Assignment MATHEMATICS

Class : XI **Summer Vacations Assignment – 1** **Topic : Sets, Relation & Function**

1. Find $A \cap B$ if : $A = \{x : x = 2n+1, n \le 6,\ n \in N\}$, $B = \{x : x = 3n-2, n \le 3,\ n \in N\}$
2. Describe the set $\{-1, 1\}$ in set builder form.
3. $A = \{1,3,5\}, B = \{2,4\}$ find B×A.
4. If $A = \{a, b\}$ find number of relations in A×A
5. Define Absolute function.
6. Given $A = \{1,2,3\},\ B = \{3,4\},\ C = \{4,5,6\}$ find $(A \times B) \cap (A \times C)$
7. Draw Venn diagram of $(A \cap B)'$ where $A \cap B \ne \phi$
8. Write down all subsets of following set : B= {a,b}
9. If $U = \{1,2,3,4,5,6,7,8,9\}, A = \{2,4,6,8\}$ and $B = \{2,3,5,7\}$. Verify that

   (i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$
10. There are 210 members in a club, 100 of them drink tea and 65 drink tea but not coffee. Find
    (i) How many drink coffee ?
    (ii) How many drink coffee but not tea ?
11. Prove that : $A - (B \cap C) = (A - B) \cup (A - C)$
12. Let X = {1, 2, 3, 4} and Y = {1, 5, 9, 11, 15, 16}
    Determine which of the following sets are functions from X to Y

    (i) $f_1 = \{(1,1), (2,11), (3,1), (4,15)\}$

    (ii) $f_2 = \{(1,1), (2,7), (3,5)\}$

    (iii) $f_3 = \{(1,5), (2,9), (3,1), (4,5), (2,11)\}$
13. Find the domain and range of function : $y = \sqrt{4 - x}$
14. Let A={1, 2, 3, 4, 6}. Let R be the relation on A defined by
    {(a, b) : $a \in A, b \in A,$ a divides b}. Find
    (a) R (b) domain of R (c) range of R
15. In set of natural numbers. Let R be the relation defined by
    R={(a,b) : a + 2b =11, $a, b \in N$ }. Write R as set of ordered pairs. Find the domain of R and the range of R.
16. In set of natural numbers. Let R be the relation defined by
    R={(a,b) : a + 2b =10, $a, b \in N$ }. Write R as set of ordered pairs. Find the domain of R and the range of R.
17. Find the domain and range of the following functions :

    (i) $y = \sqrt{4 - x^2}$ (ii) $y = x - [x]$
18. Determine the domain and range of the following relations :

    (i) $\{(x, y) : x \in N,\ y \in N\ and\ x + y = 10\}$

    (ii) $\{(x, y) : x \in N,\ x < 5,\ y = 3\}$

19. Draw the graphs of the following functions :

(i) $f : R \to R$ **such that** $f(x) = (x-2)$

(ii) $f(x) = \begin{cases} 3-x & if \quad x > 1 \\ 1 & if \quad x = 1 \\ 2x & if \quad x < 1 \end{cases}$

20. In the set A = {1, 2, 3, 4, 5}, a relation R is defined by R = {(x, y) | x, y $\in$ A and x < y}. Then R is -

(A) Reflexive (B) Symmetric (C) Transitive (D) None of these

21. Let L denote the set of all straight lines in a plane. Let a relation R be defined by $\alpha R \beta \Leftrightarrow \alpha \perp \beta, \alpha, \beta \in L$**. Then R is**

(A) Reflexive (B) Symmetric (C) Transitive (D) None of these

22. The relation R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)} on the set A = {1, 2, 3} is -

(A) Reflexive but not symmetric (B) Reflexive but not transitive

(C) Symmetric and transitive (D) Neither symmetric nor transitive

23. Establish the following results :

(i) $A \cup (B - C) = (A \cup B) - (C - A)$

(ii) $A - B = A \cap B'$

24. Define Modulus functions and fractional part function

25. Find the domain and range of $y = \sqrt{4 - x^2}$

26. If $f(x) = \dfrac{x-1}{x+1}$ **then prove that** $f(2x) = \dfrac{3f(x)+1}{f(x)+3}$

27. Define $f + g$ **and** $f.g$ **when** $f(x) = \dfrac{1}{x+4}$, $g(x) = \sqrt{x+1}$.

28. In a village, there are 87 families, of which 52 families have atmost 2 children. In a rural development programme, 20 families are to chosen for assistance, of which atleast 18 families must have atmost 2 children. In how many ways can the choice be made ? How can we aware the villagers about the rural development ?

29. In a survey of 100 people, it was found that 28 read newspaper A, 30 read newspaper B and 42 read newspaper C, 8 read newspaper A and B, 10 read newspaper A and C, 5 read newspaper B and C and 3 read all the three newspapers. Find

(i) How many read none of the three newspapers ?

(ii) How many read newspaper C only ?

(iii) What is the importance of newspapers in daily life ?

30. In a town of 10,000 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% buy B and C and 4% buy A and C. If 2% families buy all the newspapers, using set operation find the number of families which buy (i) A only (ii) B only (iii) none of A, B and C. What are the benefits of reading a newspaper ?

Assignment
MATHEMATICS

Class : XI   Summer Vacations Assignment – 2   Topic : Solution of Triangles

1. In a triangle ABC, if $a = 2$, $b = 3$ and $\sin A = \frac{2}{3}$. Find $\angle B$.

2. In a triangle ABC, if $a \cos A = b \cos B$. Show that triangle is either isosceles or right angled.

3. In any triangle ABC, show that $a \cos\left(\frac{B - C}{2}\right) = (b + c) \sin \frac{A}{2}$.

4. For any triangle ABC, prove that $a\,(b \cos C - c \cos B) = b^2 - c^2$.

5. In any triangle ABC, prove that $a \sin^2 \frac{C}{2} + c \sin^2 \frac{A}{2} = \frac{a + c - b}{2}$.

6. In any triangle ABC, if $A = 30^o$, $b = 3$ and $c = 3\sqrt{3}$, then find $\angle B$ and $\angle C$.

7. Find the area of a triangle ABC in which $\angle C = 60^o$, $a = 5\,m$ and $b = 6\,m$.

8. In a triangle ABC, $a = 3$, $b = 5$, $c = 6$. Calculate :

   (i) $\sin \frac{A}{2}$ (ii) $\cos \frac{A}{2}$ (iii) Area of the triangle

9. In any triangle ABC, prove that $(a + b + c)\left(\tan \frac{A}{2} + \tan \frac{B}{2}\right) = 2c \cot \frac{C}{2}$

10. In any triangle ABC, if $\angle C = 90^o$, prove that $\tan\left(\frac{A - B}{2}\right) = \frac{a - b}{a + b}$

11. The angles of a triangle are in the ratio 1 : 2 : 7. Show that the ratio of the greatest side to the least side is $\sqrt{5} + 1 : \sqrt{5} - 1$.

12. In a ΔABC, prove that :

$$(r + r_1) \tan\left(\frac{B - C}{2}\right) + (r + r_2) \tan\left(\frac{C - A}{2}\right) + (r + r_3) \tan\left(\frac{A - B}{2}\right) = 0.$$

13. In a ΔABC, right angled at C, if $\tan A = \sqrt{\frac{\sqrt{5} - 1}{2}}$, show that the sides a, b, c are in G.P.

14. In an acute-angled triangle ABC, the circle on the altitude AD as diameter cuts AB at P and AC at Q. show that $PQ = 2R \sin A \sin B \sin C = \frac{\Delta}{R}$.

15. The ex-radii of a triangle are 5 cm, 7.5 cm and 15 cm. Find the sides and the angles of the triangle.

Assignment MATHEMATICS

Class : XI **Summer Vacations Assignment – 3** **Topic : Trigonometric Equations**

1. If q Î [0, 5p] and r Î R such that 2sin q = $r^4 - 2r^2 + 3$ then the maximum number of values of the pair (r, q) is ?

2. The most general value of q which satisfy both the equations , cos q = $-\frac{1}{\sqrt{2}}$ and tan q = 1 is ?

3. If a , b are different values of ' x ' satisfying , a cos x + b sin x = c , then tan $\left(\frac{\alpha+\beta}{2}\right)$

4. If tan (cot x) = cot (tan x) , then sin 2 x = ?

5. The number of roots of the equation , x + 2 tan x = $\frac{\pi}{2}$ in the interval [0 , 2 p] is ?

6. Total number of solutions of , $\sin^2 x$ – sin x – 1 = 0 in [– 2 p , 2 p] is equal to ?

7. If x , y Î [0 , 2 p] , then total number of ordered pairs (x , y) satisfying the equation , sin x . cos y = 1 , is equal to ?

8. The solution of the inequation $\sin^2$ x £ $\frac{1}{4}$ is?

9. Let ' n ' be a positive integer such that , sin $\frac{\pi}{2n}$ + cos $\frac{\pi}{2n}$ = $\frac{\sqrt{n}}{2}$, then ?

10. Solve the equation , cosec x = 1 + cot x .

11. Find the coordinates of the points of intersection of the curves y = cos x , y = sin 3 x if $-\frac{\pi}{2}$ £ x £ $\frac{\pi}{2}$?

12. Find all the solution of 4 $\cos^2$ x sin x – 2 $\sin^2$ x = 3 sin x ?

13. Find the values of x Î (– p , p) which satisfy the equation , $8^{\left(1+|\cos x|+|\cos x|^2+|\cos x|^3+.......\right)} = 4^3$?

14. Find all the angles q between – p to p that satisfy the equation , 5 cos 2 q + 2 $\cos^2 \frac{\theta}{2}$ + 1 = 0 ?

15. Find all the values of a for which the equation , $\sin^4$ x + $\cos^4$ x + sin 2 x + a = 0 is valid . Also find the general solution of the equation ?

1. The value of $\cos 130^\circ + \cos 110^\circ + \cos 10^\circ$ is ?

2. The number of integral value of k for which the equation $7\cos x + 5\sin x = 2k + 1$ has a solution is ?

3. If $\tan x \tan y = a$ and $x + y = \frac{\pi}{6}$, then tan x and tan y satisfy the equation.

4. If $\alpha + \beta + \gamma = \pi$. Then the value of $\sin^2\alpha + \sin^2\beta - \sin^2\gamma$ is equal to?

5. If tan A and tan B are the roots of the quadratic equation $x^2 - ax + b = 0 : b \neq 1, a \neq 0$, then the value of $\sin^2(A + B)$ is ?

6. If $\tan\theta = n\tan\phi$ where $n > 0$, then the maximum value of $\tan^2(\theta - \phi)$ is ?

7. If $\cos^2 A + \cos^2 B + \cos^2 C = 1$, then triangle ABC is ?

8. If $y = \frac{\sqrt{1-\sin 4A}+1}{\sqrt{1+\sin 4A}-1}$, where $A \in \left(\frac{7\pi}{8}, \frac{9\pi}{8}\right)$ then one of the value of ‘ y ‘ is ?

9. For a ΔABC, it is given that $\cos A + \cos B + \cos C = \frac{3}{2}$. Prove that the triangle is equilateral.

10. If in a ΔABC, $\cos A \cos B + \sin A \sin B \sin C = 1$, show that $a : b : c = 1 : 1 : \sqrt{2}$

11. Prove that : $\tan\alpha + 2\tan 2\alpha + 4\tan 4\alpha + 8\cot 8\alpha = \cot\alpha$.

12. ABC is a triangle such that $\sin(2A + B) = \sin(C - A) = -\sin(B + 2C) = \frac{1}{2}$. If A, B and C are in arithmetic progression, determine the values of A, B and C.

13. Show that the value of $\frac{\tan x}{\tan 3x}$, wherever defined never lies between $\frac{1}{3}$ and 3.

14. Let A, B, C be three angles such that $A = \frac{\pi}{4}$ and $\tan B \tan C = p$. Find the range of p such that A, B, C are angles of a triangle.

15. Prove that : $\sum_{k=1}^{n-1}(n-k)\cos\frac{2k\pi}{n} = -\frac{n}{2}$, where $n \geq 3$ is an integer.

Assignment MATHEMATICS

Class : XI Summer Vacations Assignment – 5 Topic :Principle of Mathematical Induction

1. For every integer n, prove that $7^n - 3^n$ is divisible by 4.

2. Prove that n(n +1)(n + 5) is multiple of 3.

3. Prove that $10^{2n-1} + 1$ is divisible by 11 .

4. Prove $(2n + 7) < (n + 3)^2$.

5. Prove that n (n + 1) (2n + 1) is divisible by 6.

6. Show that the sum of the first n odd natural no is n^2.

7. Prove that $1+\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{3}}+\ldots+\frac{1}{\sqrt{n}} \geq \sqrt{n}$, ∀ n Î N.

8. Use the principle of mathematical induction to prove that for all n Î N.

   $\sqrt{2+\sqrt{2+\sqrt{2+\ldots+\ldots+\sqrt{2}}}} = 2\cos\left(\frac{\pi}{2^{n+1}}\right)$ when the L.H.S. contains n radical signs.

9. If $a_1 = 1$, $a_2 = 5$ and $a_{n+2} = 5a_{n+1} - 6a_n$, n ³ 1. Show by using mathematical induction

   that $a_n = 3^n - 2^n$.

10. If a and b are positive, use mathematical induction to prove that

    $\left(\frac{a+b}{2}\right)^n \leq \frac{a^n+b^n}{2} \ \forall \, n \in N$.

Assignment MATHEMATICS

Class : XI | **Summer Vacations Assignment – 6** | **Topic : Linear Inequalities**

1. Solve 5x -3 < 3x +1when x is an integer.
2. Solution set of the in inequations $3x-6 \geq 0, 4x-10 \leq 6$.
3. Solve 7x + 3 < 5x + 9 . Show the graph of the solution on number line.
4. Solve 3x +8 > 2 when x is a real no.
5. Solve $3x-6 \geq 0$ graphically.
6. Solve the following systems of linear inequations graphically : $2x+3y \leq 35, y \geq 3, x \geq 2, x \geq 0, y \geq 0$.
7. Ravi obtained 70 and 75 mark in first unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks.
8. The marks scored by Rohit in two tests were 65 and 70. Find the minimum marks he should score in the third test to have an average of at least 65 marks.
9. Find all pairs of consecutive odd natural no. both of which are larger than 10 such that their sum is less than 40.
10. A company manufactures cassettes and its cost equation for a week is C=300+1.5 x and its revenue equation is R=2 x , where x is the no. of cassettes sold in a week. How many cassettes must be sold by the company to get some profit?
11. The longest side of a triangle 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle at least 61 cm find the minimum length of the shortest side.
12. A sol. Of 8% boric acid is to be diluted by adding a 2% boric acid sol. to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% sol. how many litre of the 2% sol. will have to be added.
13. A Solution is to be kept between $30^o C$ and $35^o C$. What is the range of temperature in degree Fahrenheit?
14. The water acidity in a pool is considered normal when the average Ph reading of three daily measurements is between 7.2 and 7.8 If the first Ph reading are 7.48 and7.85, find the range of Ph value for the third reading that will result in the acidity level being normal.
15. How many litres of water will have to be added to 1125 litres of the 45% sol. Of acid so that the resulting mixture will contain more than 25%but less than 30% acid content.

Answer Key

Class - XI Assignment -1 (Sets, Relation and function)

1. $A \cap B = \{7\}$
2. $\{x : x^2 - 1 = 0\}$
3. $B \times A = \{(2,3)(2,5)(4,1)(4,3)(4,5)\}$
4. 16
8. $\phi, \{a\}, \{a, b\}$
10. (1) 135 (2) 100
12. (i)
13. $D = (-\infty, 4]\ R = [0, \infty)$
15. Domain { 1, 3, 5, 7, 9} Range {5,4, 3, 2, 1}
16. R = { (2, 4), (4, 3), (6, 2), (8, 1)

    D = { 2, 4, 6, 8} R = {4, 3, 2, 1}
17. (1) $D = (-2, 2]\ R = [0, 2)$ (2) $x \in R, [0, 1)$
18. D_R={1, 2,3 4,5 ,6,7,8,9} R_R={1, 2,3 4,5 ,6,7,8,9}
20. D
21. B
22. A
25. $D = (-2, 2]\ R = [0, 2)$
29. (1) 20 (2) 30

    (3) Imp knowledge of world
30. (i) 3300 (ii) 1400 (iii) 4000

Class - XI Assignment -2 (Solution of Triangles)

1. $\angle B = \frac{\pi}{2}$
6. $\angle B = 30, \angle C = 120$
7. $15\sqrt{3}$
8. (1) $\frac{1}{\sqrt{15}}$ (2) $\frac{\sqrt{14}}{\sqrt{15}}$ (3) $\frac{2}{\sqrt{14}}$

Class - XI Assignment -3 (Trigonometric Equations)

1. 2
2. $\frac{3}{4}$
3. $\frac{b}{a}$
4. $\frac{4}{\pi}$
5. 3
7. 2
8. $x = n\pi \pm \frac{\pi}{6}$
9. n = 2
10. $x = 2n\pi \pm \frac{\pi}{4} + \frac{\pi}{4}$
11. $\left(\frac{\pi}{8}, \sqrt{\frac{\sqrt{2}+1}{2\sqrt{2}}}\right)$
12. $x = n\pi$ *and* $x = n\pi + (-1)^n \frac{\pi}{8}$
13. $\left\{\frac{\pi}{3}, -\frac{\pi}{3}, \frac{2\pi}{3}, -\frac{2\pi}{3}\right\}$
15. $\left[\frac{-1}{2}, \frac{7}{2}\right]$

Class - XI Assignment -4 (Ratio and Identities)

1. 0
2. 7
3. $\sqrt{3}\tan^2 x + (a-1)\tan x + a\sqrt{3} = 0$
4. 0
7. Right angle triangle
8. y = 1
12. $45^0, 60^0, 75^0$.

5. $\dfrac{2a^2}{a^2 + \left(1 - b^2\right)^2}$ 14. $\left(-\infty, 3 - 2\sqrt{2}\right) \cup \left(3 + 2\sqrt{2}, \infty\right)$

Class - XI Assignment -6 (Linear Inequalities)

1. $[x < 2]$
2. [2, 4]
4. $[x > -2]$
7. atleast 35 marks
8. 60
9. (11, 13), (13, 15), (15, 17), (17, 19)
10. More than 600
11. 9 cm
12. More than 320 litres but less than 1280 litres.
13. Between 86^0 F and 95^0 F.
14. Between 6.27 and 8.07
15. More than 562.5 litres but less than 900 litres