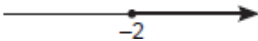
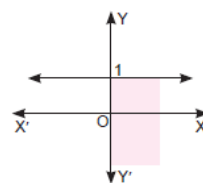


NAAHAR PUBLIC SCHOOL (CBSE) SENIOR SECONDARY, VILLUPURAM
ACADEMIC YEAR (2022-2023)
HALF-YEARLY EXAMINATION

CLASS: XI
SUB: MATHEMATICS
SUB TEACHER: Mr.RAMACHANDRAN

MARKS: 70
DUR: 3 Hrs
DATE: 16.12.2022

1. Let set $A = \{2, 4, 6, 8\}$ and set $B = \{2, 2, 4, 6, 8, 6\}$ then sets A and B are 1
 a)equal sets b)unequal sets c)(a) and (b) both d)none of these
2. The number of subsets of a set containing n elements is 1
 (a) 2^n (b) 2^{n-1} (c) $2^n - 1$ (d) n^n
3. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then $\tan(2A + B)$ is equal to 1
 (a) 1 (b) 2 (c) 3 (d) 4
4. General solution of the equation $\sin 3x = 0$ is 1
 (a) $n\pi, n \in \mathbb{Z}$ (b) $3n\pi, n \in \mathbb{Z}$
 (c) $(2n-1)\frac{\pi}{2}, n \in \mathbb{Z}$ (d) $\frac{n\pi}{3}, n \in \mathbb{Z}$
5. If $a + ib = c + id$, then 1
 (a) $a^2 + c^2 = 0$ (b) $b^2 + c^2 = 0$ (c) $b^2 + d^2 = 0$ (d) $a^2 + b^2 = c^2 + d^2$
6. Argument of complex number $-1 - i$ is 1
 (a) $\frac{\pi}{4}$ (b) $\frac{3\pi}{4}$ (c) $-\frac{3\pi}{4}$ (d) $-\frac{\pi}{4}$
7. Solution of a linear inequality in variable x, represented on the number line  is $x \in [-2, \infty)$. 1
8. Solution set of $x \geq 0$ and $y \leq 1$ is 1



State true or false.

9. The number of words formed from the letters of the word LAUGHTER, so that the vowels are never together are 1200. State true or false. 1
10. If ${}^nC_{12} = {}^nC_8$, then n is equal to 1
 (a) 20 B) 12 C) 6 D)30
11. The number of ways in which 4n students can be distributed equally among 4 sections is given by 1
 (a) $\frac{(4n)!}{n!}$ (b) $\frac{(4n)!}{4!n!}$ (c) $\frac{(4n)!}{(n!)^4}$ (d) $\frac{(4n)!}{4(n!)^4}$
12. Evaluate $(102)^3$, using binomial theorem. 1
13. The last 2-digits of the numbers 3^{400} are 01. State true or false. 1
14. The sum of terms equidistant from the beginning and end in an AP is equal to _____. 1
15. The sum of n arithmetic means between two numbers is 1
 (a) $n \times (\text{AM between the numbers})$ (c) $\frac{b-a}{n+1}$
 (b) $\frac{n}{2}[2a + (n-1)d]$ (d) none of these
16. If x, 2y, 3z are in AP, where the distinct numbers x, y, z are in GP, then common difference of the GP is 1
 (a) 3 (b) $\frac{1}{3}$ (c) 2 (d) $\frac{1}{2}$
17. The sum or difference of two GP's is again a GP. State true or false. 1

18. Find domain of the function $f(x) = \frac{x^2 + 2x + 1}{x^2 - 8x + 12}$. 1
19. If $f(x) = x^2$ and $g(x) = 2x + 1$ are two real functions. Find $(f + g)(x)$. 1
20. What is the value of $\sin \frac{31\pi}{3}$. 1
21. Express the following angle in sexagesimal system (i.e. in degrees, minutes, seconds) : $\frac{\pi^c}{5}$ 1
22. Express $\frac{4}{i^3}$ in the form $(a + ib)$. 1
23. Find the magnitude of the following : $12i - 5$ 1
24. Express the following number in polar form : $\sin 60^\circ + i \cos 60^\circ$ 1
25. Solve the inequality, $3x - 5 < x + 7$, when x is an integer 1
26. Let A and B be two sets such that $n(A) = 20$, $n(A \cup B) = 42$ and $n(A \cap B) = 4$. Find $n(B)$ 2
27. The relation f is defined by

$$f(x) = \begin{cases} x^2, & 0 \leq x \leq 3 \\ 3x, & 3 \leq x \leq 10 \end{cases}$$

 The relation g is defined by $g(x) = \begin{cases} x^2, & 0 \leq x \leq 2 \\ 3x, & 2 \leq x \leq 10 \end{cases}$ 2
28. Find the value of the following : $\sin \frac{5\pi}{3}$ 2
29. Prove the following : $\frac{\sin A + \sin 3A}{\cos A + \cos 3A} = \tan 2A$ 2
30. Find the magnitude of the following : $\frac{1+i}{2+3i}$ 2
31. Solve the inequality $x + \frac{x}{2} + \frac{x}{3} < 11$
32. How many three digit numbers are there with all distinct digits ? 2
33. Calculate : 3rd term from the end in the expansion of $(2x + 3y)^8$. 2
34. Find the value of k so that $2k + 1$, $2k - 1$, $3k + 4$ are in A.P. 2
35. Prove that : $9^{1/3} \cdot 9^{1/9} \cdot 9^{1/27} \dots = 3$ 2
36. In a school there are 20 teachers who teach mathematics or physics. Of these 12 teach mathematics and 4 teach both physics and mathematics. How many teach physics ? 3
37. Prove that, $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$. 3
38. If $z = 2 - 3i$, prove that $z^2 - 4z + 13 = 0$. 3
39. The longest side of a triangle is three times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side. 3
40. Find the number of permutations of n different things taken r at a time such that two specific things occur together. 3

41. Find $(a + b)^4 - (a - b)^4$. Hence, evaluate
 $(\sqrt{3} + \sqrt{2})^4 - (\sqrt{3} - \sqrt{2})^4$. 3

42. If $a + b + c \neq 0$ and $\frac{b+c}{a}, \frac{c+a}{b}, \frac{a+b}{c}$ are in
A.P., then prove that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in A.P.
3

43. If $\tan x = \frac{3}{4}$ and x lies in the third quadrant, find
the values of $\sin \frac{x}{2}, \cos \frac{x}{2}$ and $\tan \frac{x}{2}$. 5

44. A mathematics paper consists of 10 questions
divided into two parts I and II, each part
containing 5 questions. A student is
required to attempt 6 questions in all, taking
at least 2 questions from each part. In how
many ways the student select the questions
? 5

45. Between 1 and 31, m numbers have been
inserted in such a way that the resulting
sequence is
an A.P. and the ratio of 7^{th} and $(m - 1)^{\text{th}}$
numbers is 5 : 9. Find the value of m . 5

