

Candidate Name

Centre Number

Candidate Number



ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS

4004/1

PAPER 1

NOVEMBER 2022 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 19 printed pages and 1 blank page.

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Answer all questions

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

1 (a) Express

one million and one in figures.

Answer (a)

[1]

(b) $1\frac{3}{4}$ days in hours,

Answer (b)

[1]

(c) $11,6^\circ$ in degrees and minutes

Answer (c)

[1]

2 (a) Solve the equation $13x = 377$.

Answer (a)

[1]

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- (b) If vector $a + \begin{pmatrix} 3 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$,
find vector a .

Answer (b)

[1]

- (c) Write down the largest perfect square integer number less than 20.

Answer (c)

[1]

- 3 (a) Write the three figure bearing equivalent to North East.

Answer (a)

[1]

- (b) Write the first three positive odd integers.

Answer (b)

[1]

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- (c) Express 0,0456 correct to one significant figure.

Answer (c)

[1]

4 Evaluate

(a) $\left(\frac{7}{8}\right)^{-1}$,

Answer (a)

[1]

(b) $\log_5 80 - \log_5 16$.

Answer (b)

[2]

5 (a) Simplify the expression $\frac{2x + 3y}{6x + 9y}$.

Answer (a)

[2]



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(b) Find $\sqrt{5\frac{4}{9}}$

Answer (b)

[2]

6 Solve the equation $2x^2 - 5x - 3 = 0$.

Answer

[3]

7 Given that $f(d) = d^2 - 3d$,
find

(a) $f(3)$,

Answer (a)

(b) the values of d for which $f(d) = 10$.

[1]

Answer (b)

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8

Solve the simultaneous equations:

$$3m - n = -7$$

$$2m + n = 17$$

Answer

[3]

9

Given that $\xi = \{x : 49 \leq x \leq 58\} \quad x \in \mathbb{Z}$,State from ξ , a

(a) prime number,

Answer (a)

[1]

(b) multiple of 19,

Answer (b)

[1]

(c) square number.

Answer (c)

[1]

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10

Find the next **two** terms in the following sequences:

(a) 1; 3; 6; 10; 15; ...

Answer (a)

[2]

(b) 16; 4; $1; \frac{1}{4}; \dots$

Answer (b)

11 (a) Given that $11_a = 9_{10}$,
find the value of a .

[2]

Answer (a)

(b) Convert 202_7 to a number in base 5.

[2]

Answer (b)

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[2]



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12 Evaluate

(a) $\left(\frac{1}{3} + \frac{1}{4}\right)^2,$

Answer (a)

[2]

(b) $1\frac{1}{4} \div 1\frac{1}{2}$ leaving the answer in it lowest terms.

Answer (b)

[2]

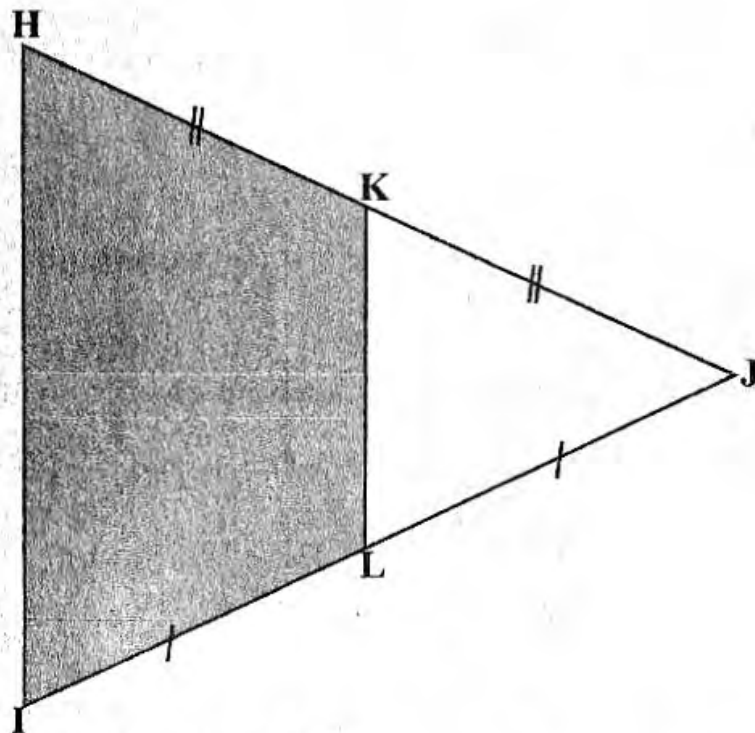
13 (a) State the number of lines of symmetry of a rhombus.

Answer (a)

[1]



(b)



The diagram above shows triangle HIJ.

Line HI is parallel to line KL, where L and K are midpoints of IJ and HJ respectively.

The area of triangle HIJ is 48 cm^2 .

Calculate the area of the shaded quadrilateral HILK.

Answer (b)

[3]

14 Factorise completely

(a) $36p^4 - 4q^2$,

Answer (a)

[3]

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10

(b) $10my + 15ny + 6m + 9n.$

Answer (b)

[2]

- 15 (a) Convert a speed of 10m/s to a speed in km/h.

Answer (a)

[2]

- (b) Given that matrix $A = \begin{pmatrix} m & 6 \\ 12 & 2m \end{pmatrix}$ is singular, find the two possible values of m .

Answer (b)

[2]

- 16 A rectangle of length x metres and width of y metres is drawn according to these conditions:

- (a) The width is greater than one third of the length.
Find an inequality that satisfies this condition.

Answer (a)

[1]

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- (b) The perimeter is not less than 400 metres but less than 560 metres.
Find an inequality which satisfy this inequality.

Answer (b)

[3]

- (n) Given that $n - 4 > 7$, find the smallest possible value of n if n is an integer.

Answer (a)

[2]

- (o) A triangle ABC is such that $AB = 3 \text{ cm}$, $AC = 5 \text{ cm}$, $BC = x \text{ cm}$
and $\hat{BAC} = 120^\circ$.

Use as much of the information given below as is necessary to answer the question.

$$\left[\sin 60^\circ = \frac{\sqrt{3}}{2}; \cos 60^\circ = \frac{1}{2}; \tan 60^\circ = \sqrt{3} \right]$$

Find the value of x .

Answer (b)

[3]



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- 18 (a) The magnitude of vector $\begin{pmatrix} x \\ 3 \end{pmatrix}$ is 5. Find the possible values of x .

Answer (a)

[2]

- (b) The universal set ξ has subsets A, B and C such that
 $\xi = \{1; 2; 3; 4; 5; 6; 7; 8; 9\}$,
 $A = \{x : x \text{ is a factor of } 8\}$,
 $B = \{2; 4; 8\}$
 $C = \{x : x \text{ is a perfect square number}\}.$

- (i) List all elements of subset C.

Answer (b)(i)

[1]

- (ii) Find $n(A \cup B)$.

Answer (b)(ii)

[1]

- (iii) Write down the relationship between sets A and B in set notation.

Answer (b)(iii)

[1]

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The midday temperature, in degrees celsius, for ten days in September in a certain town were recorded as follows:

18; 20; 22; 23; 26; 28; 22; 18; 18; 17.

(a) State the modal temperature.

Answer (a)

[1]

(b) Find the median temperature.

Answer (b)

[1]

(c) Find the temperature range.

Answer (c)

[1]

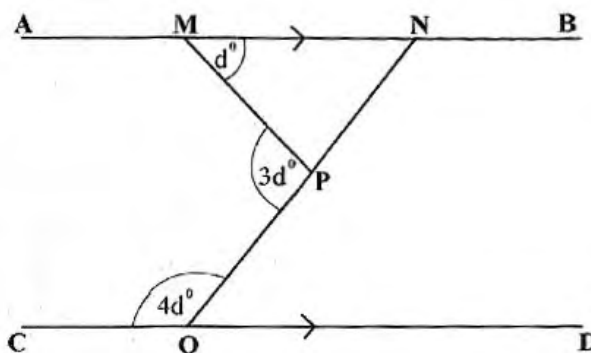
(d) Calculate the mean temperature.

Answer (d)

[2]



20 (a)



The diagram above shows two parallel lines AB and CD.

Line QN cuts the parallel lines at Q and N. Line PM cuts QN at P and AB at M.

$\angle CQP = 4d^\circ$, $\angle QPM = 3d^\circ$ and $\angle PMN = d^\circ$.

(i) Express $\angle MNP$ in terms of d .

Answer (a)(i)

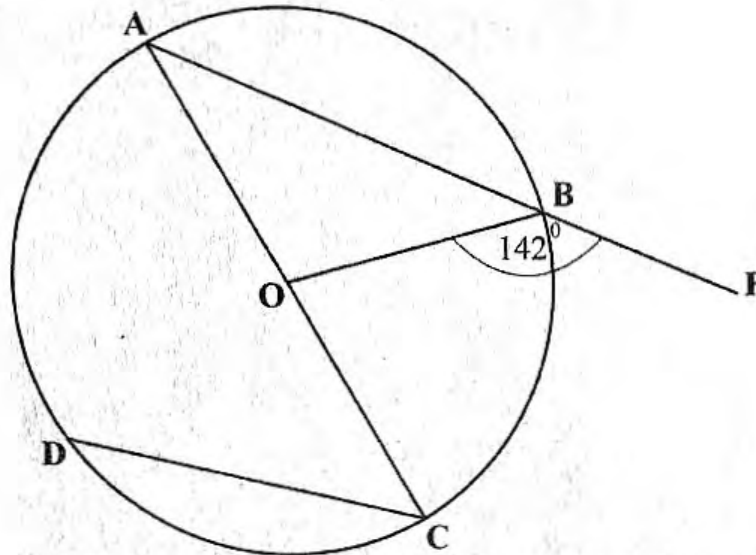
[1]

(ii) Calculate the value of d .

Answer (a)(ii)

[2]

(b)



The diagram above shows points A, B, C and D on the circumference of a circle centre O.

AB and DC are chords and AC is the diameter of the circle. Point F is on AB produced.

$\angle FBO = 142^\circ$
Calculate

(i) $\angle BAC$,

Answer (b)(i)

[1]

(ii) $\angle BOC$.

Answer (b)(ii)

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- 21 (a) The interior angle of a regular polygon is $13x^\circ$ and the exterior angle is $2x^\circ$.
- (i) Calculate the value of x .

Answer (a)(i)

[2]

- (ii) Find the number of sides of the regular polygon.

Answer (a)(ii)

[2]

- (b) A bag contains 20 balls all identical except for colour. There are 3 green balls, 5 red balls and 12 brown balls. One ball is picked at random from the bag, its colour noted and is replaced. A second ball is picked at random and its colour noted and is replaced. Calculate the probability that both balls are of the same colour.

Answer (b)

[2]

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- 22 (a) The velocity, v m/s, of a moving particle after t seconds is given by the equation $v = 5 + 4t - t^2$.
Calculate the value of

(i) v when $t = 3$ seconds,

Answer (a)(i)

[1]

(ii) t when $v = 0$.

Answer (a)(ii)

[3]

- (b) Make h the subject in the following formula, $A = 2\pi r^2 + 2\pi rh$.

Answer (b)

[2]



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18

- 23 ABCD is an isosceles trapezium with $AB = 5\text{cm}$, $DC = 17\text{cm}$ and $AD = BC$.
AB is parallel to DC.
The perimeter of the trapezium is 42cm.

Calculate the

- (a) perpendicular distance between the two parallel sides,

Answer (a)

[4]

- (b) area of the trapezium ABCD.

Answer (b)

[2]

- 24 A dealer made a profit of 20% on the buying price by selling a double bed for \$180, 00.

- (a) Calculate the buying price.

Answer (a)

[2]

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- (b) Calculate the selling price if the same bed had been sold at a loss of 20%.

Answer (b)

[2]





ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

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MATHEMATICS

4004/2

PAPER 2

NOVEMBER 2022 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.

INFORMATION FOR CANDIDATES

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

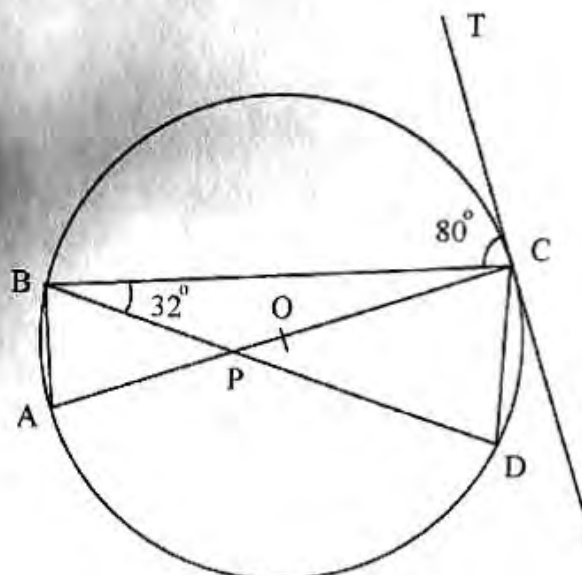
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Section A [52 Marks]

Answer all questions in this section.



In the diagram above A, B, C and D are points on the circumference of a circle centre O. TC is a tangent to the circle at C.

AC and BD intersect at P.

$\angle BCT = 80^\circ$ and $\angle CBD = 32^\circ$.

Calculate

(a) $\angle ACB$ [1]

(b) $\angle BDC$ [1]

(c) $\angle CPD$ [2]

(d) $\angle AOD$ [3]

(a) Factorise $(m - n)(4m + 2n) - (m - n)^2$. [2]

(b) The average mass of 11 players is 81 kg.
When one player is removed the average mass becomes 80, 1 kg.
Calculate the mass of the removed player. [2]

(c) Maria uses 40% of her pocket money to buy shoes.
She uses 30% of the remainder to buy a dictionary.
Find the percentage of her pocket money that is left. [2]

- (d) Solve the equation

$$\frac{4-x}{x} = \frac{x}{2}$$

[4]

3

- (a) The total surface area,
- $A \text{ cm}^2$
- , of a cone is given by the formula

$$A = \pi r^2 + \pi r l$$

where r is the base radius of the cone and l is the slant height,

- (i) Make
- l
- the subject of the formula.

[2]

- (ii) Find
- l
- when
- $A = 121,44 \text{ cm}^2$
- ,
- $r = 4,2 \text{ cm}$
- and
- $\pi = \frac{22}{7}$
- .

[2]

- (b) The time
- T
- minutes taken for a meeting is partly constant and partly varies as the square of
- N
- , the number of members present.

- (i) Express
- T
- in terms of
- N
- and the constants
- h
- and
- k
- .

[1]

- (ii) If there are 4 members present, the meeting lasts 30 minutes.
-
- If there are 6 members the meeting lasts 45 minutes.
-
- Find the values of
- h
- and
- k
- .

[3]

- (iii) Find the time that the meeting will take if there are 7 members present.

[2]

4

- (a) Simplify
- $1\frac{7}{8} - \left(1\frac{1}{2}\right)^2$
- .

[3]

- (b) Remove brackets and simplify
- $(2x - y)(3x + 2y)$
- .

[2]

- (c) Express 0,8125 as a fraction in its lowest terms.

[2]

- (d) (i) Express 5832 as a product of its prime factors in index form.

[1]

- (ii) Hence find
- $\sqrt[3]{5832}$
- .

[1]

- (e) Express
- $\frac{2}{x-4} + \frac{2}{x^2-9x+20}$
- as a single fraction in its simplest form.

[3]

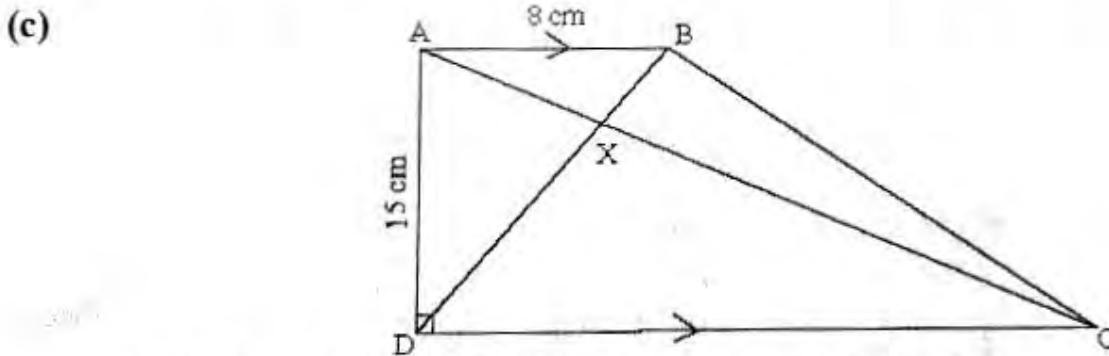
- (a) Given that matrix $A = \begin{pmatrix} 3 & 9 \\ 1 & 4 \end{pmatrix}$ and matrix $B = \begin{pmatrix} 5 & 1 \\ -4 & 2 \end{pmatrix}$,

find

(i) AB , [2]

(ii) B^{-1} the inverse of matrix B. [3]

- (b) Solve the inequality $x - 3 < 2x + 1 \leq 5 - x$.
Leave the answer in the form $a < x \leq b$ where a and b are constants. [3]



In the diagram above ABCD is a trapezium in which AB is parallel to DC.
AB = 8 cm and AD = 15 cm.

AC and BD intersect at X such that BX : XD = 3 : 5.

The area of ABCD is 180 cm^2 .

Calculate the

(i) length of DC, [2]

(ii) area of triangle BXC. [3]

Section B [48 Marks]

Answer any *four* questions from this section.

Each question carries 12 marks.

- 6 Answer the whole of this question on a sheet of plain paper.
Use ruler and compasses only for all constructions.
Show clearly all construction lines and arcs.
All constructions should be in a single diagram.

- (a) Construct a triangle ABC such that $AB = 10\text{cm}$, $\hat{ABC} = 30^\circ$ and $\hat{BAC} = 120^\circ$. [5]
- (b) Measure and write down the length of BC. [1]
- (c) Construct a perpendicular from C to meet BA produced at D. [2]
- (d) Construct the locus of points which are
- (i) equidistant from A and B, [2]
- (ii) 6 cm from point A. [1]
- (e) A point E is not more than 6 cm from A but nearer B than A.
On the diagram show by shading clearly the region in which E must lie. [1]

- 7 The table below shows times taken to complete a race by 50 athletes.

Time (t minutes)	$t \leq 5$	$5 < t \leq 8$	$8 < t \leq 10$	$10 < t \leq 12$	$12 < t \leq 14$	$14 < t \leq 16$	$16 < t \leq 18$	$18 < t \leq 20$
Frequency	0	3	5	14	16	7	4	1

- (a) Calculate an estimate of the mean time for the race. [3]
- (b) Below is a cumulative frequency table for the same times of the 50 athletes.

Time (t minutes)	$t \leq 5$	$t \leq 8$	$t \leq 10$	$t \leq 12$	$t \leq 14$	$t \leq 16$	$t \leq 18$	$t \leq 20$
Cumulative Frequency	0	3	8	22	m	45	n	50

- (i) Find the value of m and the value of n. [2]

- (ii) **Answer this part of the question on a sheet of graph paper.**
Use a scale of 2 cm to 2 minutes on the time axis and 2cm to 5 units
on the cumulative frequency axis.

Draw a cumulative frequency curve for the athletes times. [4]

(c) Use the graph to estimate the

- (i) median time for the race, [2]
 (ii) approximate number of athletes who completed the race in 9 minutes and under. [1]

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

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

$$-6 \leq x \leq 4 \text{ and } -6 \leq y \leq 8$$

- (a) Triangle P has vertices at (2; 1), (3; 3) and (1; 5).
 Draw and label triangle P. [1]

- (b) Triangle Q is the image of triangle P under a translation through vector
 $\begin{pmatrix} -6 \\ -7 \end{pmatrix}$.

Draw and label triangle Q. [3]

- (c) Triangle R with vertices at (1; 5), (3; 6) and (1; 7) is the image of triangle P under a transformation X .

(i) Draw and label triangle R. [1]

(ii) Describe fully transformation X . [3]

- (d) Triangle S is the image of triangle P under a one way stretch of stretch factor -2 with the y axis invariant.

(i) Calculate the coordinates of the vertices of triangle S. [3]

(ii) Draw and label triangle S. [1]

- 9 Answer the whole of this question on a sheet of graph paper.
Use a scale of 2cm to 1 unit on the x -axis and 2cm to 5 units on the y -axis.
The table below is for values of the function $y = 6x - x^2 - x^3$.

x	-4	-3	-2	-1	0	1	2	3
y	24	0	d	-6	0	4	0	e

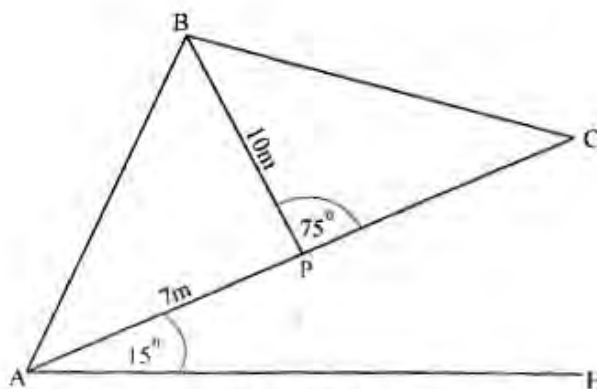
- (a) Find the values of d and e . [2]
- (b) Draw the graph of the function $y = 6x - x^2 - x^3$. [4]
- (c) Find the gradient of the curve at the point where $x = -2$. [2]
- (d) On the same axis draw the graph of $y = 2 - 2x$. [1]
- (e) Use the graphs to solve the equation $6x - x^2 - x^3 = 2 - 2x$. [3]
- 10 (a) Find vectors a and b such that :

$$a + b = \begin{pmatrix} -2 \\ 6 \end{pmatrix}$$

$$2a - b = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$$

[4]

(b)



In the diagram above BP is a post of height 10 m, standing on sloping ground AC which is inclined to the horizontal ground AH at 15° .
The post is supported by two ropes BA and BC fixed to the ground at A and C respectively.
 $AP = 7\text{m}$ and $\hat{BPC} = 75^\circ$.

- (i) Find the gradient of slope AC.
Give the answer correct to 2 decimal places. [1]
- (ii) Calculate $\hat{APB}$. [2]

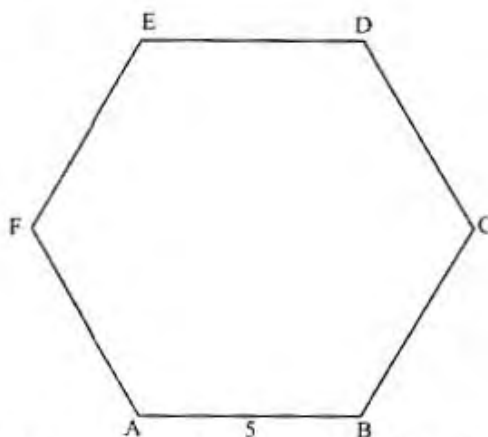
(iii) Calculate the length of the rope AB. [5]

- 11 (a) In a group of 55 teachers in a school 31 have cars, 27 have bicycles, x teachers have both a car and a bicycle and 6 have neither of the two.
 Let $\xi = \{\text{Teachers in a school}\}$
 $B = \{\text{Teachers with bicycles}\}$
 $C = \{\text{Teachers with cars}\}$

(i) Show the above information on a well labelled Venn diagram. [2]

(ii) Find the value of x . [2]

(b)



In the diagram ABCDEF is a regular hexagon. the length of each side is 5 cm. It is the base of a hexagonal prism whose height is 12cm. Calculate the

(i) length of BD, [3]

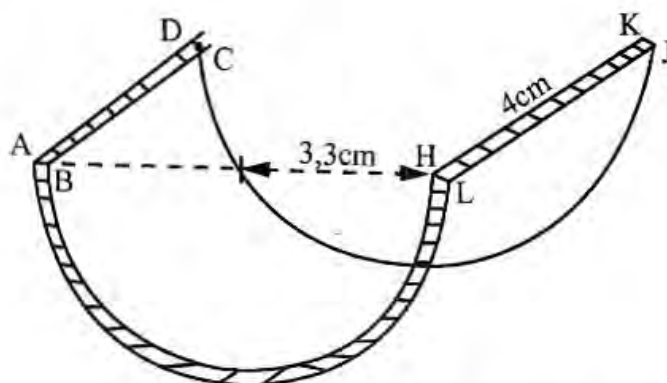
(ii) area of ABCDEF, [3]

(iii) volume of the prism. [2]

- 12 (a) Solve the equation $3x^2 - 5x - 10 = 0$.
Give the answers to 2 decimal places.

[5]

(b)



The diagram above shows a semi circular coupling ABCDHLJK made of a certain type of metal.

$AB = DC = HL = KJ = 2\text{mm}$ and $AD = BC = HK = LJ = 4\text{cm}$.

The radius of the coupling is 3.3cm.

Take π to be $\frac{22}{7}$.

Calculate the

- (i) length of arc BH, [2]
- (ii) volume of metal used in the coupling, [3]
- (iii) mass of the metal used if the density of the metal is 7.92 g/cm^3 , [2]

