**KENDRIYA VIDYALAYA DRDO ,BENGALURU**

**CLASS-8 – MATHS – WINTER BREAK HHW**

**PRACTICE PAPER-1**

## SECTION – A

**Questions 1 to 6 carry 1 mark each.**

**1.** A cuboid has total surface area of 50 $m^2$ and lateral surface area is 30 $m^2$. Find the area of its base.

(a) 10 $m^2$ (b) 20 $m^2$ (c) 30 $m^2$ (d) 40 $m^2$

**2.** If $\left(2^{3x-1}+10\right)\div 7=6$, then the value of $x$ is

(a) 2 (b) 0 (c) 1 (d) $-2$

**3.** The value of $\left(\frac{1}{2}\right)^{-2}+\left(\frac{2}{3}\right)^{-2}+\left(\frac{3}{4}\right)^{-2}$ is

(a) $\frac{289}{36}$ (b) $\frac{313}{72}$ (c) $\frac{27}{4}$ (d) $\frac{241}{36}$

**4.** $13 \times 10^{-7}$ km is the standard form of which of the following _____ .

(a) 0.000000013 km (b) 0.0000013 km

(c) 0.000000000013 km (d) 0.00000000013 km

**5.** The height of a cylinder whose radius is 7 cm and the total surface area is 968 $cm^2$ is:

(a) 15 cm (b) 17 cm (c) 19 cm (d) 21 cm

**6.** A rectangular strip 25 cm × 7 cm is rotated about the longer side. Find the total surface area of the solid thus generated.

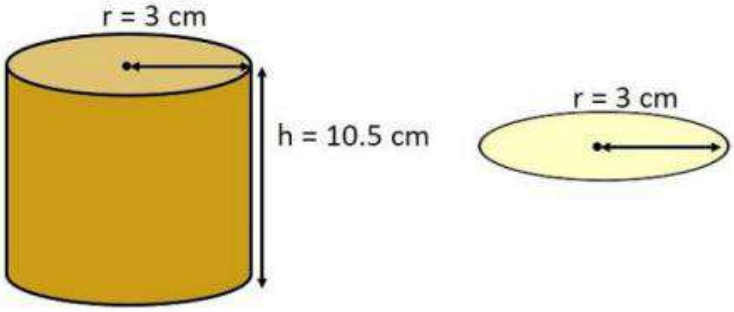
(a) 1480 $cm^2$ (b) 1408 $cm^2$ (c) 1840 $cm^2$ (d) 1804 $cm^2$

## SECTION – B(CCT Questions)

**Questions 7 to 10 carry 1 mark each.**

**CCT Question**

The students of a Vidyalaya were asked to participate in a competition for making and decorating penholders in the shape of a cylinder with a base, using cardboard. Each penholder was to be of radius 3 cm and height 10.5 cm. The Vidyalaya was to supply the competitors with cardboard. There were 35 competitors to participate in this competition. The cost of cardboard is Rs. 20 per 10 square cm.



**Based on the above situation, answer the following questions:**

**7.** Find the lateral surface area of a pen holder.
(a) 196 $cm^2$ (b) 198 $cm^2$ (c) 96 $cm^2$ (d) 128 $cm^2$

**8.** Find the total surface area of a penholder.
(a) 196/7 $cm^2$ (b) 1918/7 $cm^2$ (c) 196/7 $cm^2$ (d) 1584/7 $cm^2$

**9.** Find the Area of cardboard sheet used by 35 competitors.
(a) 1584 $cm^2$ (b) 7920 $cm^2$ (c) 1960/7 $cm^2$ (d) 1584/7 $cm^2$

**10.** What is the cost of cardboard?
(a) Rs. 1584 (b) Rs. 3168 (c) Rs. 792 (d) Rs. 396

## SECTION – C

**Questions 11 to 13 carry 2 marks each.**

**11.** A cuboidal vessel is 10 cm long and 5 cm wide. How high it must be made to hold 300 $cm^3$ of a liquid?

**12.** The curved surface area of a cylindrical road is 132 $cm^2$. Find its length if the radius is 0.35 cm.

**13.** Find the value of x for which $\left(\frac{5}{7}\right)^{-3} \times \left(\frac{5}{7}\right)^{-11} = \left(\frac{5}{7}\right)^{7x}$

## SECTION – D

**Questions 14 to 17 carry 3 marks each.**

**14.** A tea-packet measures 10 cm × 6 cm × 4 cm. How many such tea-packets can be placed in a cardboard box of dimensions 50 cm × 30cm × 0.2 m?

**15.** The circumference of the base of a cylinder is 88 cm and its height is 15 cm. Find its curved surface area and total surface area.

**16.** By what number should $\left(\frac{5}{4}\right)^{-3}$ be divided so that the quotient may be $\left(\frac{15}{16}\right)^{-2}$ ?

**17.** In a stack, there are 5 books, each having a thickness of 20 mm and 5 paper sheets, each having a thickness of 0.016 mm. What is the total thickness of the stack?

## SECTION – E

**Questions 18 to 20 carry 4 marks each.**

**18.** What will happen to the volume of a cuboid if its:
(i) Length is doubled, height is same and breadth is halved?
(ii) Length is doubled, height is doubled and breadth is same?

**19.** Simplify: (i) $\left[\left(\frac{2}{5}\right)^{-3}\right]^{4}$ (ii) $\left[\left(\frac{-6}{11}\right)^{-5}\right]^{-3}$ (iii) $\left(-\frac{2}{3}\right)^{-4} \times \left(\frac{1}{8}\right)^{-4}$ (iv) $\left(\frac{5}{7}\right)^{-1} \times \left(\frac{7}{3}\right)^{-1}$

**20.** Express the following numbers in standard form.

(i) 0.0000000000085 (ii) 0.00000000000942

(iii) 6020000000000000 (iv) 0.00000000837

**PRACTICE PAPER -2**

## SECTION – A

**Questions 1 to 6 carry 1 mark each.**

**1.** The value of $(-2/3)^4$ is equal to:

(a) 16/81 (b) 81/16 (c) -16/81 (d) 81/ −16

**2.** The volume of a cube is 64 $cm^3$. Its surface area is

(a) 16 $cm^2$ (b) 64 $cm^2$ (c) 96 $cm^2$ (d) 128 $cm^2$

**3.** If the radius of a cylinder is tripled, but its curved surface area is unchanged, then its height will be

(a) tripled (b) constant (c) one-sixth (d) one third

**4.** Sum of a – b + ab, b + c – bc and c – a – ac is

(a) 2c + ab – ac – bc (b) 2c – ab – ac – bc

(c) 2c + ab + ac + bc (d) 2c – ab + ac + bc

**5.** Volume of a rectangular box (cuboid) with length = 2ab, breadth = 3ac and height = 2ac is

(a) $12a^3bc^2$ (b) $12a^3bc$ (c) $12a^2bc$ (d) 2ab +3ac + 2ac

**6.** The value of $(7^{-1} - 8^{-1})^{-1} - (3^{-1} - 4^{-1})^{-1}$ is:

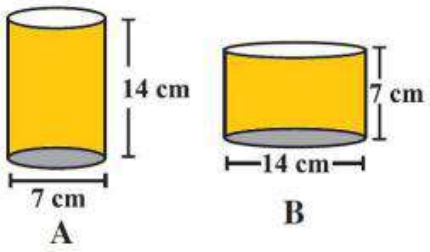
(a) 44 (b) 56 (c) 68 (d) 12

## SECTION – B(CCT Questions)

**Questions 7 to 10 carry 1 mark each.**

**CCT Question**

Mohan purchased two cylinders for his Maths Project. He marked first cylinder as 'A' and second one as 'B' with marker pen. He wants to fill sand in two cylinders and also wants to wrap with orange paper around the curved surface of two cylinders as shown in the below figure. Diameter of cylinder A is 7 cm, and the height is 14 cm. Diameter of cylinder B is 14 cm and height is 7 cm.



**Answer the following questions based on the above information:**

**7.** Find the area of orange paper in Cylinder A.
(a) 308 $cm^2$ (b) 539 $cm^2$ (c) 1078 $cm^2$ (d) 616 $cm^2$

**8.** Find the area of orange paper in Cylinder B.
(a) 308 $cm^2$ (b) 539 $cm^2$ (c) 1078 $cm^2$ (d) 616 $cm^2$

**9.** Find the volume of sand in Cylinder A.
(a) 308 $cm^3$ (b) 539 $cm^3$ (c) 1078 $cm^3$ (d) 616 $cm^3$

**10.** Find the volume of sand in Cylinder B.
(a) 308 $cm^3$ (b) 539 $cm^3$ (c) 1078 $cm^3$ (d) 616 $cm^3$

## SECTION – C

**Questions 11 to 13 carry 2 marks each.**

**11.** Subtract the following polynomials.
$3xy + 5yz - 7xz + 1$ from $-4xy + 2yz - 2xz + 5xyz + 1$

**12.** Find the height of the cylinder whose volume if 1.54 $m^3$ and diameter of the base is 140 cm.

**13.** Find the value of $m$ for which $5^m \div 5^{-3} = 5^5$

## SECTION – D

**Questions 14 to 17 carry 3 marks each.**

**14.** Simplify: $(a + b)(c - d) + (a - b)(c + d) + 2(ac + bd)$

**15.** Simplify: $\frac{3^{-5} \times 10^{-5} \times 125}{5^{-7} \times 6^{-5}}$

**16.** Simplify the following expressions:
(i) $(x + y + z)(x + y - z)$
(ii) $x^2(x - 3y^2) - xy(y^2 - 2xy) - x(y^3 - 5x^2)$

**17.** Water is pouring into a cuboidal reservoir at the rate of 60 liters per minute. If the volume of reservoir is 108 m^3, find the number of hours it will take to fill the reservoir.

## SECTION – E

**Questions 18 to 20 carry 4 marks each.**

**18.** Simplify $7x^2(3x - 9) + 3$ and find its values for $x = 4$ and $x = 6$

**19.** A road roller takes 750 complete revolutions to move once over to level a road. Find the area of the road if the diameter of a road roller is 84 cm and length 1 m.

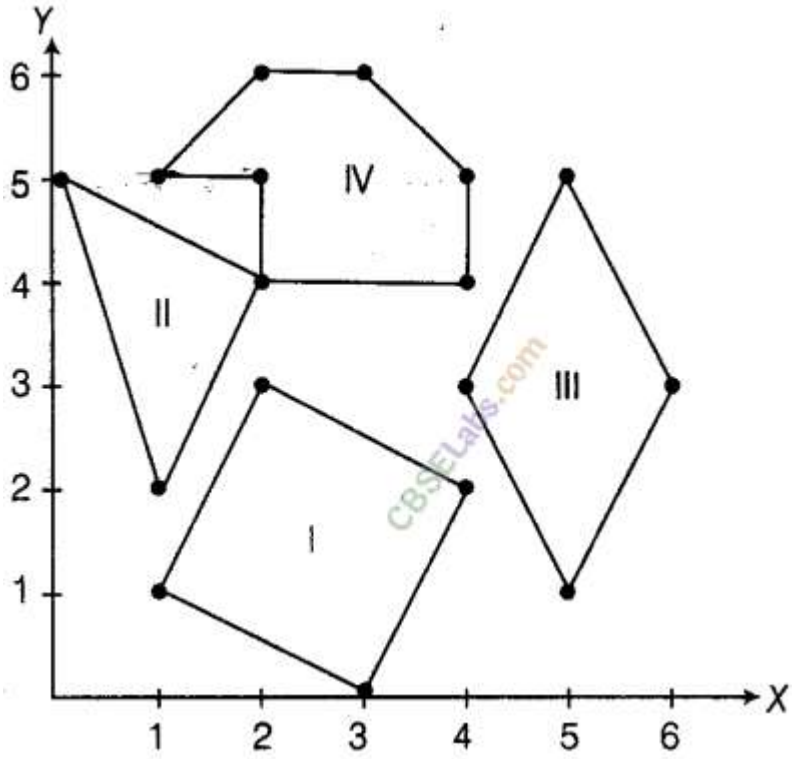
**20.** Express the following numbers in usual form.
(i) $5.325 \times 10^{-6}$ (ii) $5.45 \times 10^4$ (iii) $7 \times 10^{-8}$ (iv) $3.00201 \times 10^9$

**PRACTICE PAPER-3**

**1. Plot the given points on a graph sheet and check if the points lie on a straight line. If not, name the shape they form when joined in the given order.**
**(a) (1,2), (2,4), (3,6), (4,8)**
**(b) (14), (1,2), (2,1), (2,2)**
**(c) (4,2), (2,4), (3,3), (5,4)**

**2. The cost of a notebook is Rs 10. Draw a graph after making a table showing cost of 2,3,4… notebooks. Use it to find**
**(a) the cost of 7 notebooks.**
**(b) the number of notebooks that can be purchased with Rs 50.**

**3. Find the coordinates of the vertices of the given figures.**




**4. Locate the points A (1, 2), B (4, 2) and C (1, 4) on a graph sheet taking suitable axes. Write the coordinates of the fourth point D to complete the rectangle ABCD.**

**5. Locate the points P (3,4), Q (1,0), R (0,4), S (4,1) on a graph sheet and write the coordinates of the point of intersection of line segments PQ and RS.**

# KENDRIYA VIDYALAYA SANGATHAN
# MUMBAI REGION

## PREBOARD EXAMINATION-( 2023-24)
## Class-10

## MATHEMATICS (STANDARD)

## SET-1

**Time Allowed: 3 Hrs** **Maximum Marks: 80**

**General Instructions:**

**This Question Paper consist of 38 questions divided into 5 Sections A, B, C, D, and E.**

**Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.**

**Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.**

**Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.**

**Section D has 4 Long Answer (LA) type questions carrying 5 marks each.**

**Section E has 3 sourced based/Case Based/passage based/integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.**

**All Questions are compulsory. However internal choice has been provided in each section except section A.**

**Draw neat figures wherever required. Take $\pi$ =22/7 wherever required if not stated.**

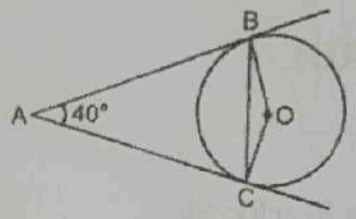
### SECTION-A

1. What is the HCF of the least prime number and the least composite number
   (a) 1 (b) 2 (c) 3 (d) 4
2. If -1 is a zero of the polynomial $x^2 - 7x - 8$, then the other zero is
   (a) 6 (b) -8 (c) 8 (d) 1
3. If (6, k) is a solution of the equation $3x + y = 22$ then, the value of k is:
   (a) 4 (b)- 4 (c) 3 (d) –3
4. The roots of the equation $7x^2 + x - 1 = 0$ are
   (a) real and distinct (b) real and equal (c) not real (d) none of these
5. $30^{th}$ term of the A.P: 10, 7, 4, …, is
   (a) 97 (b) 77 (c) -77 (d) -87
6. If k-1, k+3 and 3k-1 are in AP, then find the value of k
   (a) 4 (b) 5 (c) 3 (d) 7
7. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then

(a) $\Delta PQR \sim \Delta CAB$ (b) $\Delta PQR \sim \Delta ABC$ (c) $\Delta CBA \sim \Delta PQR$ (d) $\Delta BCA \sim \Delta PQR$

8. In the given figure, AB and AC are tangents to the circle with centre O such that $\angle BAC = 40°$, then $\angle BOC$ is equal to

(a) 40° (b) 50° (c) 140° (d) 150°




9. In $\Delta$ ABC, right-angled at B, AB = 24 cm, BC = 7 cm. The value of tan C is:

(a) 12/7 (b) 24/7 (c) 20/7 (d) 7/24

10. The value of $\frac{\tan 60°}{\cot 30°}$ is equal to:

(a) 0 (b) 3 (c) 2 (d) 1

11. If a tower 6m high casts a shadow of $2\sqrt{3}$ m long on the ground, then the sun's elevation is:

(a) 60° (b) 45° (c) 30° (d) 90°

12. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. The area of the sector formed by the arc is:

(a) 200 $cm^2$ (b) 220 $cm^2$ (c) 231 $cm^2$ (d) 250 $cm^2$

13. The length of the tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm is

(a) 10 cm (b) 5 cm (c) 7 cm (d) $2\sqrt{7}$ cm

14. Savita has a lamp placed at the centre of her square yard, each side measuring 20 m. The light of lamp covers a circle of radius 10 m on yard. What area of the yard is not lit by the lamp?

(a) $400\pi$ sq. m (b) $100\pi$ sq. m (c) $(40 - 10\pi)$ sq. m (d) $(400 - 100\pi)$ sq. m

15. Two identical fair dice have numbers 1 to 6 written on their faces. Both are tossed simultaneously. What is the probability that the product of the numbers that turn up is 12?

(a) 1/36 (b) 1/9 (c) 1/6 (d) 1/3

16. If two coins are tossed simultaneously, what is the probability of getting at most one tail?

(a) 1/4 (b) 3/4 (c) 1/2 (d) 1

17. Consider the following frequency distribution:

| Class | 0–5 | 5–10 | 10–15 | 15–20 | 20–25 |
|---|---|---|---|---|---|
| Frequency | 13 | 10 | 15 | 8 | 11 |

The sum of the upper limit and the lower limit of the modal class is

(a) 25 (b) 45 (c) 15 (d) 35

18. A point (x,y) is at a distance of 5 units from the origin. How many such points lie in the third quadrant?

(a) 0 (b) 1 (c) 2 (d) infinitely many

**DIRECTION**: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option

(a) Both assertion (A) and reason (R) are true and reason (R) is the correctexplanation of assertion (A)

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correctexplanation of assertion (A).

(c) Assertions (A) is true but reason (R) is false.

(d) Assertions (A) is false but reason (R) is true.

19. **Assertion (A):** The surface area of largest sphere that can be inscribed in a hollow cube of side 'a' is $\pi a^2 cm^2$ .

**Reason (R):** The surface area of a sphere of radius r is $\frac{4}{3}\pi r^3$

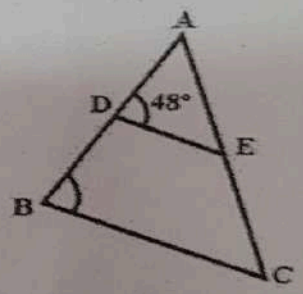
20. **Assertion (A):** The point (0, 4) lies on y-axis.

**Reason(R):** The x-coordinate of a point on y-axis is zero

## SECTION-B

21. Given that LCM (91, 26) = 182. Find the HCF OF 91and 26.

22. In figure, if AD = 6cm, DB = 9cm, AE = 8cm and EC = 12cm and $\angle ADE = 48^\circ$. Find $\angle ABC$.




23. If $\tan(A+B) = \sqrt{3}$ and $\tan(A-B) = \frac{1}{\sqrt{3}}$ $0^\circ < A+B < 90^\circ$; $A > B$, find A and B.

**OR**

Evaluate: $\sin^2 60^\circ + 2\tan 45^\circ - \cos^2 30^\circ$.

24. A chord of a circle of radius 10cm subtends a right angle at the centre. Find the area of minor segment. (Use $\pi = 3.14$)

OR

A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm Sweep in through an angle 120º. Find the total area cleaned at each sweep of the blades. (Use $\pi = 22/7$)

25. A circle touches all the four sides of a quadrilateral ABCD. Prove that

$AB + CD = BC + DA$

## SECTION-C

26. Prove that $\sqrt{5}$ is an irrational number.

27. Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients.

28. The sum of the digits of a two-digit number is 8. If 18 is added to the number, then the digits interchange their places. Find the number.

OR

For what values of a and b, the following pair of linear equations will have infinitely many solutions?

$x + 2y = 1; \quad (a - b)x + (a + b)y = a + b - 2$

29. Prove that: $(sin\ A + cosec\ A)^2 + (cos\ A + sec\ A)^2 = 7 + tan^2 A + cot^2$.

30. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

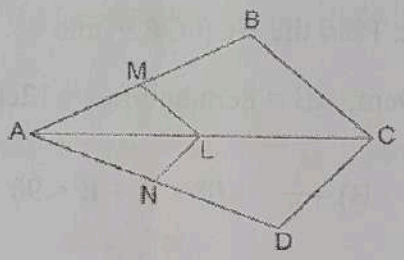
31. Find the mode of the following distribution:

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

## SECTION-D

32. (i)State and Prove Basic Proportionality theorem.

(ii) In the given Figure. , if LM || CB and LN || CD, prove that $\frac{AM}{AB} = \frac{AN}{AD}$.




33. The sum of the squares of two consecutive even numbers is 340. Find the numbers.

OR

A train covers a distance of 90 km at a uniform speed. Had the speed been 15 km/h more, it would have taken 30 minutes less for the journey. Find the original speed of the train.

34. A tent is in the shape of a cylinder surmounted by a conical top. The cylindrical part is 3.5 m high and conical part has slant height 4.2 m. Both the parts have same radius 2 m. Find the area of the canvas used to make the tent and find the cost of canvas to be purchased at the rate of ₹50 per square meter considering zero wastage . (Use $\pi = 22/7$)

35. The median of the following data is 525. Find the values of x and y, if the total frequency is 100

| Class interval | Frequency |
|---|---|
| 0–100 | 2 |
| 100–200 | 5 |
| 200–300 | x |
| 300–400 | 12 |

| | |
|---|---|
| 400–500 | 17 |
| 500–600 | 20 |
| 600–700 | y |
| 700–800 | 9 |
| 800–900 | 7 |
| 900–1000 | 4 |

## SECTION-E

36. Aditya invited his friends on his birthday. He bought a packet of toffees/candies which contains 120 candies. He arranges the candies such that in the first row there are 3 candies, in second there are 5 candies, in third there are 7 candies and so on.

On the basis of the above information, answer the following questions:

(i) Find the difference in number of candies placed in 7th and 3rd rows.

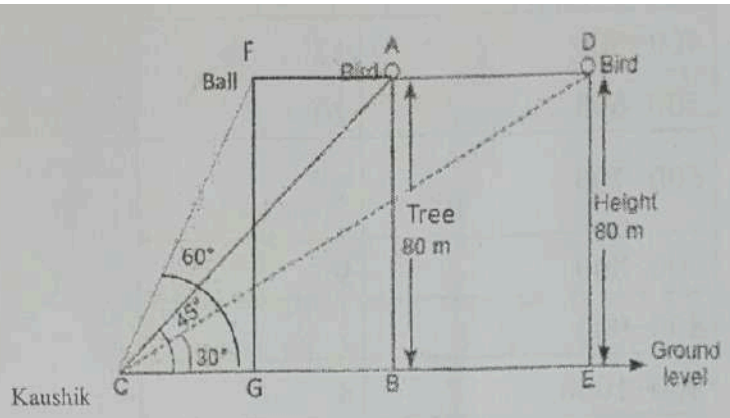
(ii) If Aditya decides to make 15 rows, then how many total candies will be placed by him with the same arrangement?

(iii) Find the total number of rows of candies.

**OR**

How many candies are placed in last row?

37. One evening, Kaushik was in a park. Children were playing cricket. Birds were singing on a nearby tree of height 80m. He observed a bird on the tree at an angle of elevation of 45°. When a sixer was hit, a ball flew through the tree frightening the bird to fly away. In 2 seconds, he observed the bird flying at the same height at an angle of elevation of 30° and the ball coming back towards him at the same height at an angle of elevation of 60°.




(i) At what distance from the foot of the tree was he observing the bird sitting on thetree?

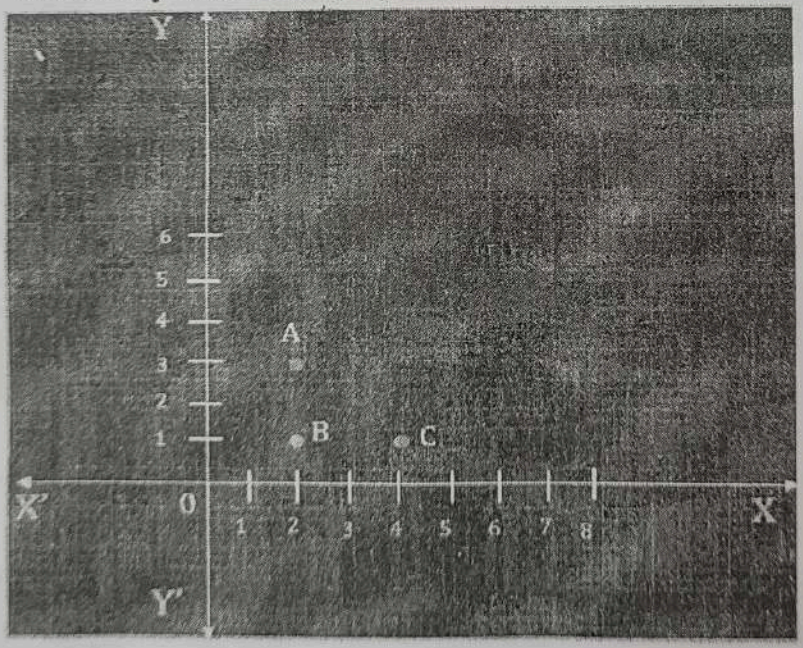
(ii) How far did the bird fly in the mentioned time?

OR

Find the distance between the Kaushik and the bird after the bird flew from the tree?

(iii) What is the speed of the bird in m/min if it had flown $20(\sqrt{3}+1)$ m?

38. Alia and Shagun are friends living on the same street in Patel Nagar. Shagun's house is at the intersection of one street with another street on which there is a library. They both study in the same school and that is not far from Shagun's house. Suppose the school is situated at the point O, i.e., the origin, Alia's house is at A. Shagun's house is at B and library is at C. Based on the above information, answer the questions.




(i) How far is Alia's house from Shagun's house?

(ii) How far is the library from Shagun's house?

(iii) Show that for Shagun, school is farther compared to Alia's house and library.

**OR**

Show that Alia's house, shagun's house and library for an isosceles right triangle.

PRE -BOARD EXAMINATION

Class X Session 2023-24

MATHEMATICS STANDARD (Code No 041)

TIME: 3 hours MAX MARKS: 80

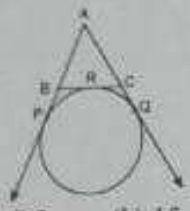
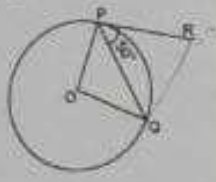
General Instructions:

1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub- parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Questions of 5 marks, 2 Questions of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

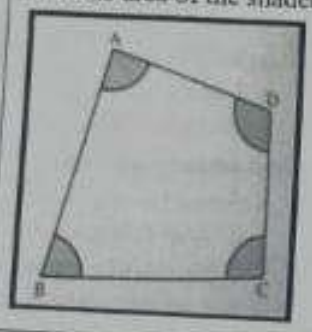
## SECTION A

*Section A consists of 20 questions of 1 mark each*

| | | |
|---|---|---|
| 01. | Find the product of the HCF and LCM of the smallest prime number and the smallest composite number.<br>(a) 12 (b) 9 (c) 8 (d) 4 | 1 |
| 02. | If zeroes of $p(x) = 2x^2 - 7x + k$ are reciprocal of each other, then the value of k is:<br>(a) 1 (b) 2 (c) 3 (d) 4 | 1 |
| 03. | If a and b are the roots of the equation $x^2 + ax - b = 0$, then find a and b.<br>(a) $a = -1$ and $b = 2$ (b) $a = 1$ and $b = 2$ (c) $a = -2$ and $b = 1$<br>(d) $a = 2$ and $b = -1$ | 1 |
| 04. | If $p - 1$, $p + 3$, $3p - 1$ are in AP, then p is equal to _____.<br>(a) 3 (b) 4 (c) 2 (d) none of these | 1 |
| 05. | Two right circular cones have their heights in the ratio 1:3 and radii in the ratio 3:1. What is the ratio of their volumes?<br>(a) 5:1 (b)1: 2 (c) 3:1 (d) 4:3 | 1 |
| 06. | The ratio in which the x-axis divides the line segment joining the points (2, -3) and (5, 6) is:<br>(a) 1: 2 (b) 3 : 4 (c) 1: 3 (d) 1: 5 | 1 |
| 07. | If $\cos A = \frac{3}{5}$, then the value of $9 + 9\tan^2 A =$<br>(a)9 (b) 16 (c)25 (d) 34 | 1 |

| | | |
|---|---|---|
| 08. | The angle of depression of a car, standing on the ground, from the top of a 75 m high tower, is 30°. The distance of the car from the base of the tower (in m) is:<br>(a) $25\sqrt{3}$ (b) $50\sqrt{3}$ (c) $75\sqrt{3}$ (d) 150 | 1 |
| 09. | If $\sin\theta - \cos\theta = 0$, then the value of $(Sin^4\theta + Cos^4\theta)$ is<br>(a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{4}$ | 1 |
| 10. | In figure DE ‖ BC. If BD = x − 3, AB = 2x, CE = x − 2 and AC = 2x + 3. Find x.<br>  <br>(a) 3 (b) 4 (c) 9 (d) none of these | 1 |
| 11. | In figure, AP, AQ and BC are tangents to the circle. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then the length of AP (in cm) is:<br>  <br>(a) 7.5 (b) 15 (c) 10 (d) 9 | 1 |
| 12. | In figure if O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, then POQ is equal to<br>  <br>(a) 100° (b) 80° (c) 90° (d) 75° | 1 |
| 13. | A square ABCD is inscribed in a circle of radius 'r'. The area of the square in square units is<br>(a) $3r^2$ (b) $2r^2$ (c) $4r^2$ (d) $r^2$ | 1 |
| 14. | The area of a sector of a circle is $\frac{1}{6}$ th of the area of the circle. The degree measure of its minor arc is<br>(a) 60° (b) 45° (c) 90° (d) 30° | 1 |
| 15. | The mean and mode of a frequency distribution are 28 and 16 respectively. Find the median<br>(a) 28 (b) 16 (c) 24 (d) 20 | 1 |

| | | |
|---|---|---|
| 16. | A card is drawn from a well shuffled deck of 52 cards. Find the probability that the card drawn is an ace.<br>(a) $\frac{1}{13}$ (b) $\frac{1}{52}$ (c) $\frac{1}{12}$ (d) $\frac{1}{2}$ | 1 |
| 17. | Two dice are thrown simultaneously. What is the probability of getting a doublet?<br>(a) 1/6 (b) 2/4 (c) 1/36 (d) 2/5 | 1 |
| 18. | If x = a and y = b is the solution of a pair of linear equations $37x + 43y = 123$ and $43x + 37y = 117$ ,then $a^3 + b^3$ is equal to<br>(a) 9 (b) 5 (c) 2 (d) 6 | 1 |
| 19. | **Direction**: In the question, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option.<br>**Assertion (A):** The value of n, if a = 10, d = 5, $a_n = 95$ is 20<br>**Reason (R):** The formula of general term an is $a_n = a + (n - 1)d$<br>Mark the correct choice as:<br>(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).<br>(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).<br>(c)Assertion (A) is true but reason (R) is false.<br>(d)Assertion (A) is false but reason (R) is true. | 1 |
| 20. | **Direction**: In the question, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option.<br>**Assertion (A):** If a right circular cylinder of radius r and height h (h>2r) just encloses a sphere,then the diameter of the sphere is 2r.<br>**Reason (R):** The surface area of the cylinder is $2\pi r^2 + 2\pi rh$<br>Mark the correct choice as:<br>(a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).<br>(b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).<br>(c)Assertion (A) is true but reason (R) is false.<br>(d)Assertion (A) is false but reason (R) is true. | 1 |
| | **SECTION B** | |
| *Section B consists of 5 questions of 2 mark each* | | |
| 21. | Find the largest number that divides 70 and 125 , leaving a remainder of 5 and 8 respectively. | 2 |

| | | |
|---|---|---|
| 22 | Find the value of x if $\tan 3x = \sin 45^\circ \cos 45^\circ + \sin 30^\circ$ | 2 |
| | OR | |
| | ABC is a right triangle, right angled at C. If $A = 30^\circ$ and AB = 40 units, find the remaining two sides of $\triangle ABC$ | 2 |
| 23. | In the figure, PQR and QST are two right triangles, right angled at R and T respectively. Prove that $QR \times QS = QP \times QT$<br>  | 2 |
| 24. | In figure, AP and BP are tangents to a circle with centre O, such that AP = 5 cm and $APB = 60^\circ$. Find the length of chord AB<br>  | 2 |
| 25. | The length of the minute hand of a clock is 6cm. Find the area swept by it when it moves from 7:05 p.m. to 7:40 p.m | 2 |
| | OR | |
| | In the given figure, arcs have been drawn of radius 7cm each with vertices A, B, C and D of quadrilateral ABCD as centres. Find the area of the shaded region.<br>  | 2 |

## SECTION C

*Section C consists of 6 questions of 3 mark each*

| | | |
|---|---|---|
| 26. | Prove that $3 + \sqrt{5}$ is irrational, given that $\sqrt{5}$ is irrational. | 3 |
| 27. | If the sum of the squares of the zeroes of the quadratic polynomial $P(x) = x^2 - 8x + k$ is 34, then find the value of $k$. | 3 |
| 28. | Find the value(s) of $k$ for which the pair of linear equations $3x - 2y - 7 = 0$ and $6x + ky + 11 = 0$ has a unique solution. | 3 |

| | | |
|---|---|---|
| | OR | |
| | Find out whether the lines representing the given pair of linear equations intersect at a point, are parallel or coincident. $5x - 4y + 8 = 0$ *and* $7x + 6y - 9 = 0$ | 3 |
| 29. | Show that $\frac{2\tan 30^\circ}{1+\tan^2 30^\circ} = Sin\ 60^\circ$. | 3 |
| | OR | |
| | If $tan(A+B) = \sqrt{3}$ and $tan(A-B) = \frac{1}{\sqrt{3}}$, $0^\circ < A+B \leq 90^\circ$, $A > B$, find A and B | 3 |
| 30. | Prove that the lengths of the tangents drawn from an external point to a circle are equal | 3 |
| | OR | |
| | Two concentric circles are of radii 5 *cm* and 3 *cm*. Find the length of the chord of the larger circle which touches the smaller circle | 3 |
| 31. | The mean of the following frequency distribution is 62.8. Find the missing frequency | 3 |

| class | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 | 100-120 |
|---|---|---|---|---|---|---|
| frequency | 5 | 8 | $x$ | 12 | 7 | 8 |

**SECTION D**

| | | |
|---|---|---|
| *Section D consists of 4 questions of 5 mark each* | | |
| 32. | A train travels 360 km at uniform speed . If the speed had been 5km / hr more ,it would have taken 1 hour less for the same journey. Find the speed of the train | 5 |
| | OR | |
| | At present Asha's age(in years) is 2 more than the square of her daughter Nisha's age When Nisha grows to her mother's present age, Ashas'age would be one year less than 10 times the present age of Nisha. Find the present ages of both Asha and Nisha | 5 |
| 33. | Sides AB and BC and median AD of a Δ ABC are respectively proportional to sides PQ and QR and median PM of Δ PQR. Show that Δ ABC ~ Δ PQR. | 5 |
| 34. | The two opposite vertices of a square are (−1,2) and (3,2) .Find the coordinates of the other two vertices. | 5 |
| | OR | |
| | Show that the points (1,7) ,(4,2) ,(−1,−1) and (−4,4) ,taken in order are the vertices of a square | 5 |

| | | |
|---|---|---|
| 35. | The median of the following data is 50. Find the value of p and q, if the sum of all the frequencies is 90. | 5 |

| Marks | Frequency |
|---|---|
| 20 – 30 | p |
| 30 – 40 | 15 |
| 40 – 50 | 25 |
| 50 – 60 | 20 |
| 60 – 70 | q |
| 70 – 80 | 8 |
| 80 – 90 | 10 |

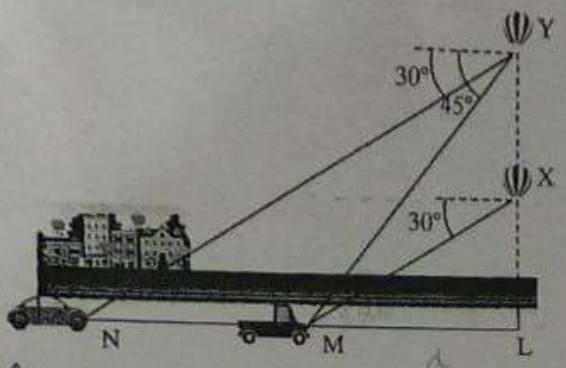
## SECTION E

*Section E consists of 3 questions of 4 mark each*

36. Push- ups are a fast and effective exercise for building strength. These are helpful in almost all sports including athletics. The push –up primarily target the muscles of the chest and shoulders. Nitesh wants to participate in the push-up challenge. She can currently make 3000 push-ups in one hour. But she wants to achieve a target of 3900 push-ups in one hour for which she practises regularly. With each day of practice, she is able to make 5 more push-ups in one hour as compared to the previous day. If on first day of practice, she makes 3000push-ups and continues to practise regularly till her target is achieved. Based on this context, answer the following questions.

| | | |
|---|---|---|
| | (i) Form an AP representing the number of push-ups per day and hence find the minimum number of days she needs to practise before the day her goal is accomplished? | 1 |
| | (ii) Find the total number of push-ups performed by Nitesh up to the day her goal is achieved. | 2 |
| | (iii) Check whether it is possible to achieve the target in 150days?<br>OR<br>On which day does she perform 3505 push-ups? | 1 |

37. A hot air balloon is a type of air craft. It is lifted by heating the air inside the balloon, usually with fire. Hot air weighs less than the same volume of cold air, which means that hot air will rise up or float when there is cold air around it, just like a bubble of air in a pot. Shivani is riding on a hot air balloon, after reaching the height $x$ at the point X, she spots a lorry parked at M on the ground at an angle of depression of $30^0$ .The balloon rises further by 40metres at point Y and now she spots the same lorry at an angle of depression $45^0$ and a car parked at N at an angle of depression of $30^0$.




| | | |
|---|---|---|
| | (i) What is the relation between the height $x$ of the balloon at the point X and the distance $d$ between the points L and M? | 1 |
| | (ii) When the balloon rises further 40 metres, what is the relation between the new height $y$ and $d$? | 2 |
| | (iii) What is the new height of the balloon at the point Y?<br>OR<br>What is the distance between L and N on the ground? | 1 |

38. Advertising columns are cylindrical outdoor sidewalk structures with a characteristic style that are used for advertising and other purposes. They are common throughout Germany its capital Berlin, where the first 100 columns were installed in 1855. Ajay has been given the task of designing an advertising column for a client. It consists of a cylindrical part surmounted by hemisphere part on the top. The base diameter of column is 7.7 feet and height of cylindrical part is 10 feet.

| | | |
|---|---|---|
| | (i) Find the surface area of the cylindrical part of the column? | 1 |
| | (ii) Find the surface area of hemispherical part of the column | 2 |
| | (iii) Find the total surface area of the advertising column?<br>OR<br>If the cost of construction is Rs 75 per sq feet, find the total cost of a column. | 1 |

# KENDRIYA VIDYALAYA SANGATHAN, ERNAKULAM REGION

## PREBOARD EXAM- MATHEMATICS BASIC

**General instructions:**

(1)This question paper contains 38 questions. All questions are compulsory.

(2)This question paper is divided in to five sections- A,B,C,D and E.

(3)In Section A, Questions no.1 to 18 are multiple choice questions(MCQs) and questions no.19 and 20 are Assertion-Reason based questions of 1 mark each.

(4)In Section B, Questions no.21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.

(5)In Section C, Questions no.26 to 31 are short answer (SA) type questions, carrying 3 marks each.

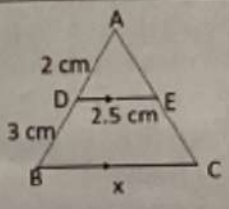
(6)In Section D, Questions no.32 to 35 are long answer (LA) type questions, carrying 5 marks each.

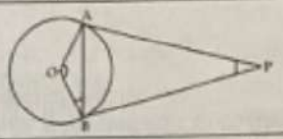
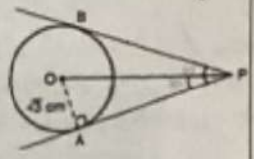
(7) In Section E, Questions no.36 to 38 are case study based questions, carrying 4 marks each. Internal choice is provided in 2 marks questions in each case study.

(8)There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.

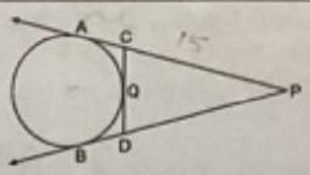
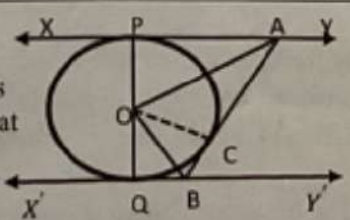
(9)Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.

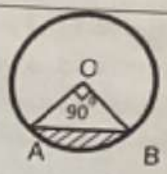
(10)Use of calculators is not allowed.

| | SECTION-A($20 \times 1 = 20$) | Marks |
|---|---|---|
| 1 | HCF of $(2^3 \times 3^2 \times 5)$ *and* $(2^2 \times 3^3 \times 5^2)$ is<br>(a)180 (b)360 (c)540 (d)900 | 1 |
| 2 | The value of k for which the system of equations 2x+3y=5 and 4x+ky=10 has infinitely many solution is<br>(a)k=(-3) (b)k=3 (c)k=0 (d) none of these | 1 |
| 3 | The value of k for which the roots of the equation $x^2+4x+k=0$ are real is<br>(a)$4 > k$ (b)$4 \geq k$ (c)$4 \leq k$ (d)none of these | 1 |
| 4 | Nature of roots of quadratic equation $2x^2 - 4x + 3 = 0$ is<br>(a) real (b) equal (c) not real (d) none of these | 1 |
| 5 | The roots of the quadratic equation $2x^2 - 9x + 7 = 0$ is<br>(a)7, 1 (b) 14, 4 (c)7/2,1 (d) 14, 1/2 | 1 |
| 6 | The 21st term of the AP: $-4\frac{1}{2}, -3, -1\frac{1}{2}, \ldots\ldots$ is<br>(a)3/2 (b)51/2 (c) -9/2 (d)60/2 | 1 |
| 7 | If k, (2k-1) and (2k+1) are the three successive terms of an AP, then the value of k is<br>(a)1 (b)2 (c)3 (d)4 | 1 |
| 8 | In the given figure, AD=2 cm, DB=3 cm, DE= 2.5 cm and DE parallel to BC. Then the value of 'x'is<br>(a) 6.25 cm (b)2.5 cm (c)10 cm (d) 3.125 cm<br>  <br> | 1 |

| | | |
|---|---|---|
| 9 | If in $\Delta ABC$ and $\Delta DEF$, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar, when<br>(a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$ | |
| 10 | The coordinates of a point on x-axis which is equidistant from the points $(-3, 4)$ and $(2, 5)$ is<br>(a) $\left(\frac{2}{5}, 0\right)$ (b) $\left(\frac{5}{2}, 0\right)$ (c) $\left(\frac{4}{5}, 0\right)$ (d) $\left(0, \frac{2}{5}\right)$ | 1 |
| 11 | In $\Delta ABC$ right angled at B, $\sin A = \frac{7}{25}$, then the value of cosC is<br>(a) $\frac{7}{25}$ (b) $\frac{24}{25}$ (c) $\frac{7}{24}$ (d) $\frac{24}{7}$ | 1 |
| 12 | If $\sin 2\theta = \sqrt{3}/2$, then the value of $\theta$ is<br>(a) $90^0$ (b) $60^0$ (c) $30^0$ (d) $45^0$ | 1 |
| 13 | Two tangents are drawn from an external point P such that $< OBA = 10^0$. Then $< BPA$ is:<br>(a) $10^0$ (b) $20^0$ (c) $30^0$ (d) $40^0$<br>  | 1 |
| 14 | Two tangents making an angle of $60^0$ between them are drawn to a circle of radius $\sqrt{3}$ cm then the length of each tangent is<br>(a) $\sqrt{3}$ cm (b) 3 cm<br>(c) $3\sqrt{3}$ cm (d) 9 cm<br>  | 1 |
| 15 | If the radii of two right circular cylinders are in the ratio 2:3 and their heights are in the ratio 5:3, what will be the ratio of their volumes?<br>(a) 20:27 (b) 10:9 (c) 6:15 (d) 4:9 | 1 |
| 16 | The upper limit of the modal class of following frequency distribution:<br>(a) 60 (b) 10 (c) 30 (d) 50 | 1 |
| 17 | If Median of data 16,18, 20, 24-x, 20 + 2x, 28, 30, 32 is 24 then x is<br>(a) 4 (b) 18 (c) 16 (d) 20 | 1 |
| 18 | Two different dice are tossed together. The probability of getting a doublet is<br>(a) 1/36 (b) 2/36 (c) 3/6 (d) 1/6 | 1 |
| | Questions number **19** and **20** are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled as Assertion(A) and the other is labelled as Reason(R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.<br><br>(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).<br>(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).<br>(c) Assertion (A) is true but Reason (R) is false.<br>(d) Assertion (A) is false but Reason (R) is true. | |
| 19 | Assertion (A): In $\Delta ABC$, DE $\parallel$ BC such that AD = (7x - 4) cm, AE = (5x - 2) cm, DB = (3x + 4) cm and EC = 3x cm than x equal to 5.<br>Reason (R): If a line is drawn parallel to one side of a triangle to intersect the other two sides in distant point, than the other two sides are divided in the same ratio. | 1 |

| Class | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
|---|---|---|---|---|---|
| Frequency | 15 | 10 | 12 | 17 | 4 |

| | | |
|---|---|---|
| 20 | Assertion : The probability of an event that cannot happen is equal to zero.<br>Reason : The probability lies between 0 and 1. Hence it cannot be negative. | 1 |
| | **SECTION-B(5× 2 = 10)** | Marks |
| 21 | Given that HCF(306,657) = 9, find the LCM(306,657). | 2 |
| 22 | Find the sum of all natural numbers from 1 and 200. | 2 |
| 23 | Three vertices of a parallelogram taken in order are ( -1, - 6 ), ( 2 , - 5) and (7, 2). Find the coordinates of the fourth vertex. | 2 |
| 24 | If $cot\theta = \frac{15}{8}$, *then evaluate* $\frac{(2+2sin\theta)(1-sin\theta)}{(1+cos\theta)(2-2cos\theta)}$.<br>**OR**<br>If $\cos(A-B) = \frac{\sqrt{3}}{2}$, $\sin(A+B)=1$, then find the value of A and B. | 2 |
| 25 | In figure PA and PB are tangents to the circle drawn from an external point P. CD is the third tangent touching the circle at Q.<br>If PA = 15 cm, find the perimeter of ΔPCD.<br>  <br>**OR**<br>Two concentric circles are of radii 8 cm and 5 cm. Find the length of the chord of the larger circle which touches the smaller circle. | 2 |
| | **SECTION-C(6× 3 = 18)** | Marks |
| 26 | Prove that $\sqrt{3}$ is an irrational number. | 3 |
| 27 | Solve for x and y.<br>47x + 31y = 63<br>31x + 47y = 15.<br>**OR**<br>Ten years hence, a man's age will be twice the age of his son. Ten years ago, man was four times as old as his son. Find their present ages. | 3 |
| 28 | Find the coordinates of a point P on the line segment joining A(1, 2) and B (6,7) such that $AP = \frac{2}{5}AB$.<br>**OR**<br>Find the ratio in which the line segment joining A( 1 , -5 ) and B( -4 , 5 ) is divided by the x-axis. Also find the coordinates of the point of division. | 3 |
| 29 | Prove that $cosec\theta - cot\theta = \sqrt{\frac{1-cos\theta}{1+cos\theta}}$ | 3 |
| 30 | In the given figure, $XY$ and $X'Y'$ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C, is intersecting $XY$ at A and $X'Y'$ at B. Prove that $\angle AOB = 90^0$.<br>  | 3 |
| 31 | Daily wages of 110 workers, obtained in a survey, are tabulated below:<br>*Daily Wages (in Rs.)* \| 100-120 \| 120-140 \| 140-160 \| 160-180 \| 180-200 \| 200-220 \| 220-240<br>*Number of Workers* \| 10 \| 15 \| 20 \| 22 \| 18 \| 12 \| 13<br>Compute the mean daily wages of these workers. | 3 |

| | SECTION-D(4× 5 = 20) | Marks |
|---|---|---|
| 32 | Find the zeroes of the quadratic polynomial $6x^2 - 7x-3$ and verify the relationship between the zeroes and the coefficients.If $\alpha$ and $\beta$ are the zeroes of the given polynomial, then write a polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.<br>**OR**<br>If $\alpha$ and $\beta$ are the zeroes of the polynomial $2x^2 - 4x +5$, findthe value of<br>(a) $\frac{1}{\alpha}+\frac{1}{\beta}$<br>(b) $\alpha^2+\beta^2$<br>(c) $(\alpha-\beta)^2$ | 5 |
| 33 | Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then the other two sides are divided in the same ratio. | 5 |
| 34 | In the given figure, AB is a chord of a circle of radius 7 cm and centred at O. Find the area of the shaded region if $\angle AOB = 90^0$. Also find the length of minor arc AB.<br>  <br><br>**OR**<br>A chord of a circle of radius 14 cm subtends $30^0$ at the centre. Find<br>(a) area of the minor sector (b) area of the minor segment<br>(c) area of the major sector | 5 |
| 35 | A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite 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. | 5 |
| | **SECTION-E(3 × 4 = 12) CASE STUDY** | Marks |
| 36 | The speed of a motor boat is 20 km/hr. For covering the distance of 15 km the boat took 1 hour more for upstream than downstream.<br>  <br>1. If the speed of the stream be x km/hr. then speed of the motorboat in upstream will be<br>a)20 km/hr b)(20+x) km/hr c)(20-x) km/hr d)(x-20) km/hr<br>2. If the speed of stream is x km/hr, and then the speed of the motor boat in downstream is<br>a) (20+x) km/hr b) (x-20) km/hr c) 20x km/hr d) 20 $x$ km/hr<br>3. The quadratic equation giving the speed of current is<br>a) $x^2+30x-200=0$ b) $x^2+20x-400=0$ c) $x^2+30x-400=0$ d) $x^2-20x-400=0$<br>**OR**<br>The speed of current is<br>a) 20km/hr b) 10 km/hr c)15km/hr d)25km/hr | 1<br>1<br>2 |

37

A mathematics teacher took her grade X students to the Taj Mahal. It was an educational trip. She was interested in history also. On reaching there she told them about the history and facts about the seventh wonder. She also told them that the structure of the monument is a combination of several solid figures. There are 4 pillars that are cylindrical in shape. A big dome in the centre and four more small domes on the four sides of the big dome on its side. The domes are hemispherical. The pillars also have domes on them.

1)How much cloth material will be required to cover a big dome of diameter of 7m? 1

(a)$77m^2$ (b)$78m^2$ (c) $79m^2$ (d)$80\ m^2$.

2)Write the formula to calculate the volume of the pillar 1

(a)$\pi r^2h + \pi r^3$ (b) $\pi r^2h + \frac{2}{3}\pi r^2l$ (c) $\pi rl + \frac{2}{3}\pi r^3$ (d) $\pi r^2h + \frac{2}{3}\pi r^3$

3) How much is the volume of the hemisphere if the radius of the base is 3m? 2

(a)$65.57\ m^3$ (b) $75.77\ m^3$ (c)$56.57\ m^3$ (d) $85.57\ m^3$.

**OR**

Find the Curved Surface Area of 4 pillars if the height of the pillars is 7 m and radius of the base is 2 m.

(a)$352\ m^2$ (b)$88\ m^2$ (c)$308\ m^2$ (d) $192\ m^2$.

38

Tushara took a pack of 52 cards. She kept aside all the black face cards and shuffled the remaining cards well. Based on the above information answer the following questions.

(1) Write the number of total possible outcomes. 1

(a)52 (b)39 (c)26 (d)46

(2) She draws a card from the well-shuffled pack of remaining cards. What is the probability that the card is a face card? 1

(a)6/52 (b)6/46 (c)12/52 (d)12/46

(3) Write the probability of drawing a black card. 2

(a)20/46 (b)20/52 (c)6/39 (d)26/52

**OR**

What is the probability of getting neither a black card nor an ace card

(a)26/46 (b)24/46 (c)13/52 (d)24/52

# Class- X Exam - 2023-24
# Mathematics - Standard

**Time Allowed: 3 Hours** **Maximum Marks : 80**

**General Instructions :**

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

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# Section - A

**Section A consists of 20 questions of 1 mark each.**

**1.** A letter of English alphabet is chosen at random, what is the probability that the letter so chosen is a consonant?
(a) $\frac{5}{26}$ (b) $\frac{21}{26}$ (c) $\frac{2}{13}$ (d) $\frac{7}{13}$

**2.** What is the HCF of smallest primer number and the smallest composite number?
(a) 2 (b) 4 (c) 6 (d) 8

**3.** If $A(5,2)$, $B(2,-2)$ and $C(-2,t)$ are the vertices of a right angled triangle with $\angle B = 90^{\circ}$, then the value of $t$ will be
(a) 1 (b) 2 (c) 3 (d) 4

**4.** The sum and product of zeroes of a quadratic polynomial are 6 and 9 respectively. The quadratic polynomial will be
(a) $x^2+9x-6$ (b) $x^2+6x+9$ (c) $x^2-6x+9$ (d) $x^2+6x-9$

**5.** Half the perimeter of a rectangular garden, whose length is 4 m more then its width, is 36 m. The dimensions of garden will be
(a) 20 m by 16 m (b) 36 m by 10 m (c) 16 m by 30 m (d) 20 m by 16 m

**6.** The quadratic equation $x^2+x-5=0$ has
(a) two distinct real roots (b) two equal real roots
(c) no real roots (d) more than 2 real roots

**7.** Which of the following equations has 2 as a root?
(a) $x^2-4x+5=0$ (b) $x^2+3x-12=0$ (c) $2x^2-7x+6=0$ (d) $3x^2-6x-2=0$

**8.** What happens to value of $\cos\theta$ when $\theta$ increases from $0^o$ to $90^o$.

(a) $\cos\theta$ decreases from 1 to 0. (b) $\cos\theta$ increases from 0 to 1.

(c) $\cos\theta$ increases from $\frac{1}{2}$ to 1 (d) $\cos\theta$ decreases from 1 to $\frac{1}{2}$

**9.** The times, in seconds, taken by 150 athletes to run a 110 m hurdle race are tabulated below

| Class | 13.8-14 | 14-14.2 | 14.2-14.4 | 14.4-14.6 | 14.6-14.8 | 14.8-15 |
|---|---|---|---|---|---|---|
| Frequency | 2 | 4 | 5 | 71 | 48 | 20 |

The number of athletes who completed the race in less than 14.6 second is :

(a) 11 (b) 71 (c) 82 (d) 130

**10.** For what value of $k$, the pair of linear equations $kx-4y=3,\ 6x-12y=9$ has an infinite number of solutions ?

(a) $k=2$ (b) $k\neq 2$ (c) $k\neq 3$ (d) $k=4$

**11.** The top of two poles of height 20 m and 14 m are connected by a wire. If the wire makes an angle of $30^\circ$ with the horizontal, then the length of the wire is

(a) 12 m (b) 10 m (c) 8 m (d) 6 m

**12.** Which term of an AP, 21, 42, 63, 84, ... is 210?

(a) 9th (b) 10th (c) 11th (d) 12th

**13.** The perimeters of two similar triangles $\Delta ABC$ and $\Delta PQR$ are 35 cm and 45 cm respectively, then the ratio of the areas of the two triangles is .....

(a) $\frac{2}{9}$ (b) $\frac{7}{9}$ (c) $\frac{49}{81}$ (d) $\frac{3}{4}$

**14.** $\dfrac{\tan^2\theta}{1+\tan^2\theta}+\dfrac{\cot^2\theta}{1+\cot^2\theta}=?$

(a) 1 (b) $2\tan^2\theta$ (c) $2\cot^2\theta$ (d) $2\sec^2\theta$

**15.** It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. The radius of the new park would be

(a) 10 m (b) 15 m (c) 20 m (d) 24 m

**16.** If two solid hemispheres of same base radius $r$ are joined together along their bases, then curved surface area of this new solid is

(a) $4\pi r^2$ (b) $6\pi r^2$ (c) $3\pi r^2$ (d) $8\pi r^2$

**17.** If zeroes of the polynomial $x^2+4x+2a$ are $a$ and $\dfrac{2}{a}$, then the value of $a$ is

(a) 1 (b) 2 (c) 3 (d) 4

**18.** If radii of two concentric circles are 4 cm and 5 cm, then the length of each of one circle which is tangent to the other circle, is

(a) 3 cm (b) 6 cm (c) 9 cm (d) 1 cm

**In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.**

**19.** **Assertion :** Pair of linear equations : $9x+3y+12=0, 8x+6y+24=0$ have infinitely many solutions.
**Reason :** Pair of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ have infinitely many solutions, if $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

**20.** **Assertion :** If $n^{\text{th}}$ term of an AP is $7-4n$, then its common differences is $-4$.
**Reason :** Common difference of an AP is given by $d=a_{n+1}-a_n$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

# Section - B

**Section B consists of 5 questions of 2 marks each.**

**21.** If two positive integers $p$ and $q$ are written as $p=a^2b^3$ and $q=a^3b$, where $a$ and $b$ are prime numbers than verify $\text{LCM}(p,q)\times\text{HCF}(q,q)=pq$

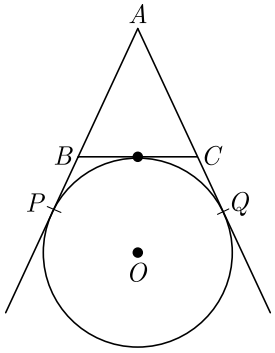
**22.** If the $n^{th}$ term of an AP $-1,4,9,14,.....$ is 129. Find the value of $n$.

**OR**

Write the $n^{th}$ term of the AP $\frac{1}{m},\frac{1+m}{m},\frac{1+2m}{m},.....$

**23.** If the mid-point of the line segment joining the points $A(3,4)$ and $B(k,6)$ is $P(x,y)$ and $x+y-10=0$, find the value of $k$.

**24.** In figure, $AP$, $AQ$ and $BC$ are tangents of the circle with centre $O$. If $AB=5\,\text{cm}$, $AC=6$ cm and $BC=4$ cm, then what is the length of $AP$?




**OR**

Two chords $AB$ and $CD$ of a circle intersect at $E$ such that $AE=2.4\,\text{cm}$, $BE=3.2\,\text{cm}$ and $CE=1.6\,\text{cm}$. What is the length of $DE$?

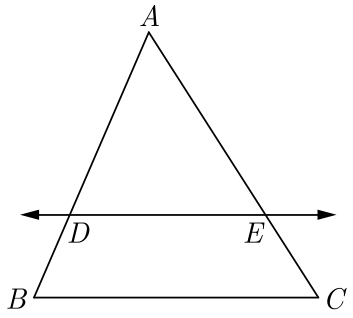
**25.** Two coins are tossed together. Find the probability of getting both heads or both tails.

# Section - C

**Section C consists of 6 questions of 3 marks each.**

**26.** Find HCF and LCM of 378, 180 and 420 by prime factorization method. Is HCF $\times$ LCM of these numbers equal to the product of the given three numbers?

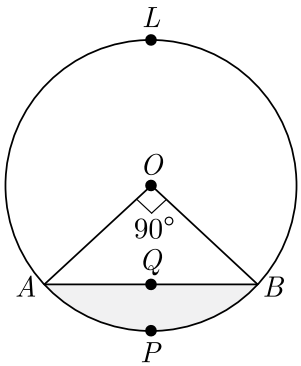
**27.** In Figure, in $\Delta ABC$, $DE \parallel BC$ such that $AD = 2.4$ cm, $AB = 3.2$ cm and $AC = 8$ cm, then what is the length of $AE$?




**28.** Prove that : $\frac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1} = \frac{1 + \cot\theta}{\sin\theta}$

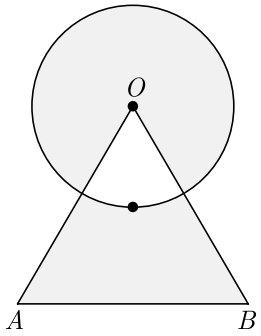
**29.** From a point $P$, which is at a distant of 13 cm from the centre $O$ of a circle of radius 5 cm, the pair of tangents $PQ$ and $PR$ are drawn to the circle, then the area of the quadrilateral $PQOR$ (in cm$^2$).

**30.** In the given figure, a chord $AB$ of the circle with centre $O$ and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment $AQBP$. Hence find the area of major segment $ALBQA$ . (Use $\pi = 3.14$)



**OR**

Find the area of shaded region shown in the given figure where a circular arc of radius 6 cm has been drawn with vertex $O$ of an equilateral triangle $OAB$ of side 12 cm as centre.




**31.** A die is thrown once. Find the probability of getting a number which (i) is a prime number (ii) lies between 2 and 6.

**OR**

A die is thrown twice. Find the probability that
(i) 5 will come up at least once.
(ii) 5 will not come up either time.

# Section - D

**Section D consists of 4 questions of 5 marks each.**

**32.** Solve the following pair of linear equations graphically:
$x+3y=12,\ 2x-3y=12$
Also shade the region bounded by the line $2x-3y=2$ and both the co-ordinate axes.

**OR**

For what values of $a$ and $b$ does the following pair of linear equations have infinite number of solution ?
$2x+3y=7, a(x+y)-b(x-y)=3a+b-2$

**33.** Show that $A(-1,0)$, $B(3,1)$, $C(2,2)$ and $D(-2,1)$ are the vertices of a parallelogram $ABCD$.

**34.** Sides $AB$ and $AC$ and median $AD$ of a triangle $ABC$ are respectively proportional to sides $PQ$ and $PR$ and median $PM$ of another triangle $PQR$. Show that $\Delta ABC \sim \Delta PQR$.

**OR**

Find the length of the second diagonal of a rhombus, whose side is 5 cm and one of the diagonals is 6 cm.

**35.** A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pipe, given that 1 cm3 of iron has approximately 8 g mass. (Use $\pi = 3.14$)

# Section - E

**Case study based questions are compulsory.**

**36.** Auditorium, the part of a public building where an audience sits, as distinct from the stage, the area on which the performance or other object of the audience's attention is presented. In a large theatre an auditorium includes a number of floor levels frequently designed as stalls, private boxes, dress circle, balcony or upper circle, and gallery. A sloping floor allows the seats to be arranged to give a clear view of the stage. The walls and ceiling usually contain concealed light and sound equipment and air extracts or inlets and may be highly decorated.

In an auditorium, seats are arranged in rows and columns. The number of rows are equal to the number of seats in each row. When the number of rows are doubled and the number of seats in each row is reduced by 10, the total number of seats increases by 300.

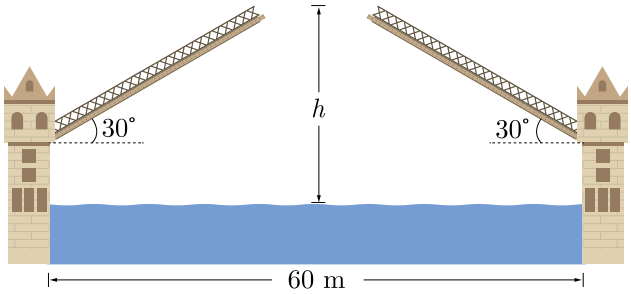
(i) If $x$ is taken as number of row in original arrangement, write the quadratic equation that describes the situation ?

(ii) How many number of rows are there in the original arrangement?

(iii) How many number of seats are there in the auditorium in original arrangement ? How many number of seats are there in the auditorium after re-arrangement.

(iv) How many number of columns are there in the auditorium after re-arrangement?

**37.** Drawbridge : A drawbridge is a bridge that can be moved in order to stop or allow passage across it. Modern drawbridges are often built across large, busy waterways. They can be lifted to allow large ships to pass or lowered to allow land vehicles or pedestrians to cross.




A drawbridge is 60 metre long when stretched across a river. As shown in the figure, the two sections of the bridge can be rotated upward through an angle of $30^\circ$.

(i) If the water level is 5 metre below the closed bridge, find the height $h$ between the end of a section and the water level when the bridge is fully open.

(ii) How far apart are the ends of the two sections when the bridge is fully opened, as shown in the figure?

**38.** Life insurance is a contract between an insurance policy holder and an insurer or assurer, where the insurer promises to pay a designated beneficiary a sum of money upon the death of an insured person (often the policy holder). Depending on the contract, other events such as terminal illness or critical illness can also trigger payment. The policy holder typically pays a premium, either regularly or as one lump sum.

SBI life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years.

| Age (in years) | Below 20 | Below 25 | Below 30 | Below 35 | Below 40 | Below 45 | Below 50 | Below 55 | Below 60 |
|---|---|---|---|---|---|---|---|---|---|
| Number of policy holders | 2 | 6 | 24 | 45 | 78 | 89 | 92 | 98 | 100 |

(i) What is the median value of age ?
(ii) What will be the upper limit of the modal class? What is the mode value of age ?
(iv) Find the mean value of age using empirical relation.

□□□□□□□

# Class- X Exam - 2023-24
# Mathematics - Standard

**Time Allowed: 3 Hours** **Maximum Marks : 80**

**General Instructions :**

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

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# Section - A

**Section A consists of 20 questions of 1 mark each.**

**1.** What are the values of $x$ and $y$ for the following pair of linear equations ?
$99x + 101y = 499$ and $101x + 99y = 501$

(a) 3 and 6 (b) 3 and 2

(c) 2 and 3 (d) 6 and 3

**2.** If a number $x$ is chosen at random from the numbers $-3$, $-2$, $-1$. 0, 1, 2, 3, then What is the probability of $x^2 < 4$?

(a) $\frac{4}{7}$ (b) $\frac{3}{7}$

(c) $\frac{1}{7}$ (d) $\frac{2}{7}$

**3.** The zeroes of polynomial $p(x) = ax^2 + bx + c$ are reciprocal of each other if

(a) $b = 2a$ (b) $c = b$

(c) $b = a$ (d) $c = a$

**4.** If $-1$ is a zero of the polynomial $p(x) = kx^2 - 4x + k$, the value of $k$ is

(a) –4 (b) –2

(c) 2 (d) 4

**5.** If $\alpha$ and $\beta$ are the roots of $ax^2 - bx + c = 0 (a \neq 0)$, then value of $\alpha + \beta$ is

(a) $\frac{b}{a}$ (b) $\frac{a}{b}$

(c) $\frac{2a}{b}$ (d) $\frac{a}{2b}$

**6.** Which of the following value of $k$ should be selected so that the pair of equations $x+2y=5$ and $3x+ky+15=0$ has a unique solution ?

(a) $k \neq 5$ (b) $k \neq 6$

(c) $k=5$ (d) $k=6$

**7.** The quadratic equation $x^2+3x+2\sqrt{2}=0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

**8.** A ladder 10 m long reaches a window 8 m above the ground. The distance of the foot of the ladder from the base of the wall is ..... m.

(a) 8 m (b) 2 m

(c) 6 m (d) 4 m

**9.** If the sum of the circumferences of two circles with radii $R_1$ and $R_2$ is equal to the circumference of a circle of radius $R$, then

(a) $R_1+R_2=R$ (b) $R_1+R_2>R$

(c) $R_1+R_2>R$ (d) $R_1+R_2<R$

**10.** The famous mathematician associated with finding the sum of the first 100 natural numbers is

(a) Pythagoras (b) Newton

(c) Gauss (d) Euclid

**11.** The value of $x$ for which $2x,(x+10)$ and $(3x+2)$ are the three consecutive terms of an AP, is

(a) 6 (b) $-6$

(c) 18 (d) $-18$

**12.** If points $A(-3,12)$, $B(7,6)$ and $C(x,9)$ are collinear, then the value of $x$ is ..... .

(a) 2 (b) 3

(c) 4 (d) 5

**13.** The value of $\sin^2 41^\circ + \sin^2 49^\circ$ will be

(a) 1 (b) $\sqrt{2}$

(c) 2 (d) $\sqrt{3}$

**14.** The number $\frac{7}{75}$ will have -

(a) non-terminating repeating decimal expansion.

(b) terminating decimal expansion.

(c) non-terminating non repeating decimal expansion.

(d) terminating non repeating decimal expansion

**15.** A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45°. The height of a tree is

(a) 10 m (b) 14 m

(c) 8 m (d) 15 m

**16.** If the perimeter of one face of a cube is 20 cm, then its surface area is

(a) $120\,cm^2$ (b) $150\,cm^2$

(c) $125\,cm^2$ (d) $400\,cm^2$

**17.** $\sin^2 60^\circ - 2\tan 45^\circ - \cos^2 30^\circ = ?$

(a) 2 (b) –2

(c) 1 (d) –1

**18.** If $x_i$'s are the mid-points of the class intervals of grouped data, $f_i$'s are the corresponding frequencies and $\overline{x}$ is the mean, then $\sum(f_i x_i - \overline{x})$ is equal to

(a) 0 (b) $-1$

(c) 1 (d) 2

**In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.**

**19.** **Assertion :** The values of $x$ are $-\frac{a}{2}, a$ for a quadratic equation $2x^2 + ax - a^2 = 0$.
**Reason :** For quadratic equation $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

**20.** **Assertion :** The two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre.
**Reason :** A parallelogram circumscribing a circle is a rhombus.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

# Section - B

**Section B consists of 5 questions of 2 marks each.**

**21.** Given that HCF (306, 1314) = 18. Find LCM (306, 1314)

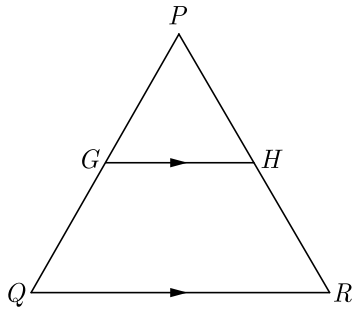
**22.** If $\alpha$ and $\beta$ are the zeroes of a polynomial $x^2 - 4\sqrt{3}\,x + 3$, then find the value of $\alpha + \beta - \alpha\beta$.

**OR**

If one of the zeroes of the quadratic polynomial $f(x) = 14x^2 - 42k^2x - 9$ is negative of the other, find the value of '$k$'.

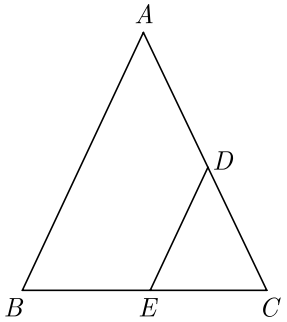
**23.** The mid-point of the line-segment $AB$ is $P(0, 4)$, if the coordinates of $B$ are $(-2,\ 3)$ then find the co-ordinates of $A$.

**24.** In the given figure, $G$ is the mid-point of the side $PQ$ of $\Delta PQR$ and $GH \| QR$. Prove that $H$ is the mid-point of the side $PR$ or the triangle $PQR$.




**OR**

In the figure of $\Delta ABC$, the points $D$ and $E$ are on the sides $CA, CB$ respectively such that $DE \| AB$, $AD = 2x, DC = x + 3, BE = 2x - 1$ and $CE = x$. Then, find $x$.




**25.** Two different dice are tossed together. Find the probability :
(i) that the number on each die is even.
(ii) that the sum of numbers appearing on the two dice is 5.

# Section - C

**Section C consists of 6 questions of 3 marks each.**

**26.** Write the smallest number which is divisible by both 306 and 657.

**27.** $\Delta ABC$ and $\Delta BDE$ are two equilateral triangle such that $D$ is the mid-point of $BC$. Ratio of the areas of triangles $ABC$ and $BDE$ is ..... .

**28.** Evaluate :
$$\frac{3\tan^2 30^\circ + \tan^2 60^\circ + \operatorname{cosec} 30^\circ - \tan 45^\circ}{\cot^2 45^\circ}$$

**29.** Prove that the rectangle circumscribing a circle is a square.

**30.** A solid is in the shape of a cone surmounted on a hemisphere. The radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.

**OR**

A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap?

**31.** The mean of the following distribution is 48 and sum of all the frequency is 50. Find the missing frequencies $x$ and $y$.

| Class | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
|---|---|---|---|---|---|
| Frequency | 8 | 6 | $x$ | 11 | $y$ |

**OR**

The table below shows the daily expenditure on food of 25 households in a locality. Find the mean daily expenditure on food.

| Daily expenditure (in ₹) | 100-150 | 150-200 | 200-250 | 250-300 | 300-350 |
|---|---|---|---|---|---|
| Number of households | 4 | 5 | 12 | 2 | 2 |

# Section - D

**Section D consists of 4 questions of 5 marks each.**

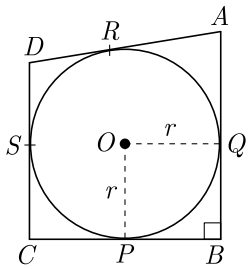
**32.** Find the values of $k$ for which the equation $(3k+1)x^2 + 2(k+1)x + 1$ has equal roots. Also find the roots.

**OR**

A person on tour has ₹ 4200 for his expenses. If he extends his tour for 3 days, he has to cut down his daily expenses by ₹ 70. Find the original duration of the tour.

**33.** Prove that the point $(3,0)$, $(6,4)$ and $(-1,3)$ are the vertices of a right angled isosceles triangle.

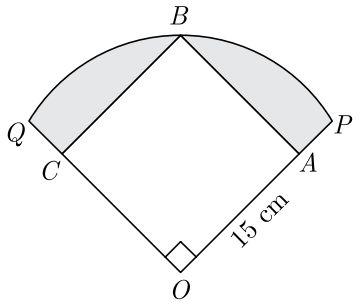
**34.** In figure, a circle with centre $O$ is inscribed in a quadrilateral $ABCD$ such that, it touches the sides $BC$, $AB$, $AD$ and $CD$ at points $P, Q, R$ and $S$ respectively. If $AB = 29$ cm, $AD = 23$ cm, $\angle B = 90^\circ$ and $DS = 5$ cm, then find the radius of the circle (in cm).




**OR**

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

**35.** In Figure, a square $OABC$ is inscribed in a quadrant $OPBQ$. If $OA = 15\,\text{cm}$, find the area of the shaded region. (Use $\pi = 3.14$).




# Section - E

**Case study based questions are compulsory.**

**36.** Bequests to Charity : At the time our mother left this Earth, she gave Rs 90000 to her children of birth. This we kept and each year added Rs 30000 more, as a lasting memorial from the children she bore. When Rs 4,20,000 is thusly attained, all goes to charity that her memory be maintained.

(i) What was the balance in the sixth year?

(ii) In what year was the goal of Rs 420,000 met?


**37.** Eiffel Tower : The Eiffel Tower is a landmark and an early example of wrought-iron construction on a gigantic scale. The lower section consists of four immense arched legs set on masonry piers. The legs curve inward until they unite in a single tapered tower. Platforms, each with an observation deck, are at three levels; on the first is also a restaurant.

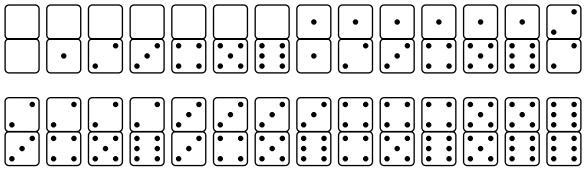
The tower, constructed of about 7000 tons of iron, has stairs and elevators. A meteorological station, a radio communications station, and a television transmission antenna, as well as a suite of rooms that were used by Eiffel are located near the top of the tower.

Continue on next page.....

(i) For a person standing 324 m from the center of the base of the Eiffel Tower, the angle of elevation to the top of the tower is $45^\circ$. How tall is the Eiffel Tower?

(ii) A car is moving at uniform speed towards the Eiffel tower. It takes 15 minutes for the angle of depression from the top of tower to the car to change from $30^\circ$ to $60^\circ$. After how much time after this, the car will reach the base of the tower?

**38.** Double-six Dominos : It is a game played with the 28 numbered tiles shown in the diagram.



The 28 dominos are placed in a bag, shuffled, and then one domino is randomly drawn. Give the following answer.

(i) What is the probability the total number of dots on the domino is three or less ?

(ii) What is the probability the total number of dots on the domino is greater than three ?

(iii) What is the probability the total number of dots on the domino does not have a blank half ?

(iv) What is the probability the total number of dots on the domino is not a "double" (both sides the same) ?

□□□□□□□

# K V DRDO, BENGALURU
## SAMPLE PAPER TEST FOR BOARD EXAM 2024

**SUBJECT: MATHEMATICS** **MAX. MARKS : 80**
**CLASS : X** **DURATION : 3 HRS**

**General Instruction:**

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

## SECTION – A
**Questions 1 to 20 carry 1 mark each.**

**1.** Three cubes each of side 15 cm are joined end to end. The total surface area of the cuboid is:
(a) 3150 $cm^2$ (b) 1575 $cm^2$ (c) 1012.5 $cm^2$ (d) 576.4 $cm^2$

**2.** The midpoint of a line segment joining two points A(2, 4) and B(-2, -4) is
(a) (-2, 4) (b) (2, -4) (c) (0, 0) (d) (-2, -4)

**3.** If the distance between the points A(2, -2) and B(-1, x) is equal to 5, then the value of x is:
(a) 2 (b) -2 (c) 1 (d) -1

**4.** If cos A = 4/5, then the value of tan A is
(a) 3/5 (b) 3/4 (c) 4/3 (d) 5/3

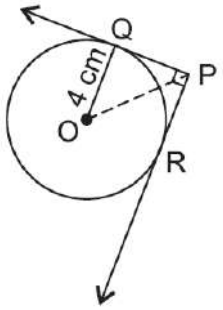
**5.** If $\cos\theta + \cos^2\theta = 1$, the value of $\sin^2\theta + \sin^4\theta$ is :
(a) –1 (b) 0 (c) 1 (d) 2

**6.** The HCF and the LCM of 12, 21, 15 respectively are
(a) 3, 140 (b) 12, 420 (c) 3, 420 (d) 420, 3

**7.** If the sum of LCM and HCF of two numbers is 1260 and their LCM is 900 more than their HCF, then the product of two numbers is
(a) 205400 (b) 203400 (c) 194400 (d) 198400

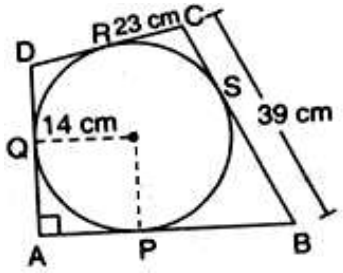
**8.** If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and -3, then
(a) a = -7, b = -1 (b) a = 5, b = -1 (c) a = 2, b = –6 (d) a = 0, b = –6

**9.** In the given figure, from an external point P, two tangents PQ and PR are drawn to a circle of radius 4 cm with centre O. If ∠QPR = 90°, then length of PQ is




(a) 3 cm (b) 4 cm (c) 2 cm (d) 2.2 cm

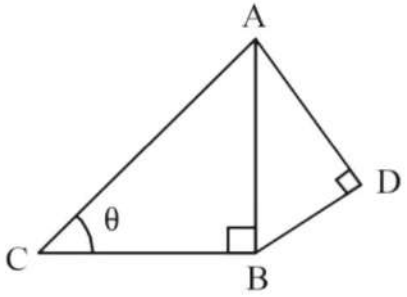
**10.** In the given figure, quadrilateral ABCD is circumscribed, touching the circle at P, Q, R and S such that ∠DAB = 90°, If CR = 23 cm and CB = 39 cm and the radius of the circle is 14 cm, then the measure of AB is




(a) 37 cm (b) 16cm (c) 30 cm (d) 39 cm

**11.** If the circumference of a circle increases from 2π to 4π then its area .....the original area :
(a) Half (b) Double (c) Three times (d) Four times

**12.** In the figure given below, AD = 4 cm, BD = 3 cm and CB = 12 cm, then cot θ equals :




(a) 3/4 (b) 5/12 (c) 4/3 (d) 12/5

**13.** The perimeters of two similar triangles are 26 cm and 39 cm. The ratio of their areas will be :
(a) 2 : 3 (b) 6 : 9 (c) 4 : 6 (d) 4 : 9

**14.** If ΔABC ~ ΔEDF and ΔABC is not similar to ΔDEF, then which of the following is not true?
(a) BC.EF = AC.FD (b) AB.EF = AC.DE (c) BC.DE = AB.EF (d) BC.DE = AB.FD

**15.** The radii of 2 cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. Then, the ratio of their volumes is:
(a) 19 : 20 (b) 20 : 27 (c) 18:25 (d) 17:23

**16.** Consider the following frequency distribution

| **Class** | 0 – 5 | 6 – 11 | 12 – 17 | 18 – 23 | 24 – 29 |
|---|---|---|---|---|---|
| **Frequency** | 13 | 10 | 15 | 8 | 11 |

The upper limit of the median class is
(a) 7 (b) 17.5 (c) 18 (d) 18.5

**17.** Consider the following distribution:

| **Marks obtained** | **Number of students** |
|---|---|
| More than or equal to 0 | 63 |
| More than or equal to 10 | 58 |
| More than or equal to 20 | 55 |
| More than or equal to 30 | 51 |
| More than or equal to 40 | 48 |
| More than or equal to 50 | 42 |

the frequency of the class 30-40 is
(a) 4 (b) 48 (c) 51 (d) 3

**18.** Two dice are thrown simultaneously. The probability that the product of the numbers appearing on the dice is 7 is

(a) 7/36 (b) 2/36 (c) 0 (d) 1/36

**Direction : In the question number 19 & 20 , A statement of Assertion (A) is followed by a statement of Reason(R) . Choose the correct option**

**19. Assertion (A):** The mid-point of the line segment joining the points A (3, 4) and B (k, 6) is P (x, y) and x + y – 10 = 0, the value of k is 7

**Reason (R):** Midpoint of line segment is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

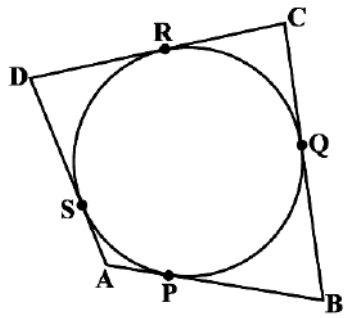
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is not the correct explanation of A
(c) A is true and R is false
(d) A is false and R is true

**20. Assertion (A):** For any two positive integers a and b, HCF(a, b) x LCM(a, b) = a x b
**Reason (R):** The HCF of two numbers is 5 and their product is 150. Then their LCM is 40.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of Assertion (A)
(c) Assertion (A) is true but reason(R) is false.
(d) Assertion (A) is false but reason(R) is true.

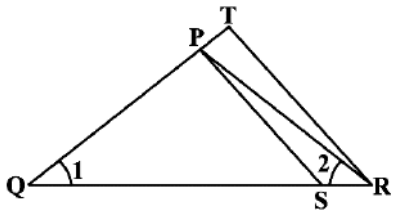
## SECTION-B

**Questions 21 to 25 carry 2M each**

**21.** A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC.




**22.** In the figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and ∠1 = ∠2, Show that ΔPQS ~ ΔTQR.




**OR**

ABCD is a trapezium in which AB || CD and its diagonals intersect each other at the point O. Using a similarity criterion of two triangles, show that $\frac{OA}{OC} = \frac{OB}{OD}$

**23.** If $\sin(A - B) = \frac{1}{2}$ , $\cos(A + B) = \frac{1}{2}$, $0^0 < A + B \leq 90^0$ , A > B. Find A and B.

**24.** Find the value of p if the pair of equations 2x + 3y – 5 = 0 and px – 6y – 8 = 0 has a unique solution.

**25.** The short and long hands of a clock are 4 cm and 6 cm long respectively. Find the sum of distances travelled by their tips in 2 days

**OR**

A car has two wipers which do not overlap. Each wiper has a blade of length 21 cm sweeping through an angle of 120°. Find the total area cleaned at each sweep of the blades

## SECTION-C

**Questions 26 to 31 carry 3 marks each**

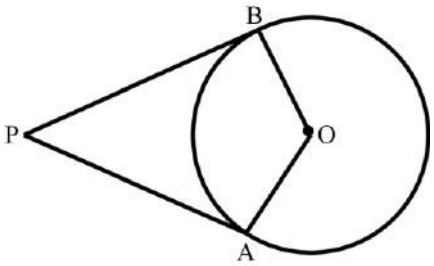
**26.** 4 Bells toll together at 9.00 am. They toll after 7, 8, 11 and 12 seconds respectively. How many times will they toll together again in the next 3 hours?

**OR**

Given that $\sqrt{3}$ is irrational, prove that $(2 + 5\sqrt{3})$ is an irrational number.

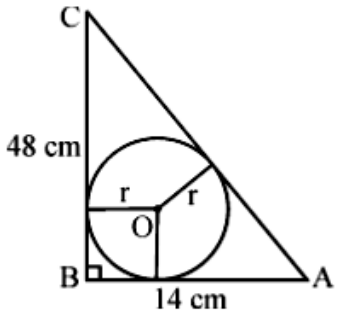
**27.** Find the ratio in which the line $2x + y - 4 = 0$ divides the line segment joining the points A (2, – 2) and B (3, 7)

**28.** In the given figure, PA and PB are the tangent segments to a circle with centre O. Show that the points A, O, B and P are concyclic.




**OR**

In the given figure, ABC is a triangle in which $\angle B = 90°$, BC = 48 cm and AB = 14 cm. A circle is inscribed in the triangle, whose centre is O. Find radius r of in-circle.




**29.** From a pack of 52 playing cards, jacks, queens, kings and aces of red colour are removed. From the remaining a card is drawn at random. Find the probability that the card drawn is (i) a black queen (ii) a red card (iii) a face card.

**30.** If a, b are the zeroes of the polynomial $2x^2 - 5x + 7$, then find a polynomial whose zeroes are $2a + 3b$, $3a + 2b$

**31.** Prove that $\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} = 2\sec A$

## SECTION-D

**Questions 32 to 35 carry 5M each**

**32.** The mean of the following frequency distribution is 62.8 and the sum of all the frequencies is 50. Compute the missing frequencies $f_1$ and $f_2$.

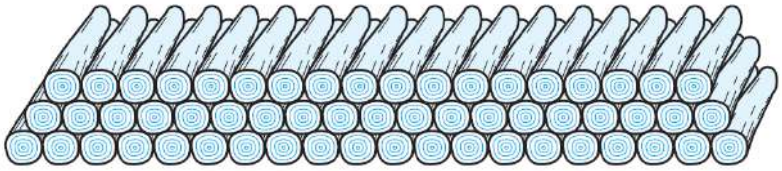
| Class | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 | 100-120 |
|---|---|---|---|---|---|---|
| Frequency | 5 | $f_1$ | 10 | $f_2$ | 7 | 8 |

**33.** A train, travelling at a uniform speed for 360 km, would have taken 48 minutes less to travel the same distance if its speed were 5 km/h more. Find the original speed of the train.

**OR**

Two water taps together can fill a tank in 6 hours. The tap of larger diameter takes 9 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

**34.** 200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see below figure). In how may rows are the 200 logs placed and how many logs are in the top row?

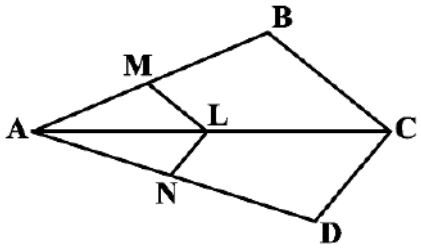


**OR**

The sum of the third and the seventh terms of an AP is 6 and their product is 8. Find the sum of first sixteen terms of the AP.

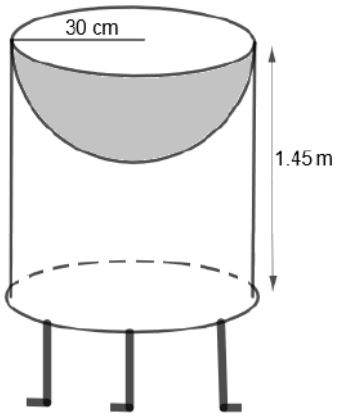
**35.** Prove that if a line is a drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio. Using the above theorem.

Prove that $\frac{AM}{MB} = \frac{AN}{ND}$ if LM || CB and LN || CD as shown in the figure.




**SECTION-E (Case Study Based Questions)**
**Questions 36 to 38 carry 4M each**

**36.** Mayank a student of class 7th loves watching and playing with birds of different kinds. One day he had an idea in his mind to make a bird-bath on his garden. His brother who is studying in class 10th helped him to choose the material and shape of the birdbath. They made it in the shape of a cylinder with a hemispherical depression at one end as shown in the Figure below. They opted for the height of the hollow cylinder as 1.45 m and its radius is 30 cm. The cost of material used for making bird bath is Rs. 40 per square meter.

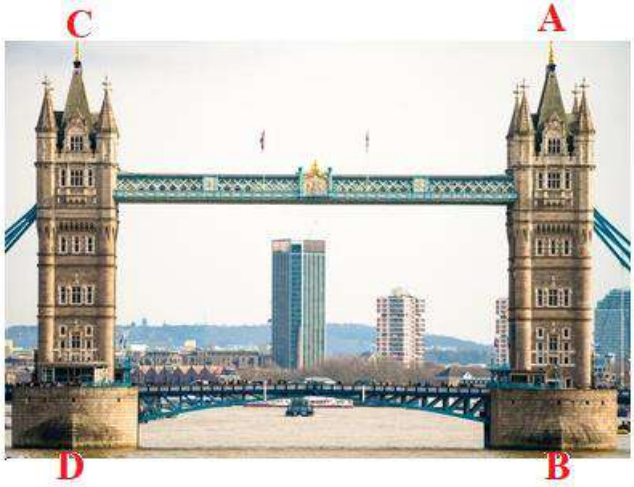



(i) Find the curved surface area of the hemisphere. (Take $\pi = 3.14$)
(ii) Find the total surface area of the bird-bath. (Take $\pi = 22/7$)
(iii) What is total cost for making the bird bath?

**OR**

(iii) Mayank and his brother thought of increasing the radius of hemisphere to 35 cm with same material so that birds get more space, then what is the new height of cylinder?

**37.** Tower Bridge is a Grade I listed combined bascule and suspension bridge in London, built between 1886 and 1894, designed by Horace Jones and engineered by John Wolfe Barry. The bridge is 800 feet (240 m) in length and consists of two bridge towers connected at the upper level by two horizontal walkways, and a central pair of bascules that can open to allow shipping.
In this bridge, two towers of equal heights are standing opposite each other on either side of the road, which is 80 m wide. During summer holidays, Neeta visited the tower bridge. She stood at some point on the road between these towers. From that point between the towers on the road, the angles of elevation of the top of the towers was 60° and 30° respectively.

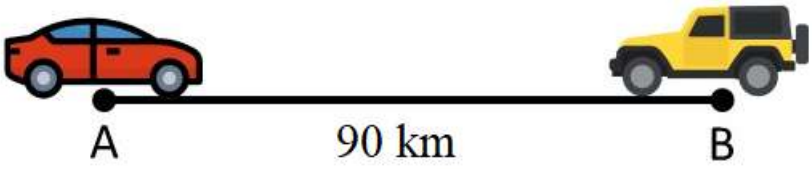



(i) Find the distances of the point from the base of the towers where Neeta was standing while measuring the height. [2]
(ii) Neeta used some applications of trigonometry she learned in her class to find the height of the towers without actually measuring them. What would be the height of the towers she would have calculated? [2]

**OR**

(ii) Find the distance between Neeta and top of tower AB? Also, Find the distance between Neeta and top tower CD? [2]

**38.** On the roadway, Points A and B, which stand in for Chandigarh and Kurukshetra, respectively, are located nearly 90 kilometres apart. At the same time, a car departs from Kurukshetra and one from Chandigarh. These cars will collide in 9 hours if they are travelling in the same direction, and in 9/7 hours if they are travelling in the other direction. Let X and Y be two cars that are travelling at x and y kilometres per hour from places A and B, respectively. On the basis of the above information, answer the following questions:




(a) When both cars move in the same direction, then find the situation which can be represented algebraically. [2]

**OR**

(a) When both cars move in the opposite direction, then find the situation which can be represented algebraically. [2]
(b) Find the speed of car x. [1]
(c) Find the speed of car y. [1]

# MATHS WINTER BREAK HOMEWORK 2024

# KENDRIYA VIDYALAYA,DRDO,C V RAMAN NAGAR,BENGALURU-93

## SAMPLE PAPER TEST 01 FOR ANNUAL EXAM 2024

**SUBJECT: MATHEMATICS** **MAX. MARKS : 80**

**CLASS : IX** **DURATION : 3 HRS**

**General Instruction:**

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

## SECTION – A

**Questions 1 to 20 carry 1 mark each.**

**1.** Value of $(256)^{0.16} \times (256)^{0.09}$ is

(a) 4 (b) 16 (c) 64 (d) 256.25

**2.** A rational number between $\sqrt{2}$ and $\sqrt{3}$ is

(a) 1.1 (b) $\frac{\sqrt{2}.\sqrt{3}}{2}$ (c) 1.5 (d) 1.8

**3.** On dividing $6\sqrt{27}$ by $2\sqrt{3}$, we get

(a) $3\sqrt{9}$ (b) 6 (c) 9 (d) none of these

**4.** $\sqrt[3]{2} \times \sqrt[4]{3}$ is equal to

(a) 648 (b) $72^{1/12}$ (c) $432^{1/12}$ (d) $216^{1/12}$

**5.** Factors of $3x^2 - x - 4$ are

(a) $(x - 1)$ and $(3x - 4)$ (b) $(x + 1)$ and $(3x - 4)$

(c) $(x + 1)$ and $(3x + 4)$ (d) $(x - 1)$ and $(3x + 4)$

**6.** Zeros of the polynomial $p(x) = (x - 2)^2 - (x + 2)^2$ are

(a) 2, – 2 (b) 2x (c) 0, – 2 (d) 0

**7.** The point which lies on y-axis at a distance of 5 units in the negative direction of y-axis is

(a) (0, 5) (b) (5, 0) (c) (0, –5) (d) (–5, 0)

**8.** The point (5, –4) lies

(a) on the x-axis (b) on the y-axis (c) in the I quadrant (d) in the IV quadrant

**9.** How many linear equations in x and y can be satisfied by x = 1 and y = 2?

(a) Only one (b) Two (c) Infinitely many (d) Three

**10.** The equation of x-axis is of the form

(a) x = 0 (b) y = 0 (c) x + y = 0 (d) x = y

**11.** The equation $2x + 5y = 7$ has a unique solution, if x, y are
(a) Natural numbers (b) Positive real numbers
(c) Real numbers (d) Rational numbers

**12.** If two complementary angles are in the ratio 13 : 5, then the angles are
(a) 65°, 35° (b) 65°, 25° (c) 13x°, 5x° (d) 60°, 30°

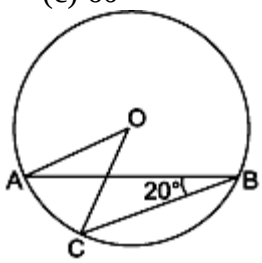
**13.** Angles of a triangle are in the ratio 2 : 4 : 3. The smallest angle of the triangle is
(a) 60° (b) 40° (c) 80° (d) 20°

**14.** Which of the following is not a criterion for congruence of triangles?
(a) SAS (b) ASA (c) SSA (d) SSS

**15.** In a parallelogram ABCD, AP and CQ are perpendicular drawn to the diagonal BD. On measuring it is found that ∠PAB = 65° and ∠DAB = 75°, then the measure of ∠QCD is
(a) 90° (b) 75° (c) 65° (d) 10°

**16.** Given a circle of radius 5 cm and centre O. OM is drawn perpendicular to the chord XY. If OM =3 cm, then length of chord XY is
(a) 4 cm (b) 6 cm (c) 8 cm (d) 10 cm

**17.** In figure, if ∠ABC = 20°, then ∠AOC is equal to:
(a) 20° (b) 40° (c) 60° (d) 10°




**18.** The area of an equilateral triangle with side $4\sqrt{3}$ cm is
(a) 20 $cm^2$ (b) 20 $cm^2$ (c) 18.784 $cm^2$ (d) 20.784 $cm^2$

**DIRECTION:** In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option

**19. Assertion (A):** 0.271 is a terminating decimal and we can express this number as 271/1000 which is of the form p/q, where p and q are integers and $q \neq 0$.
**Reason (R):** A terminating or non-terminating decimal expansion can be expressed as rational number.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

**20. Assertion (A):** The angles of a quadrilateral are x°, (x – 10)°, (x + 30)° and (2x)°, the smallest angle is equal to 58°.
**Reason (R):** Sum of the angles of a quadrilateral is 360°.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

## SECTION – B

**Questions 21 to 25 carry 2 marks each.**

**21.** Simplify: $\left[5\left(8^{\frac{1}{3}}+27^{\frac{1}{3}}\right)^3\right]^{\frac{1}{4}}$

**OR**

Simplify: $\sqrt[4]{81}-8\sqrt[3]{216}+15\sqrt[5]{32}+\sqrt{225}$

**22.** Without plotting the points indicate the quadrant in which they will lie, if
(i) ordinate is 5 and abscissa is – 3
(ii) abscissa is – 5 and ordinate is – 3
(iii) abscissa is – 5 and ordinate is 3
(iv) ordinate is 5 and abscissa is 3

**23.** If $\angle 1 = \angle 2$, $\angle 3 = \angle 4$ and $\angle 2 = \angle 4$, what is the relation between $\angle 1$ and $\angle 2$. Give reasons for your answer.

**24.** How would you rewrite Euclid's fifth postulate so that it would be easier to understand?

**25.** The height and the slant height of a cone are 21 cm and 28 cm respectively. Find the volume of the cone.

**OR**

A hemispherical bowl has a radius of 3.5 cm. What would be the volume of water it would contain?

## SECTION – C

**Questions 26 to 31 carry 3 marks each.**

**26.** Simplify $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}+\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ by rationalizing the denominator.

**27.** Factorise $x^3 - 23x^2 + 142x - 120$.

**28.** Find the solution of the linear equation $x + 2y = 8$ which represents a point on (i) $x$-axis (ii) $y$-axis

**29.** Prove that the quadrilateral formed by joining the mid-points of the sides of a quadrilateral, in order, is a parallelogram.

**30.** The following table gives the life times of 400 neon lamps:

| Life time (in hours) | Number of Lamps |
|---|---|
| 300 – 400 | 14 |
| 400 – 500 | 56 |
| 500 – 600 | 60 |
| 600 – 700 | 86 |
| 700 – 800 | 74 |
| 800 – 900 | 62 |
| 900 – 1000 | 48 |

Represent the given information with the help of a histogram.

**31.** A family with a monthly income of Rs 20,000 had planned the following expenditures per month under various heads: Draw a bar graph for the given below data.

| Heads | Expenditure (in thousand rupees) |
|---|---|
| Grocery | 4 |
| Rent | 5 |
| Education of children | 5 |
| Medicine | 2 |
| Fuel | 2 |
| Entertainment | 1 |
| Miscellaneous | 1 |

## SECTION – D

**Questions 32 to 35 carry 5 marks each.**

**32.** A gardener has to put double fence all around a triangular field with sides 120 m, 80 m and 60 m. In the middle of each of the sides, there is a gate of width 10 m.
(i) Find the length of wire needed for fencing.
(ii) Find the cost of fencing at the rate of ₹ 6 per metre.
(iii) Find the area of triangular field.
(iv) Find the cost of levelling the ground at the rate of ₹ 10 per m2.

**OR**

Anurag makes a kite using red and yellow piece of paper. Red piece of paper is cut in the shape of square with diagonal 30 cm. At one of the vertex of this square, a yellow paper with the shape of an equilateral triangle of side such that $a^2 = 32\sqrt{3}$ is attached to give the shape of a kite. Find the total area of paper required to make the kite.

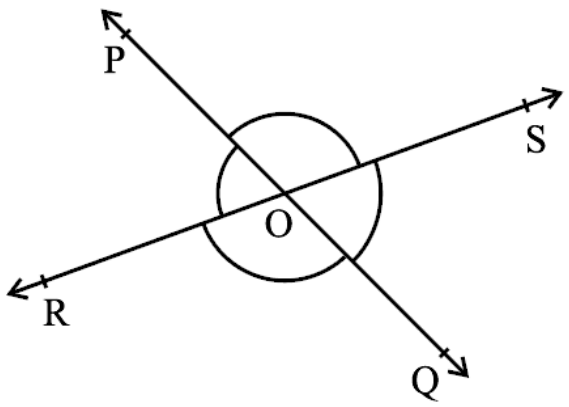
**33.** If $x^3 + ax^2 + bx + 6$ has $(x – 2)$ as a factor and leaves a remainder 3 when divided by $(x – 3)$, find the values of a and b.

**OR**

Without actual division, prove that $2x^4 – 6x^3 + 3x^2 + 3x – 2$ is exactly divisible by $x^2 – 3x + 2$.

**34.** A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of Rs 498.96. If the cost of white-washing is Rs 2.00 per square metre, find the
(i) inside surface area of the dome, (ii) volume of the air inside the dome.

**35.** Prove that "If two lines intersect each other, then the vertically opposite angles are equal."
Using this theorem, find all the angles if ∠ POR : ∠ ROQ = 5 : 7 in the below figure where lines PQ and RS intersect each other at point O.

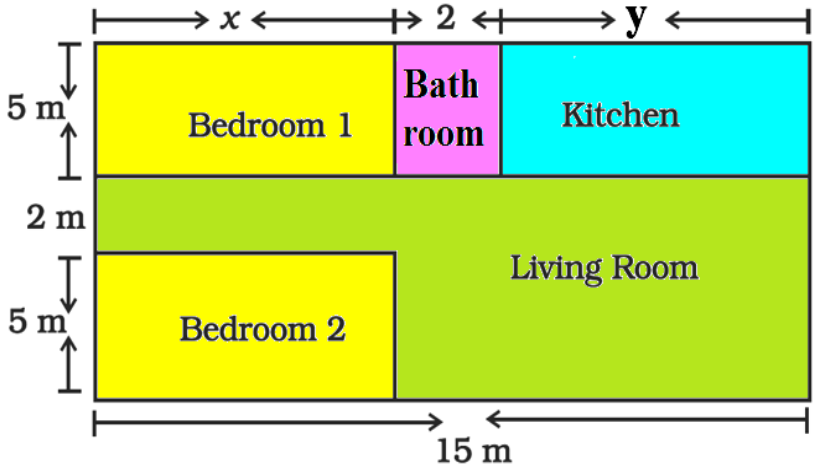


## SECTION – E(Case Study Based Questions)

**Questions 36 to 38 carry 4 marks each.**

**36. Case Study – 1**

In the below given layout, the design and measurements has been made such that area of two bedrooms and Kitchen together is 95 sq. m.




(i) Form the pair of linear equation in two variables formed from the statements. [1]

(ii) Find the length of the outer boundary of the layout. [1]

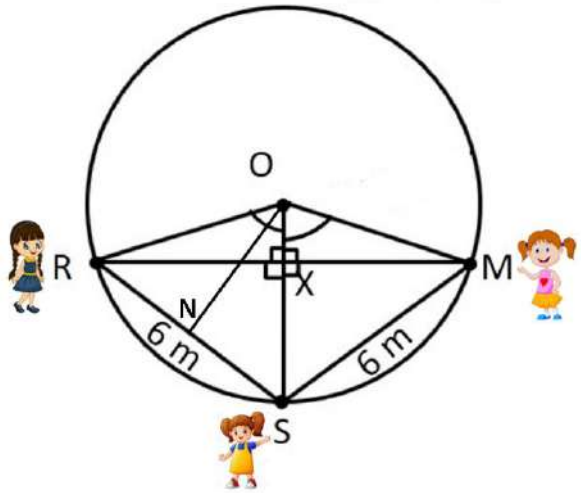
(iii) Find the area of each bedroom. [2]

**OR**

(iii) If the point (3, 4) lies on the graph of $3y = ax + 7$, then find the value of $a$.

**37. Case Study – 2**

Three girls Reshma, Salma and Mandip are playing a game by standing on a circle of radius 5m drawn in a park. Reshma throws a ball to Salma, Salma to Mandip, Mandip to Reshma. The distance between Reshma and Salma and between Salma and Mandip is 6m each. In the given below figure Reshma's position is denoted by R, Salma's position is denoted by S and Mandip's position is denoted by M.




(i) Find the area of triangle ORS. [2]

(ii) What is the distance between Reshma and Mandip? [2]

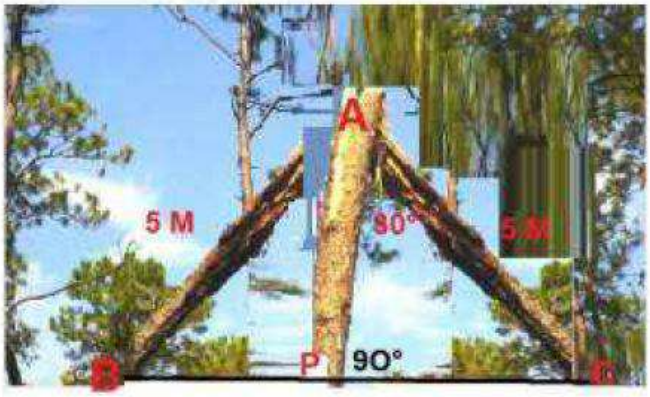
**OR**

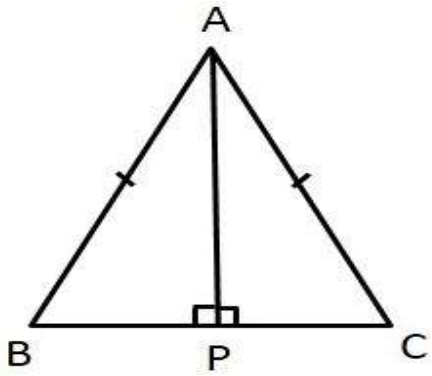
(ii) If BC is a diameter of a circle of centre O and OD is perpendicular to the chord AB of a circle, show that CA = 2OD. [2]

**38. Case Study – 3**

In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with

the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.




(i) Show that ΔACP and ΔABP are congruent.
(ii) Find the value of ∠ACP?

**OR**

What is the total height of the tree?
(iii) Find the value of ∠BAP?

# KENDRIYA VIDYALAYA,DRDO,C V RAMAN NAGAR,BENGALURU-93

## SAMPLE PAPER TEST 02 FOR ANNUAL EXAM 2024

**SUBJECT: MATHEMATICS** **MAX. MARKS : 80**

**CLASS : IX** **DURATION : 3 HRS**

**General Instruction:**

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

## SECTION – A

**Questions 1 to 20 carry 1 mark each.**

**1.** The value of $64^{\frac{1}{2}}$ is :

(a) 8 (b) 4 (c) 16 (d) 32

**2.** On rationalizing the denominator of $\frac{1}{\sqrt{7}-2}$, we get

(a) $\sqrt{7}-2$ (b) $\sqrt{7}+2$ (c) $\frac{\sqrt{7}+2}{3}$ (d) $\frac{\sqrt{7}-2}{3}$

**3.** $\frac{3\sqrt{12}}{6\sqrt{27}}$ equals

(a) $\frac{1}{2}$ (b) $\sqrt{2}$ (c) $\sqrt{3}$ (d) $\frac{1}{3}$

**4.** $4\frac{1}{8}$ in decimal form is:

(a) 4.125 (b) $4.\overline{15}$ (c) $4.1\overline{5}$ (d) $0.\overline{415}$

**5.** The factors of $2x^2 - 7x + 3$ are:

(a) (x – 3)(2x – 1) (b) (x + 3)(2x + 1)
(c) (x – 3)(2x + 1) (d) (x + 3)(2x – 1)

**6.** On dividing $x^3 + 3x^2 + 3x + 1$ by $x+\pi$ we get remainder:

$(a) -\pi^3+3\pi^2-3\pi+1$ $(b)\pi^3-3\pi^2+3\pi+1$

$(c) -\pi^3-3\pi^2-3\pi-1$ $(d) -\pi^3+3\pi^2-3\pi-1$

**7.** Signs of the abscissa and ordinate of a point in the second quadrant are respectively:

(a) +, + (b) –, + (c) +, – (d) –, –

**8.** If (2, 0) is a solution of the linear equation 2x + 3y = k, then the value of k is

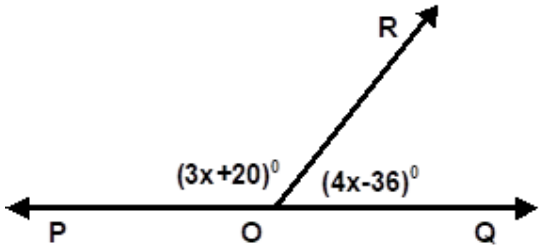
(a) 4 (b) 6 (c) 5 (d) 2

**9.** Any solution of the linear equation 2x + 0y + 9 = 0 in two variables is of the form

(a) $(-\frac{9}{2}, m)$ (b) $(n, -\frac{9}{2})$ (c) $(0, -\frac{9}{2})$ (d) (–9, 0)

**10.** The graph of the linear equation $2x + 3y = 6$ cuts the y-axis at the point
(a) (2, 0) (b) (0, 3) (c) (3, 0) (d) (0, 2)

**11.** In the adjoining figure the value of x is
(a) $25^0$ (b) $28^0$ (c) $30^0$ (d) $60^0$




**12.** The angle which is five times its supplement is
(a) $150^0$ (b) $180^0$ (c) $90^0$ (d) $360^0$

**13.** In parallelogram CARS, $m\angle C = 5x - 20$ and $m\angle A = 3x + 40$. Find the value of x.
(a) 15 (b) 20 (c) 30 (d) 130

**14.** The diagonals AC and BD of a parallelogram ABCD intersect each other at the point O. If $\angle DAC = 32^0$ and $\angle AOB = 70^0$, then $\angle DBC$ is equal to
(a) $24^0$ (b) $86^0$ (c) $38^0$ (d) $32^0$

**15.** The length of a chord of circle of radius 10 cm is 12 cm. Determine the distance of the chord from the centre
(a) 8 cm (b) 7 cm (c) 6 cm (d) 5 cm

**16.** If the area of an equilateral triangle is $81\sqrt{3}$ $cm^2$, then its height is
(a) $9\sqrt{3}$ (b) $3\sqrt{3}$ (c) $12\sqrt{3}$ (d) none of these

**17.** The class marks of a frequency distribution are given as follows: 15, 20,25, …… The class corresponding to the class mark 20 is
(a) 12.5 – 17.5 (b) 17.5 – 22.5 (c) 22.5 – 27.5 (d) 27.5 – 32.5

**18.** In the class intervals 10 – 20, 20 – 30, the number 20 is included in.
(a) 10 – 20 (b) 20 – 30 (c) both the interval (d) none of these intervals

**DIRECTION:** In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option

**19. Assertion (A):** Rational number lying between two rational numbers *x* and *y* is $\frac{1}{2}(x + y)$.

**Reason (R):** There is one rational number lying between any two rational numbers.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

**20. Assertion (A):** The point (-2, 0) lies on y -axis and (0, 4) on x -axis.
**Reason (R):** Every point on the x -axis has zero distance from x -axis and every point on the y -axis has zero distance from y -axis.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

## SECTION – B

**Questions 21 to 25 carry 2 marks each.**

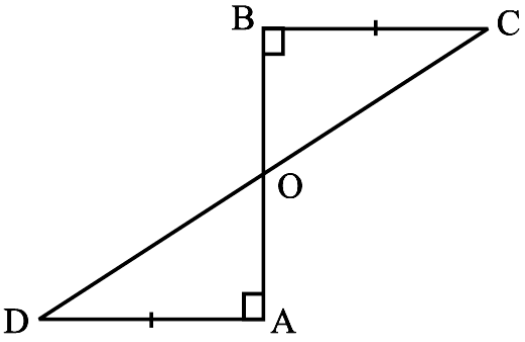
**21.** Show that $1.\overline{27}$ can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

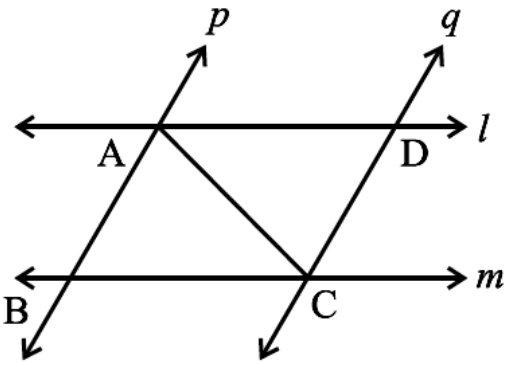
**OR**

Simplify: $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$

**22.** In which quadrant or on which axis do each of the points (– 2, 4), (3, – 1), (– 1, 0) and (– 3, – 5) lie?

**23.** AD and BC are equal perpendiculars to a line segment AB (see below left figure). Show that CD bisects AB.



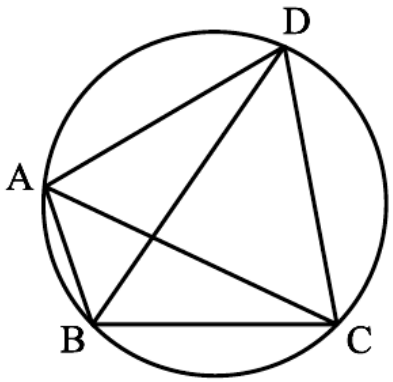




**OR**

*l* and *m* are two parallel lines intersected by another pair of parallel lines p and q (see above right sided figure). Show that $\Delta$ ABC $\cong \Delta$ CDA.

**24.** A conical tent is 10 m high and the radius of its base is 24 m. Find
(i) slant height of the tent.
(ii) cost of the canvas required to make the tent, if the cost of 1 $m^2$ canvas is Rs 70.

**25.** In the below figure, ABCD is a cyclic quadrilateral in which AC and BD are its diagonals. If $\angle$ DBC = 55° and $\angle$ BAC = 45°, find $\angle$ BCD.




## SECTION – C

**Questions 26 to 31 carry 3 marks each.**

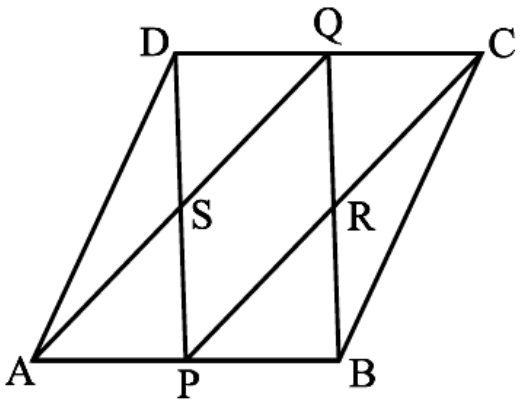
**26.** Find the value of $\frac{4}{(216)^{\frac{-2}{3}}}+\frac{1}{(256)^{\frac{-3}{4}}}+\frac{2}{(243)^{\frac{-1}{5}}}$

**27.** Factorise each of the following cubic expressions:
(i) $8x^3 - y^3 - 12x^2y + 6xy^2$ (ii) $8x^3 + 729 + 108x^2 + 486x$

**28.** Write the linear equation such that each point on its graph has an ordinate 3 times its abscissa. If the point (3, 4) lies on the graph of $3y = ax + 7$, then find the value of a.

**29.** If a point C is called a mid-point of line segment AB. Using Euclid's axiom, prove that every line segment has one and only one mid-point.

**30.** ABCD is a parallelogram in which P and Q are mid-points of opposite sides AB and CD (see below figure). If AQ intersects DP at S and BQ intersects CP at R, show that
(i) APCQ is a parallelogram.
(ii) DPBQ is a parallelogram.
(iii) PSQR is a parallelogram.




**OR**

ABCD is a rhombus. Show that diagonal AC bisects ∠ A as well as ∠ C and diagonal BD bisects ∠ B as well as ∠ D.

**31.** ABCD is a cyclic quadrilateral whose diagonals intersect at a point E. If ∠ DBC = 70°, ∠ BAC is 30°, find ∠ BCD. Further, if AB = BC, find ∠ ECD.

**OR**

A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.

## SECTION – D

**Questions 32 to 35 carry 5 marks each.**

**32.** Find the values of a and b so that the polynomial $x^4 + ax^3 - 7x^2 + 8x + b$ is exactly divisible by $(x + 2)$ as well as $(x + 3)$.

**OR**

Without actual division, prove that $x^3 - 3x^2 - 13x + 15$ is exactly divisible by $x^2 + 2x - 3$.

**33.** The diameter of the moon is approximately one-fourth of the diameter of the earth. What fraction of the volume of the earth is the volume of the moon? Find the ratio of their surface areas.

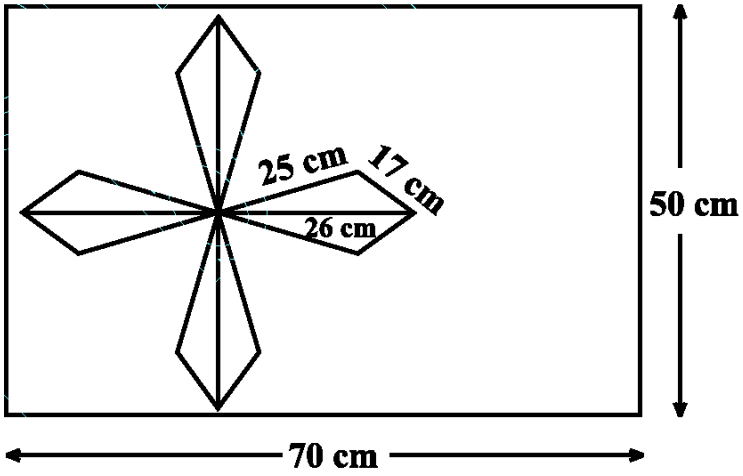
**OR**

A cloth having an area of 165 $m^2$ is shaped into the form of a conical tent of radius 5 m

(i) How many students can sit in the tent if a student, on an average, occupies $\frac{5}{7}$ $m^2$ on the ground?
(ii) Find the volume of the cone.

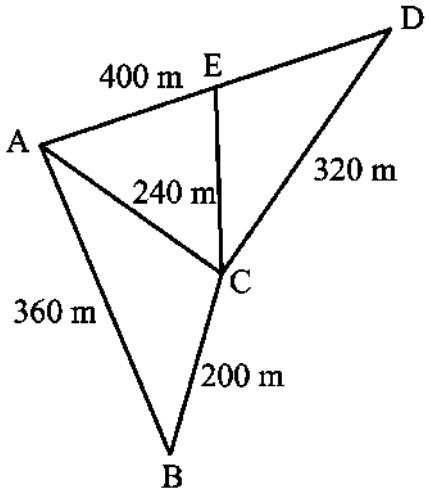
**34.** Prove that "Angles opposite to equal sides of an isosceles triangle are equal."
In an isosceles triangle ABC, with AB = AC, the bisectors of ∠ B and ∠ C intersect each other at O. Join A to O. Show that : (i) OB = OC (ii) AO bisects ∠ A

**35.** A design is made on a rectangular tile of dimensions 50 cm × 70 cm as shown in below Figure. The design shows 8 triangles, each of sides 26 cm, 17 cm and 25 cm. Find the total area of the design and the remaining area of the tile.




**OR**

Kamla has a triangular field with sides 240 m, 200 m, 360 m, where she grew wheat. In another triangular field with sides 240 m, 320 m, 400 m adjacent to the previous field, she wanted to grow potatoes and onions. She divided the field in two parts by joining the mid-point of the longest side to the opposite vertex and grew patatoes in one part and onions in the other part. How much area (in hectares) has been used for wheat, potatoes and onions? (1 hectare = 10000 $m^2$).




## SECTION – E(Case Study Based Questions)

**Questions 36 to 38 carry 4 marks each.**

**36. Case Study – 1**

Deepak bought 3 notebooks and 2 pens for Rs. 80. His friend Ram said that price of each notebook could be Rs. 25. Then three notebooks would cost Rs.75, the two pens would cost Rs.5 and each pen could be for Rs. 2.50. Another friend Ajay felt that Rs. 2.50 for one pen was too little. It should be at least Rs. 16. Then the price of each notebook would also be Rs.16.


Lohith also bought the same types of notebooks and pens as Aditya. He paid 110 for 4 notebooks and 3 pens. Later, Deepak guess the cost of one pen is Rs. 10 and Lohith guess the cost of one notebook is Rs. 30.


(i) Form the pair of linear equations in two variables from this situation by taking cost of one notebook as Rs. $x$ and cost of one pen as Rs. $y$.
(ii) Find the solution satisfying both the equations formed in (i)?
(iii) Find the cost of one pen?

**OR**

(iii) Find the total cost if they will purchase the same type of 15 notebooks and 12 pens.

**37. Case Study – 2**

A group of students decided to make a project on Statistics. They are collecting the heights (in cm) of their 51 girls of Class IX-A, B and C of their school. After collecting the data, they arranged the data in the following frequency distribution table form:


| Height (in cm) | Number of girls |
|---|---|
| 135 – 140 | 4 |
| 140 – 145 | 7 |
| 145 – 150 | 18 |
| 150 – 155 | 11 |
| 155 – 160 | 6 |
| 160 – 165 | 5 |

Based on the information, answer the following questions :
(i) What is the width of the class? [1]
(ii) How many students of the height 150 cm and below are there? [1]
(iii) How many students of the height 145 cm and above are there? [2]

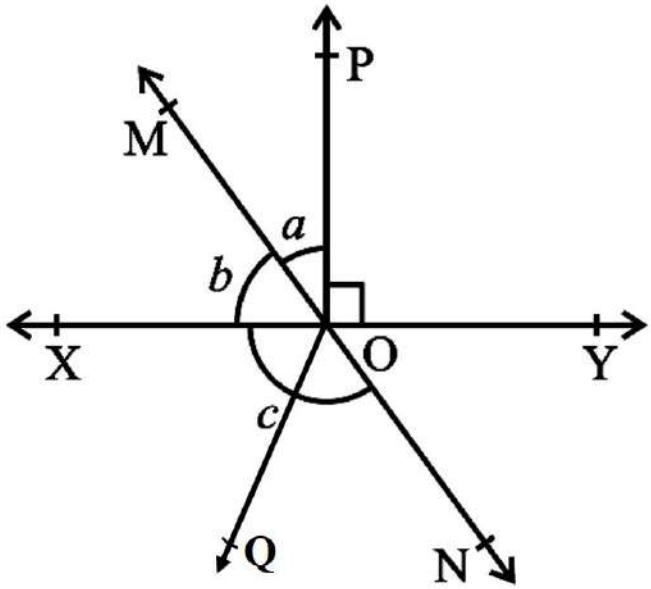
**OR**

(iii) How many students of the height more than or equal to 145 cm but less than 155 are there? [2]

**38. Case Study – 3**

One day, Maths teacher draw a figure on the blackboard in which lines XY and MN intersect at O such ∠POY = 90° and a : b = 2 : 3.

He marked ∠XON = c then he draws the bisector OQ of ∠XON.




**Answer the following questions:**

(i) What is the value of a? [1]

(ii) What is the value of b and c? [1]

(iii) What is the value of ∠QON and ∠QOY? [2]

**OR**

(e) What is the value of Reflex ∠c and Reflex ∠QON? [2]

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## SAMPLE PAPER TEST 03 FOR ANNUAL EXAM 2024

**SUBJECT: MATHEMATICS** **MAX. MARKS : 80**

**CLASS : IX** **DURATION : 3 HRS**

**General Instruction:**

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

## SECTION – A

**Questions 1 to 20 carry 1 mark each.**

**1.** The value of $\left(\sqrt{5}+\sqrt{2}\right)^2$ is:

(a) $7+2\sqrt{5}$ (b) $1+5\sqrt{2}$ (c) $7+2\sqrt{10}$ (d) $7-2\sqrt{10}$

**2.** The value of $9^{\frac{3}{2}}$ is :

(a) 18 (b) 27 (c) – 18 (d) $\frac{1}{27}$

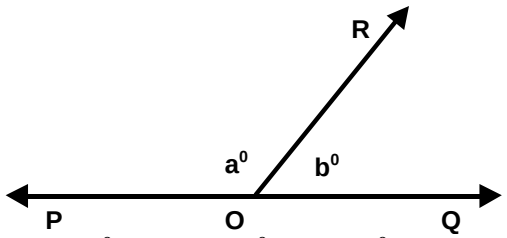
**3.** If $\left(\frac{3}{4}\right)^6 \times \left(\frac{16}{9}\right)^5 = \left(\frac{4}{3}\right)^{x+2}$, then the value of x is

(a) 2 (b) 4 (c) -2 (d) 6

**4.** The value of $p(x) = 5x - 4x^2 + 3$ for $x = -1$ is:

(a) 6 (b) –6 (c) 3 (d) – 3

**5.** In fig. $\angle POR$ and $\angle QOR$ form a linear pair if $a - b = 80^0$ then values of a and b respectively are:




(a) $130^0$ and $50^0$ (b) $50^0$ and $130^0$ c) $60^0$ and $120^0$ (d) $40^0$ and $140^0$

**6.** On dividing $x^3 + 3x^2 + 3x + 1$ by $5 + 2x$ we get remainder:

(a) $\frac{8}{27}$ (b) $\frac{27}{8}$ (c) $-\frac{27}{8}$ (d) $-\frac{8}{27}$

**7.** How many linear equations in x and y can be satisfied by x = 1 and y = 2?

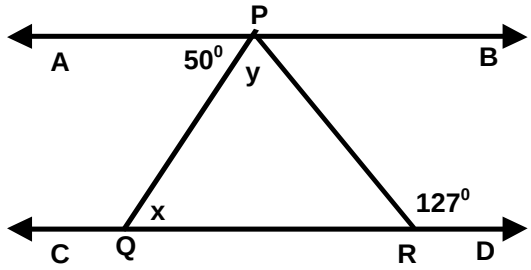
(a) only one (b) two (c) infinitely many (d) three

**8.** x = 5, y = 2 is a solution of the linear equation

(a) x + 2y = 7 (b) 5x + 2y = 7 (c) x + y = 7 (d) 5x + y = 7

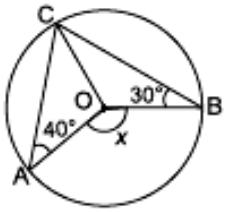
**9.** The graph of the linear equation $2x + 3y = 6$ is a line which meets the x axis at the point
(a) (2, 0) (b) (0, 3) (c) (3, 0) (d) (0, 2)

**10.** In fig., AB || CD, $\angle APQ = 50^0$, $\angle PRD = 127^0$, then the value of x and y respectively are
(a) $50^0$ and $77^0$ (b) $40^0$ and $85^0$ c) $60^0$ and $90^0$ (d) $85^0$ and $75^0$

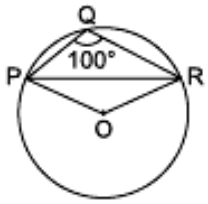



**11.** An angle is $20^0$ more than three times the given angle. If the two angles are supplementary the angles are
(a) $20^0$ and $160^0$ (b) $40^0$ and $140^0$ c) $60^0$ and $120^0$ (d) $70^0$ and $110^0$

**12.** In the given figure, O is the centre of the circle. The value of x is
(a) 140° (b) 70° (c) 290° (d) 210°




**13.** In the given figure, the value of $\angle OPR$ is
(a) 65° (b) 10° (c) 20° (d) 50°




**14.** $\Delta ABC$ is right triangle in which $\angle A = 90^0$ and AB = AC. The values of $\angle B$ and $\angle D$ will be
(a) $\angle B = \angle C = 60^0$ (b) $\angle B = \angle C = 30^0$
(c) $\angle B = \angle C = 45^0$ (d) $\angle B = \angle C = 50^0$

**15.** Three angles of a quadrilateral are $75^0$, $90^0$ and $75^0$. The fourth angle is
(a) $90^0$ (b) $95^0$ (c) $105^0$ (d) $120^0$

**16.** If the area of an equilateral triangle is $16\sqrt{3}\ cm^2$, then the perimeter of the triangle is:
(a) 64 cm (b) 60 cm (c) 36 cm (d) none of these

**17.** The area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length is
(a) 150 $cm^2$ (b) 336 $cm^2$ (c) 300 $cm^2$ (d) none of these

**18.** In a frequency distribution, the mid-value of a class is 10 and width of each class is 6. The lower limit of the class is
(a) 6 (b) 7 (c) 8 (d) 12

**DIRECTION:** In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.
Choose the correct option

**19. Assertion (A):** Supplement of angle is one fourth of itself. The measure of the angle is $144^0$.
**Reason (R):** Two angles are said to be supplementary if their sum of measure of angles is $180^0$.

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

**20. Assertion (A):** In ΔABC, AB = AC and ∠B = 50º, then ∠C is 50º.
**Reason (R):** Angles opposite to equal sides of a triangle are equal.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

## SECTION – B

**Questions 21 to 25 carry 2 marks each.**

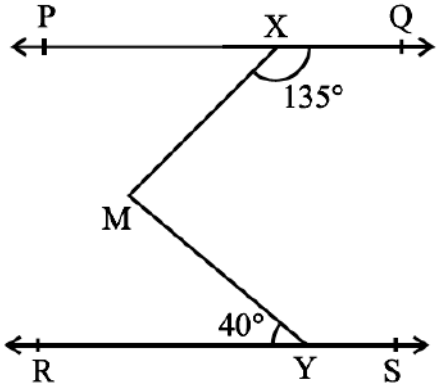
**21.** Simplify: $(256)^{(-4^{\frac{-3}{2}})}$

**OR**

Show that $1.2\overline{35}$ can be expressed in the form of $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

**22.** Expand: $(4a - b + 2c)^2$

**23.** In the below figure, if PQ || RS, ∠ MXQ = 135° and ∠ MYR = 40°, find ∠ XMY.




**24.** In Δ ABC, the bisector AD of ∠ A is perpendicular to side BC. Show that AB = AC and Δ ABC is isosceles.

**25.** A right triangle ABC with sides 5 cm, 12 cm and 13 cm is revolved about the side 12 cm. Find the volume of the solid so obtained.

**OR**

A hemispherical bowl has a radius of 3.5 cm. What would be the volume of water it would contain?

## SECTION – C

**Questions 26 to 31 carry 3 marks each.**

**26.** Factorise: (i) $6x^2 + 7x - 3$ (ii) $2x^2 - 7x - 15$

**OR**

Factorise: (i) $27y^3 + 125z^3$ (ii) $64m^3 - 343n^3$

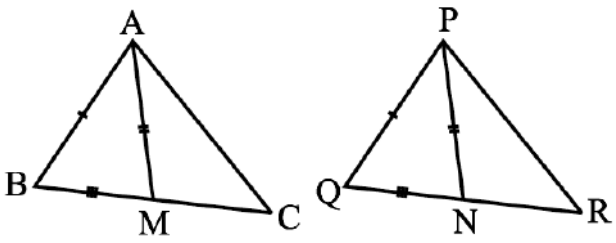
**27.** If $a + b + c = 9$ and $ab + bc + ca = 26$, find $a^2 + b^2 + c^2$.

**28.** Write the statement of Euclid's fifth postulate. How would you rewrite Euclid's fifth postulate so that it would be easier to understand?

**29.** Find the value of k, if x = 3, y = 2 is a solution of the equation 2x + 3y = k.
Find the points where the graph of the above equation cuts the x-axis and the y-axis.

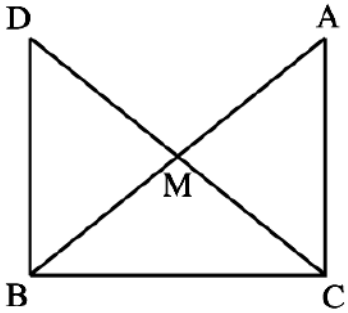
**30.** If two intersecting chords of a circle make equal angles with the diameter passing through their point of intersection, prove that the chords are equal.

**31.** Two sides AB and BC and median AM of one triangle ABC are respectively equal to sides PQ and QR and median PN of Δ PQR (see below figure). Show that:
(i) Δ ABM ≅ Δ PQN (ii) Δ ABC ≅ Δ PQR




**OR**

In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see below figure). Show that:
(i) Δ AMC ≅ Δ BMD
(ii) ∠ DBC is a right angle.
(iii) Δ DBC ≅ Δ ACB

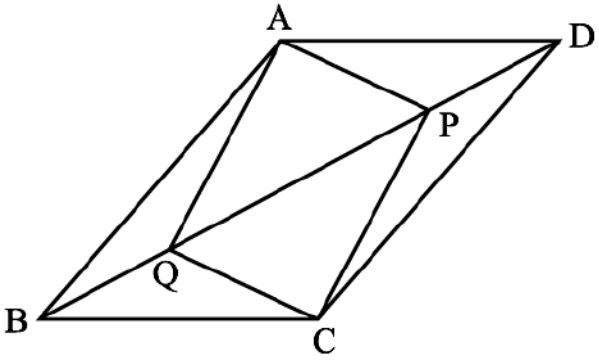



## SECTION – D

**Questions 32 to 35 carry 5 marks each.**

**32.** Evaluate: $\frac{1}{\sqrt{2}+1}+\frac{1}{\sqrt{3}+\sqrt{2}}+\frac{1}{\sqrt{4}+\sqrt{3}}+.....+\frac{1}{\sqrt{9}+\sqrt{8}}$

**33.** In parallelogram ABCD, two points P and Q are taken on diagonal BD such that DP = BQ (see below figure). Show that:




(i) Δ APD ≅ Δ CQB (ii) AP = CQ (iii) Δ AQB ≅ Δ CPD
(iv) AQ = CP (v) APCQ is a parallelogram

**OR**

ABCD is a rhombus and P, Q, R and S are the mid-points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral PQRS is a rectangle.

**34.** Draw histogram and frequency polygon for the following distribution:

| **C. I.** | 0 – 50 | 50 – 100 | 100 – 150 | 150 – 200 | 200 – 250 | 250 – 300 |
|---|---|---|---|---|---|---|
| **F** | 4 | 8 | 16 | 13 | 6 | 3 |

**35.** At a Ramzan Mela, a stall keeper in one of the food stalls has a large cylindrical vessel of base radius 15 cm filled up to a height of 32 cm with orange juice. The juice is filled in small cylindrical glasses (see below figure) of radius 3 cm up to a height of 8 cm, and sold for Rs 3 each. How much money does the stall keeper receive by selling the juice completely?

**OR**

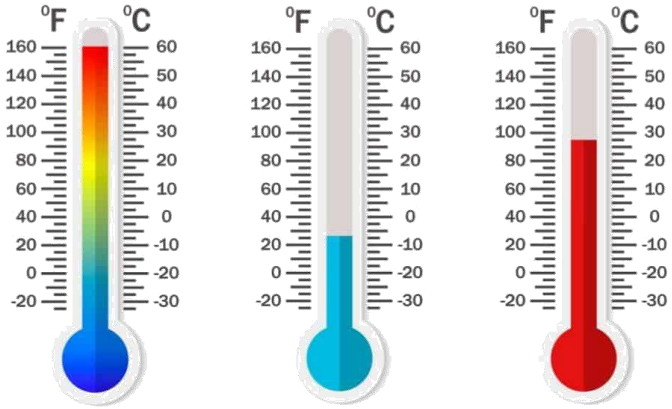
Monica has a piece of canvas whose area is 551 $m^2$. She uses it to have a conical tent made, with a base radius of 7 m. Assuming that all the stitching margins and the wastage incurred while cutting, amounts to approximately 1 m2, find the volume of the tent that can be made with it.

## SECTION – E(Case Study Based Questions)

**Questions 36 to 38 carry 4 marks each.**

**36. Case Study – 1**

Temperature can be measured in both Fahrenheit and Celsius scale. Both are the standard units for measuring temperature. There is a conversion formula by which Fahrenheit temperature can be converted into Celsius temperature. This formula is in the form of a linear equation: $F = \left(\frac{9}{2}\right)C + 32$, where, F and C are the temperatures in Fahrenheit and Celsius.




(i) If Celsius scale is taken on x-axis, then what is the point on X-axis, where this linear equation cuts the X-axis. [1]

(ii) At what point does this linear equation, cut the Y-axis ? [1]

(iii) If the temperature is 30°C, then what is the temperature in Fahrenheit? [2]

OR

(iii) If the temperature is 95°F, what is the temperature in Celsius? [2]

**37. Case Study – 2**

Triangles are used in bridges because they evenly distribute weight without changing their proportions. When force is applied on a shape like a rectangle it would flatten out. Before triangles were used in bridges, they were weak and could not be very big. To solve that problem engineers would put a post in the middle of a square and make it more sturdy. Isosceles triangles were used to construct a bridge in which the base (unequal side) of an isosceles triangle is 4 m and its perimeter is 20 m.

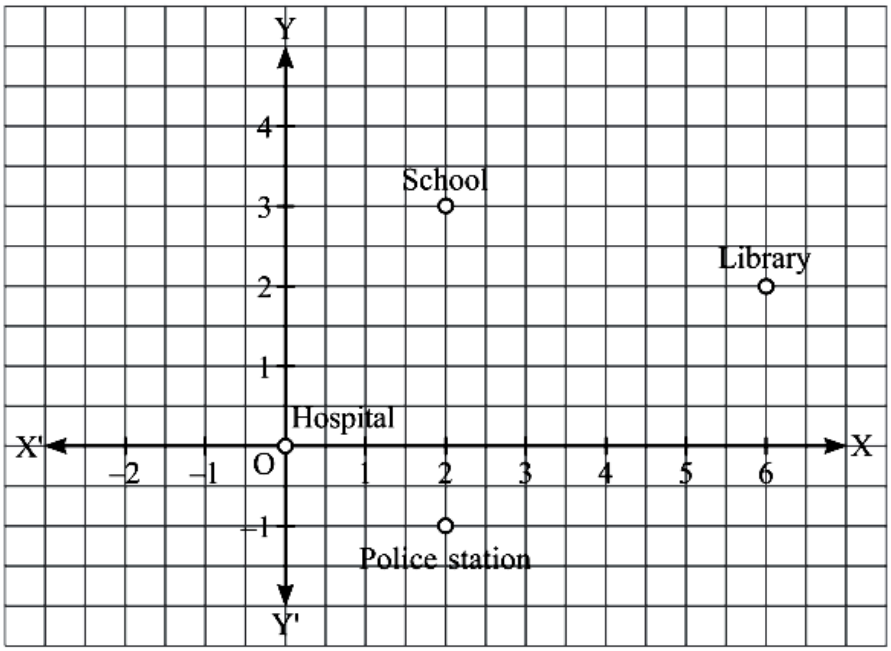
(i) What is the length of equal sides? [1]
(ii) In a ΔABC it is given that base = 12 m and height = 5 m. Find its area. [1]
(iii) What is the area of the given isosceles triangle? [2]

**OR**

(iii) Find the cost of covering the sheet for one isosceles triangle at the rate of Rs 200 per metre. [2]

**38. Case Study – 3**

Aditya is a Class IX student residing in a village. One day, he went to a city Hospital along with his grandfather for general checkup. From there he visited three places - School, Library and Police Station. After returning to his village, he plotted a graph by taking Hospital as origin and marked three places on the graph as per his direction of movement and distance. The graph is shown below:




**Answer the following questions:**

(i) What are the coordinates of Library? [1]
(ii) In which quadrant the point (-1, 4) lies? [1]
(iii) What are the coordinates of School and Police Station? Find the distance between school and police station. [2]

**OR**

(iii) Find the distance between Hospital and Library. [2]

# KENDRIYA VIDYALAYA DRDO, C.V RAMAN NAGAR
## PRACTICE PAPER 04 (2023-24)
## FRACTIONS, DECIMALS AND DATA HANDLING

**SUBJECT: MATHEMATICS** **MAX. MARKS : 40**
**CLASS : VI** **DURATION : 1½ hr**

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**General Instructions:**
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **6 MCQs** of **1 mark** each. **Section B** comprises of **1 CCT question** of **4 marks** each which contains **4 MCQs**. **Section C** comprises of 3 questions of **2 marks** each. **Section D** comprises of 4 questions of **3 marks** each and **Section E** comprises of 3 questions of **4 marks** each.

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## SECTION – A
**Questions 1 to 6 carry 1 mark each.**

**1.** If $-5/8 = 20/p$ , then value of p is
(a) 23 (b) 2 (c) 32 (d) 16

**2.** 0. 023 lies between
(a) 0.2 and 0.3 (b) 0.02 and 0.03 (c) 0.03 and 0.029 (d) 0.026 and 0.024

**3.** 15.8 – 6.73 is equal to
(a) 8.07 (b) 9.07 (c) 9.13 (d) 9.25

**4.** The mixed fraction $5\frac{1}{7}$ can be expressed as
(a) 36/7 (b)39/7 (c) 33/4 (d) 39/4

**5.** The choices of the fruits of 42 students in a class are as follows: A, O, B, M, A, G, B, G, A, G, B, M, A, G, M, A, B, G, M, B, A, O, M, O, G, B, O, M, G, A, A, B,
M, O, M, G, B, A, M, O, M, O,
where A, B, G, M and O stand for the fruits Apple, Banana, Grapes, Mango and Orange, respectively. Which two fruits are liked by an equal number of students?
(a) A and M (b) M and B (c) B and O (d) B and G

**6.** The marks (out of 10) obtained by 28 students in a Mathematics test are listed below:
8, 1, 2, 6, 5, 5, 5, 0, 1, 9, 7, 8, 0, 5, 8, 3, 0, 8, 10, 10, 3, 4, 8, 7, 8, 9, 2, 0
The number of students who obtained marks more than or equal to 5 is

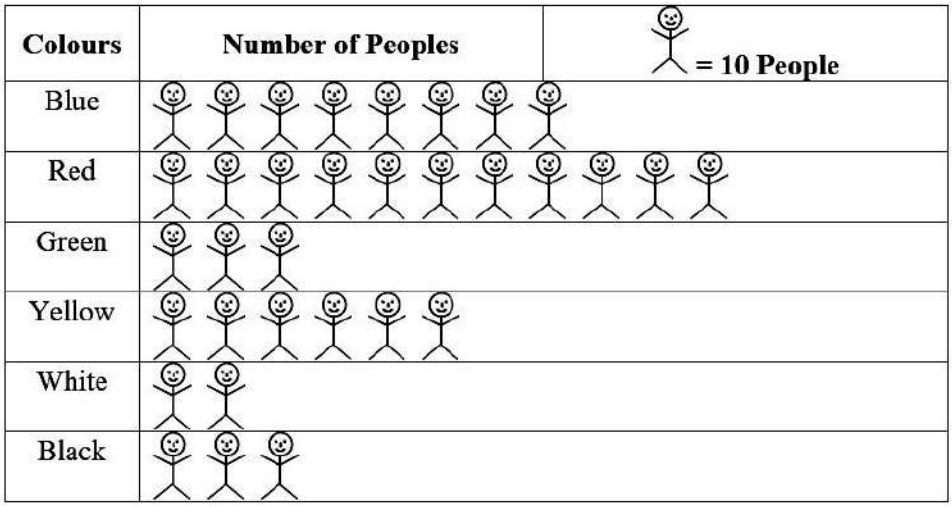
(a) 13 (b) 15 (c) 16 (d) 17

## SECTION – B(CCT Questions)

**Questions 7 to 10 carry 1 mark each.**

**CCT Question**

The colours of fridges preferred by people living in a locality are shown by the following pictograph. Read the table and answer the questions given bellow (Q7-Q10):




**7.** Find the number of people preferring blue colour.
(a) 20 (b) 80 (c) 50 (d) 10

**8.** How many people liked red colour?
(a) 120 (b) 80 (c) 50 (d) 110

**9.** Find the number of people preferring white colour.
(a) 20 (b) 80 (c) 50 (d) 10

**10.** Find the number of people preferring yellow colour.
(a) 20 (b) 80 (c) 60 (d) 50

## SECTION – C

**Questions 11 to 13 carry 2 marks each.**

**11.** Urmila's school is at a distance of 5 km 350 m from her house. She travels 1 km 70 m on foot and the rest by bus. How much distance does she travel by bus?

**12.** Following is the choice of sweets of 30 students of Class VI.
Ladoo, Barfi, Ladoo, Jalebi, Ladoo, Rasgulla, Jalebi, Ladoo, Barfi, Rasgulla, Ladoo, Jalebi, Jalebi, Rasgulla, Ladoo, Rasgulla, Jalebi, Ladoo, Rasgulla, Ladoo, Ladoo, Barfi, Rasgulla, Rasgulla, Jalebi, Rasgulla, Ladoo, Rasgulla, Jalebi, Ladoo.
Arrange the names of sweets in a table using tally marks.

**13.** Subtract: (a) $\frac{2}{9}$ from $\frac{7}{9}$ (b) $6\frac{2}{7}$ from $11\frac{4}{7}$

## SECTION – D

**Questions 14 to 17 carry 3 marks each.**

**14.** A survey was carried out on 30 students of class VI in a school. Data about the different modes of transport used by them to travel to school was displayed as pictograph.

| Modes of travelling | Number of students ☺ - 1 Student |
|---|---|
| Private car | ☺ ☺ ☺ ☺ |
| Public bus | ☺ ☺ ☺ ☺ ☺ |
| School bus | ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ ☺ |
| Cycle | ☺ ☺ ☺ |
| Walking | ☺ ☺ ☺ ☺ ☺ ☺ ☺ |

(a) Find the number of students coming by private car.
(b) Which is the most popular way.
(c) Which is used by only three students.

**15.** Ramu can mow a field in 3 days. What fraction of it can he mow in 1 day? Mahipal can mow the same field in 4 days. What fraction can Mahipal mow in 1 day? If Ramu and Mahipal work together, what fraction do they mow in 1 day?

**16.** Ravi purchased 5 kg 400 g rice, 2 kg 20 g sugar and 10 kg 850g flour. Find the total weight of his purchases.

**17.** Add $\frac{1}{2} + \frac{2}{3} + \frac{3}{4}$ and write the sum as a mixed fraction.

## SECTION – E

**Questions 18 to 20 carry 4 marks each.**

**18.** Catherine threw a dice 40 times and noted the number appearing each time as shown below :

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 | 5 | 6 | 6 | 3 | 5 | 4 | 1 | 6 |
| 2 | 5 | 3 | 4 | 6 | 1 | 5 | 5 | 6 | 1 |
| 1 | 2 | 2 | 3 | 5 | 2 | 4 | 5 | 5 | 6 |
| 5 | 1 | 6 | 2 | 3 | 5 | 2 | 4 | 1 | 5 |

Make a table and enter the data using tally marks. Find the number that appeared.
(a) The minimum number of times (b) The maximum number of times (c) Find those numbers that appear an equal number of times.

**19.** Re-arrange the given fractions in ascending order: $\frac{7}{15}, \frac{11}{21}, \frac{13}{35}$ ,

**20.** (i) Express as km using decimals.
(a) 8 m (b) 88 m (c) 8888 m (d) 70 km 5 m
(ii) Express as kg using decimals.
(a) 2 g (b) 100 g (c) 3750 g (d) 5 kg 8 g

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## PRACTICE PAPER 05 (2023-24)
## MENSURATION

**SUBJECT: MATHEMATICS** **MAX. MARKS : 40**
**CLASS : VI** **DURATION : 1½ hr**

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**General Instructions:**
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **6 MCQs** of **1 mark** each. **Section B** comprises of **1 CCT question** of **4 marks** each which contains **4 MCQs**. **Section C** comprises of 3 questions of **2 marks** each. **Section D** comprises of 4 questions of **3 marks** each and **Section E** comprises of 3 questions of **4 marks** each.

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## SECTION – A
**Questions 1 to 6 carry 1 mark each.**

**1.** The length of a rectangle is 150 cm. If its breadth is 1m, then its perimeter is
(a) 7 m (b) 5 m (c) 6 m (d) none of these

**2.** The side of a square is 8 cm. If its side is doubled, then its new perimeter is
(a) 64 cm (b) 81 cm (c) 121 cm (d) none of these

**3.** If the sides of a square are halved, then its area
(a) remains same (b) becomes half
(c) becomes one fourth (d) becomes double

**4.** If the area of a square is 64 $cm^2$, then its perimeter is
(a) 25 cm (b) 32 cm (c) 15 cm (d) none of these

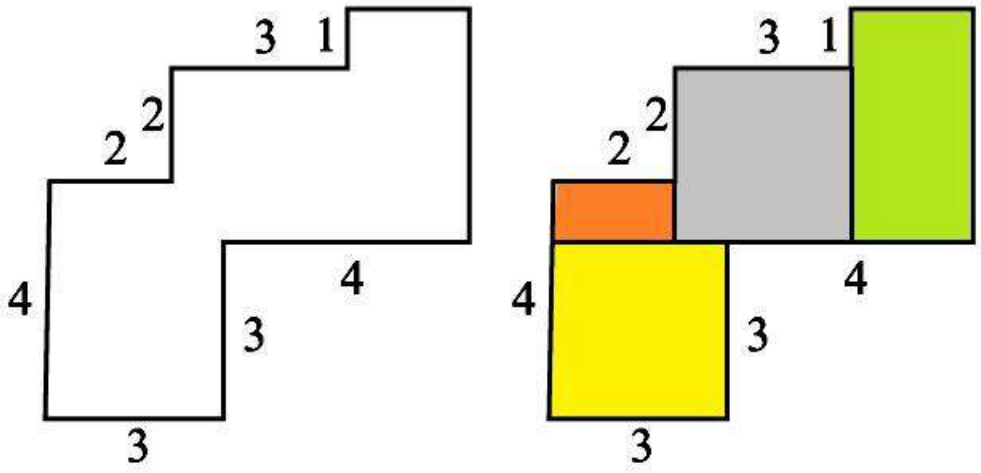
**5.** If the area of rectangle increases from 2 cm² to 4 cm² the perimeter will
(a) increase (b) decrease (c) remains same (d) none of these

**6.** The sides of a rectangle are in the ratio 5: 4. If its perimeter is 72 cm, then its length is
(a) 40 cm (b) 20 cm (c) 30 cm (d) 60 cm

## SECTION – B(CCT Questions)

**Questions 7 to 10 carry 1 mark each. CCT Question**

Kiran wants to find the area of the figure using area of rectangle. She splits the figure into four rectangles and then she coloured the four rectangles with yellow, orange, green and grey colour. (The measures are given in centimetres)






Based on the above, answer the following questions

**7.** Find the area of orange colour.
(a) 2 $cm^2$ (b) 9 $cm^2$ (c) 8 $cm^2$ (d) 10 $cm^2$

**8.** Find the area of yellow colour.
(a) 2 $cm^2$ (b) 9 $cm^2$ (c) 8 $cm^2$ (d) 10 $cm^2$

**9.** Find the area of grey colour.
(a) 2 $cm^2$ (b) 9 $cm^2$ (c) 8 $cm^2$ (d) 10 $cm^2$

**10.** Find the total area of the figure.
(a) 20 $cm^2$ (b) 29 $cm^2$ (c) 28 $cm^2$ (d) 30 $cm^2$

## SECTION – C

**Questions 11 to 13 carry 2 marks each.**

**11.** A room is 4 m long and 3 m 50 cm wide. How many square metres of carpet are needed to cover the floor of the room?

**12.** Two sides of a triangle are 12 cm and 14 cm. The perimeter of the triangle is 36 cm. What is its third side?

**13.** The lid of a rectangular box, with sides 40 cm by 10 cm, is sealed all around with tape. What is the length of the tape required?

## SECTION – D

**Questions 14 to 17 carry 3 marks each.**

**14.** A rectangular piece of land measures 0.7 km by 0.5 km. Each side is to be fenced with 4 rows of wires. What is the length of the wire needed?

**15.** Five square flower beds, each of sides 1 m, are dug on a piece of land 5 m long and 4 m wide. What is the area of the remaining part of the land?

**16.** The length and breadth of the three rectangles are as given below:
(a) 9 m and 6 m (b) 17 m and 3 m (c) 4 m and 14 m
Which one has the largest area, and which one has the smallest?

**17.** Sweety runs around a square park of side 75 m. Bulbul runs around a rectangular park with a length of 60 m and a breadth of 45 m. Who covers less distance?

## SECTION – E

**Questions 18 to 20 carry 4 marks each.**

**18.** How many tiles whose length and breadth are 12 cm and 5 cm, respectively, will be needed to fit in a rectangular region whose length and breadth are respectively:
(a) 100 cm and 144 cm? (b) 70 cm and 36 cm?

**19.** What will happen to the area of rectangle if its
(i) Length and breadth are tripled (ii) Length is doubled and breadth is same

**20.** A marble tile measures 10 cm × 12 cm. How many tiles will be required to cover a wall of size 3 m × 4 m? Also, find the total cost of the tiles at the rate of Rs 2 per tile.

# KENDRIYA VIDYALAYA DRDO BENGALURU
## Maths Holiday Homework-Class VII

**General Instruction:**
(i) All the questions are compulsory.

**SECTION – A (1 mark)**

**1.** Which of the following does not represent pair of integer (a, b) such that $a \div b = 2$
(a) $(-6, -3)$ (b) $(-2, 1)$ (c) $(-10, -5)$ (d) $(8, 4)$

**2.** The value of $4\frac{1}{3}$ of 3 is
(a) 4 (b) 13 (c) $\frac{13}{9}$ (d) $\frac{9}{13}$

**3.** On simplifying $(a + b - 3) - (b - a + 3) + (a - b + 3)$ the result is
(a) $a - b + 3$ (b) $a - b - 3$ (c) $3a - b - 3$ (d) $3a+b+3$

**4.** Find x such that $\frac{3}{5} \square \frac{x}{25}$
(a) –5 (b) –15 (c) –15 (d) none of these

**5.** What cross-sections do you get when you give a vertical cut to the round apple?
(a) rectangle b) square c) circle d) triangle

**6.** Name of the solid whose net diagram is given in below figure.
(a) Cylinder b) Cone c) Sphere d) Cuboid

**7.** Mohit bought a CD for Rs. 750 and sold it Rs. 875. Find his gain or loss percent.
(a) 5% b) 16% c) 6% d) $16\frac{2}{3}$ %

**8.** Which one is greater?
(a) $2^3$ (b) $3^2$ (c) $1^8$ (d) $4^2$

**9.** The order of the rotational symmetry of the square about the centre is
(a) 4 (b) 1 (c) 2 (d) 3

**10.** The circumference of circle whose diameter is 14 cm will be
(a) 44 cm (b) 88 cm (c) 44 $cm^2$ (d) 88 $cm^2$

## SECTION – B(2 marks)

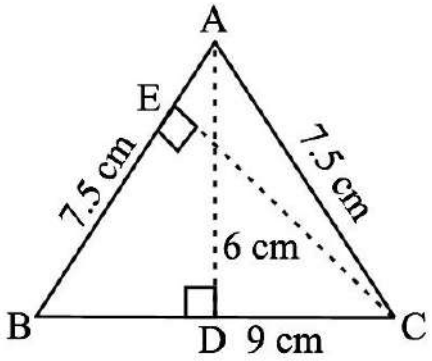
**11.** Three cubes each with 2 cm edge are placed side by side to form a cuboid. Try to make an oblique sketch and say what could be its length, breadth and height.

**12.** On a certain sum the interest paid after 3 years is Rs 450 at 5% rate of interest per annum. Find the sum.

**13.** What should be the value of $a$ if the value of $2x^2 + x - a$ equals to 5, when $x = 0$?

**14.** Express each of the following as a product of prime factors only in exponential form:
(i) 256 × 108 (ii) 270 × 3125

**15.** ΔABC is isosceles with AB = AC = 7.5 cm and BC = 9 cm (see below figure). The height AD from A to BC, is 6 cm. Find the area of ΔABC. What will be the height from C to AB i.e., CE?



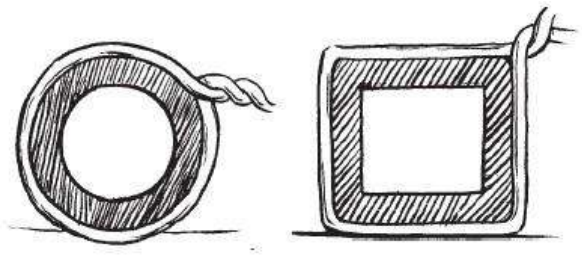

## SECTION – C(3 marks)

**17.** Draw, wherever possible, a rough sketch of
(i) a triangle with only line symmetry and no rotational symmetry of order more than 1.
(ii) a quadrilateral with line symmetry but not a rotational symmetry of order more than 1.

**18.** Verify (–30) × [13 + (–3)] = [(–30) × 13] + [(–30) × (–3)]

**19.** Simplify these expressions and find their values if a = – 1, b = – 2. (i) 10 – 3b – 4 – 5b (ii) 2a – 2b – 4 – 5 + a

**20.** Pragya wrapped a cord around a circular pipe of radius 4 cm (adjoining figure) and cut off the length required of the cord. Then she wrapped it around a square box of side 4 cm (also shown).
Did she have any cord left? ($\pi = 3.14$)



**SECTION – D(4 marks)**

**21**.Find the value of the following expressions when $n = -2$.

(i) $5n - 2$

(ii) $5n^2 + 5n - 2$

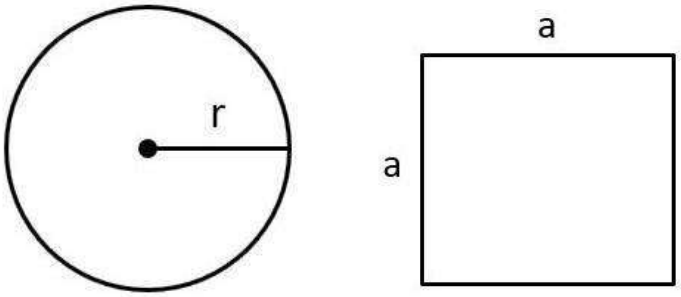
(iii) $n^3 + 5n^2 + 5n - 2$

It was estimated that because of people switching to Metro trains, about 33000 tonne of CNG, 3300 tonne of diesel and 21000 tonne of petrol was saved by the end of year 2007. Find the fraction of

(iv) the quantity of diesel saved to the quantity of petrol saved.

(v) the quantity of diesel saved to the quantity of CNG saved.

**23.** Shazli took a wire of length 44 cm and bent it into the shape of a circle. Find the radius of that circle. Also find its area. If the same wire is bent into the shape of a square, what will be the length of each of its sides? Which figure encloses more area, the circle or the square? (Take $\pi = 22/7$ )




**24.** Express the number appearing in the following statements in standard form. (a) In a galaxy there are on an average 100,000,000,000 stars.

(b) The universe is estimated to be about 12,000,000,000 years old.

(c) The earth has 1,353,000,000 cubic km of sea water.

(d) The population of India was about 1,027,000,000 in March, 2001.

**KENDRIYA VIDYALAYA SANGATHAN**
**BENGALURU REGION**
**HALF YEARLY EXAMINATION**
**SET 1**
**SESSION 2023-24**

**Class : XI** **Max.Marks : 80**
**Subject : MATHEMATICS** **Duration : 3 Hours**

**GENERAL INSTRUCTIONS :**
**(i)This Question paper contains- five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.**
**(ii)Section A has 18 MCQ's and 2 Assertion Reasoning based Questions of 1 mark each.**
**(iii)Section B has 5 Very short Answer ( VSA) – type questions of 2 mark each.**
**(iv)Section C has 6 Short Answer ( SA) – type questions of 3 mark each.**
**(v) Section D has 4 Long Answer ( LA) – type questions of 5 mark each.**
**(vi) Section E has 3 source based / case based /integrated units of assessment (4 mark each) with sub parts.**
**(vii)This paper contains 3 pages.**

## SECTION A( 20 X 1= 20)
**Multiple choice questions**

1.The value of $\sin 765^0$ is $\frac{1}{\sqrt{n}}$, the value of n is
(a) 2 b) 3 c) 4 d) 1

2. Let A ={1, 2,3} , B={2,3, 4} , then which of the following is not a function from A to B ?
(a) {(1, 2) , (1,3) , (2,3) , (3,3)} (b) {(1,3) , (2, 2) , (3,3)}
(c) {(1,3) , (2, 4)} (d) {(1, 2) ,(2,3) , (3, 2) , (3, 4)}

3. There are four bus routes between A and B, and the three bus routes between B and C. A man have travel A to C via B, the number of ways to travel from A to C is
(a) 7 (b) 12 (c) 43 (d) 34

4. If $4x + i(3x - y) = 3 + i(-6)$, where x and y are real numbers, then the values of x and y are
(a)x=3 ,y=4 (b)x=3/4 , y=33/4 (c) x=33 ,y=4 (d) x=4i , y=3

5. The total number of terms in the expression of $( x + a )^{51} - ( x - a )^{51}$ after simplification is
(a) 52 (b)102 (c) 26 (d) 25

6. If $|x + 2| \leq 9$ ,then
a)$x \in (7,11)$ (b) $x \in [11, 7]$ (c) $x \in (-\infty,-7)U(11,\infty)$ (d) $x \in (-\infty,-7)U[11,\infty)$

7. If $Z = \frac{3+4i}{3-4i}$ ,then $|Z|=$
(a) $-4$ (b) $-6$ (c) $-8$ (d)1

8. If $(1 + i)^3 = p + iq$, then $p + q =$
(a) 0 (b) 1 (c) $-4$ (d) 4

9. If $n C_r = n C_2$ then the value of n is
(a) r+2 (b) r+1 (c) n-r-2 (d) None of the above

10. If $a_n = 2n+6$ then $a_4 - a_1 =$
(a) -6 (b) 12 (c) 6 (d) 8

11.The relation between Arithmetic Mean (AM) and Geometric Mean (GM) is
(a) AM < GM (b) AM ≥ GM (c)AM > GM (d) AM ≤ GM

12. If A and B are two sets, $A \cap (A \cup B)$ equals
(a) A (b) B (c) $\emptyset$ (d) $A \cap B$

13. Let U={x: x∈ N, x ≤ 10}, A={x: x∈ N, 2 ≤ x≤8} and B={x: x is a prime number < 10} then $(A-B)'$ is equal to
(a) {3,4,5,6,7} b){4,6,8} c){2,3,5,7} d){1,2,3,5,7,9,10}

14. The domain of the real function $f(x)= \frac{1}{\sqrt{x-5}}$ is
(a) $(5,\infty)$ (b) $[5,\infty)$ (c) $R-\{5\}$ (d) $R-\{\pm 5\}$

15. Range of f(x) = sec x is

(a) $[-1,1]$ (b) R (c) $(-1,1)$ (d) $R-(-1,1)$

16. If $z = 7-9i$ , then $z\,\bar{z}$ =

(a) $\sqrt{130}$ (b)130 (c) 63 (d) $\sqrt{63}$

17. If $-3x+17 < -13$ , then

(a) $x \in (10,\infty)$ (b) $x \in [10,\infty)$ (c) $x \in (-\infty,10)$ (d) $(-10,10)$

18. The conjugate of a complex number is $\frac{1}{i-1}$ , then the complex number is

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

**Assertion-Reason Based questions (19&20)**

In the following questions, a statement of assertion (A) is followed by a statement of Reason ( R) .
Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b)Both A and R are true but R is not the correct explanation of A.

(c)A is true but R is false.

(d)A is false but R is true.

19. Assertion(A): If $\sin x = -\frac{1}{3}$ , then $\cos x = \frac{2\sqrt{2}}{3}$

Reason(R): If the value of cos x is positive and sin x is negative , then $x \in (\frac{3\pi}{2},2\pi)$

20.Assertion(A): If $(1+ax)^n = 1+8x+24x^2$ then value of a and n are 2 and 4 respectively.

Reason(R): $(1+x)^n = 1+nx+\frac{n(n+1)}{2}x^2+ \ldots\ldots +x^n$

**SECTION B(5x2=10)**

21. For what values of x the number $-\frac{2}{7}$ ,x,$-\frac{7}{2}$ are in GP.

(OR)

The sum of first three terms of a GP is 39/10 and their product is 1. Find the common ratio.

22.Describe in Roster form:A = {x:$x^2+7x-8 = 0$, $x \in R$ } , B = {x:x is a prime number and a divisor of 60}.

23.Prove that : $\sin(\frac{3\pi}{8}-5)\cos(\frac{\pi}{8}+5) + \cos(\frac{3\pi}{8}-5)\sin(\frac{\pi}{8}+5) = 1$

24.Find the value of : $(a+b)^4-(a-b)^4$

25.Find the domain of the real valued function $f(x) = \frac{1}{3x-2}$

(OR)

Find the domain of the real function $f(x) = \sqrt{x^2-9}$

**SECTION C (6x3=18)**

26.Verify De morgan's law (AUB)'= A'∩ B' if U = {1,2,3,4,5,6,7,8}; A = {1,2,3}; B = {2,4,6}

27.Let $f(x) = 2x^2$ ; g(x) = 3x+1 ; be two functions. Find

(i)fg(x) (ii) $\frac{f}{g}(x)$ (iii)(f−g)(x)

28.(a) Solve : $\frac{x+3}{x-2} \leq 2$

(OR)

The longest side of the triangle is three times the shortest side and third side is 2cm shorter than the longest side.

If the perimeter of the triangle is atleast 61 cm, find the minimum length of the shortest side.

29.Find the sum upto n terms of the series 6 + 66 + 666 + …

30. If $\cos(\alpha+\beta) = \frac{4}{5}$ and $\sin(\alpha-\beta) = \frac{5}{13}$ , where α lies between 0 and $\frac{\pi}{4}$ , find the value of tan2α.

(OR)

Prove that : $\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$

31.Find the value of x and y for which the complex numbers $-3+ix^2y$ and $x^2+y+4i$ are conjugate to each other.

(OR)

If $(x+iy)^3 = a+ib$, show that $\frac{x}{a}+\frac{y}{b} = 4(a^2 - b^2)$

## SECTION D(4x5=20)

32. In how many ways can the letters of the word MATHEMATICS can be arranged if
(i) words starting with H and ending with E (ii)All vowels are together (iii)Consonants are not together

(OR)

What are the number of ways of choosing 4 cards from a pack of 52 cards? In how many ways of these are
(i)face cards (ii) cards are of same colour (iii) Four cards of same unit

33.Expand using Binomial Theorem $(1+\frac{x}{2}-\frac{2}{x})^3$

34. Prove that $\frac{\text{Sin A} - \text{Sin 3A} + \text{Sin 5A} - \text{Sin 7A}}{\text{Cos A} - \text{Cos 3A} - \text{Cos 5A} + \text{Cos 7A}} = \text{Cot 2A}$

35. If A = {x: x is an even natural number less than 10} , B = {x: x is an odd natural number less than 15}
(i) Write the tabular form of the set A and B. (ii)Write any two subsets of A. (iii)Find $(A-B)^c$ , $B^c \cup A^c$

## SECTION E(3x4=12)

## CASE STUDY BASED QUESTIONS

36.The kola super deep Bore hole ,the deepest man made hole on Earth and the deepest artificial point on Earth, as a result of a scientific drilling project ,it was found that temperature T in degrees Celsius , x km below the surface of the Earth is given by T = 30 + 25 (x-3) , 3<x<15. If the required temperature lies between 2000 C and 3000 C then
(i)The depth x lies between
(a)9km and 13km (b)9.8km and 13.8km (c) 9.5km and 13.5 (d)10km and 14km
(ii)If x = 13 then value of T
(a)256 (b) 260 (c ) 280 (d) 282
(iii)When T = 2500 C what is x
(a)10.8 (b) 11.8 (c )12.8 (d)11.9
(iv)When T=00C what is x
(a)1.8 (b)1.28 (c )2.8 (d)3.8

37. A state cricket authority has to choose a team of 11 members , to do it so the authority asks 2 coaches of a government academy to select the team members .they can make a team of 11 cricketers amongst 15 possible candidates. In how many ways can the final eleven can be selected from15 cricket players if
(i)There is no restriction
(a)1365 (b)1635 (c ) 1536 (d)1356
(ii)One of them must be included
(a)1110 (b)1010 (c )1100 (d)1001
(iii)A particular player is never chosen
(a)364 (b) 436 (c ) 346 (d)634
(iv)One bad player should be excluded
(a)1002 (b) 1003 (c )1020 (d)1030

38. A company produces 500 computers in the third year and 600 computers in the seventh year.Assuming that the production increases uniformly by a constant number every year
(i)The value of the fixed number by which production is increasing every year
(a)25 (b)30 (c ) 35 (d) 36
(ii)The production in 1st year
(a)400 (b) 450 (c )475 (d)500
(iii)The total production in 5 years
(a)2450 (b)2475 (c )2500 (d)2457
(iv)The number of computers produced in 15 th year
(a)725 (b)750 (c )775 (d)800

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KENDRIYA VIDYALAYA IISC ,BENGALURU -12

HALF YEARLY EXAMINATION

2023 -24

Name of the subject:Mathematics

Max.Marks:80

Class :XI Time :3hrs

General Instructions:

1. This question paper contains -five sections A ,B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has18 MCQ'S and 02 Assertion-Reason based questions of 1 mark each
3. Section B has 5 very short answer (VSA) – type questions of 2 marks each.
4. Section C has 6 short answer (SA) – type questions of 3 marks each
5. Section D has 4 long answer(LA)-type questions of 5 marks each
6. Section E has source based/case base/passage based/integrated units of assessment (4 marks)with subparts

**SECTION A(1 MARK QUESTIONS)**

1. If A and B are any two sets such that A C B then A U B is

   (a) A (b) B
   (c) Φ (d) None of the above

2. Which of the following is a null set

   (a) Set of even prime numbers (b) Set of odd natural numbers divisible by 2
   (c) Set of composite numbers less than 6 (d) All of the above

3. Number of relations from A to B if n(A) = 5 n(B) = 3 is

   (a) 15 (b) $2^{15}$
   (c) $15^{2}$ (d) 30

4. If $(\frac{x}{3} + 1, y+2) = (\frac{5}{3}, 1)$ then x + y =

   (a) 1 (b) -1
   (c) 0 (d) 2

5. Which of the following is domain of $f(x) = e^{x}$

   (a) $(-\infty, 0)$ (b) $(0, \infty)$
   (c) $[0,\infty)$ (d) R

6. If tan x = $\frac{-4}{3}$ ; x is in IInd quadrant then the value of Sin $\frac{x}{2}$ is

   (a) $\frac{2\sqrt{5}}{5}$ (b) $\frac{\sqrt{5}}{5}$
   (c) ½ (d) 0

Contd…2/-

7. If the radian measure is $5\pi/3$ then its degree measure will be

(a) $90^0$ (b) $300^0$
(c) $120^0$ (d) $240^0$

8. If Z = $\frac{3+4i}{3-4i}$ then I Z I =

(a) -4 (b) -6
(c) -8 (d) 2

9. If $(1 + i)^3 = p + qi$ then p + q =

(a) 0 (b) 1
(c) -4 (d) 4

10. The multiplicative inverse of z = 2+3i is

(a) $\frac{2+3i}{\sqrt{13}}$ (b) $\frac{-2+3i}{\sqrt{13}}$
(c) $\frac{-2-3i}{\sqrt{13}}$ (d) $\frac{2-3i}{\sqrt{13}}$

11. If $\frac{-2}{x-3} > 0$ then x belongs to

(a) (3 , ∞) (b) (3,-∞)
(c) (-∞,3) (d) (- ∞, 3]

12. If 30 x < 300 and x is a natural number then x belongs to

(a) (0 , ∞) (b) {1,2,3,4,5,6,7,8,9}
(c) {0,1,2,3,4,5,6,7,8,9} (d) {-2,-1,0,1,2,3,4}

13. $n C_r = n C_2$ then the value of n is

(a) r+2 (b) r+1
(c) n-r-2 (d) None of the above

14. The value of 5! – 3 ! is

(a) 120 (b) 2
(c) 118 (d) 116

15. The number of terms in the expansion of $( x + y)^{20}$ is

(a) 21 (b) 19
(c) 18 (d) 22

16. The value of $(\sqrt{2} + 1)^2 – (\sqrt{2} - 1)^2$

(a) $5\sqrt{2}$ (b) $4\sqrt{2}$
(c) 6 (d) 116

Contd/..3/-

17. If $a_n = 2n+6$ then $a_4 - a_1 =$

(a) -6 (b) 12
(c) 6 (d) 8

18. The relation between Arithmatic Mean (AM) and Geomertric Mean (GM) is

(a) AM < GM (b) AM ≥ GM
(c) AM > GM (d) AM ≤ GM

**Assertion reason based Questions(Question no. 19 ,20 )**

In the following questions a statement of assertion(A) and Reason(R) .Choose the correct answer out of the following choices Mark the correct answer

(a) Both A and R are true and R is correct explanation of A

(b) Both A and R are true R is not a correct explanation A

(c) A is true but R is false

(d) A is false and R is true.

19. Assertion (A) : If tan 2x = -Cot ( x + $\frac{\pi}{3}$) then x = nπ +$\frac{5\pi}{6}$

Reason (R) : If tan x = tan y then x = nπ + y

20 Assertion (A): If $(1+ax)^n = 1+8x+24x^2$ then value of a and n are 2 and 4 respectively

Reason (R) : (1+x) n = $1 + nx + \frac{n(n-1)}{2!} x^2 + \cdots for\ all\ n\ \mathcal{E}\ Z$

SECTION B(2 Mark)

21.If A ={2,3,5,7,9} ,B = {4,6,8,9,10} find A – B

22. a) If A = {1,2,3,4} and R is a relation from A to A such that R = {(x , y) /x – y =0 } .write down its domain and codomain

OR

b) Find the range of R given by R = {(a,b)/ a is a multiple of b } defined on A = {2 ,3 , 4 , 8 }

23. If tan(A+B) = p and tan(A-B) = q; prove that tan 2A = $\frac{p+q}{1-pq}$

24. How many chords can be drawn through 20 points on a circle;

25(a) For what values of x the numbers $-\frac{2}{7}$ , x,- $\frac{7}{2}$ are in GP

O

(b) Find the sum of n terms of the series 1 + $\frac{2}{3}$ +$\frac{4}{9}$ + ……

Contd…4./-

SECTION C ( 3marks)

26. Verify de morgan law if U = {1,2,3,4,5,6,7,8}; A = {1,2,3}; B = {2,4,6}

27. Let f(x) = $2x^2$ ; g(x) = 3x +1 ; be two functions . Find

(i) fg(x)

(ii) $\frac{f}{g}$(x)

(iii) f-g (x)

28 (a). Prove that $\frac{\sin(x+y)}{\sin(x-y)} = \frac{\tan x+\tan y}{\tan x-\tan y}$

Or

(b) Prove that $\frac{\cos(5+x)\cos(-x)}{Sin(5-x)\cos(\frac{\pi}{2}+x)}$ =cot $^2$ x

29(a) If $(x + iy)^3 = u + iv$ then show that $\frac{u}{x} + \frac{v}{y} = 4 ( x^2 – y^2)$

(b) express the following in the form of a + ib

$$\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-\sqrt{2}i)}$$

30(a) Solve the linear inequality and represent the solution graphically

3x -7 > 2 (x-6); 6-x > 11-2x

OR

(b) The longest side of the triangle is three times the shortest side and third side is 2cm shorter than the longest side. If the perimeter of the triangle is atleast 61 cm find the minimum length of the shortest side.

31. Find the sum upto n terms of the series

0.6 +0.66 + 0.666…….

32. If A = { x/x is an even natural number less than 10}

B = { x/x is an odd natural number less than 15}

(i) Write the roster form of the set A and B
(ii) Write any two subsets of A
(iii) Find $(A – B)^c$, $B^c \cup A^c$

Contd..5-

33. Prove that $\cos^2 x + \cos^2 (x + \frac{\pi}{3}) + \cos^2 (x - \frac{\pi}{3}) = \frac{3}{2}$

34. In how many ways can the letters of the word MATHEMATICS can be arranged if

(i) words starting with H and ending with E
(ii)All vowels are together
(iii)Consonants are not together

(OR)

(b)What are the number of ways of choosing 4 cards from a pack of 52 cards? In how many ways of these are

(i) face cards (ii) cards are of same colour

(iii) Four cards of same unit

35. If a , b are distinct integers , prove that a – b is a factor of an – bn , whenever n is a positive integer.

**SECTION E (4 Marks)**

36. The kola super deep Bore hole ,the deepest manmade hole on Earth and the deepest artificial point on Earth, as a result of a scientific drilling project ,it was found that temperature T in degrees Celsius , x km below the surface of the Earth is given by

$T = 30 + 25 (x-3)$ , $3<x<15$. If the required temperature lies between $200^0$ C and $300^0$ C then

(i) The depth x lies between
(ii) If x = 13 then value of T
(iii) When T = $250^0$ C what is x

37 . A state cricket authority has to choose a team of 11 members , to do it so the authority asks 2 coaches of a government academy to select the team members .they can make a team of 11 cricketers amongst 15 possible candidates. In how many ways can the final eleven can be selected from15 cricket players if

(i) There is no restriction
(ii) One of them must be included
(iii) Both the coaches are included
(iv) One bad player should be excluded

38 . A company produces 500 computers in the third year and 600 computers in the seventh year.Assuming that the production increases uniformly by a constant number every year

(i) The value of the fixed number by which production is increasing every year
(ii) The production in 1st year
(iii) The total production in 5 years
(iv) The number of computers produced in 15 th year

***concluded****

**KENDRIYA VIDYALAYA SANGATHAN, GURUGRAM REGION**
**(SUMMER STATION)**
**FIRST PRE BOARD EXAMINATION - 2023-24**

**CLASS: XII** **Maximum Marks: 80**

**SUBJECT: MATHEMATICS** **TIME ALLOWED: 3 Hours**

**General instruction**

1 This question paper contains- five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.

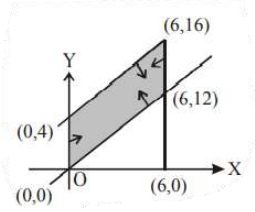
2. Section A has 18 MCQ's and 02 Assertion- Reason based question of 1 mark each.

3. Section B has 5 very short answer type questions (VSA) of 2 marks each.

4. Section C has 6 short answer type questions (SA) of 3 marks each.

5. Section D has 4 long answer type questions (LA) of 5 marks each.

6. Section E has 3 source base / case based/passage based / integrated units of aassessment 4 marks each with sub parts.

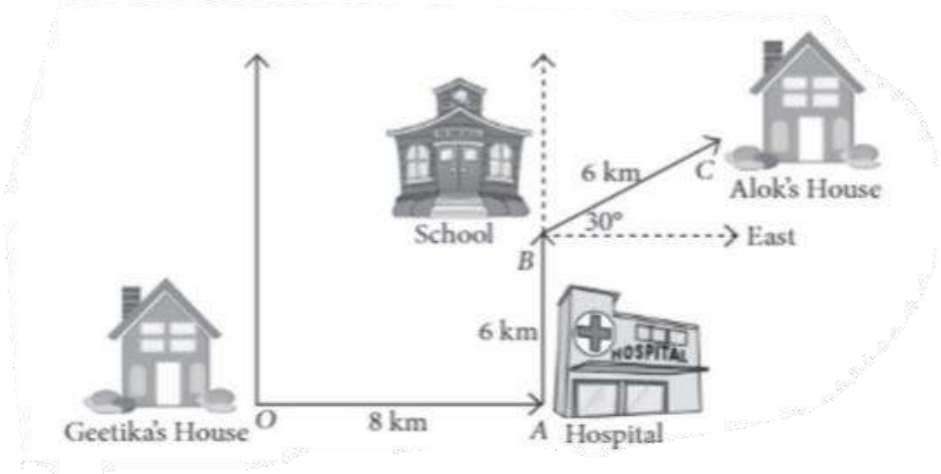
| Q.No. | **SECTION A**<br>**(MULTIPLE CHOICE QUESTIONS)** | Marks |
|---|---|---|
| 1 | If $x = \sqrt{a^{\sin^{-1} t}}$ and $y = \sqrt{a^{\cos^{-1} t}}$ then<br>(a) $x\frac{dy}{dx} + y = 0$ (b) $x\frac{dy}{dx} = y$<br>(c) $y\frac{dy}{dx} = x$ (d) none of the above | 1 |
| 2 | $\int \frac{3x^2}{x^6+1}\, dx$ *is equal to*<br>(a) $\log(x^6+1)+c$ ( b) $\tan^{-1} x^3 + c$<br>(c) $3\tan^{-1}x^3 + c$ (d) $\log x^2 + c$ | 1 |
| 3 | If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then $A^2 + 2A$ is equal to<br>(a) 4A (b) 3A (c) 2A (d) A | 1 |
| 4 | A square matrix $A = [a_{ij}]_{n\times n}$ is called a diagonal matrix if $a_{ij} = 0$ for<br>(a) i = j (b) i < j (c) i > j (d) i ≠ j | 1 |
| 5 | The feasible region for LPP is shown shaded in the figure. Let Z = 3 x – 4 y be the objective function, then maximum value of Z is<br>(a) 12<br>(b) 8<br>(c) 0<br>(d) –18<br>  | 1 |

| | | |
|---|---|---|
| 6 | The area of the feasible region for the following constraints $3y + x \geq 3$, $x \geq 0$, $y \geq 0$ will be<br>(a) Bounded (b) Unbounded (c) Convex (d) Concave | 1 |
| 7 | The direction cosines of the line which makes equal angles with the coordinate axes are<br>(a) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ (b) $\left(-\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}\right)$<br>(c) $\left(\pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}\right)$ (d) none of the above | 1 |
| 8 | If $\lvert\vec{a}\rvert = \frac{\sqrt{3}}{2}, \lvert\vec{b}\rvert = 4$ and angle between $\vec{a}$ and $\vec{b}$ is $60^0$ then the value of $\vec{a} . \vec{b}$ is equal to<br>(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$ (c) $-\sqrt{3}$ (d) none of the above | 1 |
| 9 | Order and degree of differential equation<br>$$\frac{d^2y}{dx^2} = \left[y + \left(\frac{dy}{dx}\right)^2\right]^{\frac{1}{4}}$$<br>(a) 4 and 2 (b) 1 and 2 (c) 1 and 4 (d) 2 and 4 | 1 |
| 10 | The number of all possible matrices of order 3x3 with each entry -1 or 1 is<br>(a) 512 (b) 81 (c) 27 (d) 18 | 1 |
| 11 | If the lines $\frac{x-1}{k} = \frac{y-3}{1} = \frac{z+6}{-2}$ and $\frac{x-1}{1} = \frac{y-3}{-2} = \frac{z+6}{k}$ are perpendicular, then k is equal to<br>(a) 2 (b) 1 (c) -2 (d) 3 | 1 |
| 12 | Integrating factor of differential equation $x\frac{dy}{dx} + 2y = x^2$<br>(a) $\frac{1}{x^2}$ (b) $x^2$ (c) x (d) $\frac{1}{x}$ | 1 |
| 13 | The solution of differential equation $2x\frac{dy}{dx} - y = 3$ represents:<br>(a)straight lines (b) circles (c) parabola (d) ellipse | 1 |
| 14 | If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 9 \\ 4 & 6 \end{vmatrix}$ then x is equal<br>(a) 6 (b) -6 (c) $\pm 6$ (d) none of the above | 1 |
| 15 | The probability of obtaining an even prime number on each die, when a pair of dice is rolled is<br>(a) 0 (b) $\frac{1}{3}$ (c) $\frac{1}{12}$ (d) $\frac{1}{36}$ | 1 |

| | | |
|---|---|---|
| 16 | A unit vector perpendicular to both the vectors $\hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ and $\hat{\imath} + 2\hat{\jmath} - \hat{k}$ is<br><br>(a) $\pm\frac{1}{\sqrt{3}}(\hat{\imath} + \hat{\jmath} + \hat{k})$ (b) $\pm\frac{1}{\sqrt{3}}(-\hat{\imath} + \hat{\jmath} + \hat{k})$<br>(c) $\pm\frac{1}{\sqrt{3}}(\hat{\imath} - \hat{\jmath} - \hat{k})$ (d) $\pm\frac{1}{\sqrt{3}}(\hat{\imath} - \hat{\jmath} + \hat{k})$ | 1 |
| 17 | If $A = \begin{bmatrix} 1 & 2 \\ 4 & 2 \end{bmatrix}$, then find the value of \|2A\|<br>(a) -6 (b) -24 (c) 12 (d) -12 | 1 |
| 18 | if α is the angle between any two vectors $\vec{a}$ and $\vec{b}$, then $\left\|\vec{a}.\vec{b}\right\| = \left\|\vec{a} \times \vec{b}\right\|$ when α is equal to<br><br>(a) 0 (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) $\pi$ | 1 |
| | **ASSERTION – REASON BASED QUESTIONS**<br>Directions: Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.<br>(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.<br>(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion<br>(c) Assertion is correct, reason is incorrect<br>(d) Assertion is incorrect, reason is correct. | |
| 19 | **Assertion**: A relation R = {(a,b) : \|a-b\|<2} defined on the set A = {1, 2, 3, 4, 5} is reflexive.<br>**Reason** : A relation R on the set A is said to be reflexive if (a,b)$\epsilon$ $R$ and $(b,c)\epsilon R$ for all $a, b \epsilon A$. | 1 |
| 20 | **Assertion**: The intervals in which f(x) = log sin x , $0 \leq x \leq \pi$ is Increasing is $\left(0, \frac{\pi}{2}\right)$.<br>**Reason**: A function is increasing in (a,b) if f′ (x) > 0 for each x$\epsilon(a, b)$. | 1 |
| | **SECTION B** | |
| 21 | Find the value of<br>$\cos^{-1}\frac{1}{2} + 2\sin^{-1}\frac{1}{2}$<br>**OR**<br>$\tan^{-1}(\tan\frac{7\pi}{6})$ | 2 |
| 22 | Find $\int \frac{x^2+x+1}{(x+2)(x^2+1)}\,dx$. | 2 |

| | | |
|---|---|---|
| 23 | If function $f(x) = \begin{cases} x+k, if\ x<3 \\ 4, x=3 \\ 3x-5, \ x>3 \end{cases}$ is continuous function at x=3, then find the value of k. | 2 |
| 24 | The volume of the cube is increasing at the rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of an edge is 10 centimeters?<br>**OR**<br>Find the maximum profit that a company can make, if the point function is given by<br>$p(x) = 41-72x-18x^2$ | 2 |
| 25 | Find the intervals in which the function f given by<br>$f(x) = 4x^3 -6x^2 -72x +30$<br>(a) Strictly increasing (b) strictly decreasing | 2 |
| | **SECTION C** | |
| 26 | Find $\frac{dy}{dx}, if\ y^x + x^y + x^x = a^b$<br>**OR**<br>If x= a (cost +t sint) and y = a (sint-t cost), find $\frac{d^2y}{dx^2}$. | 3 |
| 27 | Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the expectation of X.<br>**OR**<br>A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once? | 3 |
| 28 | Find a particular solution of the differential equation<br>$\frac{dy}{dx} + ycotx = 4x\ cosecx, x \neq 0, given\ that$<br>$y = 0\ when\ x = \frac{\pi}{2}$<br>**OR**<br>Find a general solution of the differential equation<br>$e^x \tan y\, dx + (1-e^x) \sec^2 y\, dy = 0$ | 3 |
| 29 | Evaluate the definite integrals<br>$\int_1^4 [\|x-1\| + \|x-2\| + \|x-3\|]\, dx$ | 3 |

| | | |
|---|---|---|
| 30 | Evaluate the integrals<br>$$\int \frac{x+3}{\sqrt{5-4x+x^2}}dx$$ | 3 |
| 31 | Solve the following Linear Programming Problems graphically<br>Maximise Z = 5x + 3y<br>Subject to 3x + 5y ≤ 15, 5x + 2y ≤ 10, x ≥ 0, y ≥ 0. | 3 |
| | **SECTION D** | |
| 32 | Find the area of the region bounded by the curve $y^2 = x$ and the lines x=1, x=4 and x-axis in the first quadrant. | 5 |
| 33 | Let A be the set of all the triangle in a plane and R be the relation defined on R as R = {($T_1$ , $T_2$ ): $T_1$ is similar to $T_2$}<br>1. Show that the relation R is an equivalence relation.<br>2. Consider three right angle triangle $T_1$ with sides 3, 4, 5, $T_2$ with sides 5, 12, 13 and $T_3$ with sides 6,8,10. Which triangle among $T_1$, $T_2$, and $T_3$ are related?<br>**OR**<br>Show that f :R→ $\{x\epsilon R : -1 < x < 1\}$ $defined\ by\ f(x) = \frac{x}{1+\|x\|}$, x$\epsilon R$ is one – one and onto function. | 4<br>+1<br><br>3<br>+2 |
| 34 | Two factories decided to award their employee for three values of (a) adaptable to new situation, (b) careful and alert in difficult situations and (c) keeping calm in tense situations, at the rate of ₹ x, ₹ y and ₹ z per person respectively. The first factory decided to honour respectively 2, 4 and 3 employees with total prize money of ₹ 29000. The second factory decided to honour respectively 5, 2 and 3 employees with a total prize money of ₹ 30500. If three prizes per person together cost ₹ 9500 then<br>(i) Represents the above situation by a matrix equation and form linear equations using matrix multiplication,<br>(ii) Solve these equation using matrices. | <br><br><br><br><br>1<br><br>4 |
| 35 | By computing the shortest distance determine whether the lines intersect or not. If not then find the shortest distance between the lines.<br>$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \quad and \quad \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$$<br>**OR** | 5 |

| | | |
|---|---|---|
| | Find the vector equation of the line passing through the point (1, 2, – 4) and perpendicular to the two lines:<br>$\frac{x-8}{3}=\frac{y+19}{-16}=\frac{z-10}{7}$ $and$ $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$ | |
| | **SECTION E**<br>**This section comprises of 3 case study questions of 4 marks having sub parts** | |
| 36 | A doctor is to visit a patient. From the past experience, it is known that the probabilities that he will come by cab, metro, bike or by other means of transport are respectively 0.3, 0.2, 0.1 and 0.4. The probabilities that he will be late are 0.25, 0.3, 0.35 and 0.1 if he comes by cab, metro, bike and other means of transport respectively.<br>(i)What is the probability that the doctor is late by other means?<br>(ii)When the doctor arrives late, what is the probability that he comes by metro?<br>(iii) When the doctor arrives late, what is the probability that he comes by bike or other means?<br>**OR**<br>When the doctor arrives late, what is the probability that he comes by cab or metro? | 1<br>1<br>2<br>2 |
| 37 |  <br>Gitika house is situated at Shalimar Bag at O, going to Aloke's house she first travel 8 km in the east, here at point A a hospital is situated. From the hospital she takes auto and goes 6 km in the north. Here at point B a school is situated. From school she travels by bus to reach Aloke's house which is $30^0$ of east and 6 km from point B.<br>(i) What is vector distance from Gitika's house to school?<br>(ii) What is vector distance from school to Aloke's house?<br>(iii) What is vector distance from Gitika's house to Aloke's house? | 1<br>1<br>2<br>2 |

| | | |
|---|---|---|
| | **OR**<br>What is the total distance travel by Gitika from her house to Aloke's house? | |
| 38 | A telephone company in a town has 500 subscribers on its list and collect fixed charges of ₹ 300 per subscriber. The company proposes to increase the annual subscription and it is believed that every increase of ₹ 1, one subscriber will discontinue the service.<br><br>(i) Based on above information find out how much amount can be increased for maximum revenue.<br><br>(ii) Find out maximum revenue received by the telephone company.<br><br>  <br> | 2<br><br>2 |

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| | **Pre-Board Exam(2023-24)** | **Set-II** |
| | **Class-XII** | |
| **Time:3h** | **Subject-Mathematics** | **MM-80** |

**Instructions:**

**1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.**
**2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.**
**3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.**
**4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.**
**5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.**
**6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts**

## SECTION A
## (Multiple Choice Questions)
## Each question carries 1 mark

**Q1. If direction cosine of a line are $< \frac{1}{a}, \frac{1}{a}, \frac{1}{a} >$ then a is**

**(a) a< 1 (b) a> 1 (c) a=±2 (d) a=$\pm\sqrt{3}$**

**Q2. The inverse of matrix $\begin{bmatrix} 7 & 1 \\ 4 & -3 \end{bmatrix}$ is**

**(a) $\begin{bmatrix} 7 & 1 \\ -4 & -3 \end{bmatrix}$ (b)$\frac{1}{25}\begin{bmatrix} 3 & 1 \\ 4 & -7 \end{bmatrix}$ $(c)$ $\begin{bmatrix} 3 & 1 \\ 4 & -7 \end{bmatrix}$ $(d)\begin{bmatrix} -3 & -1 \\ -4 & 7 \end{bmatrix}$**

**Q3. $If\ A\ is\ a\ square\ matrix\ of\ order\ 3\ and\ |A| = 4, then\ |adj\ A| =$**

**(a) 4 (b) 9 (c) 64 (d)16**

**Q4. The value of 'k' for which the function $f(x) = \begin{cases} \frac{1-cos2x}{2x^2}, x \neq 0 \\ k, x = 0 \end{cases}$ is continuous at x=0 is**

**(a) 0 (b)-1 (c) 1. (d) 2**

**Q5. The projection of the vector $7\vec{i} + \vec{j} - 4\vec{k}$ $on\ the\ vector\ 2\vec{i} + 6\vec{j} + 3\vec{k}\ is$**

**(a) $\frac{7}{\sqrt{14}}$ $(b)\frac{7}{14}$ $(c)\frac{8}{7}$ $(d)\frac{7}{2}$**

**Q6. If m and n, respectively, are the order and the degree of the differential equation $y = x(\frac{dx}{dy})^3 + \frac{d^2y}{dx^2}$, then m + n=**

**(a) 5 (b) 3 (c) 2 (d) 4**

**Q7. The solution set of the inequality 3x+5y <4 is**

**(a) an open half-plane not containing the origin.**
**(b) an open half-plane containing the origin.**
**(c) the whole XY-plane not containing the line 3x+5y=4.**
**(d) a closed half plane containing the origin.**

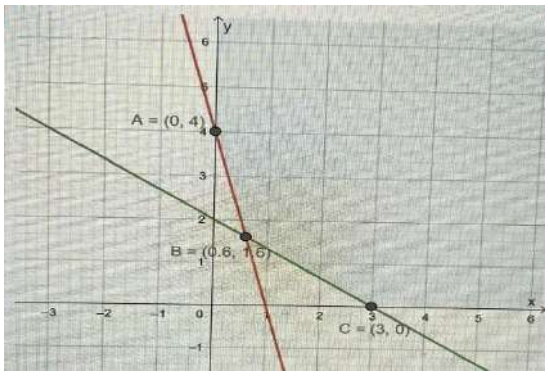
**Q8. The direction cosine of Z-axis is**

**(a) 1, 1, 1** **(b)** $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$ **(c) 0, 0, 0** **(d) 0, 0, 1**

**Q9. The value of** $\int_1^2 \frac{x^2}{x^3+1}\, dx$ **is**

**(a)** $\frac{1}{3} log \frac{9}{2}$ $(b) \frac{1}{3} log \frac{2}{9}$ $(c) log \frac{2}{8}$ $(d) 0$

**Q10. The corner points of the shaded unbounded feasible region of an LPP are (0, 4). (0.6, 1.6) and (3, 0) as shown in the figure. The minimum value of the objective function Z = 4x + 6y occurs at**




**(a) (0.6, 1.6) only** **(b) (3.0) only** **(c) (0.6, 1.6) and (3,0)** **(d) at every point of the line-segment joining the points (0.6, 1.6) and (3,0) only**

**Q11. If A and B are nonsingular square matrices of the same order, then** $AB^T - BA^T$ **is a**

**(a) skew-symmetric matrix** **(b) symmetric matrix** **(c)** $null\ matrix$ **(d) Nonsingular matrix**

**Q12. The area of triangle determined by the vectors** $\vec{\imath} + 2\vec{\jmath} + 3\vec{k}$ **and** $3\vec{\imath} - 2\vec{\jmath} + \vec{k}$ **is**

**(a)** $4\sqrt{3}$ **(b)** $8\sqrt{3}$ **(c) 36** **(d) 18**

**Q13. Find** $|A|$ **if A=**
$$\begin{bmatrix} 0 & 2x-1 & \sqrt{x} \\ 1-2x & 0 & 2\sqrt{x} \\ -\sqrt{x} & -2\sqrt{x} & 0 \end{bmatrix}$$

**(a) 4** **(b) 1** **(c) – 1** **(d) 0**

**Q 14. A and B are the two independent events such that P(A)=0.3 P(B)=0.6 and P(**$A' \cap B'$**) is**

**(a) 0.9** **(b) 0.18** **(c) 0.28** **(d) 0.1**

**Q15. The general solution of differential equation** $ydx - xdy = 0$ **is** $(a)\ xy = c$ $(b)\ x = cy^2$ $(c)\ y = cx$ $(d) y = cx^2$.

**Q16.** $The\ value\ of\ |\vec{a} - \vec{b}|\ if\ |\vec{a}| = 2, |\vec{b}| = 5\ and\ \vec{a}.\vec{b} = 8$

**(a) 0** **(b) 49** **(c)** $\sqrt{10}$ **(d)** $\sqrt{13}$

**Q17.** $\frac{d}{dx}(x^x)$ $is\ equal\ to$

**(a)** $x^{x-1}$ Type equation here. **(b)** $xlogx$ **(c)** $x^x(1+logx)$ **(d)** $xx^{x-1}$

**Q18.** $If\ [x \quad 1]\begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = O, then\ x =$

**(a) 0** **(b) 1** **(c) 2** **(d) -2**

**ASSERTION-REASON BASED QUESTIONS**

**In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.**

**(a) Both A and R are true and R is the correct explanation of A.**

**(b) Both A and R are true but R is not the correct explanation of A.**

**(c) A is true but R is false.**

**(d) A is false but R is true.**

**Q19. Assertion (A): Let f : R→** $R\ given\ by\ f(x) = x, then\ f\ is\ one-one\ function.$

**Reason(R): A function g : A→** $B\ is\ said\ to\ be\ onto\ if\ for\ each\ b \in B, \exists\ a \in A\ such\ that$

**g(a)=b.**

**Q20. Assertion (A):** $|\sin x|\ is\ a\ continuous\ function$

**Reason(R): If f(x) and g(x) both are continuous functions, then gof(x) is also a continuous function.**

## SECTION B

**(This section comprises of very short answer type-questions (VSA) of 2 marks each)**

**Q21.Find the value of x, when** $\cos^{-1}\left(\frac{5}{13}\right) = \tan^{-1}(x)$

**OR**

**Show that f: N → N defined by** $f(n) = \begin{cases} \frac{n+1}{2}, & \text{if n is odd} \\ \frac{n}{2}, & \text{if n is even} \end{cases}$ **is not one − one , but onto function.**

**Q22. A particle moves along the curve** $6y = x^3 + 2$**. Find the point at which the y coordinate is changing 8 times as fast as the** $x\ coordinate.$

Q23. **Find the maximum value of slope of the curve** $y = -x^3 + 3x^2 + 12x - 5$.

**OR**

**Find the maximum profit that a company can make, if profit function of the company is given by** $P(x) = 72 + 42x - x^2\ if\ x\ is\ the\ number\ of\ units\ and\ P\ is\ the\ profit$

**Q24. Find:** $\int \frac{dx}{\sqrt{7-6x-x^2}}$

**Q25. Check whether the function** $f : R \to R\ defined\ by\ f(x) = x^3 + x$ **has critical point(s) or not. If yes, find them.**

## SECTION C

**(This section comprises of short answer type questions (SA) of 3 marks each)**

**Q26. Find:** $\int \frac{2x}{(x^2+1)(x^2+2)}\,dx$

**Q27.Probabilities of solving a specific problem independently by A and B are ½ and 1/3 respectively. If both try to solve the problem independently, find the probability that**
**(i)the problem is solved**
**(ii) Exactly one of them solve the problem.**

**Q28. Evaluate:** $\int_0^{\frac{\pi}{2}} log tan x dx$

**Q29. Solve the differential equation:** $ydx + (x - y^3)dy = 0$

**OR**

**Solve the differential equation:** $(x^2 - y^2)\,dx + 2xy\,dy = 0$

**Q30. Solve the following Linear Programming Problem graphically:**

$Maximize\ Z = 400x + 300y\ subject\ to$

$x + y \leq 200, \quad x \leq 40, \quad x \geq 20, \quad y \geq 0$

**Q31** $If\ y = 3\cos(logx) + 4\sin(logx), show\ that: \quad x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$

## SECTION D

**(This section comprises of long answer-type questions (LA) of 5 marks each)**

**Q32. Make a rough sketch of the region in the first quadrant enclosed by x-axis, the line** $x = \sqrt{3}y$ **and the circle** $x^2 + y^2 = 4$ **and find its area using integration.**

**Q33.** $Defined\ a\ relation\ R\ in\ set\ N \times N\ as\ follows;$
$(a, b), (c, d) \in N \times N\ such\ that\ (a, b)\ R\ (c, d)\ iff\ ad = bc.$

$Prove\ that\ R\ is\ an\ equivalence\ relation.$

**OR**

$Let\ A = R - \{2\}, B = R - \{1\}. If\ f: A \to B\ is\ a\ function\ defined\ as\ f(x) = \frac{x-1}{x-2}.$

$Show\ that\ f\ is\ bijective.$

**Q34.An insect is crawling along the line** $\vec{r} = \lambda(\vec{i} - \vec{j} + \vec{k})$ **and another insect is crawling along the line** $\vec{r} = \vec{i} - j + \mu(-2\,\vec{j} + \vec{k})$. $At\ what\ points\ on\ the\ lines\ should\ they\ reach\ so\ that\ the\ distance\ between\ them\ is\ shortest?\ Find\ the\ shortest\ possible\ distance\ between\ them.$

**OR**

**Find the coordinate of the image of the point (1, 6, 3) with respect to the line $\vec{r} = (\hat{j} + 2\hat{k}) + \lambda(\hat{\imath} + 2\hat{j} + 3\hat{k})$.**

**Q35. If A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$, find $A^{-1}$. Using $A^{-1}$, solve the following system of equations:**

$$x + 2y + z = 4, \quad -x + y + z = 0, \quad x - 3y + z = 2$$

**SECTION E**

**(This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub-parts of 2 marks each.)**

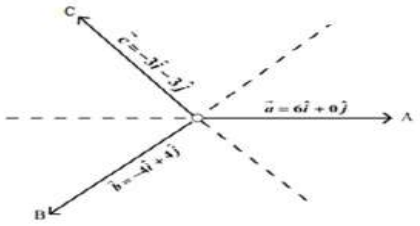
**Q36. Case-Study 1: Read the following passage and answer the following questions given below:**

**Teams A, B, C went for playing a tug of war game. Teams A, B, C have attached a rope tt a metal ring and is trying to pull the ring into their own area.**

**Team A pulls with force $F_1 = 6\hat{\imath} + 0\hat{\jmath}$ kN**

**Team B pulls with force $F_2 = -4\hat{\imath} + 4\hat{\jmath}$ kN**

**Team C pulls with force $F_3 = -3\hat{\imath} - 3\hat{\jmath}$ kN**




**(i) What is the magnitude of the force of team A?**

**(ii) Which team will win the game?**

**(iii) Find the resultant force exerted by the teams?**

**OR**

**(iii) In which direction is ring getting pulled?**

**Q37. Case study II:**


**A packaging company got the orders to make open boxes of maximum volume from rectangular sheets of dimensions 45cm × 24cm. The execution department of company suggested to cut squares of equal side from all corners of rectangular sheet and folding up the flaps as shown.**

**If square of side x cm is cut from each corner, then answer the following:**

**(i) Volume of the box is**
**(ii) The side of the square for which volume is maximum is**
**(iii)Maximum volume of the box is**

**OR**

**(iii) Area of base of box is**

**Q38. Case-Study 3: Read the following passage and answer the questions given below.**

**Recent study suggest that roughly 12% of the word population is left handed. Depending upon the parents , the chances of having a left handed childas follows:**

**A : When both father and mother are left handed :**
**Chanceges of left handed child is 24%**
**B : When father is right handed and mother is left handed :**
**Chances of left handed child is 22%**
**C : When father is left handed and mother is right handed :**
**Chanceges of left handed child is 17%.**
**D : When both father and mother are right handed :**
**Chanceges of left handed child is 9%**

**Assuming that P(A)=P(B)=P(C)=P(D)=$\frac{1}{4}$ and L denotes the event that child is left handed**

**(i) Find P($\frac{L}{C}$)**

**(ii) Find $P(\frac{\bar{L}}{A})$.**

**(iii) Find $P\left(\frac{A}{L}\right)$.**

**OR**

**(iii) Find the probality that a rendomly selected child is left handed given that exactly one of the parent is left handed.**

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PREBOARD EXAMINATION 2023-24

MATHEMATICS

CLASS XII

Time Allowed: 3 Hours Maximum Marks: 80

General Instructions:

1. This Question paper contains –Five sections A,B,C,D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion –Reason based questions of 1 mark each
3. Section B has 5 very short Answer type questions of 2 marks each
4. Section C has 6 Short Answer type questions of 3 marks each
5. Section D has 4 Long Answer type questions of 5 marks each
6. Section E has 3 source based/ case based/passage based/integrated units of assessment(4 marks each) with sub parts

## SECTION A

(Multiple choice Questions each carries 1 mark)

1. If A is a matrix of order mxn and B is a matrix such that $AB^1$ and $B^1A$ are both defined, then order of matrix B is

   a. mxm b.nxn c. nxm d. mxn

2. If $\begin{pmatrix} 1 & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ -1 \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 1 \end{pmatrix}$,then x+y+z is

   a.4 b. 3 c. 0 d. -2

3. Which of the following functions from Z toZ is bijective

   a. $f(x) = x^3$ b. f(x)=x+2 c. f(x)= 2x+1 d. $f(x)= x^2 +1$

4. If A is a square matrix of order 3,$|A^1| = -3$, then find $|AA^1|$

   a. 9 b.-9 c.-3 d.3

5. Three points P(2x,x+3), Q(0,x) and R(x+3,x+6)are collinear, then x is

   a. 0 b. 2 c. 3 d. 1

6. If $C_{ij}$ denotes the cofactor of elements $P_{ij}$ of the matrix P=$\begin{pmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & 2 & 4 \end{pmatrix}$,then the value of $C_{31}C_{23}$

   a. 5 b. 24 c. -24 d. -5

7. If $x = t^2$ and $y = t^3$ , then $\frac{d^2y}{dx^2}$ is equal to

   a. $\frac{3}{2}$ b. $\frac{3}{4t}$ c. $\frac{3}{2t}$ d. $\frac{3}{2}t$

8. $\int \frac{x^3}{x+1}dx$ is

   a. $x+\frac{x^2}{2}+\frac{x^3}{3}-\log(x+1)+c$ b. $x-\frac{x^2}{2}+\frac{x^3}{3}-\log(x+1)+c$

   c. $x+\frac{x^2}{2}-\frac{x^3}{3}-\log(x+1)+c$ d. $x+\frac{x^2}{2}+\frac{x^3}{3}+\log(x+1)+c$

9. If f : R → R defined by f(x)= $\begin{cases} \frac{\cos 3x - \cos x}{x^2} & x \neq 0 \\ \lambda & x = 0 \end{cases}$ is continuous at x=0, then $\lambda$ is equal to

a. -2 b. -4 c. -6 d. -8

10. If $\int_0^a \frac{1}{1+4x^2} dx = \frac{\pi}{8}$, then a is

a. $\frac{1}{2}$ b. $\frac{3}{5}$ c. $\frac{-1}{2}$ d. $\frac{3}{4}$

11. Which of the following is not homogeneous function of x and y

a. $x^2 - xy$ b. 2x-y c. $\cos^2\left(\frac{x}{y}\right) + \frac{y}{x}$ d. sinx-siny

12. The solution of $\log\left(\frac{dy}{dx}\right) = ax + by$ is

a. $\frac{e^{by}}{b} = \frac{e^{ax}}{a} + c$ b. $\frac{e^{by}}{-b} = \frac{e^{ax}}{a} + c$

c. $\frac{e^{-by}}{b} = \frac{e^{ax}}{a} + c$ d. $\frac{e^{-by}}{-b} = \frac{e^{ax}}{a} + c$

13. The value of $\lambda$, such that the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\hat{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal is

a.0 b. 1 c. $\frac{3}{2}$ d. $\frac{-5}{2}$

14. If $\vec{a}$ and $\vec{b}$ are unit vectors and $\theta$ be the angle between them the $|\vec{a} - \vec{b}|$ is

. a. $\sin\left(\frac{\theta}{2}\right)$ b. $2\sin\left(\frac{\theta}{2}\right)$ c. $\cos\left(\frac{\theta}{2}\right)$ d. $2\cos\left(\frac{\theta}{2}\right)$

15. If $|\vec{a}|$=10, $|\vec{b}|$=2 and $\vec{a}.\vec{b}$ =12, find $|\vec{a} \times \vec{b}|$

a.5 b. 10 c. 14 d.16

16. If the line makes an angle $\frac{\pi}{4}$ with each of y and z axis, then the angle whichit makes with x-axis is

a.0 b. $\pi$ c. $\pi/2$ d. $\pi/4$

17. The corner points of the feasible region determined by a set of linear constraints are P(0,5), Q(3,5),R(5,0) ,S(4,1) and the objective function Z = ax + 2by where a, b > 0, the condition on a and b such that the maximum Z occurs at Q and S is

a. a - 5b = 0 b. a - 3b = 0 c. a - 2b = 0 d. a - 8b = 0

18. The value of $\tan^{-1}\left[2\sin\left(2\cos^{-1}\frac{\sqrt{3}}{2}\right)\right]$ is

a.$\pi/3$ b. $2\pi/3$ c. $-\pi/3$ d. $\pi/6$

## ASSERTION- REASON BASED QUESTIONS

In the following questions, a statement of Assertion is followed by a statement of Reason. Choose the correct answer out of the following choices

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true and R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

19. **Assertion:** For an objective function Z = 15x + 20y, corner points are (0,0), (10,0),(0,15) and (5,5). Then optimal values are 300 and 0 respectively.
**Reason:** The maximum or minimum value of an objective function is known as optimal value of LPP. These values are obtained at corner points

20. **Assertion:** If A andB are any two events such that 2P(A) = P(B) = $\frac{5}{13}$ and P(A/B) = $\frac{2}{5}$ then P(AUB) = $\frac{11}{26}$
**Reason:** For any two events A and B,P(AUB) = P(A) +P(B) – P(A ∩B)

## SECTION B

(This section comprises of very short answer type questions (VSA) of 2 marks each

21. Find the value of $\cos^{-1}(\cos\frac{2\pi}{3}) + \sin^{-1}(\cos\frac{2\pi}{3})$

**OR**

Show that the function f :**R**→**R** defined as f(x) = $x^2$ is neither one one nor onto

22. If f(x) = $\begin{cases} x^2 & x \geq 1 \\ x & x < 1 \end{cases}$, then show that f is not differentiable at x = 1

23. The side of an equilateral triangle are increasing at the rate of 2cm/s. find the rate at which the area increases, when the side is 10cm.

24. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, find $(\vec{r} \times \hat{i}).(\vec{r} \times \hat{j})$ + xy

**OR**

Find the angle between $\frac{-x+2}{-2} = \frac{y-1}{7} = \frac{z+3}{-3}$ and $\frac{x+2}{-1} = \frac{2y-8}{4} = \frac{z-5}{4}$ and check whether the lines are parallel or perpendicular

25. Find a unit vector perpendicular to each of the vectors $\vec{a}$ and $\vec{b}$ where $\vec{a} = 5\hat{i} + 6\hat{j} - 2\hat{k}$ and $\vec{b} = 7\hat{i} + 6\hat{j} + 2\hat{k}$

## SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

26. Evaluate $\int \frac{dx}{\sqrt{3-2x-x^2}}$ **OR** Evaluate $\int_1^3 \frac{\sqrt{x}}{\sqrt{4-x}+\sqrt{x}} dx$

27. Differentiate $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$ with respect to x

28. Find $\int \frac{\cos x}{(1+\sin x)(2+\sin x)} dx$

29. Solve the differential equation $x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$

**OR**

Find the particular solution of the differential equation $(1+e^{2x})dy + e^x(1+y^2)dx = 0$, given that y(0) =1

30. Solve the following LPP graphically, minimise Z = 5x + 10y subject to constraints
x + 2y ≤ 120, x + y ≥ 60 ,x - 2y ≥ 0 , x,y ≥ 0

31. Let X denote the number of colleges where you will apply after your results and P(X=x) denote your probability of getting admission in x number of colleges. It is given that $P(x)=\begin{cases} kx & x=0 \text{ and } x=1 \\ 2kx & x=2 \\ k(5-x) & x=3 \text{ and } x=4 \\ 0 & x>4 \end{cases}$ where k is a positive constant. Find the value of k. Also find the probability that you will get admission in at most 2 colleges

**OR**

A coin is biased so that the head is three times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of tails. Hence find the mean of the number of tails.

## SECTION D

**(**This section comprises of long answer type questions (LA) of 5 marks each**)**

32. If A = $\begin{pmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{pmatrix}$, find $A^{-1}$. Use $A^{-1}$ to solve the following system of equations

2x-3y+5z=11, 3x+2y-4z = -5, x + y - 2z = -3

33. Show that the lines $\vec{r}=3\hat{i}+2\hat{j}-4\hat{k}+\lambda\left(\hat{i}+2\hat{j}+2\hat{k}\right)$ and $\vec{r}=5\hat{i}-2\hat{j}+\mu\left(3\hat{i}+2\hat{j}+6\hat{k}\right)$ are intersecting. Hence find the point of intersection.

**OR**

Find the equation of line passing through the point (2,-1,3) and perpendicular to the lines $\vec{r}=\hat{i}+\hat{j}-\hat{k}+\lambda\left(2\hat{i}-2\hat{j}+\hat{k}\right), \vec{r}=2\hat{i}-\hat{j}-3\hat{k}+\mu\left(\hat{i}+2\hat{j}+2\hat{k}\right)$

34. Sketch the graph of y=|x-1| and using integration evaluate $\int_0^4 |x-1|dx$

35. Define the relation R in the set NxN as follows
For (a,b),(c,d) NxN, (a,b)R(c,d) iff ad=bc. Prove that R is an equivalence relation in NxN

**OR**

Check whether the relation R in the set Z defined as R = {(a,b): a+b is divisible by 2} is reflexive, symmetric or transitive. Write the equivalence class containing 0

## SECTION E

(This section comprises of 3 case study /passage based questions of 4 marks each with two sub parts. First two case study questions have three sub parts of marks 1,1,2 respectively. The third case study questions has two sub parts of 2 marks each)

36. A person has to reach a company for an interview. He has four options to reach a company i.e. by metro, by bus, by scooter or by other means of transport. The probabilities of using these means are 3/10, 1/5,1/10 and 2/5 respectively. The probabilities that he will be late if he comes by metro, bus or scooter are 1/4, 1/3and 1/12respectively but if he comes by other means of transport he will not be late. Using above information answer the following questions

a.What is the conditional probability of reaching late by other means of trasports

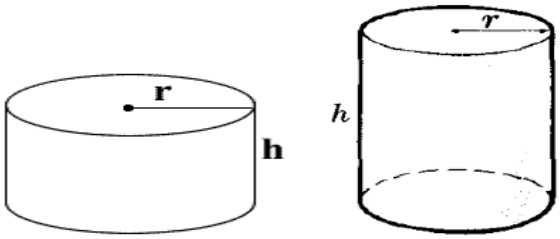
b.What is the probability that he travelled by bus and was late

c. What is the probability of reaching late?

**OR**

What is the probability that he reached late to company if he used metro as mean of transport

37. A company is launching a new product and decided to pack the product in the form of a closed right circular cylinder of volume $432\pi$ ml and having minimum surface area as shown. They tried different options and tried to get the solution by answering the questions given below:




a.If r is the radius of base of cylinder and h is the height of cylinder then establish the relation between r and h

b.Find the total surface area in terms of r only

c. Find the radius r for minimum surface area

**OR**

Find the minimum surface area

38. To reduce global warming, environmentalists and scientists came up with an innovative idea of developing a special bulb that would absorb harmful gases and thereby reduce global warming. But during the process of absorption the bulb would get inflated and its radius would be increasing at 1cm/sec

a.Find the rate at which the volume increases when the radius is 6 cm

b.At an instant when the volume was increasing at the rate of $400\pi cm^3$ /sec, find the rate at which its surface area is increasing.

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