

SBDVA Public School

Half Yearly Examination

Mathematics

Class XI

Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions:

Read the following instructions very carefully and strictly follow them:

- (i) This question paper contains 38 questions. All questions are compulsory.
- (ii) The question paper is divided into five sections A, B, C, D and E.
- (iii) In Section A, Questions no. 1 to 18 are Multiple Choice questions (MCQs) and questions number 19 and 20 are Assertion-Reason based questions of 1 mark each.
- (iv) In Section B, Questions no. 21 to 25 are very Short answer (VSA)-type questions, carrying 2 marks each.
- (v) In Section C, Questions no. 26 to 31 are Short answer (SA)-type questions, carrying 3 marks each.
- (vi) In Section D, Questions no. 32 to 35 are Long answer (LA)-type questions of 5 marks each.
- (vii) Section E Questions no. 36 to 38 are case based questions carrying 4 marks each.
- (viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and 2 questions in Section E.

SECTION A

- Q1. A real value of x satisfies the equation $\frac{x-4ix}{3+4ix} = a - ib$ ($a, b \in \mathbb{R}$), if $a^2 + b^2 =$ 1 Mark
- A 1 -1 C 2 D -2
- Q2. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A \times B$ and $B \times A$ are. 1 Mark
- 99^{200} B 99^2 C 100 D 18
- Q3. If A lies in second quadrant $3 \tan A + 4 = 0$, then the value of $2 \cot A - 5 \cot A + \sin A$ is: 1 Mark
- A $-\frac{13}{10}$ $\frac{33}{10}$ C $\frac{37}{10}$ D $\frac{7}{10}$
- Q4. For any two sets A and B, $A - (A - B)$ equals: 1 Mark
- A B B $A - B$ C $A \cap B$ $A^c \cap B^c$
- Q5. If set A has 2 elements and set B has 3 elements then how many subsets does $A \times B$ have? 1 Mark
- A 6 B 8 32 D 64
- Q6. If ${}^{n+1}C_3 = 2 \cdot {}^nC_3$, then the value of n is: 1 Mark
- A 3 4 5 D 6
- Q7. If R is a relation from a finite set A having m elements of a finite set B having n elements, then the number of relations from A to B is: 1 Mark
- A 2^{mn} $2^{mn} - 1$ C $2mn$ D m^n
- Q8. $\sin 47^\circ + \sin 61^\circ - \sin 11^\circ - \sin 25^\circ$ is equal to 1 Mark
- $\sin 36^\circ$ B $\cos 36^\circ$ C $\sin 7^\circ$ D $\cos 7^\circ$
- Q9. The domain of definition of the function $f(x) = \sqrt{x-1} + \sqrt{3-x}$ is: 1 Mark
- A $[1, \infty)$ $(-\infty, 3)$ C $(1, 3)$ D $[1, 3]$
- Q10. If $5x - 7 < 5 + x$, $11 - 5x \leq 1$, then $x \in$ 1 Mark
- A $[2, 6]$ B $[-2, 6]$ $(0, 6)$ D $(0, 6)$

Q11 If $f: \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = 3x + |x|$, then $f(2x) - f(-x) - 6x =$

- A $f(x)$ B $2f(x)$ C $f(x)$ D $f(-x)$

Q12 The number of permutations of n different things taking r at a time when 3 particular things are to be included is:

- A $n^{n-3}P_{r-1}$ B $n^{n-3}P_r$
 C n^3P_{r-3} D $r!^{n-3}C_{r-3}$

Q13 If $z = \left(\frac{1-i}{1+i} \right)^{10}$, then z^4 equals:

- A 1 B -1 C 0 D none of these.

Q14 The value of $\frac{100! + 99! + 98! + \dots + 2! + 1!}{100! + 99! + 98! + \dots + 2! + 1!} - 1$ is

- A -1 B -2 C -3 D -4

Q15 The smallest set A such that $A \cup \{1, 2\} = \{1, 2, 3, 5, 9\}$ is:

- A $\{2, 3, 5\}$ B $\{3, 5, 9\}$ C $\{1, 2, 5, 9\}$ D $\{1, 2\}$

Q16 If A, B and C are any three set, then $A \cup (B \cap C)$:

- A $(A \cup B) \cup (A \cup C)$ B $(A \cup B) \cap (A \cup C)$ C $(A \cap B) \cap (A \cap C)$ D None

Q17 $\tan 3A - \tan 2A - \tan A$ is equal to:

- A $\tan 3A \tan 2A \tan A$ B $-\tan 3A - \tan 2A \tan A$
 C $\tan A \tan 2A \tan 3A - \tan 3A \tan A$ D Non of these

Q18 The radius of the circle whose arc of length 15π makes an angle of $\frac{3\pi}{4}$ radian at the centre is:

- A 10cm B 20cm
 C $11\frac{1}{2}$ cm D $22\frac{1}{2}$ cm

Q19 Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

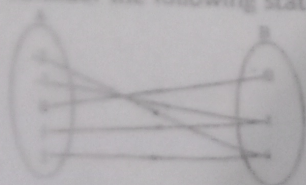
Assertion: If $(1+i)(x+iy) = 2-5i$, then $x = \frac{-3}{2}$ and $y = \frac{-7}{2}$.

Reason: If $a+ib = c+id$, then $a=c$ and $b=d$.

- A A is true, R is true; R is a correct explanation of A. B A is true, R is true; R is not a correct explanation of A.
 C A is true; R is false. D A is false; R is true.

Q20 Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

Consider the following statements



Assertion: The figure shows a relationship between the sets A and B. Then, the relation in Set-builder form is $\{(x, y) : y = x^2, x, y \in \mathbb{N} \text{ and } -2 \leq x \leq 2\}$.

Reason: The above Relation in Roster form is $\{(-1, 1), (2, 4), (0, 0), (1, 1), (2, 4)\}$.

1. A is true, R is true; R is a correct explanation of A.
 2. A is true, R is true; R is not a correct explanation of A.
 3. A is true, R is false.
 4. A is false; R is true.
 A A is true, R is true; R is a correct explanation of A. B A is true, R is true; R is not a correct explanation of A.
 C A is true; R is false. D A is false; R is true.

Section-B		
21.	Find the real numbers x and y if $(x-iy)(3+5i)$ is the conjugate of $-6-24i$.	2
22.	Find the least positive value of n, if $\left(\frac{1+i}{1-i}\right)^n = 1$.	2
23.	Evaluate: $\cot\left(\frac{-15\pi}{4}\right)$ OR Show $\sin^2\left(\frac{\pi}{8} + \frac{A}{2}\right) - \sin^2\left(\frac{\pi}{8} - \frac{A}{2}\right) = \frac{\sin A}{\sqrt{2}}$	2
24.	Solve: $-5 \leq \frac{2-3x}{4} \leq 9$	2
25.	If all letters of word 'AGAIN' are listed in dictionary, what will be 49 th word? OR How many three-digit numbers are there which have exactly one of their digits as 7? GAIN, NIGAA	2


Section-C		
26.	Let R be the relation on the set N of natural numbers defined by $R = \{(a,b) : a + 3b = 12, a \in N, b \in N\}$ Find: 1) R 2) Domain of R 3) Range of R	3
27.	If $a-ib = \frac{(x+i)^2}{(2x^2+1)^2}$ prove that $a^2 + b^2 = \frac{(x+i)^2}{(2x^2+1)^2}$	3
28.	Show $4 \sin \theta \times \sin\left(\frac{\pi}{3} + \theta\right) \times \sin\left(\frac{2\pi}{3} + \theta\right) = \sin 3\theta$.	3
29.	Prove that: $\sin \alpha + \sin(\alpha + 2\pi/3) + \sin(\alpha + 4\pi/3) = 0$. OR Find in the degrees the angle subtended at the centre of a circle of diameter 50 cm by an arc of length 11 cm.	3
30.	Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements i) do all the vowels always occur together? ii) do all the vowels never occur together? OR If all letters of word 'MATHEMATICS' are rearranged. How many number of distinct words will have "All vowels together".	3

31.	Find domain and range of $f(x) = \sqrt{4 - x^2}$ OR If $f: \mathbb{R} \rightarrow \mathbb{R}$. Find range of $f(x) = \frac{x^2}{1+x^2}$	3
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Section-D

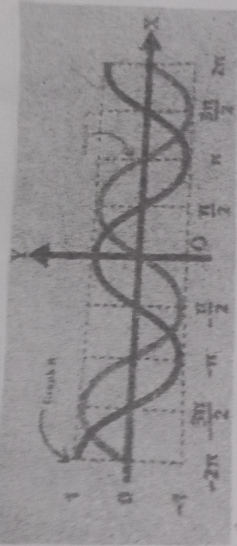
32.	Using binomial theorem, expand $\{(x + y)^5 + (x - y)^5\}$ and hence find the value of $\{(\sqrt{2} + 1)^5 + (\sqrt{2} - 1)^5\}$. ✓	5
33.	Prove that: $\cos^2 A + \cos^2 \left(A + \frac{2\pi}{3}\right) + \cos^2 \left(A - \frac{2\pi}{3}\right) = 3/2$ OR Prove that: $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$	5
34.	Solve the following system of inequations: $\frac{5x}{4} + \frac{3x}{8} > \frac{39}{8}$ $\frac{2x-1}{12} - \frac{x-1}{3} < \frac{3x+1}{4}$	5
35.	If $P(2n+1, n-1) : P(2n-1, n) = 3:5$, find n. OR What is the rank of the word RANDOM, if all letters of this word are rearranged and listed in dictionary.	5

Section-E

36.	Three friends DISHA, WISHI and TANVI were playing with each other. 	4
	Answer the following questions, using concepts of sets.	1
	(i) Write the tabular form of the name WISHI.	1
	(ii) Suppose A and B respectively represent the set of letters of the names of friends DISHA and TANVI. Then write A - B	2
	(iii) For the sets defined above in (ii), write $A \cup B$ OR	
	(iii) Let C be the set of the letters of the name WISHI. Then write $(A \cup B) \cap C$	

37.

Observe the graph shown below.



Based on the information given above, answer the following questions.

- (i) Which trigonometric function is represented by the Graph A?
- (ii) Which trigonometric function is represented by the Graph B?
- (iii) Write the range of trigonometric function represented by Graph A.

OR

- (iii) Find the difference in value of function represented by graph A at $-\frac{3\pi}{2}$ and the value at $-\pi$ from graph.

38.

Cricket is a game of all time craze. Love for the game of cricket is increasing day by day. A state cricket authority needs to select a team of 11 members. They have asked two coaches from a government academy to select the team members based on their experience and performance in the last 15 matches. There are 20 players containing 8 bowlers, 7 batsmen and 5 all-rounders from which to choose.



Answer the following on the basis of above case study.

- (i) In how many ways can a team of 11 players be selected so that it must include exactly 4 bowlers?
- (ii) In how many ways can a team of 11 players be selected so that it must include at least 4 all-rounders?