X/13/M

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MATHEMATICS

(CANDIDATES WITH PRACTICALS/INTERNAL ASSESSMENT)

Full Marks : 80
Pass Marks : 24

(CANDIDATES WITHOUT PRACTICALS/INTERNAL ASSESSMENT)

Full Marks : 100
Pass Marks : 30

Time : 3 hours

(For Both Categories of Candidates)

The figures in the margin indicate full marks for the questions

GENERAL INSTRUCTIONS :

(i) The question paper consists of 32 questions divided into six Sections A, B, C, D, E and F.

(ii) Question Nos. **1** to **30** (Section—A to Section—E) are to be answered by all the Candidates.

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

(iv) Candidates with Practicals/Internal Assessment should not answer any question from Section—F.

[P.T.O.

(v) In Question Nos. **1** to **8** of Section—A and Question No. **31** sub nos. *(a)* to *(d)*, there are four answers marked (A), (B), (C), (D). Only one of these answers is correct. The letter indicating the correct answer should be written in capital in the answer book.

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

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

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

SECTION—A

(*Marks* : 10)

(*Question Nos.* **1** *to* **10** *carry 1 mark each*)

1. Which of the following is a rational number?

   (A) $\sqrt{4}$

   (B) $\sqrt{7}$

   (C)

   (D) $3 \ \sqrt{5}$

2. A polynomial of degree 1 is called a

    (A) linear polynomial

    (B) quadratic polynomial

    (C) cubic polynomial

    (D) biquadratic polynomial

3. Which of the following lists of numbers does form an AP?

    (A) 1, 1, 2, 2, ...

    (B) 2, $-$2, 2, $-$2, ...

    (C) 4, 10, 16, 22, ...

    (D) $1^2, 3^2, 5^2, 7^2, ...$

4. The discriminant of the quadratic equation $4x^2 - 20x + 25 = 0$ is

    (A) 800

    (B) $-$800

    (C) 400

    (D) 0

5. The value of $\cos 82° - \sin 8°$ is equal to

(A) 90

(B) 74

(C) 0

(D) 1

6. The distance between the points $(-4, 3)$ and $(0, 0)$ is

(A) 1

(B) 7

(C) 12

(D) 5

7. The total surface area of a hemisphere of radius 7 cm is

(A) 308 cm^2

(B) 462 cm^2

(C) 66 cm^2

(D) 44 cm^2

[Contd.

8. A man goes 6 m due east and 8 m due north, then his shortest distance from the starting point is

(A) 14 m

(B) 10 m

(C) 48 m

(D) 2 m

9. Fill in the blanks :   ½×2=1

(a) The lengths of the two tangents drawn from an external point to a circle are ——.

(b) If a line divides any two sides of a triangle proportionally, then it must be —— to the third side.

10. Define cumulative frequency.

SECTION—B

(*Marks* : 12)

(*Question Nos.* **11** *to* **16** *carry 2 marks each*)

11. Find a quadratic polynomial whose zeroes are 5 and 8.

12. Is 302 a term of the AP 8, 13, 18, ... ?

Or

Write the first two terms of the sequence whose *n*th term (t_n) is $t_n = 2n^2 - 3n - 1$.

13. For $\theta = 30°$, verify that $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$.

14. Prove that $\sin 39° \sec 51° + \cos 47° \csc 43° = 2$.

Or

Prove that

$$\frac{1}{1 - \sin \theta} + \frac{1}{1 + \sin \theta} = 2 \sec^2 \theta$$

15. Corresponding sides of two similar triangles are in the ratio $2 : 1$. If the area of the smaller triangle is 48 cm^2, then find the area of the larger triangle.

Or

Find the length of the tangent drawn from a point whose distance from the centre of a circle of radius 7 cm is 25 cm.

16. In the adjoining figure, O is the centre of the circle and AB is a tangent to the circle at P. If $\angle OAP = 20°$, then find $\angle AOP$.
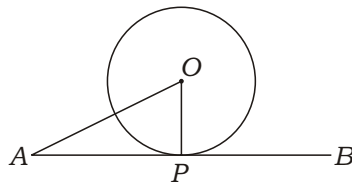
[For Visually Handicapped (Blind) Students only, in lieu of Question No. 16 above]

16. *(a)* Define a tangent. 1

   (b) The tangent at any point of a circle is perpendicular to the —— through the point of contact. (Fill in the blank) 1

SECTION—C

(*Marks* : 18)

(*Question Nos. 17 to 22 carry 3 marks each*)

17. Find the HCF and LCM of the following integers by applying prime factorization method :

$$275, \ 225 \ \text{and} \ 175$$

18. The 10th and 18th terms of an AP are 41 and 73 respectively. Find its 26th term.

Or

Evaluate :

$$8 \cdot 2 + 7 \cdot 2 + 6 \cdot 2 + \cdots \text{to 12 terms}$$

19. The coordinates of *A* and *B* are (5, −9) and (11, *k*). Find the value of *k* if the distance *AB* is 10 units.

20. If $x = r \sin \theta \cos \phi$, $y = r \sin \theta \sin \phi$ and $z = r \cos \theta$, then prove that $r^2 = x^2 + y^2 + z^2$.

Or

Prove that

$$\frac{\text{cosec } \theta + \text{cot } \theta}{\text{cosec } \theta - \text{cot } \theta} = \left(\frac{1 + \cos \theta}{\sin \theta} \right)^2$$

[P.T.O.

21. A circular flower bed lies inside a rectangular field of size 25 m $\times$ 18 m. The area of the field excluding the flower bed is 296 m^2. Find the diameter of the flower bed. (Use $\frac{22}{7}$)

Or

A circular grassy plot 42 m in diameter has a path 3·5 m wide running round it on the outside. Find the cost of gravelling the path at ₹ 4 per m^2. (Use $\frac{22}{7}$)

22. If 65% of the population have black eyes and the rest brown eyes, then what is the probability that a person selected at random has—

(a) brown eyes;

(b) black eyes?

SECTION—D

(*Marks* : 16)

(*Question Nos.* ***23*** *to* ***26*** *carry 4 marks each*)

23. Solve the following system of linear equations graphically :

$$2x - y = 4$$
$$3y - x = 3$$

Also find the points where the lines meet the y-axis. (Plot at least three points for each graph.)

**[For Visually Handicapped (Blind) Students only,
in lieu of Question No. 23 above]**

23. Solve the following system of linear equations :

$$7x \quad 5y \quad 11$$
$$3x \quad 4y \quad 17$$

24. Show that the points (4, 5), (2, 1), (3, 4) are the vertices of an isosceles triangle.

Or

Given A(4, 3), B(1, 3) and C(h, k). If AC BC, then show that $10h$ $12k$ 15 0.

25. The angle of elevation of the top of a vertical tower from a point X on the ground is 60°. At a point 40 m vertically above X, the angle of elevation of the top is 45°. Find the height of the tower. (Use $\sqrt{3}$ 1 732)

Or

From the top of a tower 300 m high, the angles of depression of two objects on the same side of the tower are 45° and 60°. Find the distance between the two objects. (Use $\sqrt{3}$ 1 732)

[P.T.O.

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

25. *(i)* Prove that

$$\frac{\cos^2\theta}{\sin\theta} + \sin\theta = \cosec\theta$$ 2

(ii) $1 + \cot^2\theta = $ ——. (Fill in the blank)   1

(iii) $\sin\theta = \cos(90 - \theta)$ (State whether True or False)   1

26. Using ruler and compass only, construct a triangle similar to a given $\triangle ABC$ such that each of its sides is $\frac{3}{4}$th of the corresponding sides of $\triangle ABC$. It is given that $AB = 3$ cm, $BC = 4$ cm and $CA = 5$ cm. (Only traces of construction are required.)

[For Visually Handicapped (Blind) Students only, in lieu of Question No. 26 above]

26. *(a)* Define an equilateral triangle.   1

(b) Two triangles are said to be similar if their corresponding sides are (equal/proportional). (Choose the correct answer)   1

(c) If two triangles are similar, the ratio of their corresponding sides is the same as the ratio of their corresponding altitudes. (State whether True or False)   1

(d) The ratio of the areas of two similar triangles is equal to the —— of the ratio of their corresponding sides. (Fill in the blank)   1

SECTION—E

(*Marks* : 24)

(*Question Nos. **27** to **30** carry 6 marks each*)

27. When 1 is added to each of the two numbers, their ratio becomes 1 : 2 and when 5 is subtracted from each of them, their ratio becomes 5 : 11. Find the numbers.

28. Prove that in a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Apply the above theorem in the following :
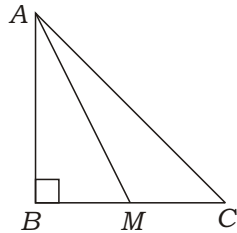
M is the mid-point of BC of a ABC, right-angled at B.

Prove that $4AM^2 = 4AB^2 + BC^2$.   4+2=6

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

28. *(a)* Define a right triangle.   1

(b) State the converse of the Pythagoras theorem.   2

(c) 3 cm, 4 cm and 5 cm are the sides of a right triangle. (State whether True or False)   1

(d) One of the acute angles of a right triangle is 40°. Find the other acute angle.   2

29. A cylindrical boiler, 2 m high, is 3·5 m in diameter. It has a hemispherical lid. Find the volume of its interior, including the part covered by the lid. (Use $\frac{22}{7}$)

Or

A rocket is in the form of a cone of height 28 cm, surmounted over a right circular cylinder of height 112 cm. The radii of the bases of cone and cylinder are equal, each being 21 cm. Find the total surface area of the rocket. (Use $\frac{22}{7}$)

30. Find the mean of the following data :

Age (in years)	0–10	10–20	20–30	30–40	40–50
No. of Persons	4	8	12	32	14

Or

Calculate the mode of the following data :

Class Interval	0–5	5–10	10–15	15–20	20–25	25–30
Frequency	2	7	18	10	8	5

(**13**)

(*Marks* : 20)

**[For Candidates without
Practicals/Internal Assessment only]**

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

(a) Which of the following has terminating decimal expansion?

(A) $\dfrac{5}{7}$

(B) $\dfrac{1}{8}$

(C) $\dfrac{13}{280}$

(D) $\dfrac{8102}{6^2\ 5^2}$

(b) Which of the following is a polynomial?

(A) $x^5\ \dfrac{3}{x}\ \dfrac{1}{3}x^2\ 4$

(B) $\sqrt{7}x^4\ \sqrt{x}\ 2x\ \dfrac{1}{3}$

(C) $x^2\ \dfrac{1}{x^2}$

(D) $1\ 5x\ 2x^2\ \dfrac{1}{6}x^3$

[P.T.O.

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

(A) $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2}$

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

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

(D) All of the above

(d) The solutions of the equation $x^2 + x - 20 = 0$ are

(A) 5, 4

(B) –5, 4

(C) 5, –4

(D) –5, 4

(e) A sequence is called an arithmetic progression if the difference of its terms and the preceding term is not the same. (State whether True or False)

(f) The perimeter of an equilateral triangle is 12 cm. Find its side.

(g) In the ordered pair (m, n), n is called the ——. (Fill in the blank)

(h) Prove that $\dfrac{\sin 40}{\cos 50} = 1$.

(i) The altitude of the sun is simply the angle of elevation of the sun. (State whether True or False)

(j) A line which intersects a circle at two points is called a —— of the circle. (Fill in the blank)

(k) Find the circumference of a circle whose diameter measures 7 cm. (Use $\frac{22}{7}$)

(l) Find the volume of a cuboid 1 cm thick, 2 cm wide and 3 cm long.

(m) Define modal class.

*(n)* A six-sided die, whose faces are numbered 1 to 6 is thrown. List all the possible outcomes.

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

(a) The product of two numbers is 396 576 and their LCM is 6336. Find their HCF.

(b) Find the sum and product of the zeroes of the quadratic polynomial $48x^2$ $13x$ 1.

(c) Find k for which the equation $9x^2$ kx 25 0 has real and equal roots.

(d) Find the common difference of the AP 1, 1, 3, 5,…, and write the next two terms.

(e) In the adjoining figure, *D* and *E* are the points on the sides *AC* and *BC* of a △*ABC*. Find whether *DE* ‖ *AB* or not, if *AC* = 10 cm, *BC* = 5 cm, *CD* = 4 cm and *CE* = 2 cm.
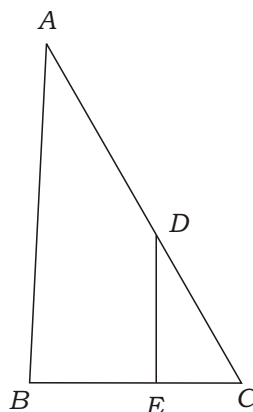
(f) Find the centroid of the triangle whose vertices are given below :

$$(4, -8), (-9, 7), (8, 13)$$

(g) Prove that

$$2\cos^2 30 - 1 = \cos 60$$

(h) A ladder 13 m long reaches the window of a building 12 m above the ground. Determine the distance of the foot of the ladder from the wall.

(i) The radius of a wheel is 84 cm. How many revolutions will it make to go 52·8 km? (Use $\frac{22}{7}$)

(j) Out of a day's production of 3000 machine parts, 500 were found to be sub-standard. What is the probability that a part selected at random being up to standard?

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