V I B G Y O R H I G H

First Preliminary Examination

AY 2020-2021

MATHEMATICS

Grade: X **Max. Marks : 80**

Date: 07/12/2020 **Time Allowed: 2½ hours**

INSTRUCTIONS: -

- **Answers to this paper must be written on the paper provided separately.**
- **You will not be allowed to write during the first 15 minutes.**
- **This time is to be spent in reading the question paper.**
- **The time given at the head of this paper is the time allowed for writing the answers.**
- **Attempt all questions from Section A and any four question from Section B**
- **The intended marks for the questions or parts of questions are given alongside the questions.**
- **All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer. Omission of essential working will result in the loss of marks.**
- **For geometry, figures are to be copied to the answer script.**

SECTION A (40 Marks)

(Attempt **all** questions from this section)

Q.1 **[10]**

a Solve the following inequation and represent the solution set on the real number line. [3]

$$-3 < \frac{-1}{2} - \frac{2x}{3} \leq \frac{5}{6},\ x \in R$$

b A man gets ₹ 4,956 at the end of one year at the rate of 6% p.a. in a recurring deposit account. Find his monthly instalment. [3]

c If $\begin{bmatrix} 8 & -2 \\ 1 & 4 \end{bmatrix} \times Z = \begin{bmatrix} 12 \\ 10 \end{bmatrix}$, Write [4]

(i) the order of the matrix Z

(ii) the matrix Z.

Q. 2 **[10]**

a There are 25 discs numbered 1 to 25. They are put in a closed box and shaken thoroughly. A disc is drawn at random from the box. Find the probability that the number on the disc is: [3]

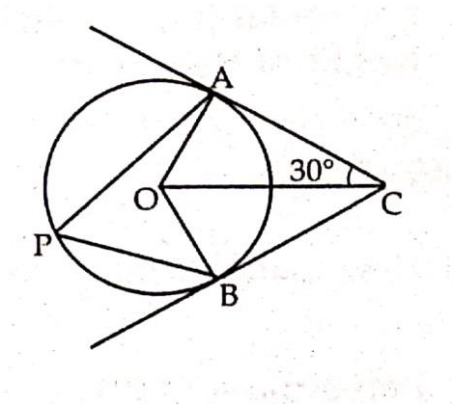
(i) an odd number

(ii) divisible by 2 and 3

(iii) multiple of 3 or 5.

b In the adjoining figure, O is the centre of the circle. Tangents to the circle at A and B meet at C. If $\angle ACO$ = 30°, find [3]

(i) $\angle BCO$ (ii) $\angle AOB$ (iii) $\angle APB$



c The distribution given below shows the marks obtained by 25 students in an aptitude test. Find the mean, median and mode of the distribution. [4]

Marks Obtained	5	6	7	8	9	10
No. Of students	3	9	6	4	2	1

[10]

Q.3

a Using remainder theorem, factorise the expression $x^3 - 2x^2 - 5x + 6$ completely [3]

b If -4 is a root of the quadratic equation $x^2 + kx - 4 = 0$ and the quadratic equation $x^2 + kx + p = 0$ has equal roots, find the value of p. [3]

c The sum of first three terms of an arithmetic progression is 42 and the product of the first and third terms is 52. Find the first term and the common difference. [4]

Q.4 **[10]**

a If a, b, and c are in continued proportion, prove that : [3]

$$\frac{a^4+a^2b^2+b^4}{b^4+b^2c^2+c^4} = \frac{a^2}{c^2}$$

b Prove the identity : $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} = \sin A + \cos A$ [3]

c Use a graph paper to answer this question [4]

(i) Plot the points A(4,6) and B(1,2)

(ii) A' is the image of A when reflected in x-axis and B' is the image of B when reflected in the line AA'. Write

the co-ordinates of A' and B'

(iii) Give the geometrical name for the figure ABA'B'

(iv) Find the area of the figure ABA'B'

SECTION B(40 Marks)

(Attempt any **four** questions from this section)

Q.5 **[10]**

a Naveen has a cumulative deposit account in State Bank of India and deposits ₹ 600 per month. The rate of interest paid by the bank is 10 % per annum. If the maturity value of his deposits is ₹ 24,930, find the time in years for which the account was held. [3]

b Solve the following equation: $x - \frac{18}{x} = 6$ and give your answer correct to two significant figures [3]

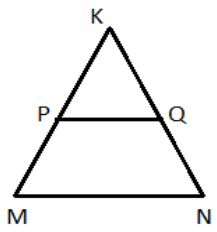
c A vessel in the form of an inverted cone is filled with water to the brim. Its height is 20 cm and diameter is 16.8 cm. Two equal solid cones are dropped in it so that they are fully submerged. As a result, one third of water in the original cone overflows. [4]

(i) What is the volume of each of the solid cone submerged?

(ii) If the height of each solid cone is 30 cm, find its radius.

Q.6 **[10]**

a In the figure, PQ is parallel to MN. If $\frac{KP}{PM} = \frac{4}{13}$ and KN = 20.4 cm, then find KQ [3]

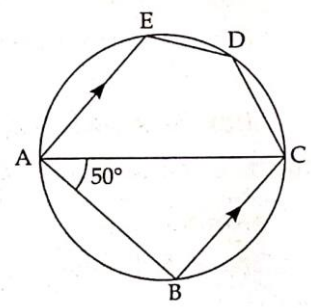


b ABC is a triangle and G(4,3) is the centroid of the triangle. If A, B and C are the points (1,3), (4,b) and (a,1) respectively. Find the values of a and b. [3]

c In the adjoining figure, ABCDE is a pentagon inscribed in a circle such that AC is a diameter and side BC // AE. If $\angle BAC$ =50°, find (giving reasons) [4]

(i) $\angle ACB$ (ii) $\angle EDC$ (iii) $\angle BEC$

Hence prove that BE is also a diameter.

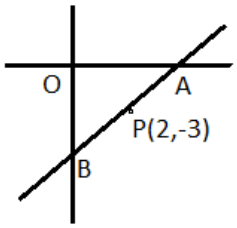


Q.7 **[10]**

a A and B are two points on the x-axis and y-axis respectively. P(2, - 3) is the mid-point of AB. Find: [3]

(i) The co-ordinates of A and B

(ii) The equation of the line AB.



b The fourth term of an A.P is 11. The sum of the 5th and 7th terms of the A.P is 34. Find the common difference. [3]

c If $2x^3 + a\,x^2 + bx - 2$ has a factor $(x + 2)$ and leaves a remainder 7 when divided by $(2x - 3)$, find the values of a and b. [4]

Q.8 **[10]**

a If $\mathcal{X} = \dfrac{\sqrt[3]{a+1} + \sqrt[3]{a-1}}{\sqrt[3]{a+1} - \sqrt[3]{a-1}}$, prove that $\mathcal{X}^3 - 3a\mathcal{X}^2 + 3\mathcal{X} - a = 0$ [3]

b If $A = \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix}$, find the matrix B such that $A^2 - 2B = 3A + 5I$, where I is a 2x 2 identity matrix. [3]

c A train covers a distance of 600 Km at $\mathcal{X}$ km/hr. Had the speed been $(\mathcal{X} + 20)$ km/hr the time taken to cover the distance would have been reduced by 5 hours. Write down an equation in $\mathcal{X}$ and solve it to evaluate $\mathcal{X}$ [4]

Q.9 **[10]**

a The daily wages of 80 workers in a project are given below: [6]

Wages (in ₹)	400 - 450	450 - 500	500 - 550	550 - 600	600 - 650	650 - 700	700 - 750
No. of workers	2	6	12	18	24	13	5

Use a graph paper to draw an ogive for the above distribution. Use your ogive to estimate:

(i) The median wage of the workers

(ii) The lower quartile wage of the workers

(iii) The number of workers who earn more than ₹ 625 daily

b A man observes the angle of elevation of the top of the tower to be 45°. He walks towards it in a horizontal line through its base. On covering 20 m the angle of elevation changes to 60°. Find the height of the tower correct to two significant figures [4]

Q.10 **[10]**

a Prove that $\sqrt{sec^2\theta + cosec^2\theta}$ = tan θ + cot θ [3]

b The mean of the following distribution is 49. Find the missing frequency a [3]

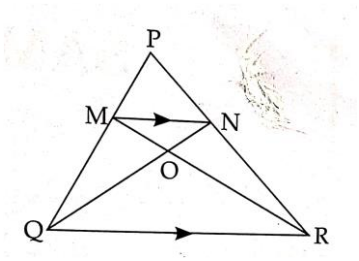
Class Interval	0-20	20-40	40-60	60-80	80-100
Frequency	15	20	30	a	10

c In triangle PQR, MN is parallel to QR and $\frac{PM}{MQ} = \frac{2}{3}$ [4]

(i) Find $\frac{MN}{QR}$

(ii) Prove that Δ OMN and Δ ORQ are similar.

(iii) Find area of Δ OMN : area of Δ ORQ



Q.11 **[10]**

a A dealer buys an article at a discount of 25% from the wholesaler, the marked price being ₹ 8000.The dealer sells it to a consumer at a discount of 10% on the marked price. If the sales are intra-state and the rate of GST is 12% find: [3]

(i) The amount paid by the consumer for the article.

(ii) The amount of GST paid by the dealer to the State Government

(iii) The amount of GST received by the Central Government.

b Find the equation of a line passing through the point (- 2 , 3) and having the x-intercept of 4 units. [3]

c A cylindrical container is to be made of tin sheet. The height of the container is 1 m and its diameter is 70 cm. If the container is open at the top and the tin sheet costs ₹ 300 per m^2, find the cost of the tin sheet for making the container. [4]

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