

**KENDRIYA VIDYALAYA SANGATHAN, HYDERABAD REGION**  
**SESSION ENDING EXAM SAMPLE PAPER 04 (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	--	--	4(1)	6(1)	10(2)
	Relations and Functions	--	2(1)	4(1)	--	06(2)
	Trigonometric Functions	1(1)	2(1)	4(1)	6(1)	13(4)
Algebra	Principle of Mathematical Induction	--	--	4(1)	--	4(1)
	Complex Numbers and Quadratic Equations	--	2(1)	4(1)	--	6(2)
	Linear Inequalities	--	--	--	6(1)	6(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)
	<b>Total</b>	<b>4(4)</b>	<b>16(8)</b>	<b>44(11)</b>	<b>36(6)</b>	<b>100(29)</b>

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**MAX. MARKS : 100**  
**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. Find the value of  $3 \sin \frac{\pi}{6} \sec \frac{\pi}{3} - 4 \sin \frac{5\pi}{6} \cot \frac{\pi}{4}$
2. Which term in the expansion of  $\left(x - \frac{1}{x}\right)^7$  is independent of  $x$ .
3. Write the negation of the statement “The number 5 is smaller than 9”.
4. Find the equation of line passing through the point  $(-4, 3)$  with slope  $\frac{1}{2}$ .

**SECTION – B**

**Questions 5 to 12 carry 2 marks each.**

5. Express  $(5 - 3i)^3$  in the form  $a + ib$ .
6. Let  $f, g : R \rightarrow R$  be defined, respectively by  $f(x) = \sqrt{x}$  and  $g(x) = 2x - 3$ . Find  $fg$  and  $\frac{f}{g}$ .
7. In how many of the distinct permutations of the letters in MISSISSIPPI do the four I's not come together?
8. Evaluate:  $\lim_{x \rightarrow 0} \frac{e^x - \sin x - 1}{x}$
9. Solve:  $\tan 2x = -\cot\left(x + \frac{\pi}{3}\right)$
10. Find the 12th term of a G.P. whose 8th term is 192 and the common ratio is 2.
11. Three coins are tossed once. Find the probability of getting (i) 3 heads (ii) 2 heads
12. Show that the following statement is true by the method of contrapositive.  
*p: If  $x$  is an integer and  $x^2$  is even, then  $x$  is also even.*

**SECTION – C**

**Questions 13 to 23 carry 4 marks each.**

13. Using properties of sets, show that (i)  $A \cup (A \cap B) = A$  (ii)  $A \cap (A \cup B) = A$ .
14. Find the equation of the line through the intersection of  $5x - 3y = 1$  and  $2x + 3y - 23 = 0$  and perpendicular to the line  $5x - 3y - 1 = 0$ .
15. Find the domain and range of the function (i)  $f(x) = \sqrt{x-1}$  (ii)  $f(x) = |x-1|$

16. Find the ratio in which the line segment joining the points  $(2,-1,3)$  and  $(-1,2,1)$  is divided by the plane  $x + y + z = 5$ .
17. A beam is supported at its ends by supports, which are 12 metres apart. Since the load is concentrated at its centre, there is a deflection of 3 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection 1 cm?
18. Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in a dictionary, what will be the 50th word?
19. Differentiate  $\frac{(x + \sec x)(x - \tan x)}{x^2 + 1}$  w.r.t.  $x$

20. Find the square root of  $-7 - 24i$

**OR**

If  $x + iy = \frac{a + ib}{a - ib}$ , prove that  $x^2 + y^2 = 1$

21. Prove by using Mathematical Induction that  $2 \cdot 7^n + 3 \cdot 5^n - 5$  is divisible by 24 for all  $n \in N$ .

**OR**

Prove by using Mathematical Induction for all  $n \in N$  that

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left[ \frac{n(n+1)}{2} \right]^2.$$

22. Show that:  $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

**OR**

In any triangle ABC, prove that  $\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2 + b^2 + c^2}{2abc}$

23. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that
- The student opted for NCC or NSS.
  - The student has opted neither NCC nor NSS.
  - The student has opted NSS but not NCC.
  - Which you would like to opt NSS or NCC? Give reason.

## SECTION – D

**Questions 24 to 29 carry 6 marks each.**

24. Solve the system of following linear equations:

$$x + y \leq 4, \quad x + 5y \geq 4, \quad 6x + 2y \geq 8, \quad x \geq 0, \quad y \geq 1, \quad x \leq 3, \quad y \leq 3$$

25. If  $\sin x = \frac{3}{5}$ ,  $\cos y = -\frac{12}{13}$ , where  $x$  and  $y$  both lie in second quadrant, find the value of  $\sin(x + y)$ ,  $\cos(x + y)$  and  $\tan(x + y)$

**OR**

The angle of elevation of the top point P of the vertical tower PQ of height  $h$  from a point A is  $45^\circ$  and from a point B, the angle of elevation is  $60^\circ$ , where B is a point at a distance  $d$  from the point A measured along the line AB which makes an angle  $30^\circ$  with AQ.

Prove that  $d = h(\sqrt{3} - 1)$

26. Show that  $\frac{1 \times 2^2 + 2 \times 3^2 + \dots + n \times (n+1)^2}{1^2 \times 2 + 2^2 \times 3 + \dots + n^2 \times (n+1)} = \frac{3n+5}{3n+1}$

**OR**

Find the sum of the sequence 7, 77, 777, 7777, ... to  $n$  terms.

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

28. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, 3 read all three newspapers. Find: (i) the number of people who read at least one of the newspapers. (ii) the number of people who read exactly one newspaper.

29. The mean of 5 observations is 4.4 and their variance is 8.24. If three of the observations are 1, 2 and 6, find the other two observations.

