# INDIAN SCHOOL AL WADI AL KABIR

## Class XI – MATHEMATICS

## Winter Holiday Work Sheet

1. Prove that; $\frac{\sin A - \sin 3A + \sin 5A - \sin 7A}{\cos A - \cos 3A - \cos 5A + \cos 7A} = \cot 2A$

2. In any ΔABC, prove $\frac{a^2 + b^2}{a^2 + c^2} = \frac{1 + \cos(A-B).\cos C}{1 + \cos(A-C).\cos B}$

3. Find the image of the point (3, 8) in the line x + 3y = 7

4. Prove by using the principle of mathematical induction for all n ∈ N:

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

5. Prove by using the principle of mathematical induction for all n ∈ N, that $x^{2n} - y^{2n}$ is divisible by x + y

6. In a town of 10000 families, it was found that 40% families buy newspaper A, 20% families buy newspaper B and 10% families buy newspaper C. 5% families buy A and B, 3% families buy B and C and 4% families buy A and C. If 2% families buy all the three newspapers, find the number of families which buy
   (i) A only (ii) B only (iii) none of A, B or C

7. Find the value of 'n' so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be Geometric Mean between 'a' and 'b'

8. Find the sum of '*n*' terms of the series : 0.5 + 0.55 + 0.555+ ……..*n* terms

9. In the expansion of $\left(x^2 - \frac{1}{x}\right)^{12}$, find (i) 4th term, (ii) term independent of x

10. A committee of 8 students is to be selected from 8 boys and 6 girls. In how many ways this can be done if each group is to consists of al least 3 boys and 3 girls.

11. Prove that $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

12. Let U = {1, 2, 3, 4, 5, 6, 7}, A = {2, 4, 6}, B = {3, 5} and C = {1, 2, 4, 7} Find,
   (i) (A U B) ∩ C (ii) A ∩ (B U C)' (iii) C – A (iv) (B – A) U (A – B)

13. The relation R is defined as, R = [(x, x + 5) : x ∈ {0, 1, 2, 3, 4, 5}]
   Write R in roster form and write its domain and range.

14. Find the value of $2 \sin^2\left(\frac{3\pi}{4}\right) + 2 \cos^2\left(\frac{3\pi}{4}\right) - 2 \tan^2\left(\frac{3\pi}{4}\right)$

15. Solve the inequality $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$

16. Find the angle between the lines $y = (2 - \sqrt{3})(x + 5)$ and $y = (2 + \sqrt{3})(x - 7)$

17 Which number is larger : $(1.2)^{4000}$ or 800

18 For the post of 5 clerks, there are 25 applicants. 2 Posts are reserved for SC candidates and remaining for others. There are 7 SC candidates among the applicants. In how many ways can the selection be done?

19 Find 'n' if ${}^{2n-1}P_n : {}^{2n+1}P_{n-1} = 22 : 7$

20 Write the complex number $\frac{1+7i}{(2-i)^2}$ in polar form

21 Show that $2^{4n} - 15n - 1$ is divisible by 225.

22 If C1, C2, C3 and C4 are the coefficients of 2nd, 3rd, 4th and 5th terms respectively in the Binomial expansion of $(1 + x)^n$, then prove that $\frac{C_1}{C_1 + C_2} + \frac{C_3}{C_3 + C_4} = \frac{2C_2}{C_2 + C_3}$

23 How many words can be made by using all letters of the word 'MATHEMATICS' in which all vowels are never together.

24 Find the sum of the series $\frac{n-1}{n} + \frac{n-2}{n} + \frac{n-3}{n} +$ ..... to 'n' terms

25 Prove that the straight lines $2x + 5y - 1 = 0$, $3x - 2y + 8 = 0$ and $7x + 3y + 11 = 0$ are concurrent.