# ARYAN INSTITUTE

## Sample Question Paper

## Class – 11th

## Subject - Mathematics

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

### General Instructions :

1. *All questions are* ***compulsory****.*
2. *The question paper consists of* ***36*** *questions divided into* ***4 Sections A, B, C*** *and* ***D****.*
3. *Section A comprises of* ***20*** *questions of* ***1*** *mark each, Section B comprises of* ***6*** *questions of* ***2*** *marks each, Section C comprises of* ***6*** *questions of* ***4*** *marks each and Section D comprises of* ***4*** *questions of* ***6*** *marks each.*
4. *There is no overall choice. However internal choice has been provided in* ***6*** *questions of* ***1*** *mark,* ***2*** *questions of* ***2*** *marks,* ***2*** *questions of* ***4*** *marks and* ***2*** *questions of* ***6*** *marks. You have to attempt only one of the alternatives in all such questions.*
5. *Write the serial number of questions before attempting.*
6. *Use of a calculator is not permitted.*

## Section - A

***Question numbers 1 to 10 carries 1 mark each. For each of these questions, four alternative choices have been provided of which only one choice is correct. Select the correct choice :***

**1.** If $x, 2y, 3z$ are in A.P. where the distinct numbers $x, y, z$ are in G.P. then the common ratio of the G.P. is

**(A)** 3 **(B)** $\frac{1}{3}$

**(C)** 2 **(D)** $\frac{1}{2}$

**2.** One vertex of the equilateral triangle with centroid at the origin and one side as $x + y - 2 = 0$ is

**(A)** $(-1, -1)$ **(B)** $(2, 2)$

**(C)** $(-2, -2)$ **(D)** $(2, -2)$

**OR**

For specifying a straight line, how many geometrical parameters should be known?

**(A)** 1 **(B)** 2

**(C)** 3 **(D)** 4

**3.** If $y = \frac{\sin(x+9)}{\cos x}$ then $\frac{dy}{dx}$ at $x = 0$ is equal to :

**(A)** cos 9 **(B)** sin 9

**(C)** 0 **(D)** 1

**OR**

If $f(x) = x - [x], \in R$, then $f'\left(\frac{1}{2}\right)$ is equal to :

**(A)** $\frac{3}{2}$ **(B)** 1

**(C)** 0 **(D)** –1

**4.** $L$ is the foot of the perpendicular drawn from a point $P(3, 4, 5)$ on the XY-plane. The coordinates of point L are

(A) $(3, 0, 0)$ (B) $(0, 4, 3)$

(C) $(3, 0, 5)$ (D) None of these

OR

What is the length of foot of perpendicular drawn from the point $P\ (3, 4, 5)$ on $Y$-axis?

(A) $\sqrt{41}$ (B) $\sqrt{34}$

(C) 5 (D) None of these

**5.** The following information relate to a sample of size 60, $\Sigma x^2 = 18000$, and $\Sigma x = 960$. Then, the variance is AI

(A) 6.63 (B) 16

(C) 22 (D) 44

**6.** If a single letter is selected at random from the word 'PROBABILITY'. Then find the probability if is a vowel. AI

(A) $\frac{1}{3}$ (B) $\frac{4}{11}$

(C) $\frac{2}{11}$ (D) $\frac{3}{11}$

**7.** If $|x + 2| \leq 9$, then

(A) $x \in (-7, 11)$ (B) $x \in (-11, 7)$

(C) $x \in (-\infty, -7) \cup (11, \infty)$ (D) $x \in (-\infty, -7) \cup (-11, \infty)$

**8.** The eccentricity of the hyperbola whose latus rectum is 8 and conjugate axis is equal to half of the distance between the foci is

(A) $\frac{4}{3}$ (B) $\frac{4}{\sqrt{3}}$

(C) $\frac{2}{\sqrt{3}}$ (D) None of these

**9.** Equation of Y-axis is considered as AI

(A) $x = 0, y = 0$ (B) $y = 0, z = 0$

(C) $z = 0, x = 0$ (D) None of these

**10.** If $a, b, c, d$ and $e$ be the observation of the mean $m$ and standard deviation $s$, then find the standard deviation of the observations $a + k, b + k, c + k, d + k$ and $e + k$ is AI

(A) $s$ (B) $ks$

(C) $s + k$ (D) $\frac{s}{k}$

***Question numbers 11 to 15 carry 1 mark each. Write whether the statement is true/false.***

**11.** The last two digits of the numbers $3^{400}$ are 01. AI

OR

If the expansion of $\left(x - \frac{1}{x^2}\right)^{2n}$ contains a term independent of $x$, then $n$ is a multiple of 2.

**12.** If $x < -5$ and $x > -2$, then $x \in (-\infty, -5)$.

**13.** Equation of the line passing through the point $(a \cos^3 \theta, a \sin^3 \theta)$ and perpendicular to the line $x \sec \theta + y \operatorname{cosec} \theta = a$ is $x \cos \theta - y \sin \theta = a \sin 2\theta$. AI

**14.** The point (1, 2) lies inside the circle $x^2 + y^2 - 2x + 6y + 1 = 0$ AI

**15.** The probability that a person visiting a zoo will see the giraffe is 0.72, the probability that he will see the bears is 0.84 and the probability that he will see both is 0.52.

*Question numbers 16 to 20 carry 1 mark each.*

**16.** If $R = \{x, y\} : x, y \in z, x^2 + y^2 = 64\}$, then, write $R$ in roster form.

OR

Let $A = \{1, 2\}, B = \{2, 3, 4\}, C = \{4, 5\}$, find $A \times (B \cap C)$.

**17.** Let $A$, $B$ and $C$ be the sets such that $A \cup B = A \cap B = A \cap C$. Show that $B = C$. AI

**18.** Write the maximum value of $\cos(\cos x)$.

OR

Find the coordinates of a point on the parabola $y^2 = 8x$, whose focal distance is 4.

**19.** Find the solution of equation $x^2 + x + 1 = 0$.

**20.** In how many ways 7 pictures can be hanged on 9 pegs?

## Section - B

*Question numbers 21 to 26 carry 2 marks each.*

**21.** Find the angles between the lines $\sqrt{3}x + y = 1$ and $x + \sqrt{3}y = 1$

OR

Evaluate $\lim\limits_{x \to 0} \dfrac{\sin x - 2\sin 3x + \sin 5x}{x}$.

**22.** If $\tan x = \dfrac{b}{a}$, then find the value of AI

$$\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$$

**23.** Given $L = \{1, 2, 3, 4\}$, $M = \{3, 4, 5, 6\}$ and $N = \{1, 3, 5\}$.

Verify that $L - (M \cup N) = (L - M) \cap (L - N)$

**24.** Evaluate $\lim\limits_{x \to 0} \dfrac{\sqrt{1+x^3} - \sqrt{1-x^3}}{x^2}$

**25.** Find the angle in radians between the hands of a clock at 7 : 20 p.m.

**26.** From a group of 2 boys and 3 girls, two children are selected. Find the sample space of this experiment. AI

OR

If A and B are mutually exclusive events, $P(A) = 0.35$ and $P(B) = 0.45$, then find $P(A' \cap B')$

## Section - C

*Question numbers 27 to 32 carry 4 marks each.*

**27.** If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, then prove that $\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$. AI

OR

If $a\cos 2\theta + b\sin 2\theta = c$ has $\alpha$ and $\beta$ as its roots, then prove that $\tan\alpha + \tan\beta = \dfrac{2b}{a+c}$

**28.** If $\left|\dfrac{z-5i}{z+5i}\right| = 1$ show that $z$ is a real number : AI

**29.** Find the mean deviation about the median for the following data :

| Marks | 0 — 10 | 10 — 20 | 20 — 30 | 30 — 40 | 40 — 50 | 50 — 60 |
|---|---|---|---|---|---|---|
| Number of girls | 6 | 8 | 14 | 16 | 4 | 2 |

**30.** Prove that : $\cos^2 x+\cos^2\left(x+\frac{\pi}{3}\right)+\cos^2\left(x-\frac{\pi}{3}\right)=\frac{3}{2}$

**OR**

Find the equation of the circle passing through the points (4, 1) and (6, 5) and whose centre is on the line $4x + y = 16$.

**31.** Show that the set of all points such that the difference of their distance from (4, 0) and (–4, 0) is always equal to 2 and it represent a hyperbola.

**32.** Find the term independent of $x$ in the expansion of $(1+x+2x^3)\left(\frac{3}{2}x^2-\frac{1}{3x}\right)^9$

## Section - D

*Question numbers 33 to 36 carry 6 marks each.*

**33.** In a group of students, 225 students know French, 100 know Spanish and 45 know both. Each student know either French or Spanish. How many students are there in the groups.

**34.** Evaluate $\lim\limits_{x\to 0}\frac{\sqrt{2}-\sqrt{1+\cos x}}{\sin^2 x}$

**OR**

$\lim\limits_{y\to 0}\frac{(x+y)\sec(x+y)-x\sec x}{y}$

**35.** Solve the following system of inequalities graphically

$3x + 2y \le 150, x + 4y \le 80, x \le 15, y \ge 0$.

**36.** If $a$ is the A.M of $b$ and $c$ and a is one AM and $G_1$ and $G_2$ are two geometric means of two numbers b and c means are $G_1$ and $G_2$ then prove that $(G_1)^3 + (G_2)^3 = 2abc$.

**OR**

The diameter of circles (in mm) drawn in a design are given below :

| Diameter (in mm) | 33 – 36 | 37 – 40 | 41 – 44 | 45 – 48 | 49 – 52 |
|---|---|---|---|---|---|
| No. of Circles | 15 | 17 | 21 | 22 | 25 |

Calculate the standard deviation and mean diameter of the circles.

**[Hint :** First make the data continuous by making the classes as 32.5 – 36.5, 36.5 – 40.5, 40.5 – 44.5, 44.5 – 48.5, 48.5 – 52.5 and then proceed].

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