GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

PORTION AND MARKS DISTRIBUTION FOR STD X (2022-2023)

SUBJECT: MATHEMATICS

FIRST INTERNAL TEST (LEVEL 1 and LEVEL 2)

Ch.no.	Name of the chapter	Marks
2	Polynomials	5
3	Pair of Linear equations in two variables	7
7	Co-ordinate Geometry	5
10	Circles	3
	Total	**20**

SECOND INTERNAL TEST (LEVEL 1 and LEVEL 2)

Ch.no.	Name of the chapter	Marks
1	Real numbers	4
15	Probability	4
8	Introduction to Trigonometry	7
12	Areas related to Circles	5
	Total	**20**

THIRD INTERNAL TEST (20marks) (LEVEL 1 and LEVEL 2)

INNOVATIVE TEST on any two /three chapters given below **or**

Presentation/Project/Assignment based on anyone of the following chapters

Ch.no.	Name of the chapter
6	Triangles
7	Co-ordinate Geometry
9	Some Applications of Trigonometry
13	Surface areas and Volumes
14	Statistics

FIRST TERM EXAM (MCQs) (LEVEL 1 and LEVEL 2)

Ch.no.	Name of the chapter	Marks
1	Real Numbers	5
2	Polynomials	5
3	Pair of Linear equations in two variables	7
15	Probability	3
8	Introduction to Trigonometry	7
7	Co-ordinate Geometry	5
10	Circles	3
12	Areas related to Circles	5
	Total	**40**

SECOND TERM EXAM (Subjective) (LEVEL 1 and LEVEL 2)

Ch.no.	Name of the chapter	Marks
4	Quadratic Equations	8
5	Arithmetic Progressions	5
14	Statistics	7
6	Triangles	5
9	Some Applications of Trigonometry	3
11	Constructions	6
13	Surface Areas and Volumes	6
	Total	**40**

PORTION FOR STD X MATHEMATICS (LEVEL2)

Name of the Chapter	Portion
1)Real Numbers	whole topic is included for evaluation
2)Polynomials	a) Concept of a Polynomial, degree-types b) Zero of a Linear Polynomial ,Quadratic Polynomial-relation between zeroes and coefficients c)Finding a Quadratic Polynomial given sum and product of zeroes/zeroes d)To find the Quotient and remainder when a Cubic Polynomial is divided by a Linear polynomial and to express in the form: Dividend =divisor x Quotient +Remainder
3)Pair of Linear equations in two variables	a) General form of a pair of linear equations in two variables b) Conditions for a pair of Linear equations in two variables to have-a unique solution, no solution, infinitely many solutions -finding the value of the unknown c)Find the solution of a pair of linear equations in two variables by (I) Elimination method (II)Substitution method (one equation should have coefficient of x and y as one) (III)Graphical method (one equation should have coefficient of x and y as one and the other equation should have coefficient of any one x or y as one)

4)Quadratic equations	a) Concept of a Quadratic equation-standard form b) Finding the Roots of a Quadratic equation by (I)Factorisation method (II)Quadratic formula C)Nature of Roots based on discriminant
5)Arithmetic Progressions	a) Concept of an AP-first term, common difference b) Direct sums based on nth term, sum of n terms of an AP
6)Triangles	a) Concept of Similarity of Triangles-Tests for similarity of Triangles b) Concept of theorem on Areas of Similar Triangles (Proof not for evaluation) c)B.P.T., Pythagoras theorem and Converse of Pythagoras theorem (Proofs for evaluation) d)Simple numerical applications of the above 4 theorems
7)Co-ordinate Geometry	Concept of (I) Distance Formula (II)Section Formula (III)Area of Triangle Formula and direct questions based on them
8)Introduction to Trigonometry	a) Concept of Trigonometry b) Trigonometric ratios and their relationships, k method c) Proving $Sin^2\theta+Cos^2\theta=1$ with the figure d)Expressions involving Trigonometric ratios of some specific angles: $0^o, 30^o, 45^o, 60^o, 90^o$ e) Trigonometric ratios of complementary angles

9)Some applications of Trigonometry	a) Heights and Distances: Angle of Elevation and Angle of Depression b) Simple problems on heights and Distances. Problems should have only one right triangle with either angle of elevation or Depression.
10)Circle	a) Concept of Tangent, Thm.10.1(proof not for Evaluation) Thm.10.2(with Proof) b) Simple numerical applications
11)Constructions	a) Construction of Tangents to a Circle from a point outside the circle b) Construction of Similar Triangles as per given scale factor. Note : Angles can also be drawn using a protractor
12)Areas related to Circles	a) Perimeter and Area of a Circle b) Areas of Segment, Sector, Quadrant of a Circle and Semicircle c)Simple applications to find areas of shaded region involving only two plane figures
13)Surface Areas and Volumes	Whole topic is included for evaluation
14)Statistics	a) Concept of Mean, Median, Mode b) To find Mean of grouped data by Direct method c)To find Mode of grouped data.
15)Probability	a) Concept of Theoretical Probability b) Probability of a Sure event and an Impossible event, $0 \leq P(E) \leq 1$, P (not E) c)Simple problems based on coins(max2), Dice (only 1), playing cards, numbered cards, items in a box.

PORTION FOR STD X MATHEMATICS (LEVEL 1)

a) Everything is included from ch. 1 to ch.15.

b) In the topic of Triangles , **Rider and numerical applications** based on the theorems will be tested.

c)In the topic of Constructions , a pair of compasses and ruler to be used to draw specific angles

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

FIRST INTERNAL TEST

MODEL PAPER (2022-2023)

STD : X MAX MARKS: 20

SUBJECT : MATHEMATICS (E) : **LEVEL 1 and LEVEL 2**

TIME : $1\ hr$

Weightage to Content/Subject Units

Sr. No.	Units	Marks
1	Polynomials	05
2	Pair of Linear Equations in Two Variables	07
3	Coordinate Geometry	05
4	Circles	03
	TOTAL	**20**

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

FIRST INTERNAL TEST

MODEL PAPER (2022-2023)

STD : X MAX MARKS: 20

SUBJECT : MATHEMATICS (E) : LEVEL 1 TIME : 1 hr

Q.1.A) Select and write the correct alternative from those given below. (1)

The value of 'k' for which the pair of linear equations $3x - 4y = 7 \quad and \quad 6x + ky = 5$ has no solution is:

a) 8 b) 2 c) -2 d) -8

B) Find the solution of **ANY ONE** of the following pair of linear equations: (3)

i) $2x - 3y = 13 \quad and \quad 4x + 5y = -7 \quad (By\ Elimination\ method\ )$

ii) $7x + 2y = 11 \quad and \quad 5x - y = 20 \quad (By\ Cross\ multiplication\ method)$

C) Find all the zeroes of the polynomial $\boldsymbol{2x^3 + x^2 - 6x - 3}$ if two of its zeroes are $\sqrt{3} \ and - \sqrt{3}$. (3)

D) The area of a rectangle gets reduced by 8 cm², if its length is reduced by 5 cm and breadth is increased by 3 cm. If we increase the length by 3 cm and the breadth by 2 cm, the area increases by 74 cm². Find the length and the breadth of the rectangle. (3)

Q.2.A) Select and write the correct alternative from those given below. (1)

The distance between the points A(2, –3) and B(2, 2) is :

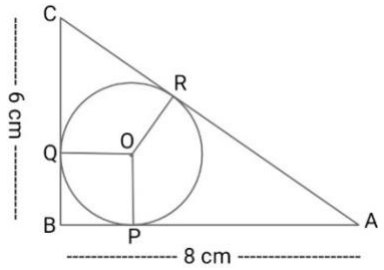
(a) 2 units (b) 3 units (c) 4 units (d) 5 units

B) Attempt the following. (2)

i) If m and n are the zeroes of the polynomial $x^2 - 7x + 12$ then find the value of $\frac{1}{m} + \frac{1}{n}$

ii) Determine if –2 is a zero of the polynomial $p(x) = x^3 + x^2 - 2x$

C) In the adjoining figure, Δ ABC is right angled at B such that BC = 6 cm and AB = 8 cm. Find the radius of the circle. (3)



D) i) Find the ratio in which the point P(2,–5) divides the line segment joining the points A(–3, 5) and B(4, –9) internally. (2)

ii) Find the area of rectangle ABCD if its vertices A(1, –3), B(13, 9), C(10, 12) and D(–2, 0) are taken in order. (2)

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N.B: In Q.1.D), Word problem or Graphical solution may be tested from the topic 'Pair of L.E in two variables'.

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

FIRST INTERNAL TEST

MODEL PAPER (2022-2023)

STD : X MAX MARKS: 20

SUBJECT : MATHEMATICS (E) : LEVEL 2 TIME : $1\ hr$

Q.1.A) Select and write the correct alternative from those given below. (1)

If $9x - 7y = 15 \quad and \quad 7x - 9y = 13$, then the value of $x + y$ is:

(a) –3 (b) – 1 (c) 1 (d) 3

B) Find the solution of **ANY ONE** of the following pair of linear equations: (3)

i) $3x + 4y = 18 \quad and \quad 7x - 3y = 5 \qquad (By\ Elimination\ method\ )$

ii) $x - y = 7 \quad and \quad 2x + 7y = -13 \qquad (By\ \ Substitution\ method\ )$

C) Divide the polynomial ($\boldsymbol{2x^3 - 5x^2 - 3x + 7}$) $\boldsymbol{by}$ ($\boldsymbol{2x - 3}$) and find the quotient (3)

and remainder. Also, express the dividend in the form:

" Dividend = divisor × quotient + remainder "

D) Find the solution of the following pair of linear equations graphically : (3)

$x - y = 5 \quad and \quad 2x + y = 7$

Rewrite and complete the following tables.

(Plot at least 3 points for each line on a graph paper)

$x - y = 5$

x			
y			

$2x + y = 7$

x			
y			

Q.2.A) Select and write the correct alternative from those given below. (1)

The distance of the point P(12, –5) from the origin is :

(a) 7 unit (b) 17 units (c) 14 units (d) 13 units

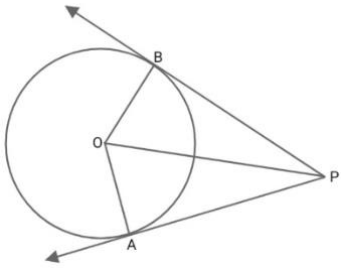
B) Attempt the following. (2)

i) If the sum of the zeroes of the polynomial $3x^2 - 2kx + 6$ is 3, then find the value of k .

ii) Find a quadratic polynomial in variable x whose zeroes are $\sqrt{5} \ and - \sqrt{5}$.

C) Given: Point O is the centre of the Circle . Two tangent segments PA and PB are drawn from an external point P to the Circle at A and B respectively. (3)

Prove that : PA = PB



D) i) Find the area of Δ ABC formed by joining the points A(10, –6), B(2, 5) and C(–1, 3). (2)

ii) Find the coordinates of the point P (x, y) which divides the line segment joining the points A(5, –2) and B(9, 6) internally in the ratio 3 : 1 . (2)

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

SECOND INTERNAL TEST

MODEL PAPER (2022-2023)

STD : X MAX. MARKS: 20

SUB – MATHEMATICS(E) (LEVEL – 1 AND LEVEL -- 2) TIME : 1 Hr

Weightage to Content/Subject Units

Sr. No	Units	Marks
1	Real Numbers	04
2	Probability	04
3	Introduction to Trigonometry	07
4	Areas Related To Circles	05
	TOTAL	20

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

SECOND INTERNAL TEST

MODEL PAPER (2022-2023)

STD : X MAX. MARKS: 20

SUB – MATHEMATICS (E): LEVEL 1 TIME : 1 Hr

Q 1 A) Select and write the most appropriate alternative from those given below. (1)

The L.C.M. and H.C.F. of two numbers are 120 and 12 respectively. If one of the numbers is 24, then the other number is _____

(a) 18 (b) 24 (c) 36 (d) 60

B) Attempt the following

i) A box contains tickets numbered from 21 to 50. If one ticket is picked at random, then find the probability of getting— (2)

a) a prime number b) a number which is a multiple of both 2 as well as 3.

ii) From a deck of 52 playing cards, red kings are removed and from the remaining cards, a card is picked at random. (2)

Find the probability of getting—

a) a red card. b) a face card.

C) Find the H.C.F of 741 and 1173 using Euclid's division algorithm. (3)

Or

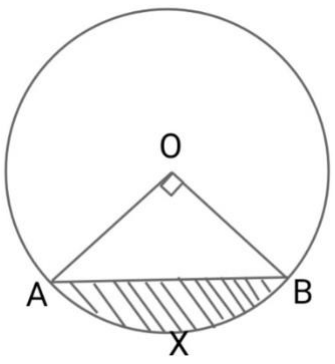
C) Prove that $\sqrt{5}$ is an irrational number. (3)

D) In the adjoining figure, 'O' is the centre of a circle with radius 28 cm. If arc AXB subtends an angle of 90^0 at the centre, then (2)

find-

i) the area of quadrant O-AXB

ii) the area of minor segment AXB



Q 2 A) Select and write the most appropriate alternative from those given below. (1)

If $\tan A = \cot (2A - 30)^0$, where 2A is an acute angle, then the value of A = _____ .

(a) 20^0 (b) 30^0 (c) 40^0 (d) 90^0

B) Evaluate the following expression using known numerical values of trigonometrical ratios. (3)

$$\frac{5 \tan^2 30^0 \text{ -- } \operatorname{cosec}^2 60^0 + 3 \sin^2 45^0}{5 \sin 30^0}$$

C) Prove the following Identity. (3)

$$(\operatorname{Cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$$

D) A circular running track of width 3.5 m is to be constructed around a circular ground of area 5,544 m^2. Find the total cost of construction of the track at Rs 900/- per m^2. (3)

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

SECOND INTERNAL TEST

MODEL PAPER (2022-2023)

STD : X MAX. MARKS: 20

SUB – MATHEMATICS (E): LEVEL 2 TIME : 1 Hr

Q 1 A) Select and write the most appropriate alternative from those given below. (1)

If the product of two numbers is 432 and their L.C.M. is 72 , then their H.C.F. is :

(a) 6 (b) 8 (c) 12 (d) 16

B) Attempt the following

i) A box contains 12 red balls , 15 orange balls and 9 blue balls. If one ball is picked at random , then find the probability of getting- (2)

a) an orange ball. b) not a blue ball.

ii) From a deck of well shuffled 52 playing cards, a card is picked at random. Find the probability of getting— (2)

a) a diamond. b) a king .

C) Assuming that $\sqrt{3}$ is irrational , prove that 5 --$\sqrt{3}$ is also irrational. (3)

Or

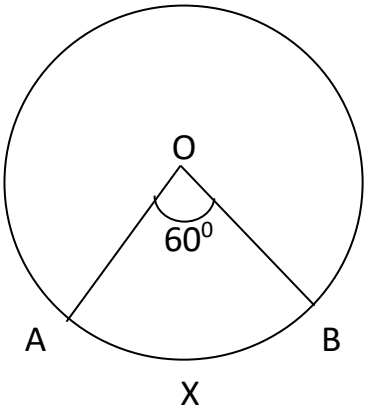
C) Find the H.C.F of 168 and 580 using Euclid's division algorithm. (3)

D) In the adjoining figure, arc AXB subtends an angle of 60^0 at the centre 'O' of a circle. If the radius of the circle is 14 cm, then find— (2)

i) length of arc AXB.

ii) area of sector O-AXB.

(take $\pi = \frac{22}{7}$)



Q 2 A) Select and write the most appropriate alternative from those given below. (1)

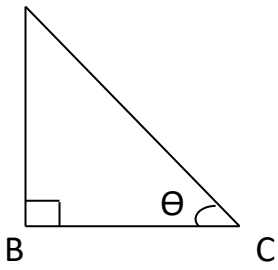
If SinP = Cos 28^0 , where P is an acute angle , then the value of P = _____ .

(a) 17^0 (b) 28^0 (c) 62^0 (d) 90^0

B) Attempt the following

i) Evaluate : Sec 53^0 -- Cosec 37^0 (1)

ii) In the adjoining figure , ΔABC is a right angled triangle , right angled at B. (2)



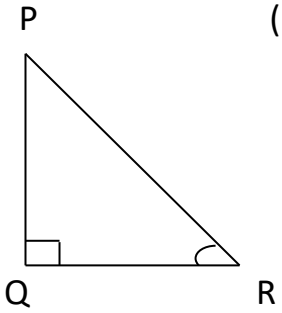
Prove that :

$\sin^2 \Theta + \cos^2 \Theta = 1$.

C) In ΔPQR , ∠Q = 90^0 and Tan R = $\frac{8}{15}$ (3)

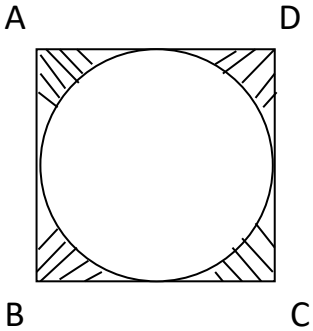
Then find—

a) the length of PR
b) the value of sin R
c) the value of cosec P



D) A circle is inscribed in square ABCD of side 14 cm., as shown in the figure. Find the area of the shaded region. (3)

(take $\pi = \frac{22}{7}$)



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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

ALTO-BETIM GOA 403521

DESIGN OF THE QUESTION PAPER FIRST TERM EXAM (2022-2023)

Class : X Subject : Mathematics - Level 1 (English)

Time : 1hr 45min Max. Marks : 40

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The weightage or the distribution of marks over different dimensions of the question paper shall be as follows:

1. Weightage to Learning Outcomes

S.No.	Learning Outcomes	Marks	Percentage of Marks
1.	Knowledge	8	20%
2.	Understanding	20	50%
3.	Application	12	30%
	Total	**40**	**100%**

2. **Weightage to Content / Subject Units**

S.No.	Units	Marks
1.	Real Numbers	5
2.	Polynomials	5
3.	Pair of Linear Equations in Two Variables	7
4.	Introduction to Trigonometry	7
5.	Co-ordinate Geometry	5
6.	Circles	3
7.	Areas related to circles	5
8.	Probability	3
	Total	**40**

3. Weightage to Difficulty level of questions

S.No.	Estimated difficulty level of questions	Percentage
1	Easy	20%
2	Average	60%
3	Difficult	20%
	Total	**100%**

4. **Number of Questions** :

There will be **40** questions of **1 mark** each.

Goa Board Of Secondary And Higher Secondary Education

Blue Print (First Terminal Examination 2022-23)

Std X : Mathematics Level 1 (English)

Duration : 1hr 45min

Type of Question : VSA type

S.No.	Content/Unit	Objectives			Total
		Knowledge	Understanding	Application	
1.	Real Numbers	1(1) 25(1)	9(1) 17(1)	33(1)	**5(5)**
2.	Polynomials	5(1)	13(1) 21(1) 29(1)	37(1)	**5(5)**
3.	Pair of Linear Equations in Two Variables	2(1) 18(1)	10(1) 30(1) 34(1)	26(1) 38(1)	**7(7)**
4.	Introduction to Trigonometry	3(1) 11(1)	19(1) 27(1) 31 (1) 35(1)	39(1)	**7(7)**
5.	Co-ordinate Geometry		4(1) 20(1) 28(1)	12(1) 36(1)	**5(5)**
6.	Circles		7(1) 15(1) 23(1)		**3(3)**
7.	Areas related to circles	8(1)		16(1) 24(1) 32(1) 40(1)	**5(5)**
8.	Probability		6(1) 22(1)	14(1)	**3(3)**
	Total	**8(8)**	**20(20)**	**12(12)**	**40(40)**

Note : Figures outside the bracket indicate the question number and figures inside the bracket indicate the marks.

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
FIRST TERM EXAMINATION MODEL PAPER (2022-2023)

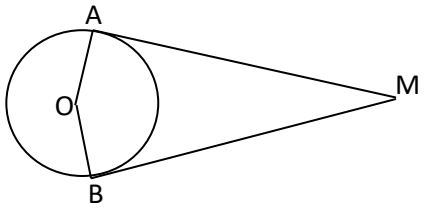
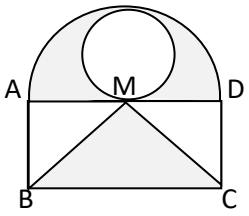
STD X **MARKS : 40**
SUBJECT : MATHEMATICS - LEVEL 1 (ENGLISH) **TIME : 1HR 45MIN**

Instructions :

1. Each question is provided with four alternatives. Choose the correct alternative.

2. Each question carries one mark . There is no negative marking for incorrect choice.

1.	The prime factorisation of 1176 is (A) $2^2 \times 3^3 \times 7$ (B) $2^3 \times 3^2 \times 7$ (C) $2^2 \times 3 \times 7^2$ (D) $2^3 \times 3 \times 7^2$
2.	If the lines given by 4x + ky = 12 and x + 2y = 3 coincide, then the value of k is (A) -8 (B) 4 (C) 8 (D) 12
3.	If $1 + \tan^2 36^o = \sec^2 2A$ where 2A is an acute angle then the value of A is (A) 18° (B) 36° (C) 54° (D) 72°
4.	The midpoint of the line segment joining the points P (-3, 4) and Q (7, -2) is (A) (-2, -1) (B) (2, -1) (C) (-2, 1) (D) (2, 1)
5.	One of the zeroes of the quadratic polynomial $4x^2 - 25$ is (A) 4/25 (B) 2/5 (C) 25/4 (D) 5/2
6.	From a deck of 52 playing cards all the ace cards are removed. If a card is then drawn at random, the probability that it is a face card is (A) 1/4 (B) 3/14 (C) 3/13 (D) 2/13
7.	The length of the tangent drawn from a point P which is at a distance of 7cm from the centre O of a circle of radius 3cm is (A) $2\sqrt{10}$ cm (B) $\sqrt{58}$ cm (C) 10 cm (D) 100cm
8.	The length of the arc of a circle of radius r and angle with degree measure θ is (A) $\frac{\theta}{180}$ x ∏r (B) $\frac{\theta}{360}$ x ∏r^2 (C) $\frac{\theta}{180}$ x 2∏r (D) $\frac{\theta}{180}$ x ∏r^2
9.	Which of the following is irrational? (A) $\sqrt{729}$ (B) $(\sqrt{3} - 2)(\sqrt{3} + 2)$ (C) $\frac{3+2\sqrt{3}}{\sqrt{3}}$ (D) $\sqrt{2}(\sqrt{2} - \sqrt{8})$
10.	If one equation of a pair of consistent linear equations is 3x -2y +4 = 0 then the second equation can be (A) 6x - 4y +1 = 0 (B) - 6x + 4y +1 = 0 (C) 6x + 4y +1 = 0 (D) 9x - 6y +1 = 0
11.	If △PQR is right angled at P and ∠ Q= 60° then the value of cos R is (A) 1 (B) 1/2 (C) 1/√2 (D) √3/2
12.	The perimeter of a triangle with vertices A(0,6) ; B(0,0) ; C(-8, 0) is (A) 10 units (B) 12 units (C) 24units (D) 36 units
13.	If the product of the zeroes of the quadratic polynomial $5x^2 - 20x - m$ is 3, then the value of m is (A) - 15 (B) - 4 (C) 4 (D) 15
14.	A box contains cards which are numbered from 5 to 102. If a card is drawn at random from the box, then the probability that it bears a two digit number which is a multiple of 7 is (A) 13/98 (B) 1/7 (C) 13/97 (D) 14/97

15.	In the figure MA and MB are tangents to the circle with centre O and radius 5cm. If OM = 13cm then perimeter of □AOBM is (A) 18 cm (B) 27 cm (C) 34 cm (D) 36 cm 
16.	□ABCD is a rectangle . If AB=5cm and the radius of the semicircle AM=7cm then area of the shaded portion is (Take π = 22/7) (A) 56 cm^2 (B) 73.5 cm^2 (C) 74.5 cm^2 (D) 76.5 cm^2 
17.	Which of the following rational numbers has a terminating decimal expansion? (A) $\frac{7}{12}$ (B) $\frac{17}{45}$ (C) $\frac{27}{72}$ (D) $\frac{37}{168}$
18.	The solution of the pair of linear equations 8x - 3y = -2 and 3 x + y = -5 is (A) x= -1, y= 2 (B) x= 1, y= - 2 (C) x= 1, y= 2 (D) x= -1, y= -2
19.	The value of the trigonometric expression : $\sin^2 30^\circ + \cos^2 45^\circ - 7\tan^2 60^\circ$ is (A) - 81/4 (B) – 79/4 (C) 79/4 (D) 81/4
20.	The ratio in which the point K(1,3) divides the line segment joining the points M(-1, 7) and N(4 , -3) internally is (A) 1 : 3 (B) 3 : 1 (C) 2 : 3 (D) 3 : 2
21.	The quadratic polynomial whose sum and product of zeroes are -9 and 20 respectively is (A) $x^2 - 9x - 20$ (B) $x^2 + 9x - 20$ (C) $x^2 - 9x + 20$ (D) $2x^2 + 18x + 40$
22.	Two dice are thrown simultaneously. The probability that the sum of the numbers appearing on top of both the dice is 4 is (A) 1/12 (B) 1/9 (C) 1/2 (D) 2/3
23.	If PA and PB are tangents from an external point P to the circle with centre O such that ∠APB = 80° then the measure of ∠AOP is (A) 10° (B) 50° (C) 100° (D) 160°
24.	The length of the minute hand of a clock is 21cm. Therefore the area swept by the minute hand in 6 minutes is (A) 13.2 cm^2 (B) 15.4 cm^2 (C) 23.1 cm^2 (D) 138.6 cm^2
25.	The product of two numbers is 1440. If their HCF is 4 , then their LCM is (A) 10 (B) 36 (C) 90 (D) 360
26.	If the pair of linear equations (k - 7)x - 2y = -5 and 4y – (k+1)x = 2 have no solution then the value of k is (A) 0 (B) 1 (C) 15 (D) 16
27.	The simplified form of (cosecA- cotA) (1+cosA) is (A) sinA (B) cosA (C) cosecA (D) secA
28.	If the area of the triangle with vertices A(4,0) ; B(-5, 0) ; C (2, k) is 36 square units then the value of k is (A) - 8 (B) - 4 (C) 4 (D) 8
29.	The remainder when $p(x)= 2x^3 - 5x^2 - 4x - 7$ is divided by $g(x)= x^2 - 2$ is (A) -17 (B) - 3 (C) 3 (D) 17

30.	If 114x +156y = 426 and 156x + 114y = 384 ; then the value of x - y is (A) -3 (B) - 1 (C) 1 (D) 3
31.	The value of the trigonometric expression: $\sin 65^{o} \cos 25^{o} + \cos 65^{o} \sin 25^{o}$ is (A) - 1 (B) 0 (C) 1 (D) 2
32.	If the perimeter of a semi circular wall piece is 108cm , then the diameter of the wall piece is (Take ∏=22/7) (A) 21cm (B) 28cm (C) 42cm (D) 56cm
33.	Toffees from two toffee jars containing 210 and 240 toffees are to be packed in small packets. The maximum number of packets that can be packed if each packet has equal number of toffees is (A) 9 (B) 18 (C) 30 (D) 36
34.	Five years hence Tom will be x years old and Jerry will be y years old. Therefore the sum of their present ages in years is (A) x + y – 5 (B) x + y + 5 (C) x + y + 10 (D) x + y - 10
35.	If 17sinA = 8 , then tanA = (A) 8/15 (B) 15/8 (C) 15/17 (D) 17/15
36.	The point which divides the line segment joining the points (7, -6) and (3,4) in the ratio 1:2 internally lies in the (A) I quadrant (B) II quadrant (C) III quadrant (D) IV quadrant
37.	If the zeroes of the quadratic polynomial $x^2 + (m+1)x + n$ are 2 and -3 , then (A) m = -7, n = - 1 (B) m = 5 , n = - 1 (C) m = - 2 , n = - 6 (D) m = 0, n = - 6
38.	If the digit in the unit's place of a two digit number is 3x and the digit in the ten's place is y then the two digit number formed after interchanging the digits is (A) 3xy (B) 3x + y (C) 3x + 10y (D) 30x +y
39.	If sinA – cosA = 0 then the value of $\sin^4 A - \sin^2 A$ is (A) -3/ 4 (B) - 1/4 (C) 1/4 (D) 3/4
40.	If the radius of a wheel is 0.63m, then the distance covered by the wheel in 400 revolutions is (Take π = 22/7) (A)142.56m (B) 1584m (C) 14256m (D) 15840m
	**********

ANSWER KEY

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
FIRST TERM EXAMINATION MODEL PAPER (2022-2023)

STD X SUBJECT : MATHEMATICS - LEVEL 1 (ENGLISH)

Q No	Answer	
1.	D	2^3 x 3 x 7^2
2.	C	8
3.	A	18°
4.	D	(2, 1)
5.	D	5/2
6.	A	1/4
7.	A	$2\sqrt{10}$ cm
8.	A	$\frac{\theta}{180}$ x ∏r
9.	C	$\frac{3+2\sqrt{3}}{\sqrt{3}}$
10.	C	6x + 4y +1 = 0
11.	D	√3/2
12.	C	24units
13.	A	-15
14.	A	13/98
15.	C	34cm
16.	B	73.5cm^2
17.	C	27/72
18.	D	x= -1, y= -2
19.	A	- 81/4
20.	C	2 : 3
21.	D	$2x^2$ +18x + 40
22.	A	1/12
23.	B	50
24.	D	138.6 cm^2
25.	D	360
26.	C	15
27.	A	sinA
28.	A	-8
29.	A	-17
30.	B	-1
31.	C	1
32.	C	42
33.	C	30
34.	D	x + y - 10
35.	A	8/15
36.	D	IV quadrant
37.	D	m = 0, n = - 6
38.	D	30x +y
39.	B	-1/4
40.	B	1584m

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
FIRST TERM EXAMINATION MODEL PAPER (2022 – 2023)
DESIGN OF THE QUESTION PAPER

STD : X **MARKS : 40**
SUBJECT: MATHEMATICS – LEVEL 2 (ENGLISH) **TIME: 1 HOUR 45 MINUTES**

The weightage or the distribution of marks over different dimensions of the question paper shall be as follows:

1. Weightage to Learning Outcomes:

Sr. No.	Learning Outcomes	Marks	Percentage of Marks
1.	Knowledge	08	20 %
2.	Understanding	24	60 %
3.	Application	08	20 %
	Total	**40**	**100 %**

2. Weightage to Content/Subject Units

Sr. No.	Units	Marks
1.	Real Numbers	05
2.	Polynomials	05
3.	Pair of Linear Equations in Two Variables	07
4.	Introduction to Trigonometry	07
5.	Coordinate Geometry	05
6.	Circles	03
7.	Areas Related to Circles	05
8.	Probability	03
	Total	**40**

3. Weightage to Difficulty level of questions:

Sr. No.	Estimated difficulty level of questions	Percentage
1.	Easy	20 %
2.	Average	60 %
3.	Difficult	20 %
	Total	**100 %**

4. Number of Questions:

There will be **40** questions of **1 mark** each

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
FIRST TERM EXAMINATION MODEL PAPER (2022 – 2023)
BLUE PRINT

STD : X **MARKS : 40**
SUBJECT: MATHEMATICS – LEVEL 2 (ENGLISH) **TIME: 1 HOUR 45 MINUTEs**

Type of Questions : VSA type

S. No.	Content/Unit	Objectives			Total
		Knowledge	Understanding	Application	
1.	Real Numbers	2(1) 15(1) 24(1) 29(1) 38(1)			**5(5)**
2.	Polynomials	1(1) 12(1)	6(1) 17(1) 34(1)		**5(5)**
3.	Pair of Linear Equations in Two Variables		4(1) 8(1) 11(1) 20(1) 27(1) 32(1) 36(1)		**7(7)**
4.	Introduction to Trigonometry		3(1) 14(1) 18(1) 39(1)	9(1) 22(1) 31(1)	**7(7)**
5.	Coordinate Geometry		7(1) 16(1) 25(1) 33(1)	37(1)	**5(5)**
6.	Circles	28(1)	5(1)	19(1)	**3(3)**
7.	Areas Related to Circles		26(1) 35(1)	13(1) 23(1) 40(1)	**5(5)**
8.	Probability		10(1) 21(1) 30(1)		**3(3)**
	Total	**8(8)**	**24(24)**	**8(8)**	**40(40)**

Note: Figures outside the bracket indicate the question number and figures inside the bracket indicate the marks.

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

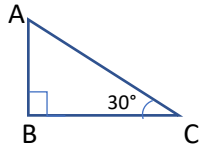
FIRST TERM EXAMINATION MODEL PAPER (2022-2023)

STD: X **MARKS: 40**

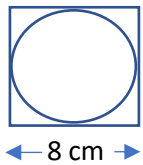
SUBJECT: MATHEMATICS-LEVEL 2 (ENGLISH) **TIME: 1 HOUR 45 MINUTES**

Instructions:

1. Each question is provided with four alternatives. Choose the correct alternative.
2. Each question carries one mark. There is no negative marking for incorrect choice.

1.	The product of zeroes of the quadratic polynomial $2x^2 - 5x + 7$ is (A) $\frac{-5}{2}$ (B) $\frac{-7}{2}$ (C) $\frac{5}{2}$ (D) $\frac{7}{2}$
2.	The prime factorisation of 504 is (A) $2^2 \times 3^3 \times 7$ (B) $2^3 \times 3^2 \times 7$ (C) $2^3 \times 3 \times 7^2$ (D) $2^2 \times 3^2 \times 7^2$
3.	If tan (A + 40)° = cot 32°, where A is an acute angle, then the value of A is (A) 18° (B) 50° (C) 58° (D) 72°
4.	The solution of the pair of linear equations $4x$ + y = 7 and x – y = 3 is (A) x = - 2, y = - 1 (B) x = - 2, y = 1 (C) x = 2, y = - 1 (D) x = 2, y = 1
5.	From an external point Q, the length of the tangent to a circle is 15 cm. If the radius of the circle is 8 cm, then the distance of Q from the centre is (A) $\sqrt{23}$ cm (B) 7 cm (C) 17 cm (D) $\sqrt{161}$ cm
6.	The quadratic polynomial having the sum and product of its zeroes as -2 and -5 respectively is (A) y^2 +2y -5 (B) y^2 - 2y - 5 (C) y^2 - 2y + 5 (D) y^2 + 2y + 5
7	The distance between the points P(1, 4) and Q(4, 0) is (A) $\sqrt{41}$ units (B) 3 units (C) 5 units (D) 25 units
8	The equation which has (2, -3) as one of its solution is (A) x – 2y = 7 (B) $3x$ + 2y = 12 (C) $5x$ + y = 9 (D) x + 2y = - 4
9	 In figure, ΔABC is right angled at B. If AB = 10 cm, then the length of BC is (A) $\frac{20\sqrt{3}}{3}$ cm (B) $\frac{10}{3}$ cm (C) $10\sqrt{3}$ cm (D) $\frac{10}{\sqrt{3}}$ cm
10	A die is thrown once. The probability of getting an odd prime number is (A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$
11	The value of 'k' for which the pair of linear equations $2x$ + 3y = 4 and $4x$ - ky = 8 has infinitely many solutions is (A) -6 (B) $\frac{-8}{3}$ (C) $\frac{8}{3}$ (D) 6
12	The degree of the polynomial $(2p^2 - 5)(3 - 4p^3)$ is (A) 2 (B) 3 (C) 5 (D) 6
13.	 In the given figure, a circle is inscribed in a trapezium of height 14 cm. If the lengths of the parallel sides of the trapezium are 10 cm and 20 cm, then the area of the shaded region is (Take π = 22/7) (A) 56 cm² (B) 188 cm² (C) 266 cm² (D) 364 cm²
14.	If cos A = $\frac{3}{5}$, then sec^2A is (A) $\frac{4}{5}$ (B) $\frac{9}{25}$ (C) $\frac{5}{3}$ (D) $\frac{25}{9}$

15	The HCF of 84 and 108 is (A) 4 (B) 12 (C) 756 (D) 9072
16	The area of ΔABC with vertices A(-4, 2), B(2, 2) and C(0, -4) is (A) 6 sq. units (B) 12 sq. units (C) 18 sq. units (D) 20 sq. units
17	The polynomial which when divided by (x + 1) gives (x^2 - 2) as the quotient and 5 as the remainder is (A) $x^3 + x^2 - 2x + 3$ (B) $x^3 + 2x^2 - 3x + 5$ (C) $x^3 - x^2 - x + 2$ (D) $x^3 - x^2 - 3x + 6$
18	The simplified form of $\sqrt{1 - cos^2 A}$ is (A) sin²A (B) cos²A (C) cos A (D) sin A
19	From an external point T, TP and TQ are two tangent segments to a circle at P and Q respectively. If O is the centre of the circle and ∠POQ = 130°, then ∠PTO is (A) 25° (B) 50° (C) 65° (D) 130°
20	The pair of linear equations $4x$ – 9y = 10 and $3x$ – 6y = 5 represents (A) intersecting lines (B) parallel lines (C) coincident lines (D) skew lines
21	The probability of getting a red king from a well shuffled deck of 52 playing cards is (A) $\frac{1}{52}$ (B) $\frac{1}{26}$ (C) $\frac{3}{26}$ (D) $\frac{3}{13}$
22	If Δ ABC is right angled at C, then the value of cosec (A + B) is (A) 0 (B) 1 (C) 2 (D) not defined
23	Two concentric circles have radii 20 cm and 15 cm. Therefore, the area of the region between the outer and inner circles is (A) 175π cm² (B)625π cm² (C) 35π cm² (D) 5π cm²
24	The rational number having a terminating decimal expansion is (A) $\frac{8}{15}$ (B) $\frac{5}{7}$ (C) $\frac{23}{20}$ (D) $\frac{19}{12}$
25	If the point P(x, y) is equidistant from A(5, 1) and B(-1, 5), then (A)3x = 2y (B) x = 5y (C) 2x = 3y (D) 2x = y
26	The area covered by the minute hand of a clock of length 6 cm in 20 minutes is (A) 2π (B) 6π (C) 10π (D) 12π
27	If (-1, 3) is the solution of the equation 3x – ky = 9, then the value of k is (A) -2 (B) -4 (C) 2 (D) 4
28	The length of the longest chord of a circle of radius 5.4 cm is (A) 1.8 cm (B) 2.7 cm (C) 5.4 cm (D) 10.8 cm
29	If the product of two numbers is 756 and their HCF is 6, then their LCM is (A) 14 (B) 21 (C) 108 (D) 126
30	If a ball is drawn at random from a bag containing 7 red, 5 blue and 8 yellow balls, then the probability of getting a ball which is not yellow is (A) $\frac{2}{5}$ (B) $\frac{3}{5}$ (C) $\frac{3}{4}$ (D) $\frac{13}{20}$
31	The value of the trigonometric expression sin²20° + sin²70° - cosec²45° is (A) -1 (B) 0 (C) ½ (D) 1
32	If 5x + 7y = 15 and 7x + 5y = 21, then the value of x + y is (A) -2 (B) -3 (C) 2 (D) 3

33	The y-coordinate of the point which divides the line segment joining the points P(6, 4) and Q(2, -8) in the ratio 1 : 3 internally is (A) -5 (B) 1 (C) 3 (D) 5
34	On dividing the polynomial $(x^3 + 3x^2 - 4x - 12)$ by $(x - 2)$, the quotient is (A) $x^2 + x - 6$ (B) $x^2 + 5x - 6$ (C) $x^2 + 5x + 6$ (D) $x^2 + x + 6$
35	In a circle of radius 7 cm, if an arc subtends an angle of 90° at the centre, then the length of the arc is (Take $\pi = \frac{22}{7}$) (A) 11 cm (B) 22 cm (C) 38.5 cm (D) 77 cm
36	The pair of linear equations $kx + 6y = 7$ and $2x - 3y = 8$ has a unique solution for all the values of 'k' other than (A) k = -4 (B) k = -9 (C) k = 4 (D) k = 9
37	If A(1, 1), B(-1, 2), C(2, 5) and D(a, 4) are the vertices of a parallelogram ABCD, then the value of 'a' is (A) -4 (B) -3 (C) 3 D) 4
38	Which of the following real numbers is irrational? (A) $\sqrt{49}$ (B) $2 + \sqrt{6}$ (C) $\sqrt{3} \times 4\sqrt{3}$ (D) $(5 - \sqrt{7})(5 + \sqrt{7})$
39	If $\tan 3\theta = \sin 45° \cos 45° + \sin 30°$, then the value of θ is (A) 15° (B) 20° (C) 30° (D) 45°
40	 The area of a circle that can be inscribed in a square of side 8 cm is (A) 4π cm² (B) 8π cm² (C) 16π cm² (D) 64π cm²

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
FIRST TERM EXAMINATION MODEL PAPER (2022 – 2023)
ANSWER KEY

STD: X **MARKS: 40**
SUBJECT: MATHEMATICS – LEVEL 2 (ENGLISH) **TIME : 1 HOUR 45 MINUTES**

Q. No	Answer		Q. No	Answer	
1	D	$\frac{7}{2}$	21	B	$\frac{1}{26}$
2	B	$2^3 \times 3^2 \times 7$	22	B	1
3	A	18°	23	A	175π cm²
4	C	x = 2, y = - 1	24	C	$\frac{23}{20}$
5	C	17 cm	25	A	3x = 2y
6	A	$y^2 + 2y - 5$	26	D	12π cm²
7	C	5 units	27	B	-4
8	D	x + 2y = -4	28	D	10.8 cm
9	C	$10\sqrt{3}$ cm	29	D	126
10	B	$\frac{1}{3}$	30	B	3/5
11	A	-6	31	A	-1
12	C	5	32	D	3
13	A	56 cm²	33	B	1
14	D	$\frac{25}{9}$	34	C	$x^2 + 5x + 6$
15	B	12	35	A	11 cm
16	C	18 sq. units	36	A	K = -4
17	A	$x^3 + x^2 - 2x + 3$	37	D	4
18	D	sin A	38	B	$2 + \sqrt{6}$
19	A	25°	39	A	15°
20	A	Intersecting	40	C	16π cm²

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GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

DESIGN OF THE SSCE QUESTION PAPER (FOR ACADEMIC YEAR 2022 – 2023)

SECOND TERM EXAMINATION

CLASS : X

MATHEMATICS (E) LEVEL – 1

TIME : 1 HOUR 45 MINUTES MARKS : 40

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1. Weightage of Learning Outcomes

Sr. No.	Learning Outcomes	Marks	Percentage of Marks
1	Knowledge	8	20%
2	Understanding	16/13*	40%
3	Application	10	25%
4	Skill	6/9*	15%
	Total	**40**	**100%**

2. Weightage to Content /Subject Units

Sr. No.	Units	Marks
1	Quadratic Equations	8
2	Arithmetic Progression	5
3	Statistics	7
4	Triangles	5
5	Some Applications of Trigonometry	3
6	Constructions	6
7	Surface Areas and Volumes	6
	Total	**40**

3. Weightage to Forms of Questions

Sr. No.	Forms of Questions	Marks for each question	Number of questions	Total Marks
1	Long Answer Type (LA)	04	02	08
2	Short Answer Type (SA-II)	03	07	21
3	Short Answer Type (SA-I)	02	04	08
4	Very Short Answer Type (VSA)	01	03	03
			Total	**40**

4. **Weightage to Difficulty Level of Questions**

Sr. No.	Estimated difficulty level of questions	Percentage
1	Easy	20%
2	Average	60%
3	Difficult	20%
	Total	**100%**

5. **Number of Main Questions and Scheme of options:**

There will be 04 main questions of 10 marks each. There is no overall choice. However internal choice will be provided in one question of 3 marks

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
BLUE PRINT (SECOND TERMINAL EXAMINATION)
STD X : MATHEMATICS (E) – LEVEL 1

Duration : 1hour 45 Minutes **Maximum Marks : 40**

Sr. No	Objectives	knowledge				Understanding				Application				Skill				Total
	Forms of questions	VSA	SA-I	SA-II	LA	VSA	SA-I	SA-II	LA	VSA	SA-I	SA-II	LA	VSA	SA-I	SA-II	LA	
	Content /Marks	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1	Statistics	Q2A(1)					Q1B(2)		Q2D(4)									**3(7)**
2	Arithmetic Progression		Q2B(2)					Q2C(3)										**2(5)**
3	Quadratic Equations	Q1A(1)						Q1C(3)					Q1D(4)					**3(8)**
4	Constructions															Q3B(3)		**2(6)**
																Q3C(3)		
5	Some Applications of Trigonometry											Q3D(3)						**1(3)**
6	Surface Areas and Volumes		Q4A(2)			Q3A(1)		Q4D(3)										**3(6)**
7	Triangles		Q4B(2)									Q4C(3)						**2(5)**
	Total	**2 (2)**	**3(6)**			**1(1)**	**1(2)**	**3(9)**	**1(4)**			**2(6)**	**1(4)**			**2(6)**		**16(40)**

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
SECOND TERM EXAMINATION
MODEL PAPER (2022-2023)

Class : X Max Marks : 40
Subject :Mathematics(E) Level – 1 Time :1 hour 45 minutes

INSTRUCTIONS :
I)Answer each main question on a fresh page.

II) All questions are compulsory

III)The question paper consists of 4 questions each of 10 marks

IV) There is no overall choice however internal choice has been provided in one question of 3 marks

V) In questions of construction the drawing should be clear and exactly as per the given measurements. The construction lines and arcs should also be maintained

VI) Use of calculator and mathematical tables is not permitted.

Q1A) Write the equation $x + \frac{1}{x} = 2$ in the form of $ax^2 + bx + c = 0$ (1)

B) The distribution below shows the weight of 30 employees in a factory.Calculate the median weight of the employees. (2)
(Write your answer correct upto one decimal place)

Weight in Kg	No. of employees
40 – 45	6
45 – 50	7
50 – 55	8
55 – 60	9

C) Find the roots of (**ANY ONE**) of the following quadratic equations (3)

i) $5x^2 + 2x – 39 = 0$ (By Factorization method)
ii) $3x^2 + 6x + 1 = 0$ (By completing the square method)

D) A number consists of 2 digits . The digit in ten's place is greater than the digit in units place by 4. The sum of the squares of the digits is 15 less than the original number. Find the original number . (4)

Q2A) Write the modal class of the following frequency distribution table (1)

Class Interval	0 – 20	20 - 40	40 - 60	60 - 80
Frequency	6	10	18	4

B) For the AP: 3, 15,27 , 39,---------- (2)
Find :
i) The 21st term.
ii) Which term of the AP is 363 ?

C) A contract on construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for the first day and then Rs 50 more on every succeeding day . Find the total amount the contractor has to pay as penalty for delaying the job by 30 days. (3)

D) The following table shows the marks scored by 60 students in a test (4)

Marks Scored (C.I)	**No. of students (f_i)**	**Class Marks x_i**	**Deviation $d_i = x_i - a$**	**$f_i d_i$**
0 – 20	10	_____	_____	_____
20 – 40	12	_____	_____	_____
40 -60	8	_____	_____	_____
60 – 80	14	_____	_____	_____
80 – 100	9	_____	_____	_____
100 - 120	7	_____	_____	_____
Total	**$\Sigma f_i = 60$**			**$\Sigma f_i . d_i$=_____**

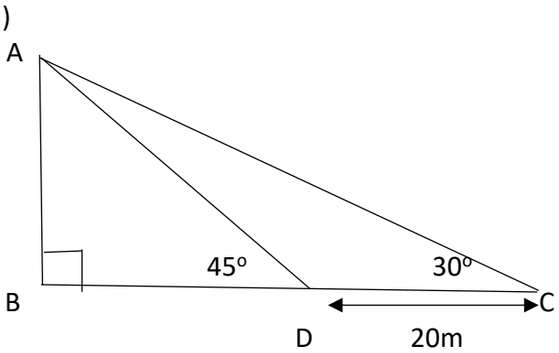
Taking the class mark denoted by 'a'of class interval 60 – 80 as the assumed mean , rewrite and complete the table and find the mean of the marks obtained by the assumed mean method.

Q3A) The inner radii of the 2 circular ends of a toy bucket are 10cm and 6cm respectively. If the height of the bucket is 15cm then find the capacity of the bucket (Take π = 22/7) (1)

B) Draw a line segment AB = 7.5cm. Taking A as the centre and radius 3cm draw a circle and taking B as centre draw another circle of radius 2.5 cm .Using a pair of compasses and ruler construct tangents to each circle from the centre of the other circle. (3)

C) Using a pair of compasses and ruler , Construct ΔABC with BC = 6cm , AB = 5.5cm and *L* ABC = 60° . Then construct ΔA'BC' whose sides are $\frac{5}{3}$ of the corresponding sides of ΔABC. (3)

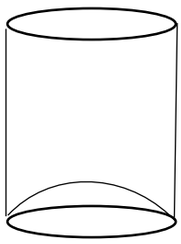
D) A tree 'AB' casts a shadow when the sun is 30° above the horizon . But when it rises 45° above the horizon , the length of the shadow reduces by 20 metres. Find the height of the tree correct upto one place of decimal . (Take √3 = 1.73) (3)



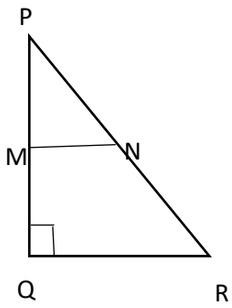
Q4A) A wooden article was made by scooping out a hemisphere from one end of a cylinder . If the height of the cylinder is 10 cm and its base is of diameter 7cm then find : (2)

i)The Curved surface area of the hemispherical part
(Do not substitute for π)

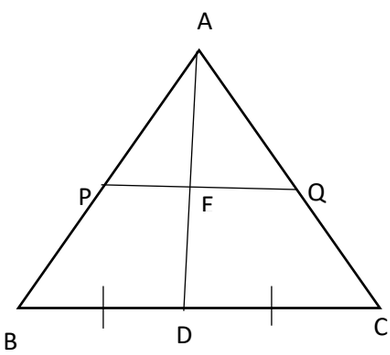
ii)TheCurved surface area of the cylindrical part
(Do not substitute for π)



B) In ΔPQR , *L* PQR = 90^o and Line segment MN ‖ QR as shown in the figure .If PM = 9cm , MQ = 2cm and ar(ΔPMN) = 81sqcm then Find ar(ΔPQR) (2)



C) In ΔABC , P and Q are points on the sides AB and AC respectively such that PQ ‖ BC. (3)
Prove that the median AD drawn from A to BC bisects PQ



D) A container shaped like a right circular cylinder having diameter 12cm and height 15cm is full of ice cream . This ice cream is to be filled into cones of height 12cm and diameter 6cm, having a hemispherical shape on the top . Find the number of such cones which can be filled with the ice cream. (3)

SSCE Second Term Examination
Mathematics (E) – Level 1 (2022 – 2023)
Model paper : Answers and Marking Scheme

Note : Any Alternative method unless otherwise specified should be considered for full marks.

Q1A) $x + \frac{1}{x} = 2$

$\frac{x^2 + 1}{x} = 2$

$x^2 + 1 = 2x$ ½

$x^2 – 2x + 1 = 0$ ½

B)

cf
6
13
21
30

½

$n = 30$

$\frac{n}{2} = \frac{30}{2} = 15$

Median class = 50 – 55

l = 50

cf = 13

f = 8

h = 5

$\text{Median} = l + \left[\frac{\frac{n}{2} - cf}{f}\right] \times h$

$= 50 + \left[\frac{15 - 13}{8}\right] \times 5$ ½ + ½

$= 50 + \frac{2}{8} \times 5$

$= 50 + \frac{10}{8}$

$= 50 + 1.25$

$= 51.25$

$= 51.3$ kg ½

C)i) $5x^2 + 2x - 39 = 0$

$5x^2 + 15x - 13x - 39 = 0$ ½

$5x(x + 3) - 13(x + 3) = 0$ ½

$(x + 3)(5x - 13) = 0$ ½

Either $x + 3 = 0$ or $5x - 13 = 0$ ½

$x = -3$ or $x = \frac{13}{5}$ ½

∴roots are -3 and $\frac{13}{5}$ ½

ii) $3x^2 + 6x + 1 = 0$

$3x^2 + 6x = -1$ ½

Dividing by 3 on both the sides

$x^2 + 2x = -\frac{1}{3}$

Last term $= \left[\frac{1}{2} \times 2\right]^2 = 1$ ½

Adding 1 on both the sides of the equation

$x^2 + 2x + 1 = -\frac{1}{3} + 1$ ½

$(x + 1)^2 = -\frac{1 + 3}{3}$

$(x + 1)^2 = \frac{2}{3}$

$(x + 1) = \pm \frac{\sqrt{2}}{\sqrt{3}}$ ½

Either $x + 1 = \frac{\sqrt{2}}{\sqrt{3}}$ or $x + 1 = -\frac{\sqrt{2}}{\sqrt{3}}$ ½

$x = \frac{\sqrt{2}}{\sqrt{3}} - 1$ or $x = -\frac{\sqrt{2}}{\sqrt{3}} - 1$

∴roots are $\frac{\sqrt{2}}{\sqrt{3}} - 1$ or $x = -\frac{\sqrt{2}}{\sqrt{3}} - 1$ ½

D) Let the digit in the units place be x

∴ the digit in the tens place is $x + 4$ ½

Original number $= 10(x + 4) + x$

$= 10x + 40 + x$

$= 11x + 40$ ½

$x^2 + (x + 4)^2 = 11x + 40 - 15$ ½

$x^2 + x^2 + 8x + 16 = 11x + 25$

$2x^2 + 8x - 11x + 16 - 25 = 0$

$2x^2 - 3x - 9 = 0$ ½

$2x^2 - 6x + 3x - 9 = 0$

$2x(x - 3) + 3(x - 3) = 0$

$(x - 3)(2x + 3) = 0$ ½

Either $x - 3 = 0$ or $2x - 3 = 0$

$x = 3$ or $x = -\frac{3}{2}$ ½

$x = -3/2$ is discarded ½

$\therefore x = 3$

$\therefore$ original number $= 11 \times 3 + 40$

$= 33 + 40$

$= 73$ ½

Q2A) 40 – 60 1

B)i) $a_n = a + (n - 1)\, d$

$a_{21} = 3 + (21 - 1)\, 12$ ½

$= 3 + 20 \times 12$

$= 3 + 240$

$= 243$ ½

ii) $a_n = 363$

$a = 3$

$d = 15 - 3 = 12$

$a_n = a + (n - 1)\, d$

$363 = 3 + (n - 1)\, 12$ ½

$363 - 3 = (n - 1)\, 12$

$360 = (n - 1)\, 12$

$\frac{360}{12} = n - 1$

$30 = n - 1$

$30 + 1 = n$

$n = 31$ ½

C) AP : 200 , 250 , 300 , 350 ,---------- ½

$a = 200$

$d = 250 - 200 = 50$

$n = 30$

$S_n = \frac{n}{2}\left[2a + (n - 1)\, d \right]$

$= \frac{15}{\cancel{30}}\left[2 \times 200 + (30 - 1)\, 50 \right]$ ½ + ½

$= 15\left[400 + (29 \times 50) \right]$ ½

$= 15\ (400 + 1450)$ ½

$= 15 \times 1850$

$= 27750$

$\therefore$ the contractor has to pay Rs 27,750 as penalty for delaying the job by 30 days. ½

D)

Marks scored (C.I)	Number of students (f_i)	Class Marks x_i	Deviation $d_i = x_i - a$, $a = 70$	$f_i d_i$
0 – 20	10	10	-60	-600
20 – 40	12	30	-40	-480
40 – 60	8	50	-20	-160
60 – 80	14	70	0	0
80 – 100	9	90	20	180
100 – 120	7	110	40	280
Total	**$\Sigma f_i = 60$**			**$\Sigma f_i d_i = -780$**

1/2 1/2 1/2 3

$$\text{Mean} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$$ ½

$$= 70 - \frac{780}{60}$$

$$= 70 - 13$$ ½

$$= 57$$

Q3A) $r_1 = 10$ cm

$r_2 = 6$cm

h = 15cm

$$V(\text{Frustum of the cone}) = \frac{1}{3}\pi h (r_1^2 + r_2^2 + r_1 r_2)$$

$$= \frac{1}{3} \times \frac{22}{7} \times 15 (10^2 + 6^2 + 10 \times 6)$$ ½

$$= \frac{22}{7} \times 5 \times 196$$

$$= 3080 \text{ cm}^3$$ ½

B) To draw line segment AB = 7.5cm ½

To draw a circle with centre A and radius 3cm ½

To draw a circle with centre B and radius 2.5cm ½

To bisect line segment AB ½

To mark points on the two circles ½

To draw tangent segments to each circle from the centre of both the circles . ½

C) To construct ΔABC with the given data 1
To draw a ray making an acute angle with side BC ½
To locate 5 points on the ray using a pair of compasses ½
To join B_3C and construct $B_5C' \parallel B_3C$ ½
To draw C'A' ‖ CA ½
ΔABC is the required triangle

D) Let the height of the tree by 'x' metres
and BD = y metres
In ΔABD

$\text{Tan } 45^o = \frac{x}{Y}$

$1 = \frac{x}{y}$

$x = y$ ½

In ΔABC

$\text{Tan } 30^o = \frac{x}{Y + 20}$ ½

$\frac{1}{\sqrt{3}} = \frac{x}{x + 20}$ ½

$x + 20 = x\sqrt{3}$

$20 = x\sqrt{3} - x$

$20 = x(\sqrt{3} - 1)$

$\frac{20}{\sqrt{3} - 1} = x$

$\frac{20}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1} = x$ ½

$\frac{20(\sqrt{3} + 1)}{(\sqrt{3} - 1)(\sqrt{3} + 1)} = x$

$\frac{20 \times (1.73 + 1)}{3 - 1} = x$

$10(2.73) = x$

$27.3 = x$ ½

∴The height of the tree is 27.3 metres ½

Q4A)i) C.S.A (hemispherical part) = $2\pi r^2$
$= 2 \times \pi \times (3.5)^2$ ½
$= 24.5\pi$ sq. cm ½

ii) C.S.A (cylindrical part) = $2\pi rh$
$= 2 \times \pi \times 3.5 \times 10$ ½
$= 70\pi$ sq.cm ½

B) $\angle PMN = \angle PQR$
$\angle PNM = \angle PRQ$ } Corresponding angles ½

$\Delta PMN \sim \Delta PQR$ By AA similarity test ½

$$\frac{ar(\Delta PMN)}{ar(\Delta PQR)} = \left[\frac{PM}{PQ}\right]^2$$

$$\frac{81}{ar(\Delta PQR)} = \left[\frac{9}{11}\right]^2$$ ½

$$ar(\Delta PQR) = \frac{81 \times 11 \times 11}{9 \times 9}$$

= 121 sq .cm ½

C) In ΔAPE and ΔABD ½
$\angle PAE = \angle BAD$ --------- common angle
$\angle APE = \angle ABD$ --------- corresponding angles
$\Delta APE \sim \Delta ABD$ ------- By AA similarity test

$\frac{AE}{AD} = \frac{PE}{BD}$ ---------- corresponding sides of similar triangles are proportional ½

Similarly $\Delta AEQ \sim \Delta ADC$ ---------- By AA similarity test

$\frac{AE}{AD} = \frac{EQ}{DC}$ ---------- corresponding sides of similar triangles are proportional ½

$\therefore \frac{PE}{BD} = \frac{EQ}{DC}$ ½

$\frac{PE}{EQ} = \frac{BD}{DC}$

= 1 Since BD = DC ½

$\therefore PE = EQ$ ½

$\therefore$ Median AD drawn from A to BC bisects PQ

D) Let the number of cones to be filled with icecream be 'n'

$R_{cylinder}$ = 6cm r_{cone} = 3cm ½

$H_{cylinder}$ = 15cm h_{cone} = 12cm

V(Cylinder) = n x { V(each cone) + V (each hemisphere) }

πR^2H = n x $\left\{ \frac{1}{3}\pi r^2h + \frac{2}{3}\pi r^3 \right\}$ ½

πR^2H = n x $\frac{1}{3}\pi r^2 (h + 2r)$

6 x 6 x 15 = n x $\frac{1}{3}$ x 3 x 3 (12 + 2 x 3) ½ + ½

6 x 6 x 15 = n x 3 x 18

$$n = \frac{\overset{2}{\cancel{6}} \times \overset{1}{\cancel{6}} \times \overset{5}{\cancel{15}}}{\underset{1}{\cancel{3}} \times \underset{1}{\cancel{18}}}$$ ½

n = 10

∴ the number of cones to be filled with icecream are 10 ½

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION

DESIGN OF THE SSCE QUESTION PAPER (FOR ACADEMIC YEAR 2022 – 2023)
SECOND TERMINAL EXAMINATION
MATHEMATICS (E) - LEVEL 2

TIME : 1HR 45 MINUTES MAX MARKS : 40

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1. Weightage to Learning Outcomes

Sr. No	Learning Outcomes	Marks	Percentage of Marks
1	Knowledge	08	20%
2	Understanding	18	45%
3	Application	08	20%
4	Skill	06	15%
	Total	40	100%

2. Weightage to Content / Subject Units

Sr. No	Units	Marks
1	Quadratic Equations	8
2	Arithmetic Progressions	5
3	Statistics	7
4	Triangles	5
5	Some Applications of Trigonometry	3
6	Constructions	6
7	Surface Areas and Volumes	6
	Total	40

3. Weightage to Forms Of Questions

Sr. No	Forms of Questions	Marks for each question	Number of questions	Total Marks
1	Long Answer Type (LA)	04	02	08
2	Short Answer Type (SA-II)	03	07	21
3	Short Answer Type (SA-I)	02	04	08
4	Very Short Answer Type (VSA)	01	03	03
		Total	16	40

4. Weightage to Difficulty level of questions :

Sr. No	Estimated difficulty level of questions	Percentage
1	Easy	20%
2	Average	60%
3	Difficult	20%
Total		100%

5. Number of Main Questions :

There will be 04 main questions of 10 marks each.

Goa Board of Secondary and Higher Secondary Education
Blue Print (Second Terminal Examination)
STD X : Mathematics (E) - Level 2

Duration : 1hr 45 minutes Maximum Marks : 40

Sr. No	Objectives	Knowledge				Understanding				Application				Skill				Total
	Forms of Questions	VSA	S.A I	S.A II	LA	VSA	S.A I	S.A II	LA	VSA	S.A I	S.A II	LA	VSA	S.A I	S.A II	LA	
	Content/Marks	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
1	Quadratic Equations		2A*(i) (1)					2C (3) 2D(3)			2A*(ii) (1)							3(8)
2	Arithmetic Progressions		1B(2)	1C*(i)(ii) (2)				1C* (iii) (1)										2(5)
3	Statistics	1A (1)					2B(2)		1D (4)									3(7)
4	Triangles							4C(3)			4B(2)							2(5)
5	Some Applications of Trigonometry											3D(3)						1(3)
6	Constructions															3B(3) 3C (3)		2(6)
7	Surface Areas and Volumes	3A(1) 4A(1)							4D*(i) (2)				4D*(ii) (2)					3(6)
	'Total	3(3)	2*(3)	1*(2)			1(2)	4* (10)	2*(6)		2*(3)	1(3)	1*(2)			2(6)		16(40)

NOTE : Figures outside the brackets indicate the questions number and figures within the brackets indicate the marks.
* Indicates objectives of the Question are shared.

GOA BOARD OF SECONDARY AND HIGHER SECONDARY EDUCATION
SECOND TERM EXAMINATION
MODEL PAPER (2022 – 2023)

STD : X MAX MARKS : 40
SUBJECT : MATHEMATICS (E) - LEVEL 2 TIME : 1hr 45 minutes

INSTRUCTIONS : i) Answer each main question on a fresh page .
ii) All questions are compulsory.
iii) The question paper consists of four questions , each of 10 marks
iv) There is no overall choice.
v) In questions on constructions , the drawing should be clear and exactly as per the given measurements. The construction lines and arcs should be maintained.
vi) Use of calculators and mathematical tables is not permitted.

Q1A) Find the class size of the class intervals 25 – 55 , 55 – 85 , 85 – 115,… (1)

B) Attempt the following : (2)
(i) Write the first four terms of an AP having first term as 19 and common difference as -3 .
(ii) State with reason if the given list of numbers is an AP or not.
1 , 3 , 9 , 27 ,…

C) Answer the following questions with reference to the given Arithmetic Progression : 11 , 15 , 19 , 23 , … (3)
(i) Find the 20^{th} term of the AP.
(ii) Find the sum of the first 12 terms of the AP.
(iii) Find which term of the AP is 91.

D) The following table shows the donation given by 50 students towards a Charitable trust.

Donation in Rs C.I	No of students f_i	Class marks x_i	$f_i x_i$
0 - 20	5	_____	_____
20 - 40	8	_____	_____
40 - 60	10	_____	_____
60 - 80	12	_____	_____
80 - 100	7	_____	_____
100 - 120	8	_____	_____
	$\sum f_i$ = 50		$\sum f_i x_i$ =

Rewrite and complete the table and find the mean donation by using the Direct Method . (4)

Q2A) Attempt the following : (2)

(i) If the sum and product of the roots of the quadratic equation are 5 and – 6 respectively , then write the quadratic equation in x .

(ii) If one root of the quadratic equation $2x^2 + m\,x - 15 = 0$ is – 5, then find the value of m .

B) Find the mode of the following frequency distribution table : (2)

Class Interval	Frequency
20 - 30	5
30 - 40	12
40 - 50	20
50 - 60	8

C) Find the roots of the Quadratic Equation $5x^2 - 14x + 8 = 0$ by using the " Factorisation Method ." (3)

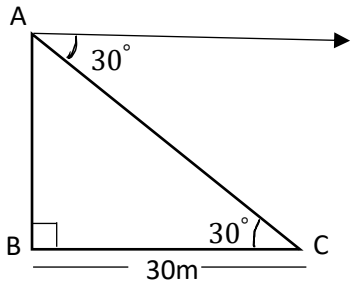
D) Find the roots of the Quadratic Equation $3x^2 - 4x - 7 = 0$ by using the " Quadratic Formula Method." (3)

3A) Find the total surface area of a hemisphere of radius 7cm. (1)
(Do not substitute the value of π)

B) Draw a line segment AB of length 7.5cm . Taking A as centre and radius 3cm , draw a circle. Using a pair of compasses and ruler , Construct tangents BP and BQ to the circle .
Measure and state the length of the tangent segments. (3)

C) Construct Δ PQR with sides PQ = 6.5cm , QR = 7cm and ∠ PQR = 60°.
Using a pair of compasses and ruler , construct Δ P'QR' similar to Δ PQR whose sides are $\frac{3}{4}$ of the corresponding sides of Δ PQR . (3)

D) From the top 'A' of a tower ' AB ' a man finds that the angle of depression of a car at point 'C' on the ground to be $30°$. If the car is at a distance of 30m from the foot of the tower , then find the height of the tower. (3)
(Take $\sqrt{3}$ = 1.73)

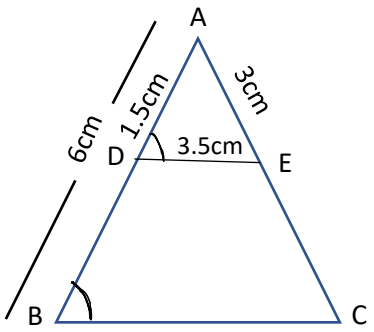


4A) Two identical solid cubes of side 2cm are joined end to end . Find the volume of the resulting cuboid. (1)

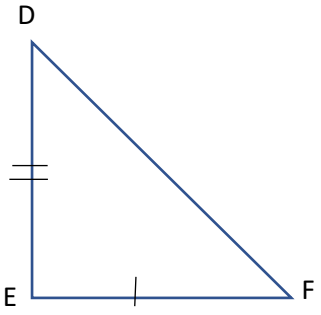
B) D and E are points on the sides AB and AC respectively of ΔABC , such that $\angle$ ADE = $\angle$ ABC . If AD = 1.5cm , AB = 6cm , AE = 3cm and DE = 3.5cm , then

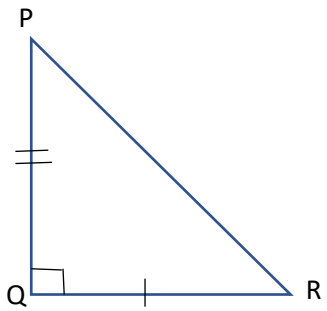
find i) EC

ii) BC (2)



C) With reference to the given figure and the given conditions , write only the proof with reasons of the following theorem :





Given : In Δ DEF , $DE^2 + EF^2 = DF^2$

Δ PQR is constructed such that PQ = DE , QR = EF and $\angle$ Q = 90^0

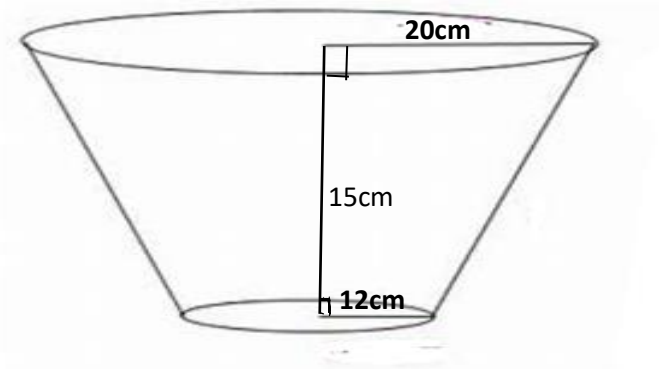
Prove that : Δ DEF is a right angled triangle. (3)

D) Attempt the following :

(i) In the figure given below an open steel bucket is in the shape of a frustum of a right circular cone of height 15cm . If the radii of its lower and upper ends are 12cm and 20cm respectively , then find

a) The slant height of the bucket

b) The curved surface area of the bucket (2)
(Do not substitute the value of π)



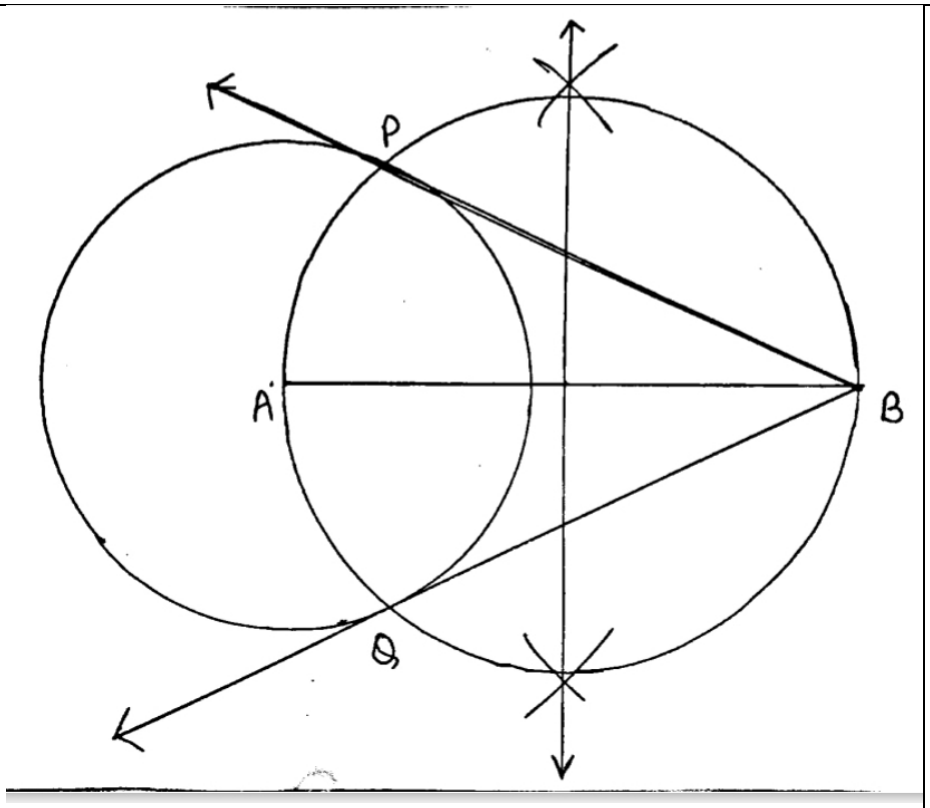
ii) A solid metallic cylinder of base diameter 6cm and height 32cm is melted to form 8 solid spheres of the same size.
Find the radius of each sphere. (2)

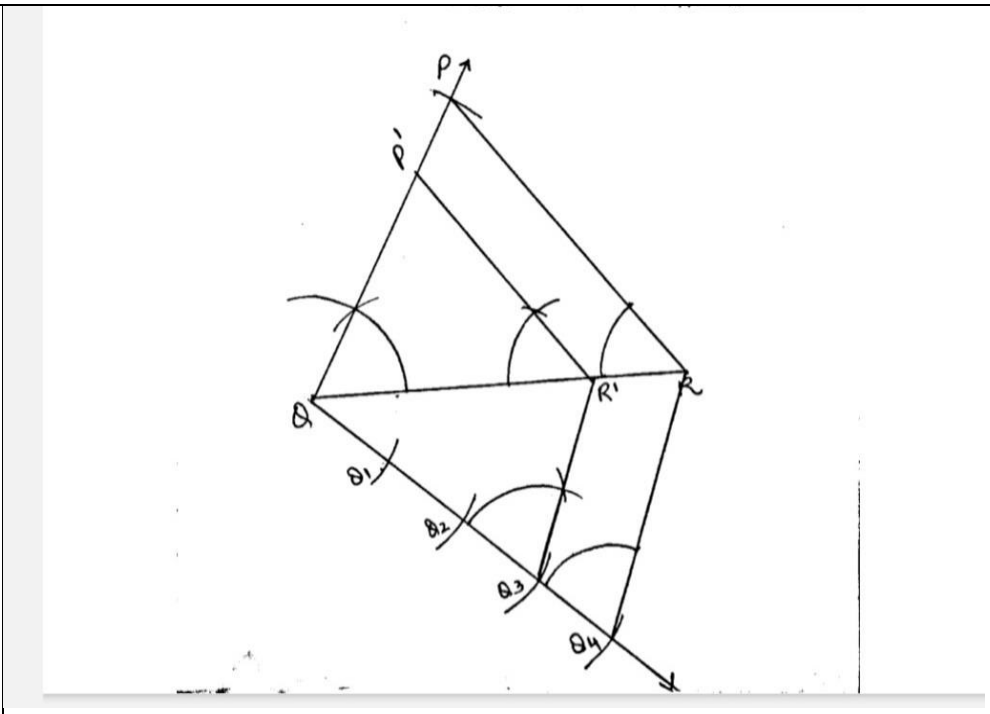
xxxxxxxxxxxxxxx The End xxxxxxxxxxxxxxxxxx

			SSC SECOND TERM EXAMINATION (MODEL PAPER)	Marks
			MATHEMATICS (E) - Level 2 (S – 2024)	
			MODEL ANSWERS AND MARKING SCHEME	
			NOTE : Any alternative method unless otherwise specified should be considered for full credit.	
1	A		30	1
	B	(i)	a = 19 , d = – 3	
			∴ The first four terms of the AP are	
			a = 19	½
			a + d = 19 + (–3) = 19 – 3 = 16	
			a + 2d = 19 + 2(–3) = 19 – 6 = 13	½
			a + 3d = 19 + 3(–3) = 19 – 9 = 10	1
		(ii)	In the given list of numbers : 1 , 3 , 9 , 27 ,…	
			$a_2 - a_1$ = 3 – 1 = 2	
			$a_3 - a_2$ = 9 – 3 = 6	½
			$a_4 - a_3$ = 27 – 9 = 18	
			Since the given list of numbers does not have a	½
			common difference it is not an AP	1
	C	(i)	a = 11 , d = 15 – 11 = 4	
			a_{20} = a + 19d	
			= 11 + 19(4)	½
			= 11 + 76	
			= 87	½
				1
		(ii)	a = 11 , d = 4 , n = 12 , S_n = ?	
			$S_n = \frac{n}{2}\left[2a + (n - 1)\, d \right]$	
			$= \frac{12}{2}\left[2(11) + (12 - 1)4 \right]$	½
			= 6 (22 + 44)	
			= 6 (66)	½
			= 396	1
		(iii)	a = 11 , d = 4 , a_n = 91 , n = ?	
			a_n = a + (n – 1) d	
			91 = 11 + (n – 1) 4	½
			91 – 11 = (n – 1) 4	
			80/4 = (n – 1)	
			20 + 1 = n	
			21 = n	
			The 21^{st} term of the AP is 91	½
				1

	D		Donation in Rs C . I	No of students f_i	Class marks x_i	$f_i\ x_i$	Marks
			0 – 20	5	10 ½	50 ½	
			20 – 40	8	30	240	
			40 – 60	10	50 ½	500 ½	
			60 – 80	12	70	840	
			80 – 100	7	90 ½	630 ½	
			100 – 120	8	110	880	
				Σf_i = 50		$\Sigma f_i\ x_i$ = 3140	
		Note:	Any 2 correct values in column x_i and $f_i\ x_i$ should be given				
			Mean of donation = $\frac{\Sigma f_i\ x_i}{\Sigma f_i}$ ½ mark				
			= $\frac{3140}{50}$				½
			= 62.8				½
							4
2	A	(i)	The quadratic equation in x is				
			x^2 – (sum of the roots)x + product of the roots = 0				
			$x^2 - 5x + (-6) = 0$				½
			$x^2 - 5x - 6 = 0$				½
			ALTERNATIVE METHOD				1
			Sum of the roots = $\frac{-b}{a}$ = 5				½
			Product of the roots = $\frac{c}{a}$ = – 6				
			∴ a = 1 , b = – 5 , c = – 6				
			The quadratic equation in x is $x^2 - 5x - 6 = 0$				½
							1
		(ii)	$2x^2 + mx - 15 = 0$				
			$2(-5)^2 + m(-5) - 15 = 0$				½
			50 – 5m – 15 = 0				
			35 – 5m = 0				
			$-5m$ = – 35				
			m = 7				½
							1
	B		l = 40 , f_1 = 20 , f_0 = 12 , f_2 = 8 (½* mk if all values are correct)				
			Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right)$ x h				
			= 40 + $\left(\frac{20 - 12}{2(20) - 12 - 8}\right)$ x 10 ½				+ ½*
			= 40 + $\left(\frac{8 \text{ x } 10}{20}\right)$				½
			= 40 + 4				
			= 44				½
							2

	C		$5x^2 - 14x + 8 = 0$	Marks
			$5x^2 - 10x - 4x + 8 = 0$	½
			$5x(x - 2) - 4(x - 2) = 0$	½
			$(5x - 4)(x - 2) = 0$	½
			Either $5x - 4 = 0$ OR $x - 2 = 0$	½
			$x = \frac{4}{5}$ $x = 2$	½
			∴ The roots are $\frac{4}{5}$ and 2	½
				3
	D		$3x^2 - 4x - 7 = 0$	
			a = 3 , b = – 4 , c = – 7	
			D = $b^2 - 4ac$	
			$= -4^2 - 4(3)(-7)$	
			$= 16 + 84$	
			$= 100$	½
			$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
			$x = \frac{-(-4) \pm \sqrt{100}}{2(3)}$	½
			$x = \frac{4 \pm 10}{6}$	½
			$Either\ x = \frac{4 + 10}{6}$ OR $x = \frac{4 - 10}{6}$	½
			$x = \frac{14}{6}$ $x = \frac{-6}{6}$	
			$x = \frac{7}{3}$ $x = -1$	½
			∴ The roots are $\frac{7}{3}$ and -1	½
				3
3	A		Total surface area of hemisphere = $3\Pi r^2$	
			$= 3\Pi \times 7 \times 7$	½
			$= 147\ \Pi cm^2$	½
				1

				Marks
	B		To draw line segment AB = 7.5cm	½
			To draw a circle with centre A and radius 3cm	½
			To bisect line segment AB	½
			To mark the points P and Q on the circle	½
			To draw the tangent segments from the point B	½
			To measure and write the length of the tangent segments	
			BP = BQ = 6.9 $\pm$ 0.1cm	½
				3

			Marks
			
C		To construct Δ PQR with the given data	1
		To draw a ray making an acute angle with side QR	½
		To locate four points on the ray using a pair of compasses	½
		To join Q_3R' ∥ Q_4R and $R'P'$ ∥ RP ½ +	½
		Δ P'QR' is the required triangle	3
D		In right Δ ABC	
		$\tan 30^\circ = \frac{AB}{BC}$	
		$\frac{1}{\sqrt{3}} = \frac{AB}{30}$ ½ +	½
		$\frac{30}{\sqrt{3}} = AB$	½
		$\frac{30\sqrt{3}}{3} = AB$	
		$10\sqrt{3} = AB$	½
		10 x 1.73 = AB	½
		17.3m = AB	½
		The height of the tower is 17.3 m	
			3

4	A		l = 4cm , b = 2cm , h = 2cm	Marks
			Volume of the cuboid = l x b x h	
			= 4 x 2 x 2	½
			= $16cm^3$	½
	B			1
			Δ ADE ~ Δ ABC By AA Similarity Criterion	
			$\frac{AD}{AB} = \frac{AE}{AC}$	½
			$\frac{1.5}{6} = \frac{3}{AC}$	
			$AC = \frac{3 \times 6}{1.5}$	
			AC = 12cm	
			EC = AC – AE = 12 – 3 = 9cm	½
			$\frac{AD}{AB} = \frac{DE}{BC}$	
			$\frac{1.5}{6} = \frac{3.5}{BC}$	½
			$BC = \frac{3.5 \times 6}{1.5}$	
			BC = 14cm	½
				2
	C		In Δ PQR	
			1) $PQ^2 + QR^2 = PR^2$ By Pythagoras theorem	½
			2) $DE^2 + EF^2 = PR^2$ Since PQ = DE , QR = EF	½
			3) $DE^2 + EF^2 = DF^2$ Given	
			4) $PR^2 = DF^2$ Statements (2) & (3)	
			5) PR = DF Statement (4)	½
			6) Δ PQR ≅ Δ DEF SSS Congruence rule	½
			7) ∠ Q = ∠ E C.P.C.T	½
			8) But ∠ Q = 90° Given	
			9) ∴ ∠ E = 90° From (7) & (8)	
			10) ∴ Δ DEF is a right angled triangle	½
				3

	D	(i)(a)	h = 15cm , Upper radius (R) = 20cm , Lower radius (r) = 12cm	
			Slant height of the bucket = $\sqrt{h^2 + (R - r)^2}$	
			= $\sqrt{15^2 + (20 - 12)^2}$	½
			= $\sqrt{15^2 + 8^2}$	
			= $\sqrt{225 + 64}$	
			= $\sqrt{289}$	
			= 17cm	½
		(b)	C.S.A of the bucket = Π (R + r) l	
			= Π (20+ 12) 17	½
			= Π x 32 x 17	
			= 544 Πcm^2	½
				2
		(ii)	Cylinder : r = $\frac{d}{2}$ = $\frac{6}{2}$ = 3cm	
			h = 32 cm	
			Sphere : radius (R) = ?	
			Volume of 8 spheres = Volume of cylinder	
			$\frac{8 \text{ x } 4}{3}$ ΠR^3 = $\Pi r^2 h$	
			$\frac{8 \text{ x } 4}{3}$ x R^3 = 3 x 3 x 32 ½	+ ½
			R^3 = $\frac{3 \text{ x } 3 \text{ x } 32 \text{ x } 3}{8 \text{ x } 4}$	
			R^3 = 27	½
			R = 3cm	½
			The radius of each sphere is 3cm	
				2