

Grade: XI MATHEMATICS - worksheet

1. Out of 280 students in class XI of a school, 135 play Hockey, 110 play football, 80 play volleyball, 35 of these play hockey and football, 30 play volleyball and hockey, 20 play football and volleyball. Also, each student plays at least one of the three games. How many students play all the three games?
2. In a survey of 100 students, the number of students studying the various languages were found to be: English only 18, English but not Hindi 23, English and German 8, English 26, German 48, German and Hindi 8, no language 24. Find the number of students who were studying (i) Hindi (ii) English and Hindi (iii) English, Hindi and German.
3. A school awarded 58 medals for Honesty, 20 for Punctuality and 25 for Obedience. If these medals were bagged by a total of 78 students and only 5 students got medals for all the three values, find the number of students who received medals for exactly two of the three values.
4. Let $A = \{5,6,7,8\}$, $B = \{-11,4,7,-10,-7,-9,-13\}$ and $f = \{(x, y) : y = 3 - 2x, x \in A, y \in B\}$
(i) Write down the elements of f (ii) what is the co-domain? (iii) what is the range?
5. If $f(x) = 3x^4 - 5x^2 + 9$, find $f(x-1)$
6. $f(x) = x + \frac{1}{x}$, prove that $[f(x)]^3 = f(x^3) + 3f\left(\frac{1}{x}\right)$.
7. Let f be defined by $f(x) = x - 4$ and g be defined by $g(x) = \begin{cases} \frac{x^2 - 16}{x + 4}, & x \neq -4 \\ \lambda, & x = -4 \end{cases}$.
Find the value of λ such that $f(x) = g(x)$.
8. Find the domain of the following function

(i) $\frac{2x-3}{x^2-3x+2}$ (ii) $\sqrt{x-2}$ (iii) $\frac{7}{\sqrt{4-x}}$

9. Find the range : (i) $\frac{1}{\sqrt{x-5}}$ (ii) $\frac{x}{1+x^2}$

10. Let f and g be two real functions defined by $f(x) = \frac{1}{x+4}$ and $g(x) = (x+4)^3$.

Find (i) f + g

(ii) f - g (iii) f g (iv) 1/f

1. Find the radian measures : (i) $5^\circ 37' 30''$ (ii) 520°

2. Find the values of (i) $\cos 765^\circ$ (ii) $\sec(-1410^\circ)$ (iii) $\tan \frac{19\pi}{3}$

(iv) $\cot\left(\frac{-15\pi}{4}\right)$ (v) $\cos \cos(-1710^\circ)$

3. Find the value $\sin 15^\circ$

4. Prove that $\sin 780 \sin 480 + \cos 120 \cos 60 = \frac{1}{2}$

5. Find the values of the following: (a) $\sin 420$ (b) $\cos 120$
(c) $\cos 150$ (d) $\cos 3\pi/2$ (e) $\tan 3\pi/4$

6. Simplify: $\frac{\cot(90-\theta)\sin(180+\theta)\sec(360-\theta)}{\tan(180+\theta)\sec(-\theta)\cos(90+\theta)}$

7. If $a \sin^2 \theta + b \cos^2 \theta = c$, show that $\tan^2 \theta = \frac{c-b}{a-c}$

8. Prove that

$$3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) = 13$$

9. Prove that $\cos(A-B) = \cos A \cos B + \sin A \sin B$.

10. Prove that $\frac{1 + \sin \theta - \cos \theta}{1 + \sin \theta + \cos \theta} = \tan \frac{\theta}{2}$

11. If $\tan \theta = 3$, find $\tan 3\theta$

12. Show that $\sin 20 \sin 40 \sin 80^\circ = \frac{\sqrt{3}}{8}$

13. Prove that $\cos 20 + \cos 100 + \cos 140 = 0$

14. If $A+B+C = \pi$ Prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

15. If $A+B+C = \pi$ prove that If

$$\cos^2 A + \cos^2 B - \cos^2 C = 1 - 2 \sin A \sin B \cos C$$

16. Prove that $\sin 20 \sin 40 \sin 60 \sin 80 = 3/16$
17. $\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$
18. Find the value of $\sin 18^\circ$
19. If $A + B = 45^\circ$ show that $(1 + \tan A)(1 + \tan B) = 2$ and deduce the value of $\tan 22\frac{1}{2}^\circ$
20. Find the values of the following: (a) $\sin(2460)$ (b) $\cos 240$ (c) $\sin 300$ (d) $\sin 3\pi$ (e) $\cos 2\pi$
21. Prove that
$$\frac{\sin(180 + A) \cos(90 - A) \tan(270 - A)}{\sec(540 - A) \cos(360 + A) \csc(270 + A)} = -\sin A \cos^2 A$$
22. Prove that
$$\frac{\sin 300 \cdot \tan 330 \cdot \sec 420}{\cot 135 \cdot \cos 210 \cdot \csc 315} = -\sqrt{\frac{2}{3}}$$
23. Find the value of
$$\tan^2 30 + 2 \sin 60 + \tan 45 - \tan 60 + \cos^2 30$$