

Time Allowed : 3 Hours

Maximum Marks : 80

General Instructions:

- I. All questions are compulsory.
- II. The question paper consists of 40 questions divided into four sections A, B, C and D.
- III. Section A contains 20 objective questions of 1 mark each. Section B contains 6 questions of 2 marks each. Section C contains 8 questions of 3 marks each. Section D contains 6 questions of 4 marks each.
- IV. There is no overall choice. However, an internal choice has been provided in 2 questions of section A, 2 questions of section B, 3 questions of section C and 3 questions of section D. You have to attempt only one of the alternatives in all such questions.
- V. Use of calculators is not permitted.

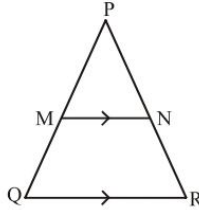
SECTION - A

(Q. 1 – Q. 10) Multiple choice type questions. Select the correct option.

1. Which of the following is irrational?

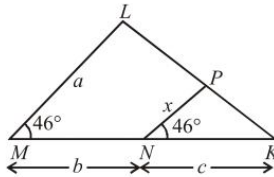
- (a) $\frac{22}{7}$
- (b) 3.141592
- (c) 2.78181818
- (d) 0.123 223 222 322 223

2. In the triangle PQR, MN \parallel QR and MN divides the triangle into two parts of equal areas, then $\frac{QM}{PQ}$



- (a) $\frac{1}{\sqrt{2}+1}$
- (b) $\frac{2-\sqrt{2}}{2}$
- (c) $\frac{\sqrt{2}-1}{\sqrt{2}}$
- (d) $\frac{1}{\sqrt{2}-1}$

3. In the given figure, express x in terms of a , b and c .

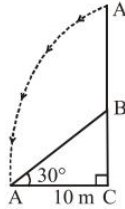


- (a) $x = \frac{ab}{a+b}$
- (b) $x = \frac{ac}{b+c}$
- (c) $x = \frac{bc}{b+c}$
- (d) $x = \frac{ac}{a+c}$

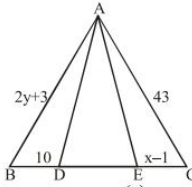
4. If $\sin(A+2B) = \frac{\sqrt{3}}{2}$ and $\cos(A+4B) = 0$, find A and B .

- (a) $30^\circ, 15^\circ$
- (b) $45^\circ, 60^\circ$
- (c) $0, 90^\circ$
- (d) $45^\circ, 45^\circ$

5. The top of a broken tree has its top touching the ground (shown in the figure) at a distance of 10 m from the bottom. If the angle made by the broken part with ground is 30° , then the length of the broken part is



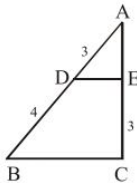
- (a) $10\sqrt{3}$ m (b) $\frac{20}{\sqrt{3}}$ m (c) 20 m (d) $20\sqrt{3}$ m
6. The 4th term of an A.P. is equal to 3 times the first term and the 7th term exceeds twice the third term by 1. The 1st term of A.P. is
 (a) -3 (b) 2 (c) 4 (d) 3
7. The perpendicular distance of the point P(3, 4) from the y-axis is :
 (a) 3 (b) 4 (c) 5 (d) 7
8. If $\tan^2\theta = 1 - a^2$ then the value of $\sec\theta + \tan^3\theta \operatorname{cosec}\theta$ is
 (a) $(2 - a^2)$ (b) $(2 - a^2)^{1/2}$ (c) $(2 - a^2)^{2/3}$ (d) $(2 - a^2)^{3/2}$
9. In a square PQRS, if P(1, 0), Q(4, 0) and S(1, 3), then the coordinates of point R will be
 (a) (4, 1) (b) (4, 4) (c) (3, 4) (d) (4, 3)
10. In the given figure, AD = AE and $\angle BAD = \angle EAC$, then



- (a) $x = 11$ (b) $x = 13$ (c) $y = 21$ (d) $y = 11$

(Q. 11 – Q. 15) Fill in the blanks.

11. Values of k for which the roots are real and equal in the equation $x^2 - 2kx + 7k - 12 = 0$ are _____.
12. In the adjoining figure, $DE \parallel BC$ and all measurements are in centimetres. The length of AE is _____.



13. If $\sin 3\theta = \cos(\theta - 6^\circ)$ where (3θ) and $(\theta - 6^\circ)$ are both acute angles, then the value of θ is _____.
14. If the distance between the points (2, -2) and (-1, x) is 5, one of the values of x is _____.
15. If the mean of the observations $x, x + 3, x + 5, x + 7$ and $x + 10$ is 9, the mean of the last three observations is _____.

OR

In the formula $\bar{x} = a + h \left(\frac{\sum f_i u_i}{\sum f_i} \right)$, for finding the mean of grouped frequency distribution $u_i =$ _____.

(Q. 16 – Q. 20) Answer the following questions.

16. Given $\triangle ABC \sim \triangle DEF$. If $AB = 2DE$ and area of $\triangle ABC$ is 56 cm^2 , then find the area of $\triangle DEF$.
17. If $\cos A = \frac{3}{5}$, find the value of $9 \cot^2 A - 1$.
18. Find the distance between the points $(\sqrt{3} + 1, \sqrt{2} - 1)$ and $(\sqrt{3} - 1, \sqrt{2} + 1)$.
19. What is the probability of choosing a vowel from the alphabet?

OR

- A card is drawn at random from a well shuffled pack of 52 cards. Find the probability that it is not a club.
20. The mean of 11 numbers is 35. If the mean of first 6 numbers is 32 and that of last 6 numbers is 37, then the 6th number?

SECTION - B

21. Find the HCF of 1,656 and 4,025 by Euclid's division algorithm.

OR

Find the least number that is divisible by all the numbers from 1 to 10 (both inclusive)

22. If the point $P(k - 1, 2)$ is equidistant from the points $A(3, k)$ and $B(k, 5)$, find the values of k .
23. The probability of selecting a rotten apple randomly from a heap of 900 apples is 0.18. What is the number of rotten apples in the heap?
24. The probability of selecting a red ball at random from a jar that contains only red, blue and orange balls is $\frac{1}{4}$. The probability of selecting a blue ball at random from the same jar is $\frac{1}{3}$. If the jar contains 10 orange balls, find the total number of balls in the jar.
25. Sum of the ages of a father and the son is 40 years. If father's age is three times that of his son, then find their respective ages.

OR

For what value of k , the equations $3x - y + 8 = 0$ and $6x - ky = -16$ represent coincident lines?

26. If the ratio of the sum of first n terms of two A.P.'s is $(7n + 1) : (4n + 27)$, find the ratio of their m th terms.

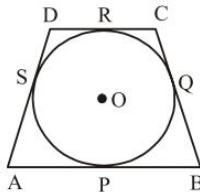
SECTION - C

27. Show that $\frac{2}{5\sqrt{3}}$ is irrational.
28. Obtain all other zeroes of the polynomial $4x^4 + x^3 - 72x^2 - 18x$, if two of its zeroes are $3\sqrt{2}$ and $-3\sqrt{2}$.
29. If $\frac{\cos \alpha}{\cos \beta} = m$ and $\frac{\cos \alpha}{\sin \beta} = n$, show that $(m^2 + n^2) \cos^2 \beta = n^2$

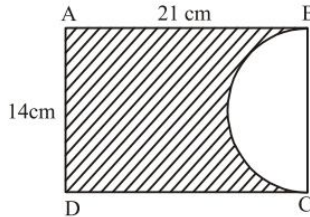
OR

Find the value of 'x' such that $2 \cos^2 30^\circ + x \sin^2 60^\circ - \frac{3}{4} \tan^2 30^\circ = 10$

30. In figure, a quadrilateral ABCD is drawn to circumscribe a circle, with centre O, in such a way that the sides AB, BC, CD and DA touch the circle at the points P, Q, R and S respectively. Prove that $AB + CD = BC + DA$.



31. In the given figure, ABCD is a rectangle of dimensions 21 cm × 14 cm. A semicircle is drawn with BC as diameter. Find the area and the perimeter of the shaded region in the figure.



32. A cubical block of side 10 cm is surmounted by a hemisphere. What is the largest diameter that the hemisphere can have? Find the cost of painting the total surface area of the solid so formed, at the rate of ₹ 5 per 100 sq. cm [Use $\pi = 3.14$].

OR

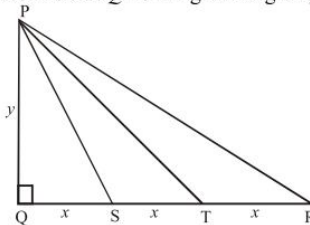
504 cones, each of diameter 3.5 cm and height 3 cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. [Use $\pi = \frac{22}{7}$]

33. Find the sum of values of a and b for which the following system of linear equations has infinite number of solutions:

$$2x + 3y = 7$$

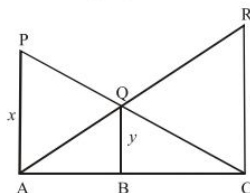
$$(a + b + 1)x + (a + 2b + 2)y = 4(a + b) + 1$$

34. In the given figure, S and T trisect the side QR of a right triangle PQR. Prove that $8PT^2 = 3PR^2 + 5PS^2$



OR

In the given figure PA, QB and RC, each are perpendicular to AC. Prove that $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$



SECTION - D

35. A well of diameter 4 m is dug 21 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment.

36. Solve the following for x : $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$

OR

Solve for x : $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$, $x \neq -1, -2, -4$

37. The angles of depression of the top and bottom of a 50 m high building from the top of a tower are 45° and 60° respectively. Find the height of the tower and the horizontal distance between the tower and the building. (use $\sqrt{3} = 1.73$)

OR

A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h . At a point on the plane, the angles of elevation of the bottom and the top of the flag staff are α and β

respectively. Prove that the height of the tower is $\left(\frac{h \tan \alpha}{\tan \beta - \tan \alpha} \right)$

38. If $\frac{b+c-a}{a}$, $\frac{c+a-b}{b}$, $\frac{a+b-c}{c}$ are in A.P. then prove $\frac{1}{a}$, $\frac{1}{b}$, $\frac{1}{c}$ in A.P.

OR

If the p th term of an A.P. is $\left(\frac{1}{q} \right)$ and its q th term is $\left(\frac{1}{p} \right)$, show that the sum of its first pq terms is $\frac{1}{2}(pq+1)$.

39. Draw a triangle ABC with side $BC = 7$ cm. $\angle B = 45^\circ$, $\angle A = 105^\circ$. Construct a triangle whose sides are $(4/3)$ times the corresponding side of ΔABC .
40. On the annual day of school, age-wise participation of students is given in the following frequency distribution table :

Age (in years)	Number of students
Less than 6	2
Less than 8	6
Less than 10	12
Less than 12	22
Less than 14	42
Less than 16	67
Less than 18	76

Draw a less than type given for the ogive data. Hence obtain the median age from the graph.