SPECTRA SAMPLE PAPER 2025-26
SPECTRA CLASSES
CLASS 11 - MATHEMATICS

Time: 3 hours **Marks : 80**

General Instructions

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

Section A

1 For any two sets A and B, $A \cap (A \cup B) =$ .... **[1]**

a) ϕ b) B c) A d) $\neq \phi$

2 The coordinates of the foot of the perpendicular drawn from the point (2, - 3, 4) on the y - axis is: **[1]**

a) (- 2, - 3, - 4) b) (0, - 3, 0)

c) (2, 3, 4) d) (2, 0, 4)

3 If $\tan\alpha = \frac{x}{x+1}$ and $\tan\beta = \frac{1}{2x+1}$, then $\alpha+\beta$ is equal to **[1]**

a) $\frac{\pi}{6}$ b) $\frac{\pi}{2}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{4}$

4 sin 18° = ? **[1]**

a) $\frac{(\sqrt{3}-1)}{2}$ b) $\frac{(\sqrt{5}-1)}{4}$ c) $\frac{(\sqrt{5}+1)}{4}$ d) $\frac{(\sqrt{3}+1)}{2}$

5 If z_1 and z_2 are non - real complex numbers such that $|z_1| = |z_2|$ and Amp. z_1 + Amp. $z_2 = \pi$, then $z_1 =$ **[1]**

a) z_2 b) $-\overline{z_2}$ c) $\overline{z_2}$ d) - z_2

6 If $|x-1| > 5$, then **[1]**

a) $x \in (-\infty, -4) \cup (6, \infty]$ b) $x \in [6, \infty)$

c) $x \in (-\infty, -4) \cup (6, \infty)$ d) $x \in (6, \infty)$

7 How many words can be formed using the letter A thrice, the letter B twice and the letter C once? **[1]**

a) 60 b) 6 c) 120 d) 90

8 Find a if the coefficient of x^2 and x^3 in the expansion of $(3+ax)^9$ are equal **[1]**

a) $\frac{8}{5}$ b) $\frac{9}{7}$ c) $\frac{9}{5}$ d) $\frac{8}{7}$

9 If second term of a G.P. is 2 and the sum of its infinite terms is 8, then its first term is **[1]**

a) $\frac{1}{4}$ b) 4 c) $\frac{1}{2}$ d) 2

10 The acute angle between the lines ax + by + c = 0 and (a + b)x = (a – b)y , a≠ b , is **[1]**

a) 60^o b) 15^o c) 30^o d) 45^o

11 Area of a triangle is 5 sq. units. Its two vertices are (2, 1) and (3, -2). Third vertex is on the line y = x + 3. The coordinates of that vertex are **[1]**

a) $(\frac{8}{5}, \frac{6}{5})$ b) $(\frac{8}{3}, \frac{5}{3})$ c) (8, 14) d) $(\frac{7}{2}, \frac{13}{2})$

12 The vertex of the parabola $(y - 2)^2 = 16 (x - 1)$ is **[1]**

a) (1, 2) b) (1, - 2) c) (2, 1) d) (- 1, 2)

13 The eccentricity of the ellipse, if the minor axis is equal to the distance between the foci, is **[1]**

a) $\frac{2}{\sqrt{3}}$ b) $\frac{\sqrt{3}}{2}$ c) $\frac{1}{\sqrt{2}}$ d) $\frac{\sqrt{2}}{3}$

14 The equation $\vec{r} = \hat{\lambda} i$ represents **[1]**

a) the YOZ plane b) the Z axis c) the Y axis d) the X axis

15 Derivative of $\tan\sqrt{x^2+1}$ w.r.t $\sqrt{x^2+1}$ is **[1]**

a) $\frac{2x}{\sqrt{1+x^2}}$ b) $\sec^2\left(\frac{x}{\sqrt{x^2+1}}\right)$ c) $\sec^2 x$ d) $\sec^2\sqrt{x^2+1}$

16 If $f(x) = \frac{x-4}{2\sqrt{x}}$, then f'(1) is equal to: **[1]**

a) 0 b) $\frac{5}{4}$ c) 1 d) $\frac{4}{5}$

17 The number of telephone calls received in 245 successive, one - minute intervals at an exchange is given below in the following frequency distribution. **[1]**

Number	0	1	2	3	4	5	6	7
Frequency	14	21	25	43	51	40	39	12

What is the mode of distribution?

a) 4 b) 6 c) 5 d) 3

18 Two dice are thrown simultaneously. The probability of obtaining total score of seven is **[1]**

a) $\frac{7}{36}$ b) $\frac{6}{36}$ c) $\frac{8}{36}$ d) $\frac{5}{36}$

19 **Assertion (A):** The collection of all natural numbers less than 100' is a set. **[1]**

Reason (R): A set is a well - defined collection of the distinct objects.

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.

20 **Assertion (A):** A = {(1, 5), (1, 5), (7, - 8), (7, - 8), (7, - 8)} is function. **[1]**

Reason (R): A function is a relation which describes that there should be only one output for each input (or), we can say that a special kind of relation (a set of ordered pairs), which follows a rule i.e., every x - value should be associated with only one y - value is called a function.

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.

Section B

21 Prove that:$\cos^2 A + \cos^2 B - 2 \cos A \cos B \cos (A + B) = \sin^2 (A + B)$. **[2]**

22 Find the multiplicative inverse of the complex numbers:$(1+i\sqrt{3})^2$. **[2]**

23 Solve system of linear inequation: $-11 \leq 4x - 3 \leq 13$ **[2]**

24 Show that the middle term in the expansion of $\left(\frac{2x^2}{3}+\frac{3}{2x^2}\right)^{10}$ is 252. **[2]**

25 Find the equation of the parabola which is symmetric about the y - axis, and passes through the point (2, - 3). **[2]**

26 Evaluate:$\lim_{x\to 5} \frac{\log x - \log 5}{x-5}$ **[2]**

Section C

27 Prove that: $\sin^2 42^o - \cos^2 78^o = \frac{\sqrt{5}+1}{8}$. **[3]**

28 Solve the inequality and show the graph for the solution on number line:$\frac{x}{2} \geq \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$ **[3]**

29 How many different words can be formed by using all the letters of the word ALLAHABAD? **[3]**

In how many of them, vowels occupy the even position?

In how many of them, both L do not come together?

30 The sum of first three terms of a G. P is 13/12 and their product is -1. Find the common ratio and the terms. **[3]**

31 Show that the points A(1,1), B (- 1, - 1) and C($-\sqrt{3}$, $\sqrt{3}$) are the vertices of an equilateral triangle each of whose sides is $2\sqrt{2}$ units. **[3]**

32 Find the equation of the hyperbola whose vertices are (0, ±3) and the eccentricity is $\frac{4}{3}$ .Also find the coordinates of its foci. **[3]**

33 A problem in mathematics is given to 4 students A,B, C, D. Their chances of solving the problem, respectively, are $\frac{1}{3},\frac{1}{4},\frac{1}{5}$ and $\frac{2}{3}$ .What is the probability that **[3]**

the problem will be solved?

at most one of them solve the problem?

Section D

34 **Read the following text carefully and answer the questions that follow:** **[4]**

Representation of a Relation

A relation can be represented algebraically by roster form or by set - builder form and visually it can be represented by an arrow diagram which are given below

Roster form In this form, we represent the relation by the set of all ordered pairs belongs to R.

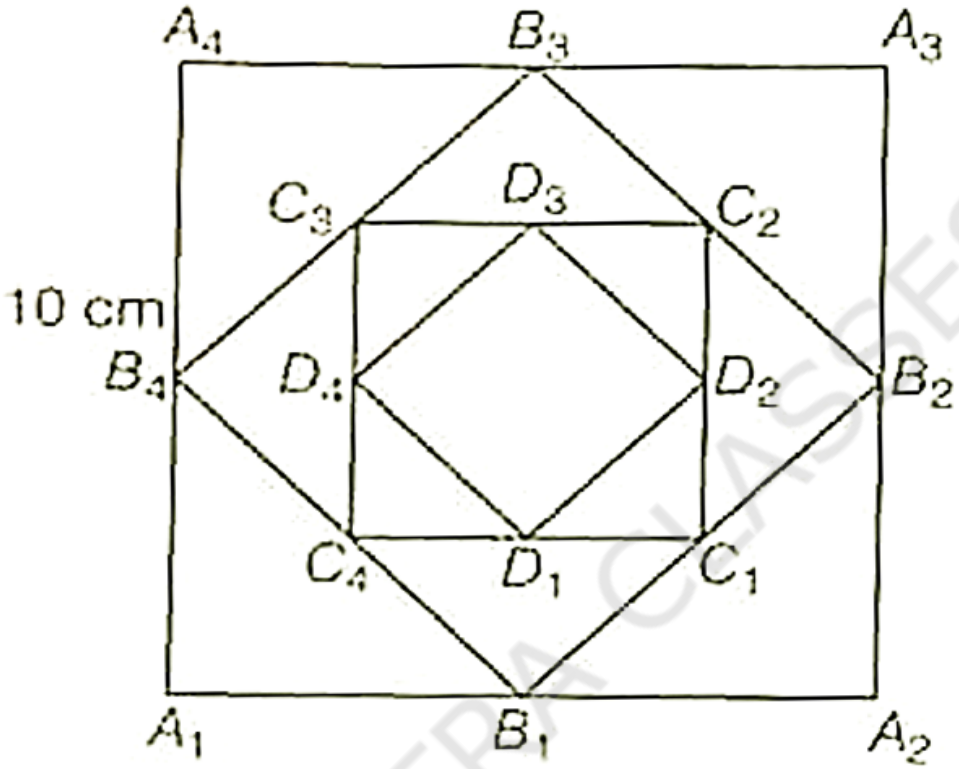
Set - builder form In this form, we represent the relation R from set A to set B as R = {(a, b): a ∈ A, b ∈ B and the rule which relate the elements of A and B}.

Arrow diagram To represent a relation by an arrow diagram, we draw arrows from first element to second element of all ordered pairs belonging to relation R.

Questions:

35 **Read the following text carefully and answer the questions that follow:** **[4]**

A student of class XI draws a square of side 10 cm. Another student joins the mid - point of this square to form a new square. Again, the mid - points of the sides of this new square are joined to form another square by another student. This process is continued indefinitely.



Write the given information in progression and name progression. (1)

Find the sum of areas of all the square formed is (in sq cm)? (1)

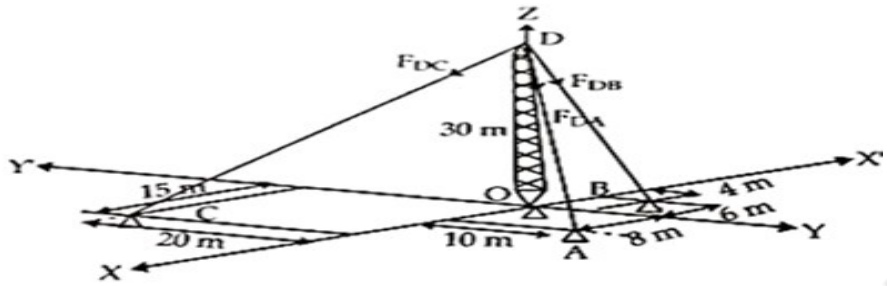
Find the sum of the perimeter of all the square formed is (in cm)? (2)

OR

Find the sum area of 5 squares? (2)

36 **Read the following text carefully and answer the questions that follow:** **[4]**

A pillar is to be constructed on a field. Kavita is an Engineer for that project. This was Kavita's first project after completing his Engineering. She draws the following diagram of that pillar for the approval. Consider the following diagram, where the forces in the cable are given.



Write the coordinates of A and B. (1)

Write the coordinates of C and D. (1)

Find the equation of the line along the cable AD. (2)

OR

Find the sum of the distances OA, OB and OC. (2)

Section E

37 Prove that: $\sin 10° \sin 30° \sin 50° \sin 70° = \frac{1}{16}$. **[5]**

38 Find the coefficient of x^7 in $\left(ax^2+\frac{1}{bx}\right)^{11}$ and x^{-7} in $\left(ax-\frac{1}{bx^2}\right)^{11}$ and find the relation between a and b so that these coefficients are equal. **[5]**

39 There are 60 students in a class. The following is the frequency distribution of the marks obtained by the students in a test: **[5]**

Marks	0	1	2	3	4	5
Frequency	x - 2	x	x^2	$\frac{(x+1)}{2}$	2x	x + 1

where x is a positive integer. Determine the mean and standard deviation of the marks.