Meghalaya Board of School Education

QUESTION PAPERS

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Total No. of Printed Pages—15

X/24/M

2024

MATHEMATICS

(FOR CANDIDATES WITH INTERNAL ASSESSMENT)

Full Marks : 80
Pass Marks : 24

(FOR CANDIDATES WITHOUT INTERNAL ASSESSMENT)

Full Marks : 100
Pass Marks : 30

Time : 3 hours

(FOR ALL CATEGORIES OF CANDIDATES)

General Instructions :

(i) This Question Paper comprises of 32 questions divided into six Sections A, B, C, D, E and F.

(ii) Marks allocated to every question are indicated against each.

(iii) Question Nos. **1** to **30** (Section—A to Section—E) are to be answered by all candidates.

(iv) Question Nos. **31** and **32** of Section—F are to be answered only by the **Candidates without Internal Assessment**.

(v) In question on construction, the drawing should be neat and exactly as per the given measurements.

(vi) Questions, which are meant for Visually Handicapped (Blind) Students, should be answered by them only.

(vii) Use of Calculator/Mobile Phone is not permitted.

SECTION—A

(*Marks* : 8)

(*Question Nos.* ***1*** *to* ***8*** *carry 1 mark each*)

1. What is the total number of factors of a prime number? 1

2. What is the degree of a zero polynomial? 1

3. Write the common difference of the A.P. whose nth term is $5n + 3$. 1

4. If $A + B = 90°$ and $\tan A = \frac{3}{4}$, what is the value of $\cot B$? 1

5. At most how many tangents can be drawn parallel to a given secant of a circle? 1

6. Find the circumference of a circle whose diameter is 35 cm. $\left(\text{Use } \pi = \frac{22}{7}\right)$ 1

7. What is the length of the altitude of an equilateral triangle of side 2 cm? 1

8. Write the empirical relationship among mean, mode and median. 1

SECTION—B

(*Marks* : 14)

(*Question Nos.* ***9*** *to* ***15*** *carry 2 marks each*)

9. Solve the quadratic equation $3x^2 - 14x - 5 = 0$ by factorization. 2

10. Find the value of

$$2\cot^2 60° + 3\sin^2 30° + 2\cos^2 90°$$ 2

11. Find the value of

$$\tan 7° \tan 23° \tan 67° \tan 83°$$ 2

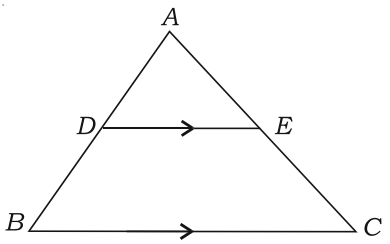
12. The line segment joining the points $A(4, -5)$ and $B(4, 5)$ is divided by the point P such that

$$\frac{AP}{BP} = \frac{2}{5}$$

Find the coordinates of P. 2

13. $A(3, 2)$ and $B(-2, 1)$ are two vertices of a ΔABC whose centroid G has the coordinates $\left(\frac{5}{3}, \frac{-1}{3}\right)$. Find the co-ordinates of the third vertex C of the triangle. 2

14.

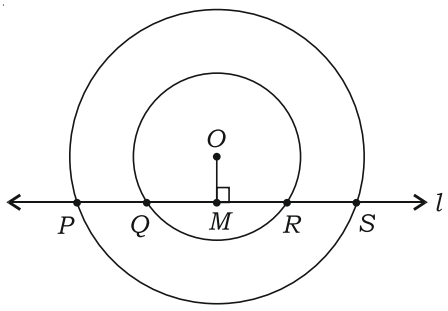


In the above figure, in a ΔABC, D and E are the points on the sides AB and AC respectively such that $DE \parallel BC$. If $\frac{AD}{DB} = \frac{4}{7}$ and $AE = 2{\cdot}4$ cm, find AC. 2

[For Visually Handicapped (Blind) Students only, instead of Question No. 14 given above]

14. State Basic Proportionality Theorem. 2

15. In the figure below, l is a line intersecting the two concentric circles, whose common centre is O, at the points P, Q, R and S, and OM is perpendicular to line l. Show that $PQ = RS$. 2



[For Visually Handicapped (Blind) Students only, instead of Question No. 15 given above]

15. *(a)* Define a circle. 1

(b) The length of a tangent from an external point on a circle is always less than the radius of the circle.

(State whether True or False) 1

SECTION—C

(*Marks* : 24)

(*Question Nos.* ***16*** *to* ***23*** *carry 3 marks each*)

16. Using ruler and compass only, draw a line segment of length 8 cm and divide it internally in the ratio 4 : 5. (Only traces of constructions are required) 3

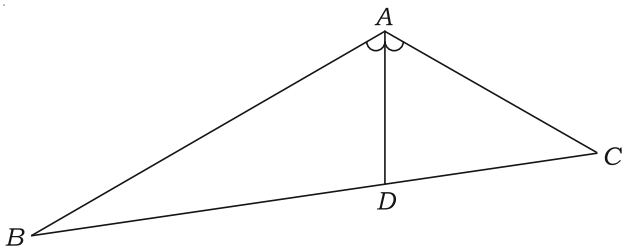
[For Visually Handicapped (Blind) Students only, instead of Question No. 16 given above]

16. *(a)* Define scalene triangle. 2

(b) The distance between the parallel lines is always the same.

(State whether True or False) 1

17. In the figure below, in a ΔABC, AD is the bisector of $\angle A$, intersecting the side BC at D. If $AB = 10$ cm, $AC = 6$ cm and $BC = 12$ cm, find BD and DC. 3



Or

O is the centre of a circle of radius 8 cm. The tangent at a point *A* on the circle cuts a line through *O* at *B* such that *AB* = 15 cm. Find *OB*. 3

[For Visually Handicapped (Blind) Students only, instead of Question No. 17 given above]

17. *(a)* The greatest side of a _____ triangle is called hypotenuse.

(Fill in the blank) 1

(b) The sum of the squares of the sides of a rhombus is equal to the sum of the squares of its diagonals.

(State whether True or False) 1

(c) State Midpoint Theorem. 1

18. A circular park, 42 m in diameter, has a path 3·5 m wide running around it on the outside. Find the cost of gravelling the path at ₹ 20 per sq. m. (Use $\pi = \frac{22}{7}$) 3

Or

A chord of a circle of radius 14 cm subtends an angle 60° at the centre. Find the area of the major sector. (Use $\pi = \frac{22}{7}$) 3

19. If α and β are zeroes of the polynomial $5x^2 + 2x - 3$, then prove that

$$\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{-34}{15}$$ 3

20. Find the largest positive integer which divides 615 and 963, leaving remainder 6 in each case. 3

21. A box contains 20 balls numbered from 1 to 20. A ball is drawn at random from the box. Find the probability that the number on the ball is—

(a) an even number;

(b) divisible by 3 or 5. 3

22. Find the sum of all 3-digit natural numbers, which are multiples of 11. 3

23. Prove that

$$\operatorname{cosec}^6\theta = \cot^6\theta + 3\cot^2\theta \cdot \operatorname{cosec}^2\theta + 1$$ 3

Or

If $\cos\theta + \sin\theta = \sqrt{2}\sin\theta$, prove that $\cos\theta - \sin\theta = \sqrt{2}\cos\theta$. 3

SECTION—D

(*Marks* : 16)

(*Question Nos.* ***24*** *to* ***27*** *carry 4 marks each*)

24. A two-digit number is such that the product of its digits is 14. If 45 is added to the number, the digits interchange their places. Find the number. 4

Or

The present age of a woman is 3 years more than three times the age of her daughter. Three years later, the woman's age will be 10 years more than twice the age of her daughter. Find their present ages. 4

25. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height 5 metres. From a point on the plane, the angles of elevation of the bottom and the top of the flag-staff are 30° and 60°. Find the height of the tower. 4

Or

Two men are on opposite sides of a tower. The measures of the angles of elevation of the top of the tower are 30° and 45° respectively. If the height of the tower is 50 metres, find the distance between the two men. (Use $\sqrt{3} = 1 \cdot 732$) 4

[For Visually Handicapped (Blind) Students only, instead of Question No. 25 given above]

25. *(a)* Define angle of elevation. 2

(b) If the Sun's altitude decreases, then the length of shadow of a tower _____.

(Fill in the blank) 1

(c) The value of $\cot \theta$ is always less than 1.

(State whether True or False) 1

26. If the points $A(x, y)$, $B(-5, 7)$ and $C(-4, 5)$ are collinear, then show that $2x + y + 3 = 0$. 4

27. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides. 4

[For Visually Handicapped (Blind) Students only, instead of Question No. 27 given above]

27. *(a)* Define similar polygons. 2

(b) If two triangles are equiangular, then the ratio of the corresponding sides is the _____ as the ratio of the corresponding medians.

(Fill in the blank) 1

(c) If a line divides any two sides of a triangle in the same ratio, then the line must be parallel to the third side.

(State whether True or False) 1

SECTION—E

(*Marks* : 18)

(*Question Nos.* ***28*** *to* ***30*** *carry 6 marks each*)

28. Solve the following system of linear equations graphically :

$$2x - 3y + 6 = 0$$
$$4x + y - 16 = 0$$

Find the area of the triangle formed by the lines and the x-axis. (Plot at least three points for each graph) 6

[For Visually Handicapped (Blind) Students only, instead of Question No. 28 given above]

28. Solve the following system of linear equations : 6

$$2x - 3y = 13$$
$$7x - 2y = 20$$

29. A military tent of height 8·25 m is in the form of a right circular cylinder of base diameter 30 m and height 5·5 m surmounted by a right circular cone of same base radius. Find the length of the canvas used in making the tent, if the breadth of the canvas is 1·5 m. (Use $\pi = \frac{22}{7}$) 6

Or

The internal and external diameters of a hollow hemispherical shell are 6 cm and 10 cm respectively. It is melted and recast into a solid cone of base diameter 14 cm. Find the height of the cone so formed. 6

30. The mean of the following frequency distribution is 57·6 and the sum of the observations is 50. Find the missing frequencies f_1 and f_2 : 6

Class interval	0–20	20–40	40–60	60–80	80–100	100–120
Frequency	7	f_1	12	f_2	8	5

Or

Find the median of the following frequency distribution : 6

Class interval	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45
Frequency	5	6	15	10	5	4	2	2

SECTION—F

(*Marks* : 20)

[For Candidates without Internal Assessment (WIM)]

31. Answer the following as directed (any *eight*) : 1×8=8

(a) The prime factors of 4050 is

(A) $2 \times 3^3 \times 5$

(B) $2 \times 3^4 \times 5$

(C) $2 \times 3^4 \times 5^3$

(D) $2 \times 3^4 \times 5^2$

(Choose the correct option)

(b) The sum of the zeroes of the polynomial $2x^2 - 3x - 9$ is

(A) $\frac{-3}{2}$

(B) $\frac{3}{2}$

(C) $\frac{9}{2}$

(D) $\frac{-9}{2}$

(Choose the correct option)

(c) If a pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ represents parallel lines, then

(A) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

(B) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

(C) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

(D) None of the above

(Choose the correct option)

(d) The *n*th term of the A.P. with first term '*a*' and common difference '*d*' is given by

(A) $2a + (n-1)d$

(B) $a + 2(n-1)d$

(C) $a + \left(\frac{n-1}{2}\right)d$

(D) $a + (n-1)d$

(Choose the correct option)

(e) A polynomial having _____ terms is called binomial.

(Fill in the blank)

(f) The quantity $b^2 - 4ac$ for a quadratic equation $ax^2 + bx + c = 0$ is called its discriminant.

(State whether True or False)

(g) Evaluate :

$$\frac{\tan 20^\circ}{\cot 70^\circ}$$

(h) Write the formula of the volume of a sphere of radius r units.

(i) The _____ value of data is called mode.

(Fill in the blank)

(j) Find the class mark of class 0–20.

(k) The sum of two irrational numbers is an irrational number.

(State whether True or False)

(l) Write the value of $\text{cosec}^2(90^\circ - \theta) - \tan^2\theta$.

(m) Define prime number.

(n) The common point of a tangent to a circle and the circle is called as _____.

(Fill in the blank)

32. Answer any *six* from the following : 2×6=12

(a) If the product of two numbers is 540 and their HCF is 30, find their LCM.

(b) Find a quadratic polynomial whose sum and product of its zeroes are $\frac{8}{3}$ and 7 respectively.

(c) Find the coordinates of the midpoint of the line segment joining the points $P(-2, 8)$ and $Q(-6, -4)$.

(d) Write the nature of the roots of the quadratic equation $3x^2 - 5x + 2 = 0$.

(e) Find the common difference of the A.P.

$$50, 58, 66, 74, \cdots$$

and write the next two terms.

(f) If $\sqrt{3}\sin\theta = \cos\theta$, find the acute angle θ.

(g) A box contains 3 blue, 2 white and 4 red marbles. If a marble is drawn at random from the box, what is the probability that it will not be a white marble?

(h) The circumference of a circle is 39·6 cm. Find its area. (Use $\pi = \frac{22}{7}$)

(i) Find the 20th term of the A.P. given by

21, 16, 11, 6, 1, –4, –9, ⋯

(j) State Pythagoras Theorem.

(k) If $A = 60°$ and $B = 30°$, verify that

$$\sin(A - B) = \sin A \cdot \cos B - \cos A \cdot \sin B$$

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