

Phil

KENDRIYA VIDYALAYA SANGATHAN: CHENNAI REGION
SESSION ENDING EXAMINATION 2016-17

CLASS: XI

Max Marks: 100

Subject: Mathematics

Time Allotted: 3 HOURS

GENERAL INSTRUCTIONS:

- (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.
- (vii) There is no overall choice. However Internal choices are given for 3 questions of section C and section D

SECTION - A

1. Write the interval $(-5, -3]$ in set-builder form.
2. Prove that $3^{1/2} \cdot 3^{1/4} \cdot 3^{1/8} \dots = 3$.
3. Find the lengths of intercepts cut off by the line $2x + 3y = 6$ on x axis and y axis.
4. Write the contra positive of the following statement: "If the physical environment changes, then the biological environment changes."

SECTION B

5. If $P = \{x: x < 3, x \in \mathbb{N}\}$, $Q = \{x: x \leq 2, x \in \mathbb{W}\}$, then find $(P \cup Q) \setminus (P \cap Q)$.
6. Find the domain and range of the relation $R = \{(x, y): y = x + \frac{6}{x}, x, y \in \mathbb{N}, x < 6\}$.
7. If x lies in the second quadrant, then show that

$$\frac{\sqrt{1+\sin x}}{\sqrt{1-\sin x}} + \frac{\sqrt{1-\sin x}}{\sqrt{1+\sin x}} = -2 \operatorname{cosec} x.$$

8. Prove that: $\frac{\cos x - \cos 5x}{\sin 7x - \sin 3x} = \frac{\sin 3x}{\cos 5x}$

9. Find the conjugate of $\frac{3-i}{2+i}$.

10. Evaluate: $\lim_{x \rightarrow 0} \frac{e^{x+1} - e^1}{x}$

11. State whether "OR" used in the following compound statement is exclusive or inclusive. Also write the component statements.

r: you are wet when it rains or you are in a river.

12. Find the probability of getting a doublet when a pair of dice is thrown once.

SECTION -C

13. If $f(x) = 2x + 5$ and $g(x) = x^2 - 1$ are two real valued functions,

then find (i) $f + g$ (ii) $f - g$ (iii) $f.g$ (iv) $\frac{f}{g}$

14. Prove that $\sin x + \sin 3x + \sin 5x + \sin 7x = 4 \cos x \cos 2x \sin 4x$.

(OR)

Solve for x : $\sqrt{3} \cos x + \sin x = \sqrt{2}$.

15. Using the principle of mathematical induction, prove that for all $n \in \mathbb{N}$,

$$1.2.3 + 2.3.4 + 3.4.5 + \dots + n(n+1)(n+2) = \frac{n(n+1)(n+2)(n+3)}{4}$$

16. Find the square root of $-15-8i$.

✓ 17. Find the number of arrangements which can be made from the letters of the word "INDEPENDENCE". In how many of these arrangements

(i) words start with P

(ii) all the vowels occur together

(iii) Write the significance of independence day?

(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".

How do you find the reference of dictionary in your writing/speaking skills?

18. 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 girl ?

(ii) atleast 2 girls ?

19. Find the equation of the straight line through the intersection of the lines $5x - 6y - 1 = 0$ and $3x + 2y + 5 = 0$ and perpendicular to the line $3x - 5y + 11 = 0$

20. Find the coordinates of foci, vertices, lengths of major axis, minor axis, latus rectum and the eccentricity of the ellipse $9x^2 + 25y^2 = 225$.

21. Show that the points $(0, -1, -7)$, $(2, 1, -9)$ and $(6, 5, -13)$ are collinear. Also find the ratio in which the first point divides the join of other two points.

22. Find the derivative of $\sin(2x + 1)$ using first principle.

23. Three squares of a chess board are selected at random. Find the probability of selecting two squares of one colour and other of a different colour.

(OR)

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

(i) Student opted for NCC or NSS

(ii) Student opted neither NCC nor NSS

(iii) Student opted NSS but not NCC.

SECTION - D

24. A survey of 500 television viewers produced the given information:

285 watch football, 195 watch hockey, 115 watch cricket, 45 watch football and cricket, 70 watch football and hockey, 50 watch cricket and hockey and 50 do not watch any of the three games. How many watch exactly one of the three games?

25. For any triangle ABC, prove that

(i) $a(\cos C - \cos B) = 2(b - c) \cos^2 \frac{A}{2}$.

$$(ii) \frac{a-b}{c} = \frac{\sin \frac{(A-B)}{2}}{\cos \frac{C}{2}}$$

(OR)

A lamp post is situated at the middle point M of the side AC of a triangular plot ABC with BC=7m, CA=8m and AB=9m. Lamp post subtends an angle 15° at the point B. Determine the height of the lamp post.

26. Solve the following system of linear inequalities graphically.

$$3x + 2y \geq 24, 3x + y \leq 15, x \geq 4, x, y \geq 0.$$

27. The coefficients of $(r-1)^{th}$, r^{th} and $(r+1)^{th}$ terms in the expansion of $(x+1)^n$ are in the ratio 1:3:5. Find n and r.

28. Find the sum of the following series up to n terms.

$$\frac{1^2}{1} + \frac{1^2+2^2}{1+3} + \frac{1^2+2^2+3^2}{1+3+5} + \dots$$

(OR)

If p, q, r are in G.P. and the equations $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.

29. Find the mean, variance and standard deviation of the following frequency distribution.

Class interval	0-10	10-20	20-30	30-40	40-50
frequency	5	8	15	16	6

(OR)

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