

ATUL CLASSES

Worksheet Name: Atul Classes
Standard: 11th Science
Subject: Mathematics
Student Name:

Section:

Roll No.:

Questions: 50	Time: 01:00 hh:mm	Marks: 252
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Instructions

1. do it

Q1. $\tan x \tan\left(x + \frac{\pi}{3}\right) + \tan x \tan\left(\frac{\pi}{3} - x\right) + \tan\left(x + \frac{\pi}{3}\right) \tan\left(x - \frac{\pi}{3}\right) = -3$

Q2. Prove that:

$$\frac{\sin A \sin 2A + \sin 3A \sin 6A}{\sin A \cos 2A + \sin 3A \cos 6A} = \tan 5A$$

Q3. Solve the following equations:

$$3 - 2 \cos x - 4 \sin x - \cos 2x + \sin 2x = 0$$

Q4. If X lies in the first quadrant and $\cos x = \frac{8}{17}$, then prove that

$$\cos\left(\frac{\pi}{6} + x\right) + \cos\left(\frac{\pi}{4} - x\right) + \cos\left(\frac{2\pi}{3} - x\right) = \left(\frac{\sqrt{3}-1}{2} + \frac{1}{\sqrt{2}}\right) \frac{23}{17}$$

Q5. Prove that $(2\sqrt{3} + 3) \sin x + 2\sqrt{3} \cos x$ lies between $-(2\sqrt{3} + \sqrt{15})$ and $(2\sqrt{3} + \sqrt{15})$.

Q6. Prove that:

$$\cos \frac{\pi}{15} \cos \frac{2\pi}{15} \cos \frac{3\pi}{15} \cos \frac{4\pi}{15} \cos \frac{5\pi}{15} \cos \frac{6\pi}{15} \cos \frac{7\pi}{15} = \cos \frac{1}{128}$$

Q7. Prove that:

$$\begin{aligned} & \sin \alpha + \sin \beta + \sin \gamma - \sin(\alpha + \beta + \gamma) \\ &= 4 \sin\left(\frac{\alpha+\beta}{2}\right) \sin\left(\frac{\beta+\gamma}{2}\right) \sin\left(\frac{\gamma+\alpha}{2}\right) \end{aligned}$$

Q8. If $T_n = \sin^n x + \cos^n x$, Prove that

$$2T_6 - 3T_4 + 1 = 0$$

Q9. If $\tan \alpha = x + 1$, $\tan \beta = x - 1$, prove that $2 \cot(\alpha - \beta) = x^2$

Q10. If $\sin \alpha + \sin \beta = a$ and $\cos \alpha + \cos \beta = b$, show that

$$\sin(\alpha + \beta) = \frac{2ab}{a^2 + b^2}$$

Q11. If $\tan\left(x + \frac{\pi}{3}\right) + \tan\left(x - \frac{2\pi}{3}\right) = 3$, prove that $\frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x} = 1$

Q12. $a(\cos B \cos C + \cos A) = b(\cos C \cos A + \cos B)$
 $= c(\cos A \cos B + \cos C)$.

Q13. Show that:

$$\begin{aligned} & \sin(B - C) \cos(A - D) + \sin(C - A) \\ & \cos(B - D) + \sin(A - B) \cos(C - D) = 0 \end{aligned}$$

Q14. If θ lies in the first quadrant and $\cos \theta = \frac{8}{17}$, then find the value of $\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta)$.

Q15. If $\alpha + \beta = \frac{\pi}{2}$, show that the maximum value of $\cos \alpha \cos \beta$ is $\frac{1}{2}$.

Q16. In a $\triangle ABC$, if $\angle B = 60^\circ$, prove that $(a + b + c) = 3ca$

Q17. Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ in each of the following :

$$\tan x = -\frac{4}{3}, x \text{ in quadrant II}$$

Q18. In a circle of diameter 40cm, the length of a chord is 20cm. Find the length of minor arc of the chord.

Q19. Solve the following equations:

$$3 \tan x + \cot x = 5 \operatorname{cosec} x$$

Q20. If $T_n = \sin^n x + \cos^n x$, Prove that

$$6T_{10} - 15T_8 + 10T_6 - 1 = 0$$

Q21. If in a $\triangle ABC$, $\cos^2 A + \cos^2 B + \cos^2 C = 1$, prove that the triangle is right angled.

Q22. Reduce each of the following expressions to the sine and cosin of a single expression:

$$\sqrt{3} \sin x - \cos x$$

Q23. prove that:

$$\frac{\cos(A+B+C)+\cos(-A+B+C)+\cos(A-B+C)+\cos(A+B-C)}{\sin(A+B+C)+\sin(-A+B+C)+\sin(A-B+C)-\sin(A+B-C)} = \cot C$$

Q24. Prove that:

$$2 \sin^2 \frac{3\pi}{4} + 2 \cos^2 \frac{\pi}{4} + 2 \sec^2 \frac{\pi}{3} = 10$$

Q25. Prove that:

$$\tan x \tan \left(\frac{\pi}{3} - x \right) \tan \left(\frac{\pi}{3} + x \right) = \tan 3x$$

Q26. Find the general solution for each of the following equations:

$$\sec^2 2x = 1 - \tan 2x$$

Q27. Solve the following equations:

$$4 \sin x \cos x + 2 \sin x + 2 \cos x + 1 = 0$$

Q28. If $\cos(\alpha + \beta) \sin(\gamma + \delta) = \cos(\alpha - \beta) \sin(\gamma - \delta)$,

$$\text{prove that } \cot \alpha \cot \beta \cot \gamma = \cot \delta$$

Q29. Two ships leave a port at the same time. One goes 24km/ hr in the direction N 38° E and other travels 32km/ hr in the direction S 52° E. Find the distance between the ships at the end of 3hrs.

Q30. At the foot of a mountain, the elevation of its summit is 45°; after ascending 1000m towards the mountain up a slope of 30° inclination, the elevation is found to be 60°. Find the height of the mountain.

Q31. If $\frac{\cos(A-B)}{\cos(A+B)} + \frac{\cos(C+D)}{\cos(C-D)} = 0$, prove that $\tan A \tan B \tan C \tan D = -1$

Q32. Solve the following equations:

$$\sin x - 3 \sin 2x + \sin 3x = \cos x - 3 \cos 2x + \cos 3x$$

Q33. If $T_n = \sin^n x + \cos^n x$, Prove that

$$\frac{T_3 - T_5}{T_1} = \frac{T_5 - T_7}{T_3}$$

Q34. $4 \left(bc \cos^2 \frac{A}{2} + ca \cos^2 \frac{B}{2} + ab \cos^2 \frac{C}{2} \right) = (a + b + c)^2$

Q35. If are two different values of X lying between 0 and π which satisfy the equation $6 \cos x + 8 \sin x = 9$ find the value of $\sin(\alpha + \beta)$.

Q36. prove that:

$$\sin(B - C) \cos(A - D) + \sin(C - A) \cos(B - D) + \sin(A - B) \cos(C - D) = 0$$

Q37. Show that $\sin 100^\circ - \sin 10^\circ$ is positive.

Q38. A person observes the angle of elevation of the peak of a hill from a station to be α . He walks c metres along a slope inclined at an angle β and finds the angle of elevation of the peak of the hill to be γ . Show that the height of the peak above the ground is

$$\frac{c \sin \alpha \sin(\gamma - \beta)}{(\sin \gamma - \alpha)}$$

Q39. Find the general solution for each of the following equations:

$$\sin x + \sin 3x + \sin 5x = 0$$

Q40. Reduce each of the following expressions to the sine and cosine of a single expression:

$$\cos x - \sin x$$

Q41. Prove that:

$$\begin{aligned} &\cos(A+B+C) + \cos(A - B+C) + \cos(A+B - C) \\ &+ \cos(-A+B+C) = 4 \cos A \cos B \cos C \end{aligned}$$

Q42. $\sin 5x = 5 \cos^4 x \sin x - 10 \cos^2 x \sin^3 x + \sin^5 x$

Q43. If $\tan \theta + \sin \theta = m$ and $\tan \theta - \sin \theta = n$, then prove that $m^2 - n^2 = 4 \sin \theta \tan \theta$

Q44. Solve the following equations:

$$3 \sin 2x - 5 \sin x \cos x + 8 \cos 2x = 2$$

Q45. If $\sin \alpha \sin \beta - \cos \alpha \cos \beta + 1 = 0$ prove that $1 + \cot \alpha \tan \beta$

Q46. In a $\triangle ABC$, if $\sin^2 A + \sin^2 B = \sin^2 C$, show that the triangle is right angled.

Q47. If $\tan A + \tan B = a$ and $\cot A + \cot B = b$, prove that $\cot(A + B) = \frac{1}{a} - \frac{1}{b}$.

Q48. Solve the following equations:

$$\sin x \tan x - 1 \tan x - \sin x$$

Q49. If the sides a, b, c of a $\triangle ABC$ are in H.P., prove that $\sin^2 \frac{A}{2}, \sin^2 \frac{B}{2}, \sin^2 \frac{C}{2}$ are in H.P.

Q50. Prove that:

$$\cos 20^\circ \cos 100^\circ + \cos 100^\circ \cos 140^\circ - \cos 140^\circ \cos 200^\circ = -\frac{3}{4}$$