KENDRIYA VIDYALAYA SANGATHAN JABALPUR REGION
SESSION ENDING EXAMINATION (2022-23)
CLASS – XI, MATHEMATICS (041)

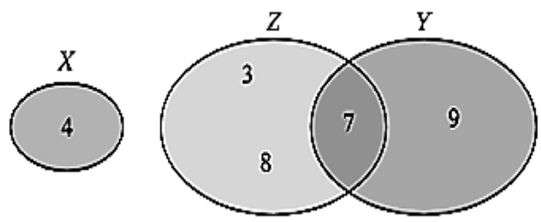
Time allowed: 3 Hours **Maximum Marks:80**

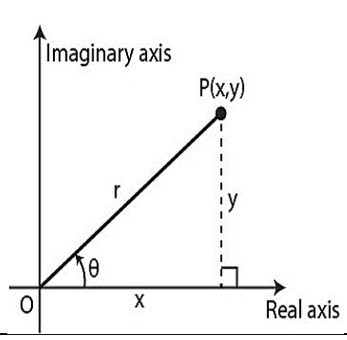
General Instructions:

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. You have to attempt only one of the alternatives in all such questions.
ii	Section A has 18 MCQ's and 02 Assertion - Reason based questions of 1 mark each.
iii	Section B has 5 Very Short Answer (VSA) - type questions of 2 marks each.
iv	Section C has 6 Short Answer (SA) - type questions of 3 marks each.
v	Section D has 4 Long Answer (LA) - type questions of 5 marks each.
vi	Section E has 3 source based / case based / passage based / integrated units of assessment (4 marks each) with sub parts.
vii	Use of calculator is not permitted. You may ask for logarithmic tables, if required.

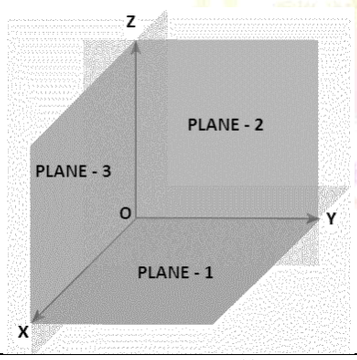
SECTION – A

Direction (Q.1 - Q.18) - There are multiple choice type questions. Choose the correct answer:

Q.	QUESTIONS	M
1	"The complement of the intersection of two sets is the union of their complements." This statement is called: (a) Complement Law (b) Associative Law (c) Idempotent Law (d) De Morgan's Law	1
2	For the Venn - diagram given below, the set $(Z - Y) \times (X \cup Y)$ is: (a) {(3,4), (3,7), (3,9), (8,4), (8,7), (8,9)} (b) (b) {(4,8), (9,8), (7,8), (4,3), (9,3), (7,3)} (c) {(8,4), (8,9), (8,7), (4,3), (9,3), (7,3)} (d) {(4,8), (9,8), (7,8), (3,4), (3,9), (3,7)} 	1
3	The domain of the function f given by $f(x) = \frac{x^2+2x+1}{x^2-x-6}$ (A) $\mathbf{R} - \{3, -2\}$ (B) $\mathbf{R} - \{-3, 2\}$ (C) $\mathbf{R} - [3, -2]$ (D) $\mathbf{R} - (3, -2)$	1
4	The angle made by an arc of unit length of a unit circle is (a) 1 degree (b) 360 degree (c) 1 radian (d) π radians	1
5	How many chords can be drawn through 15 points on a circle? (a) 30 (b) 90 (c) 105 (d) 210	1

Q.	QUESTIONS	M
6	In the figure given below, the point $P(x, y)$ represents the complex number $z = x + iy$. The length r of line segment OP is called:  (a) Conjugate of z. (b) Modulus of z. (c) Real part of z. (d) Imaginary part of z.	1

7	Consider the following statements about Pascal's triangle: (i) Every number in a row is the sum of the two numbers diagonally above it (ii) Sum of the numbers in a row is equal to 2^n (iii) It is a triangular arrangement of numbers that gives the coefficients in the expansion of any binomial expression, such as $(x + y)^n$ Which of the (i), (ii) and (iii) are always true: (a) Only (i) and (ii) (b) Only (i) and (iii) (c) Only (ii) and (iii) (d) All are true	1
8	Total number of terms in the expansion of $(x+a)^{51} + (x-a)^{51}$ after simplification are: (a) 26 (b) 52 (c) 25 (d) 104	1
9	If the Arithmetic Mean and Geometric Mean of two different positive real numbers a and b are A.M. and G.M. respectively, then which of the following is always true? (a) A.M. ≤ G.M. (b) A.M. < G.M. (c) A.M. ≥ G.M. (d) A.M. > G.M.	1

10	The equation of straight line parallel to the $x-axis$ at a distance 5 units below it is (a) $y = -5$ (b) $y = 5$ (c) $x == -5$ (d) $x = 5$	1
11	The coordinates of the centre and radius of the circle whose equation in standard form is $(x+3)^2 + (y-5)^2 = 16$, are: (a) Centre: $(-3, 5)$, Radius: 4 (b) Centre: $(3, -5)$, Radius: 4 (c) Centre: $(-3, 5)$, Radius: 16 (d) Centre: $(3, -5)$, Radius: 16	1
12	In the figure given below, the names of the planes 1, 2 and 3 are respectively: Pick the correct option - (a), (b), (c) or (d)  		Plane - 1	Plane - 2	Plane - 3
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(a)	ZY	YX	ZX
(b)	XY	YZ	ZX
(c)	XZ	YZ	ZY
(d)	YZ	XY	ZX		1
13	The value of $\lim_{x \to 0} \frac{x}{x}$ is: (a) 0 (b) 1 (c) ∞ (d) Does not exist	1
14	If $f(x) = 1 + x + \frac{x^2}{2} + \ldots + \frac{x^{100}}{100}$, then $f'(1)$ is equal to (A) $\frac{1}{100}$ (B) 100 (C) does not exist (D) 0	1
15	The value of $\lim_{x \to 0} \left(\frac{\sin 4x}{\sin 3x}\right)$ is: (a) $\frac{3}{4}$ (b) 4 (c) 3 (d) $\frac{4}{3}$	1

16	Which of the following is not a measure of dispersion: (a) Median (b) Range (c) Mean deviation (d) Standard deviation	1

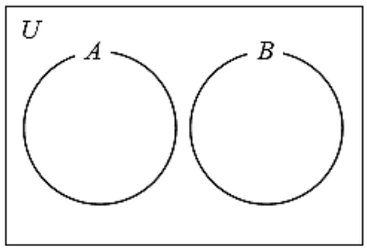
17	If A and B are two mutually exclusive events then which of the following are true: $(i)\ A \cap B = \phi$ $(ii)\ P(A) = P(B)$ $(iii)\ P(A) + P(B) = 1$ (iv) $P(A \cup B) = P(A) + P(B)$ (a) Only (i) and (ii) (b) Only (ii) and (iii) (c) Only (i) and (iv) (d) Only (iii) and (iv)	1
18	If a single letter is selected at random from the word 'PROBABILITY', then the probability that it is a vowel is $(a)\ \frac{1}{3}$ $(b)\ \frac{4}{11}$ $(c)\ \frac{2}{11}$ $(d)\ \frac{3}{11}$	1

ASSE RTION - REASON BASED QUESTIONS

Direction (Q.19 - Q.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.

Q.	QUESTIONS	M
19	**Assertion (A):**  If $A \subseteq B$ for any two sets A and B, then adjacent Venn diagram represents correct relationship between A and B. **Reason (R):** If $A \subseteq B$, then all elements of A are also in B.	1

20	**Assertion (A):** If a convex polygon has 11 sides, then number of its diagonals are 44. **Reason (R):** Number of Diagonals of a Polygon having n sides $is: {}^{n}C_2 - n$	1

SECTION – B

Direction (Q.21 - Q.25) - This section comprises of very short answer type-questions (VSA) of 2 marks each.

Q.	QUESTIONS	M
21	Using binomial theorem, expand $\left(x^2 + \frac{3}{x}\right)^4, x \neq 0$ **OR** Using the binomial theorem, show that $6^n - 5n$ always leaves remainder 1 when divided by 25.	2
22	Insert two arithmetic means between 49 and 28.	2
23	Find the equation of parabola with vertex $(0, 0)$ and focus $(0, -6)$. **OR** Find the eccentricity and the coordinates of foci of the ellipse $9x^2 + 4y^2 = 36$.	2
24	Find the coordinates of a point on y-axis which are at a distance of $5\sqrt{2}$ from the point P (3, –2, 5).	2
25	Evaluate: If $\lim_{x \to 2}\left(\frac{x^n - 2^n}{x-2}\right) = \lim_{x \to 4}(5x^2 + 2x - 8)$ and $n \in N$, then find n.	2

SECTION – C

Direction (Q.26 - Q.31) - This section comprises of short answer type-questions (SA) of 3 marks each.

Q.	QUESTIONS	M
26	Given a relation $R = \{(x, y) : x, y \in W,\ x^2 + y^2 = 25\}$, where W is the set of all whole numbers. Find: (i) R in roster form (ii) Domain of R (iii) Range of R	3

27	Find the domain and range of real function $f(x) = \sqrt{x-1}$	3

	OR The function f is defined by $f(x) = \begin{cases} 1-x, & x<0 \\ 1, & x=0 \\ x+1, & x>0 \end{cases}$. Draw the graph of $f(x)$.	
28	Prove that: $\sin 105^0 + \cos 105^0 = \frac{1}{\sqrt{2}}$	3
29	Reduce $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$ to the standard form.	3
30	Find the sum of the sequence: $6, 66, 666, 6666, \ldots\ldots\ldots$ to n terms. **OR** In a G.P, the 3rd term is 24 and 6th term is 192. Find the 10th term.	3
31	Find the derivative with respect to x: $\frac{x\tan x}{\sec x+\tan x}$ **OR** $\frac{x^5-\cos x}{\sin x}$	3

SECTION – D

Direction (Q.32 - Q.35) - This section comprises of long answer type-questions (LA) of 5 marks each.

Q.	QUESTIONS	M
32	If $\cos x = -\frac{1}{3}$, x lies in 3rd Quadrant, then find the values of (i) $\sin\frac{x}{2}$ (ii) $\cos\frac{x}{2}$ **OR** Prove that: $sin10^0\ sin50^0\ sin60^0\ sin70^0 = \frac{\sqrt{3}}{16}$.	5
33	A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added?	5
34	**Solve any one of the Parts (Solve either Part – 1 or Solve Part – 2)** **Part -1** Solve the questions (i), (ii) and (iii) given below: (i) Find the equation of the line which intersects $x-axis$ at a distance 2 units in the right of origin and $y-axis$ at distance 3 units below to the origin. (ii) Find the distance of point $(-2, 3)$ from the line $5y = 12x - 2$. (iii) Find the angle between the $x-axis$ and the line joining the points $(3, -1)$ and $(4, -2)$. **OR** **Part -2** Find equations of lines which pass through the point $(3, 4)$ and the sum of its intercepts on the axes is 14.	2 1 2 5
35	Calculate mean, variance and standard deviation for the following distribution.	5

Classes	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	3	7	12	15	8	3	2

SECTION – E

Direction (Q.36 - Q.38) - This section comprises of 3 case-study / passage-based questions of 4 marks each.

Q.	QUESTIONS	M
36	**Case-Study: Read the Case study given below and attempt (i), (ii) and any one sub part of (iii):**	4

Playing cards was introduced in the 16th century by the Mughal emperors from Central Asia. The first references made to 'Ganjifa' was found in the biography of Babur, who was the founder of the Mughal dynasty in India. The emperors were fond of this game and named it after a Persian word known as 'ganjifeh'. This card game soon became part of kings court games and was played with lavish sets of cards that were made with various ivory or tortoise shells and were decorated with various precious stones such as gold and silver. The wealthier you were, the more expensive you're sets of cards were. 1

What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these: 1

(ii) Four cards are of the same suit 2

(iii) Four cards belong to four different suits 2

<u>OR (The option is only for part (iii))</u>

(iii) Are face cards

37 **<u>Case-Study</u>: Read the Case study given below and attempt (i), (ii) and any one subpart of (iii):** 4

Four persons Abdul, Kavita, Monika and Pramod are appearing in an interview to get a job in a software company. Chances of Abdul's selection are same as that of Pramod. Chances of Kavita's selection are double that of Abdul. Chances of Monika's selection are four times that of Abdul. One and only one among these are sure to be selected.

(i) What is the probability that Abdul gets selection? 1

(ii) What is the probability that Kavita gets selection? 1

(iii) What is the probability that Abdul or Monika get selection? 2

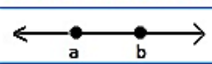
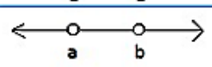
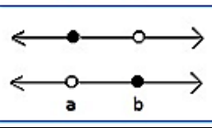
<u>OR (The option is only for part (iii))</u>

What is the probability that Pramod does not get selection? 2

38 **<u>Passage-based question</u>: Study the passage and table given below and answer the questions (i) and (ii) given below:** 4

The intervals are defined as the set of all real numbers lying between two given real numbers (end points / boundary points). It is a way of writing subsets of the set of all real numbers. Based on the inclusion / exclusion of end points the intervals are classified as – closed, open and semi closed / semi open intervals as shown in the following table.

Intervals

Name of interval	Notation	Inequality description	Number line representation
Closed	[a, b]	$a \leq x \leq b$	
Open	(a, b)	$a < x < b$	
Closed - Open **and** Open - Closed	[a, b) (a, b]	$a \leq x < b$ $a < x \leq b$	

	Intervals are sets so we can combine two or more intervals using set operations. **(i)** To join the Indian Army under technical entry scheme the age of a candidate must be more than 16½ years and not above 19½ years. Represent the age limit using the interval. **(ii)** According to weather report of Meteorological department the hottest month in Srinagar is July (minimum temperature 6°C, maximum temperature 32°C) and the coldest are December – January (temperature is between −15°C and 0°C). Represent the range of temperature in both the seasons as a single interval using the set operations.	2 2