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Q1. $\frac{\sin\theta}{1+\cos\theta}+\frac{1+\cos\theta}{\sin\theta}=2\operatorname{cosec}\theta$.

Q2. If $\tan A=\frac{3}{4}$, then $\sin A\cos A=\frac{12}{25}$.

Q3. $(\sin\alpha+\cos\alpha)(\tan\alpha+\cot\alpha)=\sec\alpha+\operatorname{cosec}\alpha$.

Q4. $(\sqrt{3}+1)(3-\cot 30^\circ)=\tan^3 60^\circ-2\sin 60^\circ$.

Q5. $1+\frac{\cot^2\alpha}{1+\operatorname{cosec}\alpha}=\operatorname{cosec}\alpha$.

Q6. $\tan\theta+\tan(90^\circ-\theta)=\sec\theta\sec(90^\circ-\theta)$.

Q7. Find the angle of elevation of the Sun when the shadow of a pole h m high is $\sqrt{3}\,h$ m long.

Q8. If $\sqrt{3}\tan\theta=1$, then find the value of $\sin^2\theta-\cos^2\theta$.

Q9. A ladder 15 m long just reaches the top of a vertical wall. If the ladders makes an angle of 60° with the wall, then find the height of the wall.

Q10. Simplify $(1+\tan^2\theta)(1-\sin\theta)(1+\sin\theta)$.

Q11. If $2\sin^2\theta-\cos^2\theta=2$, then find the value of θ.

Q12. Show that $\frac{\cos^2(45^\circ+\theta)+\cos^2(45^\circ-\theta)}{\tan(60^\circ+\theta)\tan(30^\circ-\theta)}=1$.

Q13. An observer 1.5 m tall is 20.5 m away from a tower 22 m high. Determine the angle of elevation of the top of the tower from the eye of the observer.

Q14. Show that $\tan^4\theta+\tan^2\theta=\sec^4\theta-\sec^2\theta$.

Q15. $\frac{\tan A}{1+\sec A}+\frac{\tan A}{1-\sec A}=2\operatorname{cosec}A$.

Q16. If $\operatorname{cosec}\theta+\cot\theta=p$, then prove that $\cos\theta=\frac{p^2-1}{p^2+1}$.

Q17. The angle of elevation of the top of a tower from certain point is 30°. If the observer moves 20 m towards the tower, the angle of elevation of the top increases by 15°. Find the height of the tower.

Q18. Prove that $\sqrt{\sec^2\theta+\operatorname{cosec}^2\theta}=\tan\theta+\cot\theta$.

Q19. If $1+\sin^2\theta=3\sin\theta\cos\theta$, then prove that $\tan\theta=1$ or $\frac{1}{2}$.

Q20. If $\sin\theta+2\cos\theta=1$, then prove that $2\sin\theta-\cos\theta=2$.

Q21. The angle of elevation of the top of a tower from two points distant s and t from its foot are complementary. Prove that the height of the tower is $\sqrt{st}$.

Q22. If $\tan\theta+\sec\theta=l$, then prove that $\sec\theta=\frac{l^2+1}{2l}$.

Q23. The shadow of a tower standing on a level plane is found to be 50 m longer when Sun's elevation is 30° than when it is 60°. Find the height of the tower.

Q24. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h. At a point on the plane, the angles of elevation of the bottom and the top staff are α and β respectively. Prove that the height of the tower is $\left(\frac{h \tan \alpha}{\tan \beta - \tan \alpha}\right)$.

Q25. If $\sin \theta + \cos \theta = p$ and $\sec \theta + \operatorname{cosec} \theta = 1$, then prove that $q(p^2 - 1) = 2p$.

Q26. The angle of elevation of the top of a tower 30 m high from the foot of another tower in the same plane is 60° and the angle of elevation of the top of the second tower from the foot of the first tower is 30°. Find the distance between the two towers and also the height of the tower.

Q27. Prove that $\frac{1 + \sec \theta - \tan \theta}{1 + \sec \theta + \tan \theta} = \frac{1 - \sin \alpha}{\cos \theta}$.

Q28. If $a \sin \theta + b \cos \theta = c$, the prove that $a \cos \theta - b \sin \theta = \sqrt{a^2 + b^2 - c^2}$.

Q29. From the top of a tower h m high, angles of depression of two objects, which are in line with the foot of thetower are α and β ($\beta > \alpha$). Find the distance between the two objects.

Q30. The lower window of a house is at a height of 2 m above the ground and its upper window is 4 m vertically above the lower window. At certain instant the angles of elevation of a balloon from these windows are observed to be 60° and 30°, respectivelly. Find the height of the balloon above the ground.

Q31. A window of a house is h m above the ground. From the window, the angles of elevation and depression of the top and the bottom of another house situated on the opposite side of the lane are found to be α and β, reapectively. Prove that the height of the other house is $h(1 + \tan \alpha \cot \beta)$ m.

Q32. A ladder against a vertical wall at an inclination a to the horizontal. Its foot is pulled away from the wall through a distance p, so that its upper end slides a distane q down the wall and then the ladder makes as angle β to the horizontal. Show that $\frac{p}{q} = \frac{\cos \beta - \cos \alpha}{\sin \alpha - \sin \beta}$.

Q33. The angle of elevation of the top of a vertical tower from a point on the ground is 60°. From another point 10 m vertically above the first, its angle of elevation is 45°. Find the height of the tower.

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S1. Proved.

S2. Proved.

S3. Proved.

S4. Proved.

S5. Proved.

S6. Proved.

S7. 30°.

S8. $-1/2$.

S9. $15/2$ m.

S10. 1

S11. $\theta = 90°$.

S12. Proved.

S13. 45°.

S14. Proved.

S15. Proved.

S16. Proved.

S17. $10(\sqrt{3}+1)$ m

S18. Proved.

S19. Proved.

S20. Proved.

S21. Proved.

S22. Proved.

S23. Height of tower = $25\sqrt{3}$ m .

S24. Proved.

S25. Proved.

S26. Distance between tower = $10\sqrt{3}$, Height of tower = 10 m.

S27. Proved.

S28. Proved.

S29. Required distance = $h(\cot\alpha - \cot\beta)$.

S30. Height of balloon above the ground = 8 m.

S31. Proved.

S32. Proved.

S33. Height of tower = $5(\sqrt{3}+3)$ m .