Directorate of Education, GNCT of Delhi

Practice Paper -I

(2023-24)

Class – XI

Mathematics (Code: 041)

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

General Instructions :

1. This Question paper contains - **five sections A,B,C,D,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.(20 Marks)
3. **Section B**has 5 **Very Short Answer (VSA)-type** questions of 2 marks each.(10 Marks)
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3 marks each.(18 Marks)
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5 marks each.(20 Marks)
6. **Section E has 3 Source based/Case based/passage based/integrated units of assessment (4 marks each) with sub parts.(12 Marks)**

Section – A

Question Number 1-18 are of MCQ type question one mark each.

1. If $P = 3\sin 10^\circ - 4\sin^3 10^\circ$, then the value of $(2P^2 - 1)$ is : **1**

(a) -0.5	(b) 0
(c) 0.5	(d) 1

2. Which of the following is <u>not</u> equal to cos 2x? **1**

(a) $\cos^2 x - \sin^2 x$	(b) $1 - 2\sin^2 x$
(c) $1 - 2\cos^2 x$	(d) $\frac{1 - \tan^2 x}{1 + \tan^2 x}$

3. Greatest value of sinx cos x is : **1**

(a) 0	(b) -1
(c) 1	(d) 0.5

4. Power set of a set with n elements has how many subsets? **1**

(a) 2^n	(b) n^2
(c) n!	(d) n

5. The domain of the function defined by f(x)=$\sqrt{4-x}+\frac{1}{\sqrt{x^2-1}}$ is equal to : **1**

(a) $(-\infty,-1)$U (1 ,4]	(b) $(-\infty,-1]$U (1,4]
(c) $(-\infty,-1)$U [1,4]	(d) $(-\infty,-1)$U [1,4)

6. Number of relations that can be defined on the set A = {a, b, c, d} is **1**

(a) 24	(b) 4^4
(c) 16	(d) 2^{16}

7. The number of telephone calls received in 245 successive, one-minute intervals at an exchange is given below in the following frequency distribution. **1**

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Number	0	1	2	3	4	5	6	7
Frequency	14	21	25	43	51	40	39	12

What is the median of the distribution?

(a) 3.5	(b) 5
(c) 4	(d) 4.5

8. $\lim_{x\to\pi}\frac{\sin 5x}{x-\pi}$ is equal to: **1**

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

9. If the sum of n terms of an AP is given by $S_n=3n+2n^2$ then the common difference of the AP is : **1**

(a) 3	(b)2
(c) 6	(d) 4

10. Solve the system of inequalities:$4x+3\geq 2x+17, 3x-5<-2$ for the values of x, then **1**

(a) No solution	(b) $\left(\frac{-3}{2},\frac{2}{6}\right)$
(c) (-4, 12)	(d) (-2, 2)

11. If $\frac{-2}{x-3}>0$ then x belongs to : **1**

(a) $(3,\infty)$	(b)$[3,-\infty)$

	(c) $(-\infty, 3)$	(d) $(-\infty, 3]$

12. If $(1+i)^6 = p+iq$ then (p+q) equals to : **1**

(a)-2	(b) -4
(c) -6	(d)-8

13. The value of $\frac{i^{592}+i^{590}+i^{588}+i^{586}+i^{584}}{i^{582}+i^{580}+i^{578}+i^{574}} - 1$ is : **1**

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

14. If five GM.s are inserted between 486and 2/3 then fourth G.M equals: **1**

(a) 6	(b) 12
(c) 4	(d) -6

15. If P(A)=0.2 , P(B)=0.3 and P($A \cap B$)=0.1 Then P($A \cup B$) is equal to : **1**

(a) $\frac{1}{5}$	(b) $\frac{2}{5}$
(c) $\frac{1}{2}$	(d) $\frac{3}{10}$

16. $\sqrt{\frac{1+sinx}{1-sinx}}$ equals to : **1**

(a) $\cot\frac{x}{2}$	(b)$\tan\frac{x}{2}$
(c) $\tan\left(\frac{\pi}{4}+\frac{x}{2}\right)$	(d) $\cot\left(\frac{\pi}{4}+\frac{x}{2}\right)$

17. A line cutting off intercept – 3 from the y-axis and the tangent at angle to the x-axis is $\frac{3}{5}$, its equation is: **1**

(a) 5y-3x+15=0	(b) 5y-3x-15=0
(c) 3y-5x-15=0	(d) 3y-5x+15=0

18 The total number of terms in the expansion of $(x+k)^{100}+(x-k)^{100}$ after simplification is : **1**

(a) 101	(b) 50
(c) 202	(d) 51

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(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.

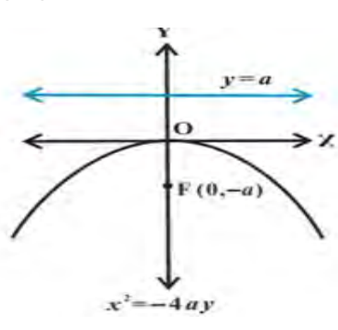
(a) Both A and R are true and R is the correct explanation of A.

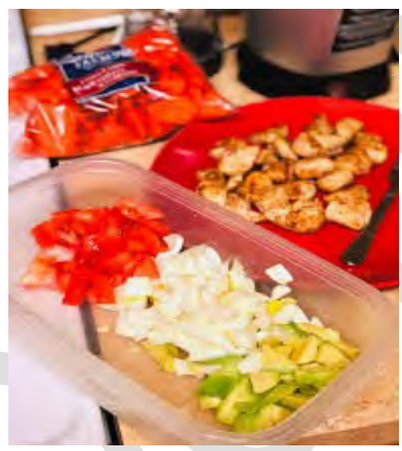
(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

19	**Assertion(A) :** Let A={a, b} and B={a, b, c}, then ,$A \not\subseteq B$ **Reason (R) :** If $A \subseteq B$, then $A \cup B = B$	
20	**Assertion(A) :** $\frac{d}{dx}\left[\left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}\right]$=1 **Reason (R) :** Derivative of a constant function is zero	**1**
	(Section B) **This section contains 5 Very Short Answer (VSA)-type questions of 2 marks each.**	
21.	Let R be a relation from N to N defined by R = {(a, b) : a, b$\in N$and $a=b^2$ }. Are the following true? (i) (a, a) for all a $\in N$ (ii) (a, b) $\in R$implies (b, a) $\in R$ (iii) (a, b)$\in R$, (b, c) $\in R$ implies (a, c) $\in R$ Justify your answer in each case. OR Find the domain and the range of the real function $f(x)=\frac{\lvert x-4\rvert}{x-4}$:	**2**
22.	Find the derivative of $\frac{\sin^2 x}{1+\cos x}$w. r. t x.	**2**
23.	Find the value of $\lim_{x\to\frac{\pi}{4}} \frac{sinx-\cos x}{x-\frac{\pi}{4}}$	**2**
24.	If the coefficient of (r-5)th and (2r-1)th term in the expansion of $(1+x)^{34}$ are equal , then find the value of x OR Find the middle term in the given expansion $(3x-\frac{x^3}{6})^9$	**2**
25.	Find the angle between the pair of straight lines x-4y=3 and 6x-y=11	**2**
	Section C	
	This section contains 6 Short Answer (SA)-type questions of 3marks each.	
26.	Let A={1, 2, 3, 4, }, B={1, 2, 3} and C={2,4}. Find all sets X satisfying each pairs of conditions : (i)$X \subset B$ and $X \not\subset C$ (ii)$X \subset B, X \neq B$ and $X \not\subset C$ (iii)$X \subset A, X \subset B$ and $X \subset C$	**3**

	OR Which of the following pair of sets are dijoint? (i){1, 2, 3, 4} and {x:x is a natural number and $4 \le x \le 6$} (ii){a, e, i, o, u}and {c, d, e,f} (iii){x:x is an even integer} and {x:x is an odd integer]	
27.	Find $(x+1)^6+(x-1)^6$. Hence or otherwise evaluate $(\sqrt{2}+1)^6+(\sqrt{2}-1)^6$	**3**
28.	Find the value of k , such that the line $x\cos\theta+y\sin\theta-k=0$ touches the circle $x^2+y^2-2ax\cos\theta-2ay\sin\theta=0$ OR If the line y=mx+1 is tangent to the parabola $y^2=4x$ then find the value of m	**3**
29.	If $^{22}P_{r+1}:{}^{20}P_{r+2}=\frac{11}{52}$, find r	**3**
30.	In an AP first term is 2 and the sum of the first five terms is one- fourth of next five terms , show that 20th term is -112 .	**3**
31.	Evaluate $\lim_{x\to 0}\frac{\sqrt{2}-\sqrt{1+\cos x}}{\sin^2 x}$ OR Differentiate $\frac{\sin x+\cos x}{\sin x-\cos x}$	**3**
	(SECTION D) This section contains **four Long Answer (LA)-type** questions of 5marks each.	
32.	A bag contains 6 red , 4 white and 8 blue balls. If three balls are drawn at random , find the probability that: (i) One is red and two are white (ii)Two are blue and one is red (iii)One is red	**5**
33.	Prove that $\cos 2x.\cos\frac{x}{2}-\cos 3x.\cos\frac{9x}{2}=\sin 5x.\sin\frac{5x}{2}$ OR Prove that $\cos 10^\circ\cos 30^\circ\cos 50^\circ\cos 70^\circ=\frac{3}{16}$	**5**
34.	Find the equation of ellipse whose foci are (4, 0) and (-4, 0), eccentricity= $\frac{1}{3}$ **OR** Find the (i)lengths of major and minor axes (ii)coordinates of the vertices (iii)coordinates of foci, (iv)eccentricityand (iv)length of latus rectum of ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$	**5**
35.	The Arithmetic Mean (AM) and Standard Deviation,(SD) OF 100 items was recorded as 40 and 5.1 respectively. Later on it was discovered that one observation 40 was wrongly copied down as 50. Find the correct standard deviation (SD)	**5**
	(Section E) **Source based/Case based/passage based/integrated units of assessment Questions**	
36.	Indian track and field athlete Neeraj Chopra becomes world No .1 in World Athletics Men's, in the Javelin throw by winning a gold medal at Tokyo Olympics. He is the first track and field athlete to win a gold medal for India at the Olympics.  	**1+1+2**

	Based on above information answer the following questions : (i)Name the shape of path followed by a javelin. If equation of such a curve is given by $x^2 = -16y$, then find the coordinates of foci. (ii) Find the equation of directrix and length of latus rectum of parabola $x^2 = -16y$. (iii) Find the equation of parabola with Vertex (0,0), passing through (5,2) and symmetric with respect to y-axis and also find equation of directrix. OR (iii) Find the equation of the parabola with focus (2, 0) and directrix x = -2 and also length of latus rectum	
37.	A restaurant at Canaught Place New Delhi offers 5 choices of appetizer, 10 choices of main meal, and 4 choices of dessert. A customer can choose to eat just one course, or two different courses, or all three courses. Assuming all choices are available,   Using the information given above answer the following : (i) If the customer has a 2 -course meal , Find the the number of ways of doing this . (ii)If the customer has 3- course meal , then find the number of combinations of doing this. (iii)Find how many different possible meals do the restaurant offer ie; number of possible meals ? OR (iii) Find the possible number of choices of a person who eats an apetiser and the main meal.	**1+1+2**
38.	In a company , 100 employees offerd to do a work . In out of them , 10 employees offered ground floor only , 15 employees offered first floor only, 10 employees offered second floor only, 30 employees offerd second and ground floor to work, 25 employees offered first and second floor , 15 employees offered ground and first floor , 60 employees offered second floor .  Based on the above information answer the following questions . (i)Find the number of employees who offered all three floors. (ii)Find the number of employees who offered grround and first floor but not second floor .	**2+2**