KENDRIYA VIDYALAYA SANGATHAN, HYDERABAD REGION
SESSION ENDING EXAM SAMPLE PAPER 05 (2017-18)

SUBJECT: MATHEMATICS(041)

BLUE PRINT : CLASS XI

Unit	Chapter	VSA (1 mark)	SA (2 marks)	LA – I (4 marks)	LA– II (6 marks)	Total
Sets & functions	**Sets**	1(1)	--	4(1)	6(1)	**11(3)**
	Relations and Functions	--	2(1)	4(1)	--	**06(2)**
	Trigonometric Functions	--	2(1)	4(1)	6(1)	**12(3)**
Algebra	**Principle of Mathematical Induction**	--	--	--	6(1)	**6(1)**
	Complex Numbers and Quadratic Equations	--	2(1)	4(1)	--	**6(2)**
	Linear Inequalities	--	--	4(1)	--	**4(1)**
	Permutations and Combinations	--	2(1)	4(1)	--	**6(2)**
	Binomial Theorem	1(1)	--	--	6(1)	**7(2)**
	Sequences and Series	--	2(1)	--	6(1)	**8(2)**
Coordinate geometry	**Straight Lines**	1(1)	--	4(1)	--	**5(2)**
	Conic Sections	--	--	4(1)	--	**4(1)**
	Introduction to Three Dimensional Geometry	--	--	4(1)	--	**4(1)**
Calculus	**Limits and Derivatives**	--	2(1)	4(1)	--	**6(2)**
Mathematical reasoning	**Mathematical Reasoning**	1(1)	2(1)	--	--	**3(2)**
Statistics & probability	**Statistics**	--	--	--	6(1)	**6(1)**
	Probability	--	2(1)	4(1)	--	**6(2)**
	Total	**4(4)**	**16(8)**	**44(11)**	**36(6)**	**100(29)**

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SUBJECT: MATHEMATICS **MAX. MARKS : 100**
CLASS : XI **DURATION : 3 HRS**

General Instruction:
(i) **All** questions are compulsory.
(ii) This question paper contains **29** questions.
(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.
(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.
(v) Question **13-23** in **Section C** are long-answer-I type questions carrying **4** marks each.
(vi) Question **24-29** in **Section D** are long-answer-II type questions carrying **6** marks each**.**

SECTION – A
Questions 1 to 4 carry 1 mark each.

1. Given that N = {1, 2, 3, ..., 100}, then write the subset B of N, whose element are represented by $x + 2$, where $x \in$ N.

2. Find the coefficient of a^5b^7 in $(a - 2b)^{12}$.

3. Find the equation of a line which passes through the point (2, 3) and makes an angle of 30° with the positive direction of x-axis.

4. Write the negation of "2 + 3 = 5 and 8 < 10."

SECTION – B
Questions 5 to 12 carry 2 marks each.

5. Find the domain for which the functions $f(x) = 2x^2 - 1$ and $g(x) = 1 - 3x$ are equal.

6. A circular wire of radius 3 cm is cut and bent so as to lie along the circumference of a hoop whose radius is 48 cm. Find the angle in degrees which is subtended at the centre of hoop.

7. What is the probability that a randomly chosen two-digit positive integer is a multiple of 3?

8. Evaluate : $(1 + i)^6 + (1 - i)^3$

9. The 4th term of a G.P. is square of its second term, and the first term is – 3. Determine its 7th term.

10. Find the value of n such that ${}^nP_4 : {}^{n-1}P_4 = 5 : 3, n > 4$.

11. Find the positive integer n so that $\lim\limits_{x \to 3} \dfrac{x^n - 3^n}{x - 3} = 108$

12. Write the converse of the following statements
(i) If $x < y$, then $x + 5 < y + 5$
(ii) If ABC is an equilateral triangle, then ABC is an isosceles triangle

SECTION – C
Questions 13 to 23 carry 4 marks each.

13. Let A, B and C be sets, then using properties of sets, show that
$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$$

14. Find the derivative of $f(x) = \tan(ax + b)$, by first principle.

15. Find the coordinate of the points which trisect the line segment joining the points A (2, 1, – 3) and B (5, – 8, 3).

16. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girls (ii) at least one boy and one girl (iii) at least three girls.

OR

If the letters of the word RACHIT are arranged in all possible ways as listed in dictionary. Then what is the rank of the word RACHIT ?

17. Prove by using Mathematical Induction for all $n \in N$ that $n^3 - 7n + 3$ is divisible by 3, for all natural numbers n.

18. Find the coordinates of the foot of perpendicular from the point (–1, 3) to the line $3x - 4y - 16 = 0$.

19. Find the equation of the circle which passes through the points (20, 3), (19, 8) and (2, –9). Find its centre and radius.

20. Suppose that each child born is equally likely to be a boy or a girl. Consider a family with exactly three children. Find probability of :
(i) The event that exactly one child is a girl.
(ii) The event that at least two children are girls
(iii) The event that no child is a girl

21. Find the range of the function (i) $f(x) = \dfrac{|x-4|}{x-4}$ (ii) $f(x) = \sqrt{16 - x^2}$

22. If $(x+iy)^{\frac{1}{3}} = a + ib$ where $x, y, a, b \in$ R, show that $\dfrac{x}{a} - \dfrac{y}{b} = -2(a^2 + b^2)$

OR

If $a + ib = \dfrac{(x+i)^2}{2x^2+1}$, then prove that $a^2 + b^2 = \dfrac{(x^2+1)^2}{(2x^2+1)^2}$

23. Solve the equation $\sin\theta + \sin 3\theta + \sin 5\theta = 0$

OR

Prove that: $\dfrac{\sec 8\theta - 1}{\sec 4\theta - 1} = \dfrac{\tan 8\theta}{\tan 2\theta}$

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. If α and β are the solutions of the equation $a\tan\theta + b\sec\theta = c$, then show that

$$\tan(\alpha + \beta) = \frac{2ac}{a^2 - c^2}$$

OR

A tree stands vertically on a hill side which makes an angle of 15° with the horizontal. From a point on the ground 35m down the hill from the base of the tree, the angle of elevation of the top of the tree is 60°. Find the height of the tree.

25. If a and b are the roots of $x^2 - 3x + p = 0$ and c, d are roots of $x^2 - 12x + q = 0$, where a, b, c, d form a G.P. Prove that $(q + p) : (q - p) = 17:15$.

OR

Find the sum of the following series up to n terms: 0.6 + 0.66 + 0.666+…

26. Solve the system of inequalities graphically: $x + 2y \leq 10$, $x + y \geq 1$, $x - y \leq 0$, $x \geq 0$, $y \geq 0$

27. Find a, b and n in the expansion of $(a + b)^n$ if the first three terms of the expansion are 729, 7290 and 30375, respectively.

OR

Find the expansion of $(3x^2 - 2ax + 3a^2)^3$ using binomial theorem.

28. In a town of 10,000 families it was found that 40% families buy newspaper A, 20% families buy newspaper B, 10% families buy newspaper C, 5% families buy A and B, 3% buy B and C and 4% buy A and C. If 2% families buy all the three newspapers.
Find (a) The number of families which buy newspaper A only. (b) The number of families which buy none of A, B and C (c) Write the importance of newspaper reading.

29. From the data given below state which group is more variable, A or B?

Marks	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Group A	9	17	32	33	40	10	9
Group B	10	20	30	25	43	15	7