

**DELHI PUBLIC SCHOOL JAMMU**  
**HALF YEARLY ASSIGNMENT**  
**(SESSION 2019-20)**

**SUB: MATHEMATICS**

**CLASS: XI**

1. If  $\cos \theta = \frac{1}{2}\left(x + \frac{1}{x}\right)$ , then find  $\frac{1}{2}\left(x^2 + \frac{1}{x^2}\right)$ .
2. Solve the following equation  $\sin 2\theta + \cos \theta = 0$ .
3. A survey shows that 65% of the Indians like apples, whereas 52% like oranges. What percentage of Indians like both apples and oranges?
4. Find the term independent of  $x$  in the expansion of  $\left(2x - \frac{1}{x}\right)^{10}$ .  
Using Binomial theorem, Prove that  $7^n - 6n$  always leaves remainder 1 when divided by 36.
5. In how many ways 4 boys and 3 girls can be seated in a row, so that they are alternate.
6. Find the number of different words that can be formed from the letters of the word 'TRIANGLE' so that no vowel is together.
7. Find the multiplicative inverse of the complex number  $(2 + \sqrt{3}i)^2$ .
8. Find the general solution of the equation  $4\sin x \cos x + 2\sin x + 2\cos x + 1 = 0$ .
9. If the term free from  $x$  in the expansion of  $\left(\sqrt{x} - \frac{k}{x^2}\right)^{10}$  is 405, find the value of  $k$ .
10. Find the value of  $x$ , if the ratio of 10<sup>th</sup> term to 11<sup>th</sup> term in the expansion of  $(2 - 3x^3)^{20}$  is 45:22.
11. Let  $a_1, a_2, a_3, \dots$  be the terms of an A.P. If  $\frac{a_1 + a_2 + a_3 + \dots + a_p}{a_1 + a_2 + a_3 + \dots + a_q} = \frac{p^2}{q^2}$ , where  $p \neq q$ , find the value of  $\frac{a_6}{a_{21}}$ .
12. Prove by using the principle of mathematical induction  $\forall n \in N$   
 $2+5+8+11 \dots + (3n-1) = \frac{1}{2}n(3n + 1)$ .
13. Using Principle of mathematical induction, prove that  $4^n + 15n - 1$  is divisible by 9  $\forall n \in N$ .
14. If  $f$  is a function satisfying  $f(x+y) = f(x) f(y) \forall x, y \in N$  such that  $f(1) = 3$  and  $\sum_{x=1}^n f(x) = 120$ , find the value of  $n$ .
15. In a triangle ABC, prove that  $(b^2 - c^2) \cot A + (c^2 - a^2) \cot B + (a^2 - b^2) \cot C = 0$ .
16. Find the domain and range of the function  $\left\{ \left(x, \frac{1}{1-x^2}\right) : x \in R, x \neq \pm 1 \right\}$ .
17. If  $(x + iy)^3 = u + iv$ , then show that  $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$ .
18. How many different words can be formed by using all the letters of the word 'ALLAHABAD'?
  - i) In how many of them, vowels occupy the even position?
  - ii) In how many of them, both 'L' do not come together?
19. If  $a = \cos \theta + i \sin \theta$ , then find  $\frac{1+a}{1-a}$ .

20. If  $3\sin^2\theta + 2\sin^2\phi = 1$  and  $3\sin 2\theta = 2\sin 2\phi$ ,  $0 < \theta < \frac{\pi}{2}$  and  $0 < \phi < \frac{\pi}{2}$ , then find the value of  $\theta + 2\phi$ .

21. Prove that  $\cos\left(\frac{3\pi}{4}+x\right) - \cos\left(\frac{3\pi}{4}-x\right) = -\sqrt{2} \sin x$ .

22. Find the domain of the function defined by  $f(x) = \sqrt{4-x} + \frac{1}{\sqrt{x^2-1}}$  and  $g(x) = 4 - x + \frac{1}{x^2-1}$ .

23. Prove that  $\frac{\sec 8\theta - 1}{\sec 4\theta - 1} = \frac{\tan 8\theta}{\tan 2\theta}$ .

24. If  $x$  lies in third quadrant and  $5\sin x + 3 = 0$ , find the value of  $\frac{2 \tan x - 5 \sin x + \cot x}{2 \sin \frac{x}{2} \cos \frac{x}{2}}$ .

25. If  $a, b, c$  and  $d$  are in G.P and the equation  $ax^2+2bx+c=0$  and  $dx^2+2ex+f=0$  have a common root, then show that  $\frac{d}{a}, \frac{e}{b}, \frac{f}{c}$  are in A.P .