X/21/M

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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 by **Candidates without Internal Assessment**.

[P.T.O.

(2)

(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. Find the prime factorization of 96. 1

2. Find the 5th term of the sequence $a_n = 2n + 5$. 1

3. Write the discriminant of the quadratic equation $3x^2 - 2x + 8 = 0$. 1

4. What is the area of an equilateral triangle of side 'a'? 1

5. In how many points does a line intersect the circle at most? 1

6. Find the area of a circle whose radius is 10·5 m. (Use $\pi = \frac{22}{7}$) 1

7. Evaluate : 1

$$\sin 60° \cos 30° + \cos 60° \sin 30°$$

8. Find the class mark of class 10–25. 1

(3)

(*Marks* : 14)

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

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

10. If $A = 30°$, verify that
$$\sin 2A = 2\sin A \cos A$$
2

11. Find the value of $x\,(0° < x < 90°)$ in
$$\tan 3x = \sin 45° \cos 45° + \sin 30°$$
2

Or

In $\triangle ABC$, right angled at B, if $AB = 5$, $BC = 12$ and $AC = 13$, find $\sin A$ and $\tan A$.   2
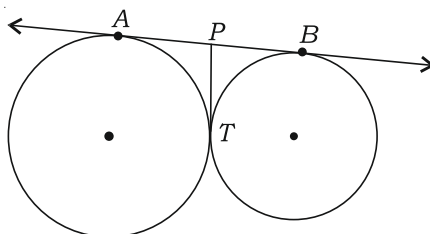
12. Find the distance between the pair of points $(-6, 7)$ and $(-1, -5)$.   2

13. Find the coordinates of the midpoint of the line segment joining the points $P(12, -8)$ and $Q(8, -4)$.   2

Or

Find the coordinates of the centroid of the triangle whose vertices are $(8, 0)$, $(0, 6)$ and $(8, 12)$.   2

14. In the figure below, AB is a common tangent to the given circles, which touch externally at P. If $AP = 3 \cdot 2$ cm, find the length of AB :   2
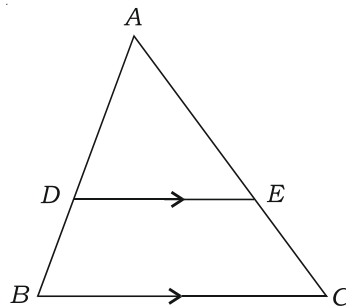

    [P.T.O.

(4)

14. *(a)* Define a secant. 1

(b) A tangent cannot be drawn from a point lying within the circle.

(State whether True or False) 1

15.

In the above figure, *ABC* is a triangle. *D* and *E* are the points on the sides *AB* and *AC* respectively, such that *DE* ∥ *BC*. If $AD = x$ cm, $DB = (x - 2)$ cm, $AE = (x + 2)$ cm and $EC = (x - 1)$ cm, find the value of *x*. 2

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

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

(Fill in the blank) 1

(5)

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 7 cm and divide it internally in the ratio 2 : 3. (Only traces of construction are required.) 3

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

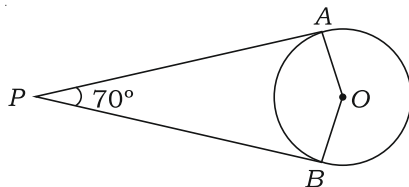16. *(a)* When are two triangles said to be similar? 2

   (b) Define an equilateral triangle. 1

17. The two tangents drawn from an external point P to a circle with centre O are PA and PB. If $\angle APB = 70°$, what is the value of $\angle AOB$? 3
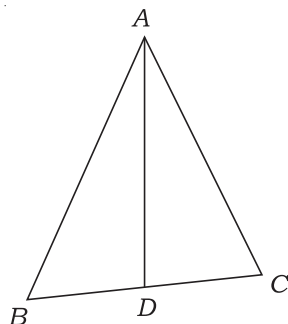

Or

In the figure below, AD is the bisector of $\angle A$ in $\triangle ABC$, intersecting the side BC at D. If $AB = 5$ cm, $AC = 4.2$ cm and $DC = 2.1$ cm, find BD : 3

[P.T.O.

(6)

[For Visually Handicapped (Blind) Students only, instead of Question No. 17 given in Page No. 5]

17. *(a)* State Basic Proportionality Theorem.   2

(b) A tangent to a circle is _____ to the radius through the point of contact.

                   (Fill in the blank)   1

18. Find the angle subtended at the centre of a circle of radius 5 cm by an arc of length $\dfrac{5\pi}{3}$ cm.   3

Or

The difference between the circumference and the radius of a circle is 37 cm. Find the area of the circle. (Use $\pi = \dfrac{22}{7}$)   3

19. A bag contains 6 red balls, 8 white balls, 5 green balls and 3 black balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is—

(a) white;

(b) red or black.   3

20. Find the HCF and LCM of 84, 90, 120 by applying prime factorization method.   3

Or

Given that HCF $(306, 657) = 9$, find the LCM of 306 and 657.   3

21. Which term in the A.P. 68, 64, 60, ... is –8 ?   3

Or

Find the sum of 100 terms of the A.P. 2, 4, 6, ...   3

22. Find a quadratic polynomial whose zeroes are –5 and –7.   3

23. Evaluate :   3

$$\frac{4}{\cot^2 30°} + \frac{1}{\sin^2 30°} - 2\cos^2 45° - \sin^2 0°$$

Or

If $\tan(A-B) = \dfrac{1}{\sqrt{3}}$ and $\tan(A+B) = \sqrt{3}$, $\quad 0° < (A+B) < 90°$

and $A > B$, find A and B.   3

SECTION—D

(*Marks* : 16)

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

24. The sum of two numbers is 16. The sum of their

reciprocals is $\dfrac{1}{3}$. Find the numbers.   4

Or

The sum of the numerator and denominator of a fraction
is 12. If the denominator is increased by 3, the
fraction becomes $\dfrac{1}{2}$. Find the fraction.   4

25. A tower stands vertically on the ground. From a point on
the ground 20 m away from the foot of the tower, the
angle of elevation of the top of the tower is 60°. What is
the height of the tower? (Use $\sqrt{3} = 1·732$)   4

Or

The string of a kite is 100 m long and it makes an angle
of 60° with the horizontal. Find the height of the kite,
assuming that there is no slack in the string.
(Use $\sqrt{3} = 1·732$)   4

(8)

25. *(a)* The value of $\cot 90° =$ _____.

(Fill in the blank)   1

(b) If $\cos\theta = 1$, then $\theta = 0°$.

(State whether True or False)   1

(c) Write down the relation between $\sin\theta$, $\cos\theta$ and $\tan\theta$.   2

26. Find the coordinates of the point, which divides the join of $A(-1, 7)$ and $B(4, -3)$ in the ratio $2:3$.   4

Or

If the points $(2, 1)$ and $(1, -2)$ are equidistant from the point (x, y), prove that $x + 3y = 0$.   4

27. Prove that, in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.   4

27. *(a)* Define a right triangle.   2

(b) The length of the diagonal of a square of side 'a' is _____.

(Fill in the blank)   2

(9)

(*Marks* : 18)

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

28. Solve the following system of linear equations graphically :

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

Also, find the points where the lines meet the axis of y. (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

$$2x + y = 7$$
$$4x - 3y + 1 = 0$$

29. If the total surface area of a solid hemisphere is 462 cm^2, find its volume. (Use $\pi = \frac{22}{7}$) 6

Or

A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere. 6

30. Find the mean of the following data : 6

Marks	0–10	10–20	20–30	30–40	40–50	50–60
Number of Students	12	18	27	20	17	6

Or

Find the mode of the following frequency distribution : 6

Class Interval	10–15	15–20	20–25	25–30	30–35	35–40
Frequency	30	45	75	35	25	15

(**10**)

(*Marks* : 20)

[For Candidates without Internal Assessment]

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

(a) The common difference of the A.P. 4, 1, –2, –5, ... is

(A) 3

(B) –3

(C) 4

(D) 2   (Choose the correct option)

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

(A) primes

(B) coprimes

(C) twin primes

(D) None of the above

(Choose the correct option)

(c) In which quadrant does the point (–2, 6) lie?

(A) 1st quadrant

(B) 2nd quadrant

(C) 3rd quadrant

(D) 4th quadrant   (Choose the correct option)

(d) The area of a circle with radius 'r' is

(A) πr^2 square units

(B) $2\pi r^2$ square units

(C) $\dfrac{1}{2}\pi r^2$ square units

(D) $3\pi r^2$ square units

(Choose the correct option)

(e) Define constant polynomial.

(f) If the polynomial $ax^2 + bx + c$ is a perfect square, then $b^2 = 4ac$.

(State whether True or False)

(g) What is the degree of a cubic polynomial?

(h) Find the circumference of a circle whose radius is 10·5 m. (Use $\pi = \frac{22}{7}$)

(i) How many tangents can be drawn to a circle from a point outside the circle?

(j) Each quadratic equation has at most two roots.

(State whether True or False)

(k) Write the value of $\sec 60°$.

(l) The total surface area of a right circular cylinder of radius 'r' and height 'h' is _____.

(Fill in the blank)

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

(Fill in the blank)

(n) π is an irrational number.

(State whether True or False)

(**12**)

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

    (a) Express 0·125 as a rational number.

    (b) Find the zeroes of the polynomial $x^2 - 2x - 3$.

    (c) Find the distance between the pair of points $(a, 0)$ and $(0, b)$.

    (d) A chord of a circle of radius 14 cm subtends a right angle at the centre. What is the area of the minor sector? (Use $\pi = \frac{22}{7}$)

    (e) A die is thrown once. What is the probability of getting a number other than 4?

    (f) The difference between two numbers is 26 and one number is three times the other. Find the numbers.

    (g) Find the coordinates of the midpoint of the line segment joining the points $P(7, 0)$ and $Q(-5, 4)$.

    (h) Find the sum of the first 100 natural numbers.

    (i) Find the value of $x\,(0° < x < 90°)$ in $2\cos 3x = 1$.

    (j) If α, β are zeroes of the polynomial $P(x) = 3x^2 - 2x - 6$, then find $\frac{1}{\alpha} + \frac{1}{\beta}$.

    (k) Determine the value of 'k' for which $x = 1$ is a solution of the equation $x^2 + kx + 3 = 0$.

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