# PRACTICE PAPER – 1 (2020-21)
# CLASS XII
# MATHEMATICS

**TIME ALLOWED: 3 HOURS** **MAXIMUM MARKS: 80**

## GENERAL INSTRUCTIONS:

1. This question paper contains two parts A and B. Each part is compulsory. Part A carries 24 marks and Part B carries 56 marks.
2. Part-A has Objective Type Questions and Part -B has Descriptive Type Questions.
3. Both Part A and Part B have choices.

### Part – A

1. It consists of two sections- I and II.
2. Section I comprises of 16 very short answers type questions.
3. Section II contains 2 case studies. Each case study comprises of 5 case-based MCQs. An examinee is to attempt any 4 out of 5 MCQs.

### Part – B

1. It consists of three sections- III, IV and V.
2. Section III comprises of 10 questions of 2 marks each.
3. Section IV comprises of 7 questions of 3 marks each.
4. Section V comprises of 3 questions of 5 marks each.
5. Internal choice is provided in 3 questions of Section –III, 2 questions of Section IV and 3 questions of Section-V. You have to attempt only one of the alternatives in all such questions.

## PART – A
## SECTION – I
**All questions are compulsory. In case of internal choices attempt any one.**

1. Find The Principal Value of $Sin^{-1}(Sin\frac{3\pi}{4})$.

2. Find the probability of obtaining an even prime number on each die, when a pair of dice is Rolled.

3. Find the value of x is, if $Sin[\mathrm{Sin}^{-1}(\frac{x}{5})+\mathrm{Cos}^{-1}(\frac{3}{5})]=1$

4. How many arbitrary constants are there in the particular solution of the differential equation $\frac{dy}{dx}=-4xy;\ \ y(0)=1$

5. Find the area bounded by $y = x^2$, *the* x – axis and the lines $x = -2$ and $x = 2$.

**OR**

Give an example of a function which is continuous everywhere but fails to be differentiable at exactly two points.

**6. If** $(\vec{a}\times\vec{b})^2+(\vec{a}.\vec{b})^2=225\ \ and\ \ |\vec{a}|=5$ **then find the value of** $|\vec{b}|$.

**7. Find the perpendicular distance of P (1, 1, 1) from the plane 2x + 2y – z = 6.**

**8. Find the integrating factor for solving the differential equation:** $x\dfrac{dy}{dx}-2y=e^x.x^3$.

**9. Find the value of** $\int_{-\pi}^{\pi} x^3\sin^2 x.dx.$

**OR**

**If** $\int e^x(x+1)dx=f(x)+c\ ,then\ \ find\ \ f(x).$

**10. Find the slope of the tangent to the curve y = $x^3$ – x at x = 2.**

**11. Given that the two numbers appearing on throwing two dice are different. Find the probability of the event 'the sum of numbers on the dice is 4'.**

**12. If** $A=\begin{bmatrix}2 & 1\\ 5 & 3\end{bmatrix}, find\ \ AA^{-1}.$

**OR**

**If A is a square Matrix such that $A^2$ = A, then Find the value of (m + n), If $(I + A)^3$ – 7A = m I** + nA. (Where m and n are Constants)

**13. Write the direction cosines of x-axis.**

**14. Find the value** $|\hat{i}-\hat{j}|^2$.

**OR**

**Find the Projection of** $2\hat{i}-\hat{j}+2\hat{k}$ **on** $\hat{i}-2\hat{j}-2\hat{k}$.

**15. For what value of 'm' is the following a homogeneous differential equation:**

$$\frac{dy}{dx}=\frac{y^m+\sqrt{x^2+y^2}}{x}$$

**OR**

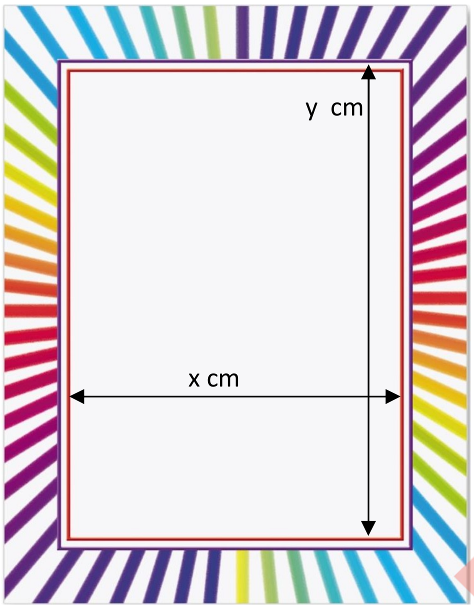
**Find the Sum of the order and degree of the differential equation:** $(\dfrac{dy}{dx})^3+\dfrac{d^2y}{dx^2}=3$.

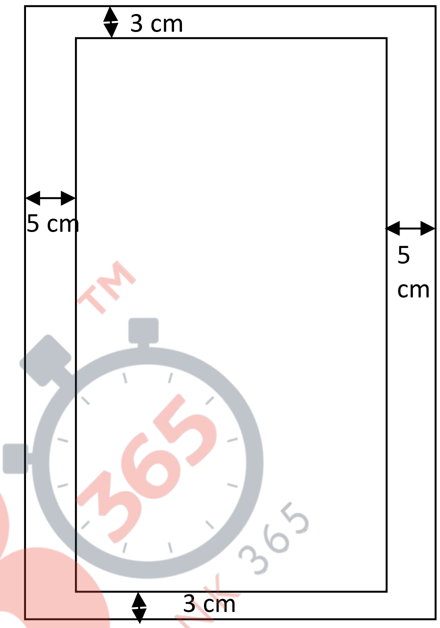
**16. What is the cosine of the angle which the vector** $\sqrt{2}\hat{i}+\hat{j}+2\hat{k}$ **makes with y – axis.**

**Section II**

**Both the Case study based questions are compulsory.**
**Attempt any 4 sub parts from each question (17 and 18).**
**Each question carries 1 mark.**

**17. A printed page must contain 60 $cm^2$ of printed material. There are to be margins of 5 cm on either side and margins of 3 cm on the top and bottom (Fig. 16-3).**




**Let x be the length of the line and let y be the height of the printed material**
**Based on the above information answer the following:**

**(i) What will be the relation between x and y?**
- (a) $xy = 15$
- (b) $xy = 5$
- (c) $xy = 3$
- (d) $xy = 60$

**(ii) What will be the total area (A) of the paper in terms of x and y?**
- (a) $A = (x + 5)(y + 3)$
- (b) $A = (x + 3)(y + 5)$
- (c) $A = (x + 10)(y + 6)$
- (d) $A = (2x + 10)(2y + 6)$

**(iii) What will be the total area (A) of the paper in terms of x?**
- (a) $A = 20 + x + \dfrac{100}{x}$
- (b) $A = 6(20 + x + \dfrac{100}{x})$

(c) $A = 60 + x + \dfrac{100}{x}$

(d) $A = 20 + 100x + \dfrac{1}{x}$

**(iv) How long should the printed lines be in order to minimize the amount of paper used?**

**(a) 6 cm**
**(b) 8 cm**
**(c) 10 cm**
**(d) 12 cm**

**(v) How long should the printed material in height in order to minimize the amount of paper used?**

**(a) 6 cm**
**(b) 8 cm**
**(c) 10 cm**
**(d) 5 cm**

**18. Two farmers Ramkishan and Gurcharan Singh cultivates only three varieties of rice namely Basmati, Permal and Naura. The Quantity of sale (in Kg) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B.**

$$A(September\ \ sales) = \begin{array}{c} \begin{matrix}\text{BASMATI} & \text{PERMAL} & \text{NAURA}\end{matrix} \\ \begin{bmatrix} 1000 & 2000 & 3000 \\ 5000 & 3000 & 1000 \end{bmatrix} \end{array} \begin{matrix}\text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH}\end{matrix}$$

$$B(October\ \ sales) = \begin{array}{c} \begin{matrix}\text{BASMATI} & \text{PERMAL} & \text{NAURA}\end{matrix} \\ \begin{bmatrix} 5000 & 10000 & 6000 \\ 20000 & 10000 & 10000 \end{bmatrix} \end{array} \begin{matrix}\text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH}\end{matrix}$$

**Based on the above information answer the following:**

**(i) Find the combined sales in September and October for each farmer in each variety.**

$$(a) Total\ \ sales = \begin{array}{c} \begin{matrix}\text{BASMATI} & \text{PERMAL} & \text{NAURA}\end{matrix} \\ \begin{bmatrix} 6000 & 3000 & 9000 \\ 7000 & 13000 & 2000 \end{bmatrix} \end{array} \begin{matrix}\text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH}\end{matrix}$$

$$(b) Total\ \ sales = \begin{array}{c} \begin{matrix}\text{BASMATI} & \text{PERMAL} & \text{NAURA}\end{matrix} \\ \begin{bmatrix} 6000 & 12000 & 9000 \\ 7000 & 13000 & 2000 \end{bmatrix} \end{array} \begin{matrix}\text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH}\end{matrix}$$

$$(c) Total\ \ sales = \begin{array}{c} \begin{matrix}\text{BASMATI} & \text{PERMAL} & \text{NAURA}\end{matrix} \\ \begin{bmatrix} 6000 & 12000 & 9000 \\ 25000 & 13000 & 2000 \end{bmatrix} \end{array} \begin{matrix}\text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH}\end{matrix}$$

$$(d) Total\ \ sales = \begin{array}{c} \begin{matrix}\text{BASMATI} & \text{PERMAL} & \text{NAURA}\end{matrix} \\ \begin{bmatrix} 6000 & 12000 & 9000 \\ 25000 & 13000 & 11000 \end{bmatrix} \end{array} \begin{matrix}\text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH}\end{matrix}$$

**(ii) Find the decrease in sales from September to October.**

$$(a)\,Net\ Decrease\ in\ sales = \begin{array}{c} \begin{array}{ccc} \text{BASMATI} & \text{PERMAL} & \text{NAURA} \end{array} \\ \begin{bmatrix} 4000 & 8000 & 9000 \\ 7000 & 13000 & 2000 \end{bmatrix} \end{array} \begin{array}{l} \text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH} \end{array}$$

$$(b)\,Net\ Decrease\ in\ sales = \begin{array}{c} \begin{array}{ccc} \text{BASMATI} & \text{PERMAL} & \text{NAURA} \end{array} \\ \begin{bmatrix} 4000 & 8000 & 3000 \\ 15000 & 13000 & 2000 \end{bmatrix} \end{array} \begin{array}{l} \text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH} \end{array}$$

$$(c)\,Net\ Decrease\ in\ sales = \begin{array}{c} \begin{array}{ccc} \text{BASMATI} & \text{PERMAL} & \text{NAURA} \end{array} \\ \begin{bmatrix} 4000 & 8000 & 3000 \\ 15000 & 7000 & 9000 \end{bmatrix} \end{array} \begin{array}{l} \text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH} \end{array}$$

$$(d)\,Net\ Decrease\ in\ sales = \begin{array}{c} \begin{array}{ccc} \text{BASMATI} & \text{PERMAL} & \text{NAURA} \end{array} \\ \begin{bmatrix} 4000 & 8000 & 3000 \\ 15000 & 13000 & 9000 \end{bmatrix} \end{array} \begin{array}{l} \text{RAMAKRISHAN} \\ \text{GURCHARAN SINGH} \end{array}$$

**If Ramakrishan sell the variety of rice (per kg) i.e. Basmati, Permal and Naura at Rs. 30, Rs. 20 & Rs. 10 respectively, While Gurcharan Singh Sell the variety of rice (per kg) i.e. Basmati, Permal and Naura at Rs. 40, Rs. 30 & Rs. 20 respectively.**

**(iii) Find the Total Selling Price received by Ramakrishan in the month of September.**

**(a) Rs. 80,000**
**(b) Rs. 90,000**
**(c) Rs. 1,00,000**
**(d) Rs. 1,10,000**

**(iv) Find the Total Selling Price received by Gurcharan Singh in the month of September.**

**(a) Rs. 1,10,000**
**(b) Rs. 2,10,000**
**(c) Rs. 3,00,000**
**(d) Rs. 3,10,000**

**(v) Find the Total Selling Price received by Ramakrishan in the month of September & October.**

**(a) Rs. 4,00,000**
**(b) Rs. 5,00,000**
**(c) Rs. 5,10,000**
**(d) Rs. 6,10,000**

## Part – B

## Section III

**19. Check whether the relation R in the set Z of integers defined as R = {$(a, b) : a + b$ is "divisible by 2"} is reflexive, symmetric or transitive.**

**20. How many reflexive relations are possible in a set A whose $n(A)$ = 3. Also find How many symmetric relations are possible in a set B whose $n(\mathrm{B})$ = 2.**

21. Find the vector and Cartesian equation of a line joining the points B(4,7,1) and C(3,5,3).

**OR**

Prove that the lines $x = py + q$, $z = ry + s$ and $x = p'y + q'$, $z = r'y + s'$ are perpendicular if $pp' + rr' + 1 = 0$.

22. Find the area of the parallelogram whose adjacent sides are determined by the vectors

$\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ *and* $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

**OR**

Let $\vec{a},\ \vec{b}$ *and* $\vec{c}$ be three vectors such that $|\vec{a}| = 3,\ |\vec{b}| = 4,\ |\vec{c}| = 5$ & each one of them being perpendicular to the sum of the other two then find the value of $|\vec{a} + \vec{b} + \vec{c}|$.

23. Find the values of x for which $y = [x(x-2)]^2$ is an increasing function.

24. Evaluate: $\int \frac{dx}{x^2 - 4x + 3}$

25. Find $\frac{dy}{dx}$, *when* $x = a(\cos\theta + \theta\sin\theta)$, *and*, $y = a(\sin\theta - \theta\cos\theta)$

26. Show that the relation R on defined as R = {(a, b) : $a \leq b^3$} is not transitive.

**OR**

Let A = R – {3} & B= R – {$\frac{2}{3}$}, If f: A→B, f(x) = $\frac{2x-4}{3x-9}$ then prove that f is Bijective function.

27. Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx.$

28. Find the area of the region bounded by the parabola $y^2 = 8x$ and the line $x = 2$.

## Section IV

**All questions are compulsory. In case of internal choices attempt any one.**

29. Find the area of the ellipse $x^2 + 9y^2 = 36$ using integration.

30. There are three coins. One is a biased coin that comes up with tail 60% of the times, the second is also a biased coin that comes up heads 75% of the times and the third is an unbiased coin. One of the three coins is chosen at random and tossed, it showed heads. What is the probability that it was the unbiased coin?

**OR**

Four defective bulbs are accidently mixed with six good ones. If it is not possible to just look at a bulb and tell whether or not it is defective, find the probability distribution of the number of defective bulbs, if four bulbs are drawn at random from this lot.

**31. Two dice are thrown together and the total score is noted. The events E, F and G are 'a total of 4', 'a total of 9 or more', and 'a total divisible by 5', respectively. Calculate P(E), P(F) and P(G) and decide which pairs of events, if any, are independent.**

**32. Show that the function f(x) = 2x – |x| is continuous but not differentiable at x = 0.**

**OR**

**If** $y = Cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)$**, such that** $x \in (0, \frac{\pi}{2})$ **,Find the value of** $\frac{dy}{dx}$.

**33. Solve the differential equation:** $x \log x \frac{dy}{dx} + y = \frac{2}{x}\log x.$

**34. Find the equation of the tangent & Normal to the curve** $x = aSin^3\theta$ & $y = bCos^3\theta$ at $\theta = \frac{\pi}{4}$.

**35. Evaluate the integrals:** $\int_{-1}^{2} |x^3 - x|\, dx$

**OR**

**Evaluate the integrals,** $\int \frac{(x+1).dx}{(x+3)(x^2+4)}$



**SECTION – V**

**36. If** $A = \begin{bmatrix} 2 & 1 & 3 \\ 3 & 2 & 1 \\ 1 & 3 & 2 \end{bmatrix}$, **Find A$^{-1}$ and use the result to solve the following system of equations**

**2x + y + 3z = 6**
**3x + 2y + z = 6**
**x + 3y + 2z = 6**

**OR**

**If** $A = \begin{bmatrix} 1 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & 3 & 5 \end{bmatrix}$, **find A$^{-1}$ & Use it to solve the following system of equations:**

**x – y + z = 1**
**- x + 2y + 3z – 4 = 0**
**x + y + 5z = 7**

**37. Find the equation of the plane through the intersection of the planes x + 3 y + 6 = 0 and 3 x– y – 4z = 0 and whose perpendicular distance from origin is unity.**

OR

Find the distance of the point (3, 4, 5) from the plane x + y + z = 2 measured parallel to the line 2 x = y = z.

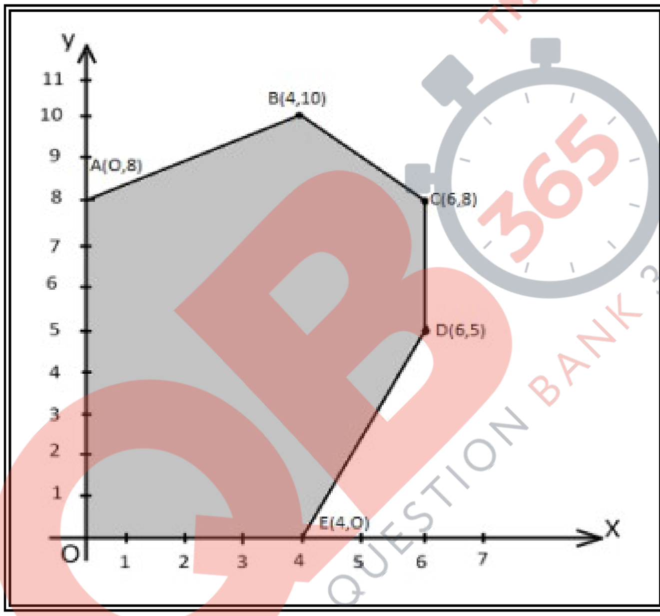
38. Solve the following linear programming problem (L.P.P) graphically.

Maximize $Z$ = 400x + 1000$y$ subject to constraints ;

$$x + y \le 200$$
$$4x - y \le 0$$
$$x \ge 20$$
$$x, y \ge 0$$

OR

The corner points of the feasible region determined by the system of linear constraints are as shown below:




Answer each of the following:

(i) Let $Z$ = 3x – 4y be the objective function. Find the maximum and minimum value of Z and also the corresponding points at which the maximum and minimum value occurs.

(ii) Let $Z = px + qy$, where $p, q > o$ be the objective function. Find the condition on $p$ and $q$ so that the maximum value of $Z$ occurs at B(4,10) $and$ C(6,8). Also mention the number of optimal solutions in this case.