CUMULATIVE EXAM Session 2022-23
Class XI
Mathematics (Code-041)

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

General Instructions :

1. This Question paper contains - five sections A, B, C, D and 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.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 mark each.
4. Section C has 6 Short Answer (SA)-type questions of 3 mark each.
5. Section D has 4 Long Answer (LA)-type questions of 5 mark each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

SECTION A
(Multiple Choice Questions) Each question carries 1 mark

Q1. The set given by $\{x: x = 3x,\ x \in R\}$ represents

(a) $\emptyset$ (b)Infinite set (c)$Singleton\ set$ (d)$None\ of\ these$

Q2. For any two sets A and B, $(A - B) \cap B$ is

(a) A (b) B (c)$A \cap B$ (d) $\emptyset$

Q3. $If\ \left(\frac{x}{2} + 1, y - \frac{2}{3}\right) = \left(\frac{3}{2}, \frac{1}{3}\right),\ the\ value\ of\ 2x + y\ will\ be$

(a)4 (b)3 (c)0 (d)$None\ of\ these$

Q4.

$If\ the\ set\ A\ has\ 3\ elements\ and\ the\ set\ B = \{2, 3\},\ then\ the\ number\ of\ relations\ from\ A\ to\ B\ is$

(a)6 (b)64 (c)2 (d)32

Q5.$If\ f(x) = \frac{x-2}{|x-2|},\ x \neq 2\ then\ the\ Range\ of\ f\ is$

(a){1} (b)**R** (c)$\{-1, 1\}$ (d)$(0, \infty)$

Q6.$The\ value\ of\ \frac{\cos cos\ 17° + \sin sin\ 28°}{\cos cos\ 17° - \sin sin\ 28°}$

(a) $\cot cot\ 11°$ (b)$\tan tan\ 11°$ (c)$\tan tan\ 55°$ (d) $None\ of\ these$

Q7. In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of minor arc of the chord is

(a)41.86 cm (b)20.93 cm (c)$10.46\ cm$ (d)$None\ of\ these$

Q8. The value of $sin(-\frac{11\pi}{3})$ is

(a)$\frac{\sqrt{3}}{2}$ (b)$\frac{1}{2}$ (c)$-\frac{1}{2}$ (d) $None\ of\ these$

Q9. The conjugate of $(5 + 2i)^2\ is$

(a)$5 - 2i$ (b)$21 - 20i$ (c)$6 - 17i$ (d)$None\ of\ these$

Q10. $The\ value\ of\ i^{2023}\ is$

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

Q11. Solution of $\frac{x}{3} > \frac{x}{2} + 1\ is$

(a)$(-\infty, 6)$ (b)$(-6, \infty)$ (c) $(-\infty, -6)$ (d) $None\ of\ these$

Q12. If $-3x + 17 <- 13,\ then$ solution set is

(a) $(10, \infty)$ (b) $[10, \infty)$ (c) $(-\infty, 10)$ (d) (-10,10)

Q13. If $|x - 1|$>5, then

(a) $x \in (-4, 6)$ (b) $x \in [-4, 6]$ (c) $x \in (-\infty, -4) \cup (6, \infty)$ (d) none of these

Q14. Number of all the numbers between 99 and 1000 having 7 in the units place is

(a) 100 (b) 90 (c) 630 (d) 64

Q15. The number of different four digit numbers that can be formed with the digits 2,3, 4, 7 and using each digit only once is

(a) 120 (b96 (c) 24 (d) 100

Q16. The number of triangles that are formed by choosing the vertices from a set of 12 points, seven of which lie on the same line is

(a)105 (b)15 (c) 175 (d) 185

Q17.If number of terms in the expansion of binomial $(2x + y)^{2n-3}\ is\ 84\ then\ value\ of\ n\ will\ be$

(a) 44 (b) 87/2 (c) 45 (d) 43

Q18. The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification is

(a) 50 (b) 202 (c) 51 (d) $None\ of\ these$

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.

Q19. Assertion (A): Number of terms in the expansion of binomial $(2x + y)^{101}\ is\ 102$

(R): Number of terms in the expansion of binomial $(a + b)^n\ is\ n + 1$

Q20. Assertion (A): If $z = 1 - i$, then principal argument of z is $\frac{3\pi}{4}$

Reason(R): If z=x+iy and $\theta\ be\ the\ pricipal\ argument\ of\ z\ then \tan tan\ \theta = \frac{y}{x}$

SECTION B

This section comprises of very short answer type-questions (VSA) of 2 marks each

Q21. If A={1,2,5,7,9} and B={3,5,6,7} then verify that $A - B = A \cap B'$

Q22 Find the multiplicative inverse of : $\frac{5+2i}{3+i}$ in a+ib form

Q23. Ravi obtained 70 and 75 marks in first two unit test. Find the number if minimum marks he should get in the third test to have an average of at least 60 marks.

OR

Solve the inequality for real value of x: $3(2 - x) \geq 2(1 - x)$

Q24 Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that all vowels occur together

Q25. Expand: $(\frac{2}{x} + 3x)^5$

SECTION C

(This section comprises of short answer type questions (SA) of 3 marks each)

Q26. If A and B are two sets such that $A \cup B = A \cup C \text{ and } A \cap B = A \cap C \text{ then prove that } B = C.$

Q27. If A= {1,2,3,4,5,6} and a relation R from A to A is defined as R={$(x, y): 2x + y = 13$}, write R in roster form also write domain and range of R.

Q28. Prove that $\frac{\sin sin\ 5x - 2sin 3x + \sin sin\ x}{\cos cos\ 5x - \cos cos\ x}$ = tan x

OR

Prove that $\sin sin\ 3x + \sin sin\ 2x - \sin sin\ x = 4 \sin sin\ x\ \cos cos\ \frac{x}{2}\ \ \frac{3x}{2}$

Q29.) In how many ways 4 boys and 6 girls be seated in a line so that no two boys may sit together?

OR

A discipline committee of 3 persons is to be constituted from a group of two men and three women.(i) In how many ways can this be done?(ii) How many of these committees would consist of one man and two women?

Q30. If $(x+iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$

Q31. Find $(x+1)^6 + (x-1)^6$. Hence or otherwise evaluate $(\sqrt{2} + 1)^6 + (\sqrt{2} - 1)^6$.

SECTION D

(This section comprises of long answer-type questions (LA) of 5 marks each)

Q32. Find the domain and range of the functions f given by

(a) $f(x) = \sqrt{9 - x^2}$ 1+1.5 Marks

(b) $f(x) = \frac{2x-3}{x+5}$ 1+1.5 Marks

Q33. Prove that: $cos10^0 . cos50^0 . cos60^0 . cos70^0 = \frac{\sqrt{3}}{16}$.

OR

Prove that: $cos^3 A + cos^3(120^0 + A) + cos^3(240^0 + A) = \frac{3}{4} cos\ 3A$

Q34. 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 1280 litres of the 8% solution, how many litres of the 2% solution will have to be added?

Q35. Find the coefficient of x^5 in the product $(1 + 2x)^6 (1 - x)^7$ using binomial theorem

OR

If three consecutive coefficients in the expansion of$(1 + x)^n$ are in the ratio 6:33:110, find the value of n.

SECTION E

(This section comprises of 3 case-study/passage-based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub-parts of 2 marks each.)

Q36. Case-Study 1: Two non empty sets A and B are given by

A={x: x is a letter in I LOVE MATHEMATICS}

B={x: x is a letter in I LOVE STATISTICS}

Based on the information, answer the following questions

(i) Find A∩B

(ii) Find A∪B

(iii) Find $B - A$

OR

(iii) Find number of subsets of B

Q37. Case-Study 2: If $cot = \frac{5}{12}$, x lies in third quadrant.

Based on the information, the following questions

(i) Find the value of cos x

(ii) Find the value of cos 2x.

(iii) $Find\ the\ value\ of\ sin\frac{x}{2}$

OR

$Find\ the\ value\ of\ tan\frac{x}{2}$

Q38. Case-Study 3: Teacher divided the students of their classroom in three different groups Shivaji, Tagore and Ashoka and gave them to form different words using all the letter of the word EDUCATION with certain conditions?

Shivaji-Words starting and ending with vowels

Tagore- Words starting and ending with consonants

Ashoka-Vowels comes together

Using above information find

(i)Number of words formed by Shivaji Group

(ii) Number of words formed by Tagore Group

OR

Number of words formed by Ashoka Group