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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 only by Candidates without Practicals/Internal Assessment.

[P.T.O.

(iv) In Question Nos. **1** to **8** of Section—A and Question No. **31** sub Nos. *(a)* to *(g)*, 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.

(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* : 10)

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

1. The product of the common primes of the two given numbers is

(A) their HCF

(B) their LCM

(C) their HCF   LCM

(D) the product of the given numbers

2. The decimal expression of a rational number $\frac{p}{q}$ $(q \neq 0)$ terminates, if its denominator q has only powers of

(A) 2 and 7

(B) 5 and 7

(C) 2 and 5

(D) 2 and 3

3. If the discriminant of the quadratic equation $ax^2 + bx + c = 0$ is equal to zero, then the equation has

(A) real and unequal roots

(B) real and equal roots

(C) no real roots

(D) None of the above

4. The next term of the AP

$$0, \quad 4, \quad 8, \quad 12, \cdots$$

is

(A) −14

(B) 14

(C) 16

(D) −16

[P.T.O.

5. In the ordered pair (a, b), the x-coordinate is also known as

(A) origin

(B) abscissa

(C) ordinate

(D) axes

6. The value of

$$2\cos^2 30° - 1$$

is

(A) $\dfrac{1}{2}$

(B) $-\dfrac{1}{2}$

(C) $\dfrac{\sqrt{3}}{2}$

(D) 0

7. The area of a ring whose internal and external radii are r and R respectively is

(A) $R^2 - r^2$

(B) $R^2 + r^2$

(C) $\pi(R^2 - r^2)$

(D) $\pi(R^2 + r^2)$

8. In an isosceles ABC, if $AC = BC$ and $AB^2 = 2AC^2$, then C is

(A) a right angle

(B) an acute angle

(C) an obtuse angle

(D) a straight angle

9. Fill in the blanks : ½+½=1

(a) A _____ is a part of the circle whose end points are end points of a diameter.

(b) If the areas of two similar triangles are equal, they are _____.

10. Define cumulative frequency curve.

SECTION—B

(*Marks* : 12)

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

11. Explain why $11 \times 13 \times 17 + 17$ is a composite number.

12. Find a quadratic polynomial whose zeroes are 0 and $\dfrac{1}{7}$.

Or

Which term of an AP is 14 whose first term is –6 and common difference is 1·25 ?

13. Find the value of

$$\frac{\sin 60}{\cos^2 45} \cdot \cot 30 - 5\cos 90$$

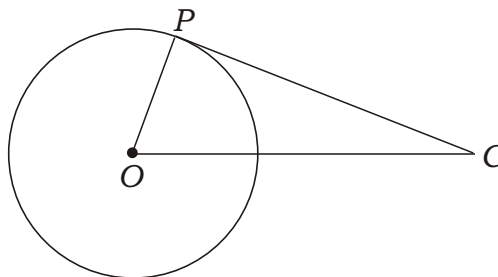**14.** If $\tan \theta + \cot \theta = 2$, then find the value of $\tan^2 \theta + \cot^2 \theta$.

Or

Prove that

$$\frac{(1 + \tan^2 A)\cot A}{\cosec^2 A} = \tan A$$

15. The areas of two similar triangles are in the ratio 9 : 16. If one side of the smaller triangle is 4·5 cm, then find the length of the corresponding side of the larger triangle.

16. In the adjoining figure, O is the centre of the circle and CP is tangent to the circle at P.

Find OC, if $OP = 8$ cm and the tangent $PC = 15$ cm.

[Contd.

(**7**)

16. *(a)* Define secant of a circle. 1

(b) Tangent at any point of a circle is _____ to the radius through the point of contact. (Fill in the blank) 1

SECTION—C

(*Marks* : 18)

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

17. Using Euclid's division algorithm, find the HCF of 17017 and 210.

18. The 5th term of an AP is 26 and the 10th term is 51. Find the 15th term of the AP.

Or

Find the sum of first 100 even natural numbers divisible by 5.

19. The centroid of a triangle is at the origin. Find the third vertex, if two of its vertices are (3, 1) and (0, 2).

20. Prove that

$$\sin^6 A + \cos^6 A = 1 - 3\sin^2 A \cos^2 A$$

Or

Prove that

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

21. In a circle of radius 6 cm, a chord of 10 cm makes an angle of 110° at the centre of the circle. Find the area of the sector so formed. (Use $\frac{22}{7}$) (Correct up to two places of decimals)

Or

A wire is in the form of a circle of radius 35 cm. It is now bent in the form of a square. Find the length of the side of the square. (Use $\frac{22}{7}$)

22. Out of a day's production of 3000 machine parts, 500 were found to be substandard. What is the probability that a part selected at random being up to substandard and standard?

SECTION—D

(*Marks* : 16)

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

23. The product of Ram's age 5 years ago and his age 8 years hence is 30. Find his present age.

24. Find the ratio in which the point $P\left(\dfrac{10}{3}, \dfrac{10}{3}\right)$ divides the segment joining the points A (6, 6) and B (2, 2).

Or

Show that the points A (0, 0), B (a, b) and C (a, b) are the vertices of an isosceles triangle.

25. From a terrace of a house 8 m high, the angle of elevation of the top of a tower is 45° and the angle of depression of the bottom is 60°. Find the height of the tower and the distance of the tower from the house. (Use $\sqrt{3}$ 1 732)

Or

From a point P on the level ground, the angle of elevation of the top of the tower is 30°. If the tower is 100 m high, how far is P from the foot of the tower and also, how far is P from the top of the tower? (Use $\sqrt{3}$ 1 732)

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

25. *(a)* Prove that

$$\cos 82 \quad \sin 8 \quad 0 \qquad\qquad 1$$

(b) Solve for if $\tan 5$ 1, where 0 90 . 2

(c) Prove that

$$\dfrac{1}{\sec \quad \tan} \quad \sec \quad \tan \qquad\qquad 1$$

[P.T.O.

26. Divide a line segment 6 cm long, internally in the ratio 4 : 3. (Only traces of construction are required.)

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

26. *(a)* Define a line segment.   1

     (b) The perimeter of a circle is referred to as the (circumference/area) of a circle.

                                     (Choose the correct answer)   1

     (c) The sum of all the angles of a triangle is three right angles.   (State whether True or False)   1

     (d) Define an arc of a circle.   1

SECTION—E

(*Marks* : 24)

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

27. Solve the following system of linear equations graphically :

$$2x + 3y + 12 = 0$$
$$2x + y + 4 = 0$$

Also, find the coordinates of the points where the lines meet the *x*-axis. (Plot at least three points for each graph.)

(11)

27. Solve the following system of linear equations :

$$8x \quad 9y \quad 20$$
$$7x \quad 10y \quad 9$$

28. Prove that the lengths of the two tangents drawn from an external point to a circle are equal.   4

Using the above result, do the following :

XP and *XQ* are two tangents to a circle with centre *O* from the point *X* outside the circle. *ARB* is a tangent to the circle at *R*. Prove that *XA*   *AR*   *XB*   *BR*.   2
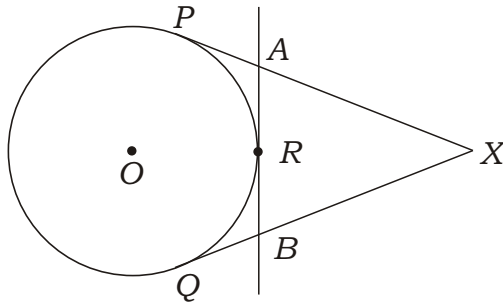
**[For Visually Handicapped (Blind) Students only,
instead of Question No. 28 above]**

28. *(a)*   Define tangent to a circle.   1

    (b)   How many tangents can be drawn from an external point to a circle?   1

    (c)   All radii of a circle are unequal.
                               (State whether True or False)   1

(d) Tangents drawn at the end of a diameter of a circle are (parallel/equal). (Choose the correct answer) 1

(e) Find the area of a circle whose radius is 2·8 cm.
(Use $\frac{22}{7}$) 2

29. The largest possible sphere is carved out from a solid cube of side 7 cm. Find the volume and surface area of the sphere. (Use $\frac{22}{7}$)

Or

A metallic sphere of radius 10·5 cm is melted and then recast into small cones, each of radius 3·5 cm and height 3 cm. Find how many cones are obtained.

30. The distribution below gives the marks obtained by the students of a class in a test. Maximum marks being 80. Find the median marks of the students :

Marks obtained	below 10	below 20	below 30	below 40	below 50	below 60	below 70	below 80
No. of students	15	35	60	80	96	127	190	200

Or

Calculate the mode of the following data :

Class Interval	15–25	25–35	35–45	45–55	55–65	65–75	75–85
Frequency	5	4	7	12	8	1	4

(**13**)

SECTION—F

(*Marks* : 20)

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

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

(a) If w is the given whole number, then the next whole number will be

(A) w

(B) w 1

(C) w 1

(D) w 2

(b) Every composite number can be expressed as a product of

(A) even numbers

(B) prime numbers

(C) odd numbers

(D) None of the above

(c) A polynomial of degree zero is called a

(A) binomial

(B) linear polynomial

(C) biquadratic polynomial

(D) constant polynomial

(d) If a pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has no solution, then

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

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

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

(D) $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$

(e) A quadratic equation in the variable x is an equation of the form $ax^2 + bx + c = 0$ where a, b and c are real numbers and

(A) $a = 0$

(B) $a \neq 0$

(C) $\dfrac{a}{b} = 0$

(D) $\dfrac{a}{c} = 0$

(f) The area of a circular face of a hemisphere of radius r is

(A) πr

(B) $2 \pi r^2$

(C) $3 \pi r^2$

(D) πr^2

(g) The distance between the pair of points (3, 0) and (0, 3) is

(A) 3

(B) 3

(C) $3\sqrt{2}$

(D) $2\sqrt{3}$

(h) Is $x^5 - \dfrac{3}{x} - \dfrac{1}{3}x^2 - 4$ a polynomial?

(State whether True or False)

(i) Find the value of

$$\dfrac{5\cos 65}{7\sin 25}$$

(j) A _____ of a circle is the figure bounded by two radii and an arc of a circle. (Fill in the blank)

(k) Find the mean of the first 10 natural numbers.

(l) Define median of a grouped data.

(m) A coin is tossed twice. List all the possible outcomes.

(n) The perimeter of an equilateral triangle is 27 cm. Find its side.

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

(a) Given that HCF (1133, 515) $=$ 103; find LCM (1133, 515).

(b) Find a quadratic polynomial whose sum and product of its zeroes are respectively $4\sqrt{2}$ and 6.

(c) Find the first two terms of the sequence whose nth term is
$$t_n = 2n^2 - 3n + 1$$

(d) Solve $6x^2 - 11x + 3 = 0$ by factorisation.

(e) In $\triangle ABC$, $XY \parallel BC$, if $AX = 4$ cm, $XB = 6$ cm and $AY = 3$ cm. Find AC.

(f) A man goes 150 m due east and then 200 m due north. How far is he from the starting point?

(g) If sec $-$ tan $= m$ and sec $+$ tan $= n$, then prove that $mn = 1$.

(h) A conical tent is of diameter 24 m at the base and its height is 16 m. Find the slant height of the tent.

(i) Find the coordinate of the midpoint of the line segment having the end points (-4, -7) and (-4, 3).

(j) An unbiased die is tossed—
   (i) find the probability of getting a number greater than 4;
   (ii) find the probability of getting a prime number.

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