results were used to draw a cumulative frequency curve.



Use the graph to answer the following questions.

- (a) (i) Complete the frequency distribution table below.

Time in hrs (t)	$0 < t \leq 2$	$2 < t \leq 3$	$3 < t \leq 4$	$4 < t \leq 5$	$5 < t \leq 6$	$6 < t \leq 8$
Frequency	20	25	19			

[2]

- (ii) Calculate an estimate mean of the number of hours the 80 motorists took giving your answer to the nearest hour.

[3]

- (iii) Find the median.

[2]

- (iv) Find the probability that two motorists chosen at random took more than 5 hours but less or equal to 7 hours.

[2]

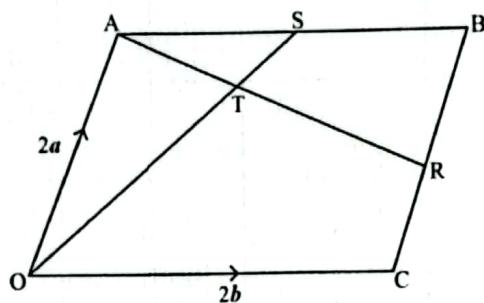


(b)

Marks (m)	$17 < m \leq 21$	$21 < m \leq 24$	$24 < m \leq 27$	$27 < m \leq 30$	$30 < m \leq 32$	$32 < m \leq 40$
Frequency	2	3	9	15	9	2

If the information above were to be represented in a histogram, calculate the heights of the first three class intervals. [3]

10



In the diagram $OABC$ is a parallelogram S is the midpoint of AB and R is the midpoint of BC . $\vec{OA} = 2a$ and $\vec{OC} = 2b$

(a) Express the following vectors in terms of a and/or b

(i) \vec{AS} , [1]

(ii) \vec{OS} , [1]

(iii) \vec{OR} , [1]

(iv) \vec{AR} . [1]

(b) OS and AR intersect at T . Given that $\vec{AT} = h\vec{AR}$, show that $\vec{OT} = (2 - h)a + 2b$. [2]

(c) Given that $\vec{OT} = k\vec{OS}$, express \vec{OT} in terms of a , b and k . [1]

(d) Using these two expressions for \vec{OT} , find the value of h and the value of k . [4]

(e) Find the ratio $\frac{\vec{TR}}{\vec{AR}}$. [1]



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

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

Triangle XYZ has vertices at $X(1;1)$, $Y(4;1)$ and $Z(2;3)$.

- (a) Draw and label triangle XYZ . [1]

- (b) Triangle XYZ is mapped onto triangle $X_1Y_1Z_1$ by a transformation M which is represented by matrix $\begin{pmatrix} 1 & -1 \\ 1 & 2 \end{pmatrix}$

Draw and label triangle $X_1Y_1Z_1$. [3]

- (c) Triangle $X_1Y_1Z_1$ is mapped onto triangle $X_2Y_2Z_2$ by a 90° anticlockwise rotation about $(-2; 0)$.

Draw and label triangle $X_2Y_2Z_2$. [3]

- (d) Triangle $X_3Y_3Z_3$ has vertices at $X_3(-3; -3)$, $Y_3(-12; -3)$ and $Z_3(-6; -9)$.

Draw and label triangle $X_3Y_3Z_3$. [1]

- (e) Describe fully the single formation that maps triangle XYZ onto triangle $X_3Y_3Z_3$. [3]

- (f) Write down the matrix which represents the transformation in (e). [1]

- (12) (a) Find the LCM of $2^3 \times 3^2 \times 7^2$
 $2^4 \times 3^3 \times 5 \times 7^3$
 $2^5 \times 3 \times 5^2 \times 7$.

Give the answer in index form. [1]

- (b) Simplify

(i) $6u \times 5 - 3 \times 4u - 12u$. [2]

(ii) $4\frac{1}{8} \times \frac{4}{11} \div 6\frac{2}{3}$. [2]

- (c) (i) During a one hour radio programme there were 12 minutes of talking ; the rest was music.

Calculate the percentage of radio programme that was music. [2]



(ii) Given that $y = 2.9 \times 10^2$.

Evaluate $\sqrt{y - 1}$, giving the answer in standard form.

[2]

(iii) (d) Evaluate $38_9 + 1001_4$, giving the answer in base 5.

[3]

(iv)

$$\begin{pmatrix} 1 & 1 \\ y & 1 \end{pmatrix}$$

is an invertible matrix. If

$$\begin{pmatrix} 1 & 1 \\ y & 1 \end{pmatrix}^{-1} = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix},$$

(v)

$$\tan(\theta + 12^\circ) = \tan \theta \cdot \frac{\tan 12^\circ + 1}{\tan 12^\circ - 1},$$

(vi)

$\sin(180^\circ - \theta) = \sin \theta$

(vii)

$$\frac{1}{2} \sin(2\theta) = \frac{1}{2} \sin(2\theta) + \frac{1}{2} \cos(2\theta) = \frac{1}{2} (\sin 2\theta + \cos 2\theta)$$

(viii)

$$\begin{aligned} \frac{1}{2} \sin(2\theta) &= \frac{1}{2} \sin(2\theta) + \frac{1}{2} \cos(2\theta) \\ &\Rightarrow \frac{1}{2} \sin(2\theta) = \frac{1}{2} \cos(2\theta) \\ &\Rightarrow \sin(2\theta) = \cos(2\theta) \end{aligned}$$

(ix)

$$\sin(2\theta) = \cos(2\theta) \Rightarrow \tan(2\theta) = 1 \Rightarrow 2\theta = 45^\circ \Rightarrow \theta = 22.5^\circ$$

(x)

$$\sin(2\theta) = \cos(2\theta) \Rightarrow \tan(2\theta) = 1 \Rightarrow 2\theta = 45^\circ \Rightarrow \theta = 22.5^\circ$$

(xi)

$$\sin(2\theta) = \cos(2\theta) \Rightarrow \tan(2\theta) = 1 \Rightarrow 2\theta = 45^\circ \Rightarrow \theta = 22.5^\circ$$

(xii)

$$\sin(2\theta) = \cos(2\theta) \Rightarrow \tan(2\theta) = 1 \Rightarrow 2\theta = 45^\circ \Rightarrow \theta = 22.5^\circ$$

(xiii)

$$\sin(2\theta) = \cos(2\theta) \Rightarrow \tan(2\theta) = 1 \Rightarrow 2\theta = 45^\circ \Rightarrow \theta = 22.5^\circ$$



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