2023
MATHEMATICS

Total marks : 80   Time : 3 hours

General Instructions:
i)   Approximately 15 minutes is allotted to read the question paper and revise the answers.
ii) The question paper consists of 19 questions.
iii) All questions are compulsory.
iv) Internal & general choice have been provided in some questions.
v)   Marks allocated to every question are indicated against it.
N.B: Check to ensure that all pages of the question paper is complete as indicated on the top
   **left side.**

Section – A

1. **Choose the correct answer from the given alternatives.**

    (a) If the sum of squares of zeroes of the quadratic polynomial $3x^2 + 5x + k$

         is $\dfrac{-2}{3}$, then the value of k is   **1**

         (i) $\dfrac{31}{6}$ (ii) $\dfrac{25}{7}$ (iii) $\dfrac{35}{6}$ (iv) $\dfrac{27}{7}$

    (b) The point of intersection of the lines $y = 3x$ and $x = 3y$ is   **1**
         (i) $(3,0)$ (ii) $(0,3)$ (iii) $(3,3)$ (iv) $(0,0)$

    (c) If one root of quadratic equation $4x^2 - 2x + (\lambda - 4) = 0$ be the reciprocal
         of the other, then λ is equal to   **1**
         (i) 4   (ii) 8   (iii) -4 (iv) -8

    (d) The sum of the first 20 odd natural number is   **1**
         (i) 100   (ii) 210   (iii) 400   (iv) 420

    (e) The distance between the two points A (2, –3) and B (2, 2) is   **1**
         (i) 2 units   (ii) 3 units   (iii) 4 units   (iv) 5 units

    (f) In $\triangle$ABC, right angled at B, AB = 5 cm and $\sin C = \dfrac{1}{2}$, the length of

         AC will be: **1**
         (i) 10 cm   (ii) 2.5 cm   (iii) 7.5 cm   (iv) 6 cm

    (g) From a point Q, the length of the tangent to a circle is 24 cm and the
         distance of Q from the centre is 25 cm. The radius of the circle is   **1**
         (i) 7 cm   (ii) 12 cm   (iii) 15 cm   (iv) 24.5 cm

(h)   The area of sector of central angle 'x' of a circle with radius '$4r$' is   **1**

     (i) $\dfrac{4\pi xr}{360°}$ (ii) $\dfrac{2\pi xr^2}{45°}$ (iii) $\dfrac{\pi r^2 x}{360°}$ (iv) $\dfrac{2\pi rx}{360°}$

(i)   A conical military tent having diameter of the base 24 m and slant height
of the tent is 13 m, then the curved surface area of the cone is [use $\pi = 3.14$]   **1**
(i) 409.28 m^2 (ii) 489.8 m^2 (iii) 415.28 m^2 (iv) 495.5 m^2

(j)   If two coins are tossed simultaneously, the probability of getting at most
one tail is   **1**

     (i) $\dfrac{1}{4}$ (ii) $\dfrac{1}{2}$ (iii) $\dfrac{3}{4}$ (iv) 1

Section – B

2.   Find the LCM and HCF of 12, 15 and 21 by the prime factorization method.   **2**

3.   Find the roots of the quadratic equation $\sqrt{3}x^2 + 8x + 5\sqrt{3} = 0$ by factorization
method.   **2**

4.   In the adjoining figure, if DE ‖ BC, find AD.   **2**
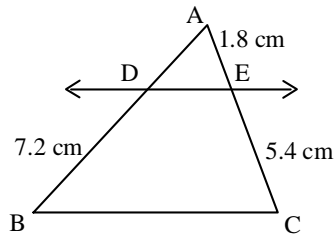
5.   If (1, 2), (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order,
find x and y.   **2**

6.   In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find the
length of the arc.   **2**

Section – C

7.   **Answer any three from the following questions (a) to (e).**   **$3 \times 3 = 9$**

(**a**)   If 2 and -3 are the zeroes of the quadratic polynomial $x^2 + (a+1)x + b$, then
find the value of a and b.

(**b**)   Solve the following pair of linear equations by elimination method:
$3x + 4y = 10$ and $2x - 2y = 2$.

(c) Find the roots of the quadratic equation $2x^2 - 7x + 3 = 0$ by applying the quadratic formula.

(d) Determine the AP whose third term is 16 and 7th term exceeds the 5th term by 12.

(e) Find the sum of first 51 terms of an AP whose second and third terms are 14 and 18 respectively.

8. **Answer any two from the following questions (a) to (d).** $2 \times 3 = 6$

(a) If $3\cot A = 4$, then prove that $\dfrac{1 - \tan^2 A}{1 + \tan^2 A} = \cos^2 A - \sin^2 A$ with the help of a right triangle.

(b) Prove that: $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$.

(c) Evaluate: $\dfrac{\cos 45°}{\sec 30° + \cos ec\,30°}$

(d) The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it are complementary. Prove that the height of the tower is 6 m.

9. **Case Study based question:**   **3**
Students of a colony undertake to work for the campaign "say no to plastics". They cover the region under the coordinates (2, 3), (10, 3), (x, 6) and (4, 6). The coordinates of the region taken in the given order form a parallelogram, where the units of distances are measured in kilometre. The shortest distance between the longer parallel sides of the region is 3 km. Based on the above information, answer the following questions (i) to (iii).

(i) The value of x is
    (a) 8   (b) 10   (c) 12   (d) 14

(ii) The area of the region covered is
    (a) 16 km^2 (b) 24 km^2 (c) 26 km^2 (d) 28 km^2

(iii) The distance between the first and the last coordinates of the region is
    (a) $\sqrt{13}$ km   (b) $\sqrt{14}$ km   (c) $\sqrt{15}$ km   (d) $\sqrt{16}$ km

10. **a.** Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and $\angle ABC = 60°$. Then construct a triangle whose sides are $\dfrac{3}{4}$ times the corresponding sides of the triangle ABC. (Traces of construction only is required)

Or   **3**

b. Draw a triangle ABC with side BC = 7 cm, $\angle$ B = 45°, $\angle$ A = 105°. Then, construct a triangle whose sides are $\frac{4}{3}$ times the corresponding sides of $\triangle$ABC. (Traces of construction only is required)

11. **Answer any one from the following questions (a) to (c).**   **1 × 3 = 3**

   (**a**) Find the area of the sector of a circle with radius 4 cm and angle 30°. Also, find the area of the corresponding major sector (Use π = 3.14).

   (**b**) A car has two wipers which do not overlap. Each wiper has a blade of length 25 cm sweeping through an angle of 115°. Find the total area cleaned at each sweep of the blades.

   (**c**) A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π.

12. **a.** Consider the following distribution of daily wages of 50 workers of a factory.

Daily wages (in `)	500-520	520-540	540-560	560-580	580-600
Number of workers	12	14	8	6	10

Find the mean daily wages of the workers of the factory by using Assumed Mean Method.

<div align="center">Or</div>   **3**

   b. The following data gives the information on the observed lifetimes (in hours) of 225 electrical components:

Lifetimes (in hours)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 - 120
Frequency	10	35	52	61	38	29

Determine the modal lifetimes of the components.

13. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting: (i) a face card   (ii) a spade   (iii) a king of red colour   **3**

<div align="center">Section – D</div>

14. **a.** A two digit number is 5 less than 5 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.

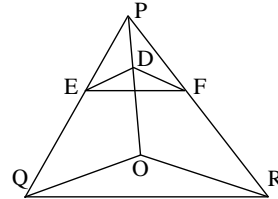<div align="center">Or</div>   **5**

b. A person on tour has ` 3600 for his expenses. If he extends his tour for 4 days, he has to cut his daily expenses by ` 30. Find the original duration of the tour and expenditure per day.

15. **a.** State and prove Basic Proportionality Theorem (Thales Theorem).

<p align="center">**Or**</p> 5

**b.** In the adjoining figure, DE ∥ OQ and DF ∥ OR. Show that EF ∥ QR.

16. **a.** Two poles of equal heights are standing opposite to each other on either side of the road, which is 80 m wide. From a point between them on the road, the angle of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and distances of the point from the poles.

<p align="center">**Or**</p> 5

b. A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite to the tower, the angle of elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joining this point to the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower and the width of the canal.
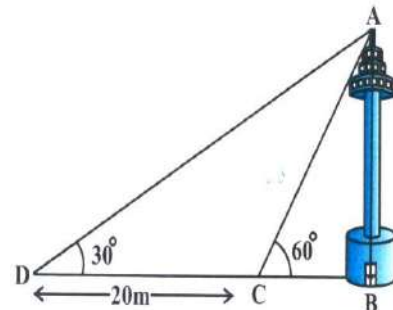
17. **a.** Prove that the parallelogram circumscribing a circle is a rhombus.

<p align="center">**Or**</p> 5

b. Two tangent TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.

18. **a.** From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest cm^2.

<p align="center">**Or**</p> 5

b. A solid iron pole consist of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass. [use $\pi = 3.14$]

19. **a.** If the median of the distribution given below is 28.5, find the values of x and y.

Class interval	Frequency
0 - 10	5
10 - 20	x
20 - 30	20
30 - 40	15
40 - 50	y
50 - 60	5
Total	**60**

Or   **5**

b. The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance is ` 18. Find the missing frequency f.

Daily pocket allowance (in `)	11- 13	13 - 15	15 - 17	17 - 19	19 - 21	21 - 23	23 - 25
Number of children	7	6	9	13	f	5	4

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