MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

TRIGONOMETRIC IDENTITIES

Solved Examples

1. Prove that $\left(1-\sin^2\theta\right)\sec^2\theta=1$

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2. Prove that

$(i)\left(\operatorname{cosec}^2\theta-1\right)\tan^2\theta=1$ $(ii)\left(\sec^2\theta-1\right)\left(1-\operatorname{cosec}^2\theta\right)=-1$

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3. $\frac{\sin^3\theta+\cos^3\theta}{\sin\theta+\cos\theta}+\sin\theta\cos\theta=\ ?$

A. 1

B. -1

C. 2

D. $\frac{1}{2}$

Answer: A

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4. Prove that

$$(\sin\theta-\operatorname{cosec}\theta)(\cos\theta-\sec\theta)=\frac{1}{\tan\theta+\cot\theta}.$$

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5. Prove that

$$(1+\cot\theta-\operatorname{cosec}\theta)(1+\tan\theta+\sec\theta)=2.$$

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6. Find the value of

$$\frac{\cos\theta}{(1-\tan\theta)}+\frac{\sin\theta}{(1-\cot\theta)}$$

A. $\cos\theta+\sin\theta$

B. $\cos\theta-\sin\theta$

C. $\frac{1}{\cos\theta+\sin\theta}$

D. $\frac{\cos\theta+\sin\theta}{2}$

Answer: A

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7. Prove that $\tan\theta=\frac{\sin\theta-2\sin^3\theta}{2\cos^3\theta-\cos\theta}$

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8. Find

$$\frac{\tan A}{(1-\cot A)}+\frac{\cot A}{(1-\tan A)}$$

A. $\frac{1+\sin A\cos A}{\sin A\cos A}$

B. $(1+\tan A+\cot A)$

C. both (a) and (b)

D. none of these

Answer: C

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9. Prove that

$$(\text{cosec}A-\sin A)(\sec A-\cos A)=\frac{1}{(\tan A+\cot A)}.$$

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10. $\left(\frac{1+\tan^2 A}{1+\cot^2 A}\right)=\left(\frac{1-\tan A}{1-\cot A}\right)^2=\tan^2 A$

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11. Prove that

$(i)\dfrac{\tan A+\sin A}{\tan A-\sin A}=\dfrac{\sec A+1}{\sec A-1}$

$(ii)\dfrac{\cot A-\cos A}{\cot A+\cos A}=\dfrac{\text{cosec}A-1}{\text{cosec}A+1}$

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12. Prove that

$(i)\sec^2\theta+\text{cosec}^2\theta=\sec^2\theta\text{cosec}^2\theta$

$(ii)\tan^2\theta-\sin^2\theta=\tan^2\theta\sin^2\theta$

$(iii)\tan^2\theta+\cot^2\theta+2=\sec^2\theta\text{cosec}^2\theta$

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13. Prove that $(\cos ec\theta-\cot\theta)^2=\dfrac{1-\cos\theta}{1+\cos\theta}$

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14. Prove the following identity: $\sec^4\theta - \sec^2\theta = \tan^4\theta + \tan^2\theta$

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15. Prove that

$$\left(1+\frac{1}{\tan^2 A}\right)\left(1+\frac{1}{\cot^2 A}\right) = \frac{1}{\left(\sin^2 A - \sin^4 A\right)}.$$

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16. Prove that

$$(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = \left(7 + \tan^2\theta + \cot^2\theta\right).$$

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17. Prove that

$$(i)\ \frac{1-\sin\theta}{1+\sin\theta} = (\sec\theta - \tan\theta)^2$$

$(ii)\dfrac{(1+\cos\theta)}{(1-\cos\theta)} = (\text{cosec}\theta + \cot\theta)^2$

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18. Prove that

$(i)\dfrac{1}{(\text{cosec}\theta - \cot\theta)} = (\text{cosec}\theta + \cot\theta)$

$(ii)\dfrac{(\sec\theta - \tan\theta)}{(\sec\theta + \tan\theta)} = (1 + 2\tan^2\theta - 2\sec\theta\tan\theta)$

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19. $\dfrac{1}{cosec\theta - \cot\theta} - \dfrac{1}{\sin\theta} = \dfrac{1}{\sin\theta} - \dfrac{1}{cosec\theta + \cot\theta}$

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20. Prove that

$\dfrac{1}{(\sec\theta - \tan\theta)} - \dfrac{1}{\cos\theta} = \dfrac{1}{\cos\theta} - \dfrac{1}{(\sec\theta + \tan\theta)}.$

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21. Prove that

$(i)\dfrac{\sin\theta}{(1-\cos\theta)} = (\text{cosec}\theta + \cot\theta)$

$(ii)\dfrac{1}{(\sec\theta - \tan\theta)} = (\sec\theta + \tan\theta)$

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22. Prove that : $\dfrac{\sec\theta + \tan\theta - 1}{\tan\theta - \sec\theta + 1} = \dfrac{\cos\theta}{1-\sin\theta}$

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23. Prove that

$\dfrac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \dfrac{1}{(\sec\theta - \tan\theta)}.$

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24. Prove that

$\dfrac{\cot\theta + \text{cosec}\theta - 1}{\cot\theta - \text{cosec}\theta + 1} = \dfrac{1+\cos\theta}{\sin\theta}.$

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25. Prove that

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

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26. Prove the following trigonometric identities:

$\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta \quad \sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

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27. Prove that $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$

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28. Prove that: $\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}+\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}=2\cos ec\,\theta$

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29. $\frac{\cos ec\theta}{\cos ec\theta-1}+\frac{\cos ec\theta}{\cos ec\theta+1}=2\sec^2\theta$

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30. Show that

$\left(\cos^2\theta-\sin^2\theta\right)=\frac{2\tan\theta}{\left(1-\tan^2\theta\right)}$ is not an identity .

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31. Prove that

$(i)\left(\sin^2 A\cos^2 B-\cos^2 A\sin^2 B\right)=\left(\sin^2 A-\sin^2 B\right)$

$(ii)\left(\tan^2 A\sec^2 B-\sec^2 A\tan^2 B\right)=\left(\tan^2 A-\tan^2 B\right)$

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32. Prove the following identities:

$$\tan^2 A - \tan^2 B = \frac{\cos^2 B - \cos^2 A}{\cos^2 B \cos^2 A} = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$$

$$\frac{\sin A - \sin B}{\cos A + \cos B} + \frac{\cos A - \cos B}{\sin A + \sin B} = 0$$

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33. If

$x = a\sin\theta + b\cos\theta$ and $y = a\cos\theta - b\sin\theta$, prove that $x^2 + y^2 = a^2$

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34. If $x = a\sin\theta and y = b\tan\theta$, then prove that $\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1$

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35. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$ then prove $m^2 - n^2 = 4\sqrt{mn}$

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36. If $\sec\theta + \tan\theta = m$, show that $\frac{(m^2-1)}{(m^2+1)} = \sin\theta.$

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37. If $\sin\theta + \cos\theta = m$ and $\sec\theta + \text{cosec}\theta = n$, prove that $n(m^2 - 1) = 2m.$

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38. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$; show that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

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39. If $\sin\theta + \sin^2\theta = 1$ Prove that $\cos^2\theta + \cos^4\theta = 1$

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40. If $\cos\theta + \sin\theta = 1$, prove that $\cos\theta - \sin\theta = \pm 1$.

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41. If $x\sin^3\theta + y\cos^3\theta - \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, prove that $x^2 + y^2 = 1$

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42. If $x = a\sec\theta\cos\varphi$, $y = b\sec\theta\sin\varphi$ and $z = c\tan\theta$, show that $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1$

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43. If $x = r\sin\alpha\cos\beta, y = r\sin\alpha\sin\beta$ and $z = r\cos\alpha,$ prove that $x^2 + y^2 + z^2 = r^2.$

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44. If $\cos ec\theta - \sin\theta = m and \sec\theta - \cos\theta = n,$ prove that $\left(m^{2n}\right)^{\frac{2}{3}} + \left(mm^2\right)^{\frac{2}{3}} = 1$

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

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46. If $(3\sin\theta + 5\cos\theta) = 5,$ prove that $(5\sin\theta - 3\cos\theta) = \pm 3.$

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Exercise 13 A

1. Prove each of the following identities :

$(i)\left(1-\cos^2\theta\right)\operatorname{cosec}^2\theta=1 \qquad (ii)\left(1+\cot^2\theta\right)\sin^2\theta=1$

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2. Prove each of the following identities :

$(i)\left(\sec^2\theta-1\right)\cot^2\theta=1 \qquad (ii)\left(\sec^2\theta-1\right)\left(\operatorname{cosec}^2\theta-1\right)=1$

$(iii)\left(1-\cos^2\theta\right)\sec^2\theta=\tan^2\theta$

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3. Prove that :

(i) $\dfrac{1}{1+\tan^2\theta}+\dfrac{1}{1+\cot^2\theta}=1$

(ii) $\sin^2\theta+\dfrac{1}{1+\tan^2\theta}=1$

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4. Prove each of the following identities :

$(i)(1+\cos\theta)(1-\cos\theta)\left(1+\cot^2\theta\right)=1$

$(ii)\text{cosec}\theta(1+\cos\theta)(\text{cosec}\theta-\cot\theta)=1$

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5. Prove each of the following identities :

$(i)\cot^2\theta-\dfrac{1}{\sin^2\theta}=-1 \qquad (ii)\tan^2\theta-\dfrac{1}{\cos^2\theta}=-1$

$(iii)\cos^2\theta+\dfrac{1}{\left(1+\cot^2\theta\right)}=1$

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6. Prove each of the following identities :

$\dfrac{1}{(1+\sin\theta)}+\dfrac{1}{(1-\sin\theta)}=2\sec^2\theta$

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7. Prove each of the following identities :

$(i)\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)=1$

$(ii)\sin\theta(1+\tan\theta)+\cos\theta(1+\cot\theta)=(\sec\theta+\operatorname{cosec}\theta)$

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8. Prove each of the following identities :

$(i)1+\dfrac{\cot^2\theta}{(1+\operatorname{cosec}\theta)}=\operatorname{cosec}\theta$

$(ii)1+\dfrac{\tan^2\theta}{(1+\sec\theta)}=\sec\theta$

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9. Prove each of the following identities :

$\dfrac{\left(1+\tan^2\theta\right)\cot\theta}{\operatorname{cosec}^2\theta}=\tan\theta$

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10. Prove each of the following identities :

$$\frac{\tan^2\theta}{(1+\tan^2\theta)}+\frac{\cot^2\theta}{(1+\cot^2\theta)}=1$$

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11. Prove each of the following identities :

$$\frac{\sin\theta}{(1+\cos\theta)}+\frac{(1+\cos\theta)}{\sin\theta}=2\text{cosec}\theta$$

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12. Prove each of the following identities :

$$\frac{\tan\theta}{(1-\cot\theta)}+\frac{\cot\theta}{(1-\tan\theta)}=(1+\sec\theta\text{cosec}\theta)$$

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13. Prove each of the following identities :

$$\frac{\cos^2\theta}{(1-\tan\theta)}+\frac{\sin^3\theta}{(\sin\theta-\cos\theta)}=(1+\sin\theta\cos\theta)$$

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14. Prove each of the following identities :

$$\frac{\cos\theta}{(1-\tan\theta)} - \frac{\sin^2\theta}{(\cos\theta-\sin\theta)} = (\cos\theta+\sin\theta)$$

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15. Prove each of the following identities :

$$\left(1+\tan^2\theta\right)\left(1+\cot^2\theta\right) = \frac{1}{\left(\sin^2\theta-\sin^4\theta\right)}$$

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16. Prove each of the following identities :

$$\frac{\tan\theta}{\left(1+\tan^2\theta\right)^2} + \frac{\cot\theta}{\left(1+\cot^2\theta\right)^2} = \sin\theta\cos\theta$$

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17. Prove each of the following identities :

$(i) \sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$

$(ii) \sin^2\theta + \cos^4\theta = \cos^2\theta + \sin^4\theta$

$(iii) \text{cosec}^4\theta - \text{cosec}^2\theta = \cot^4\theta + \cot^2\theta$

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18. Prove each of the following identities :

$(i) \dfrac{1-\tan^2\theta}{1+\tan^2\theta} = (\cos^2\theta - \sin^2\theta)$

$(ii) \dfrac{1-\tan^2\theta}{\cot^2 - 1} = \tan^2\theta$

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19. Prove each of the following identities :

$(i) \dfrac{\tan\theta}{(\sec\theta - 1)} + \dfrac{\tan\theta}{(\sec\theta + 1)} = 2\text{cosec}\theta$

$(ii) \dfrac{\cot\theta}{(\text{cosec}\theta + 1)} + \dfrac{(\text{cosec}\theta + 1)}{\cot\theta} = 2\sec\theta$

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20. Prove each of the following identities :

$(i)\dfrac{\sec\theta-1}{\sec\theta+1}=\dfrac{\sin^2\theta}{(1+\cos\theta)^2}$

$(ii)\dfrac{\sec\theta-\tan\theta}{\sec\theta+\tan\theta}=\dfrac{\cos^2\theta}{(1+\sin\theta)^2}$

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21. Prove each of the following identities :

$(i)\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}}=(\sec\theta+\tan\theta)$

$(ii)\sqrt{\dfrac{1-\cos\theta}{1+\cos\theta}}=(\text{cosec}\theta-\cot\theta)$

$(iii)\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}}+\sqrt{\dfrac{1-\cos\theta}{1+\cos\theta}}=2\text{cosec}\theta$

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22. Prove each of the following identities :

$\dfrac{\cos^3\theta+\sin^3\theta}{\cos\theta+\sin\theta}+\dfrac{\cos^3\theta-\sin^3\theta}{\cos\theta-\sin\theta}=2$

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23. Prove each of the following identities :

$$\frac{\sin\theta}{(\cot\theta+\operatorname{cosec}\theta)}-\frac{\sin\theta}{(\cot\theta-\operatorname{cosec}\theta)}=2$$

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24. Prove each of the following identities :

$$(i)\ \frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}+\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}=\frac{2}{\left(2\sin^2\theta-1\right)}$$

$$(ii)\ \frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}+\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}=\frac{2}{(1-2\cos^2\theta)}$$

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25. Prove each of the following identities :

$$\frac{1+\cos\theta-\sin^2\theta}{\sin\theta(1+\cos\theta)}=\cot\theta$$

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26. Prove each of the following identities :

$(i)\dfrac{\text{cosec}\theta+\cot\theta}{\text{cosec}\theta-\cot\theta}=(\text{cosec}\theta+\cot\theta)^2=1+2\cot^2\theta+2\text{cosec}\theta\cot\theta$

$(ii)\dfrac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta}=(\sec\theta+\tan\theta)^2=1+2\tan^2\theta+2\sec\theta\tan\theta$

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27. Prove each of the following identities :

$(i)\dfrac{1+\cos\theta+\sin\theta}{1+\cos\theta-\sin\theta}=\dfrac{1+\sin\theta}{\cos\theta}$

$(ii)\dfrac{\sin\theta+1-\cos\theta}{\cos\theta-1+\sin\theta}=\dfrac{1+\sin\theta}{\cos\theta}$

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28. Prove that $\dfrac{\sin\theta}{\sec\theta+\tan\theta-1}+\dfrac{\cos\theta}{\cos ec\theta+\cot\theta-1}=1$

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29. Prove each of the following identities :

$$\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}+\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}=\frac{2}{\left(\sin^2\theta-\cos^2\theta\right)}=\frac{2}{\left(2\sin^2\theta-1\right)}$$

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30. $\frac{\cos\theta\cos ec\theta-\sin\theta\sec\theta}{\cos\theta+\sin\theta}=\cos ec\theta-\sec\theta$

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31. Prove each of the following identities :

$$(1+\tan\theta+\cot\theta)(\sin\theta-\cos\theta)=\left(\frac{\sec\theta}{\text{cosec}^2\theta}-\frac{\text{cosec}\theta}{\sec^2\theta}\right)$$

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32. What will be the value of following identities :

$$\frac{\cot^2\theta(\sec\theta-1)}{(1+\sin\theta)}+\frac{\sec^2\theta(\sin\theta-1)}{(1+\sec\theta)}$$

A. 0

B. 1

C. 2

D. 3

Answer: A

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33. Prove the following identity:

$$\left(\frac{1}{\sec^2\theta - \cos^2\theta} + \frac{1}{\cos ec^2\theta - \sin^2\theta}\right)\sin^2\theta\cos^2\theta = \frac{1 - \sin^2\theta\cos^2\theta}{2 + \sin^2\cos^2\theta}$$

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34. Prove each of the following identities :

$$\frac{(\sin A - \sin B)}{(\cos A + \cos B)} + \frac{(\cos A - \cos B)}{(\sin A + \sin B)} = 0$$

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35. Prove: $\frac{\tan A + \tan B}{\cot A + \cot B} = \tan A \tan B$

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36. Show that none of the following is an identity:

$(i)\cos^2\theta + \cos\theta = 1$ $(ii)\sin^2\theta + \sin\theta = 2$ $(iii)\tan^2\theta + \sin\theta$

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37. Prove that: $\left(\sin\theta - 2\sin^3\theta\right) = \left(2\cos^3\theta - \cos\theta\right)\tan\theta.$

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

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Exercise 13 B

1. If $a\cos\theta + b\sin\theta = manda\sin\theta - b\cos\theta = n,$ Prove that $a^2 + b^2 = m^2 + n^2$

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2. If $x = a\sec\theta + b\tan\theta$ and $y = a\tan\theta + b\sec\theta$ then prove that $x^2 - y^2 = a^2 - b^2$

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3. If $\left(\frac{x}{a}\sin\theta - \frac{y}{b}\cos\theta\right) = 1$ and $\left(\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta\right) = 1,$ prove that $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right) = 2.$

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4. If $(\sec\theta + \tan\theta) = m$ and $(\sec\theta - \tan\theta) = n$, shown that $mn = 1$.

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5. If $(\text{cosec}\theta + \cot\theta) = m$ and $(\text{cosec}\theta - \cot\theta) = n$, show that $mn = 1$.

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6. If $x = a\cos^3\theta$ and $y = b\sin^3\theta$, prove that $\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3} = 1$.

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7. If $(\tan\theta + \sin\theta) = m$ and $(\tan\theta - \sin\theta) = n$, prove that $(m^2 - n^2)^2 = 16mn$.

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8. If $\cot\theta + \tan\theta = m$ and $\sec\theta - \cos\theta = n$ then $(m^2 n)^{\frac{2}{3}} - (mn^2)^{\frac{2}{3}} =$

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9. If $\operatorname{cosec}\theta - \sin\theta = a^3$ and $\sec\theta - \cos\theta = b^3$ then prove that $a^2 b^2 (a^2 + b^2) = 1.$

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10. If $(2\sin\theta + 3\cos\theta) = 2$, prove that $(3\sin\theta - 2\cos\theta) = \pm 3.$

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11. If $(\sin\theta + \cos\theta) = \sqrt{2}\cos\theta$, show that $\cot\theta = (\sqrt{2} + 1).$

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12. If $\cos\theta + \sin\theta = \sqrt{2}\sin\theta$ then $\sin\theta - \cos\theta$ is

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13. If $\sec\theta + \tan\theta = p$, prove that

(i)

$$\sec\theta = \frac{1}{2}\left(p + \frac{1}{p}\right) \quad \text{(ii)} \quad \tan\theta = \frac{1}{2}\left(p - \frac{1}{p}\right) \quad \text{(iii)} \quad \sin\theta = \frac{p^2 - 1}{p^2 + 1}$$

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14. If $\tan A = n\tan B$ and $\sin A = m\sin B$, prove that $\cos^2 A = \frac{m^2 - 1}{n^2 - 1}$

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15. If $m = \cos\theta - \sin\theta$ and $n = \cos\theta + \sin\theta$ then show that $\sqrt{\frac{m}{n}} + \sqrt{\frac{n}{m}} = \frac{2}{\sqrt{1 - \tan^2\theta}}$

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Exercise 13 C

1. Write the value of $\left(1-\sin^2\theta\right)\sec^2\theta$.

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2. $\left(1-\cos^2\theta\right)\cos ec^2\theta=1$

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3. Write the value of $\left(1+\tan^2\theta\right)\cos^2\theta$.

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4. Write the value of $\left(1+\cot^2\theta\right)\sin^2\theta$.

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5. What is the value of $\sin^2\theta + \frac{1}{1+\tan^2\theta}$?

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6. Write the value of $\cot^2\theta - \frac{1}{\sin^2\theta}$.

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7. Write the value of $\sin\theta\cos(90^\circ - \theta) + \cos\theta\sin(90^\circ - \theta)$.

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8. Write the value of $\text{cosec}^2(90^\circ - \theta) - \tan^2\theta$.

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9. Write the value of $\sec^2\theta(1+\sin\theta)(1-\sin\theta)$.

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10. Write the value of $\text{cosec}^2\theta(1+\cos\theta)(1-\cos\theta)$.

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11. Write the value of $\sin^2\theta\cos^2\theta\left(1+\tan^2\theta\right)\left(1+\cot^2\theta\right)$.

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12. Smlplify : $\left(1+\tan^2\theta\right)(1-\sin\theta)(1+\sin\theta)$

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13. Write the value of $3\cot^2\theta - 3\text{cosec}^2\theta$.

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14. Write the value of $4\tan^2\theta - \dfrac{4}{\cos^2\theta}$.

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15. Write the value of $\dfrac{\tan^2\theta - \sec^2\theta}{\cot^2\theta - \text{cosec}^2\theta}$.

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16. If $\sin\theta = \dfrac{1}{2}$, write the value of $\left(3\cot^2\theta + 3\right)$.

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17. If $\cos\theta = \dfrac{2}{3}$, write the value of $\left(4 + 4\tan^2\theta\right)$.

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18. If $\cos\theta = \frac{7}{25}$, write the value of $(\tan\theta + \cot\theta)$.

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19. If $\cos\theta = \frac{2}{3}$, write the value of $\frac{(\sec\theta - 1)}{(\sec\theta + 1)}$.

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20. If $5\tan\theta = 4$, write the value of $\frac{(\cos\theta - \sin\theta)}{(\cos\theta + \sin\theta)}$.

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21. If $3\cot\theta = 4$, write the value of $\frac{(2\cos\theta + \sin\theta)}{(4\cos\theta - \sin\theta)}$.

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22. If $\cot\theta = \frac{1}{\sqrt{3}}$, show that $\frac{1-\cos^2\theta}{2-\sin^2\theta} = \frac{3}{5}$

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23. If $\tan\theta = \frac{1}{\sqrt{5}}$, write the value of $\frac{(\text{cosec}^2\theta - \sec^2\theta)}{(\text{cosec}^2\theta + \sec^2\theta)}$.

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24. If $\cot A = \frac{4}{3}$ and $(A+B) = 90^\circ$, what is the value of tan B?

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25. If $A + B = 90o$ and $\cos B = \frac{3}{5}$, what is the value of $\sin A$?

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26. If $\sqrt{3}\sin\theta = \cos\theta$ and θ is an acute angle, find the value of θ.

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27. The value of $\tan 10^\circ \cdot \tan 20^\circ \cdot \tan 45^\circ \cdot \tan 70^\circ \cdot \tan 80^\circ$ =_____

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28. The value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \ldots \tan 89^\circ$ is

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29. Write the value of $\cos 1^\circ \cos 2^\circ \ldots \cos 180^\circ$.

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30. If tan A=5/12, find the value of (sin A+cos A) sec A

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31. If $\sin\theta = \cos(\theta - 45^\circ)$, where θ is acute, find the value of θ.

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32. Find the value of $\frac{\sin 50^\circ}{\cos 40^\circ} + \frac{\text{cosec}40^\circ}{\sec 50^\circ} - 4\cos 50^\circ \quad \text{cosec}40^\circ$.

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33. Find the value of $\sin 48^\circ \sec 42^\circ + \cos 48^\circ \text{cosec}42^\circ$.

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34. If $x = a\sin\theta$ and $y = b\cos\theta$, write the value of $\left(b^2x^2 + a^2y^2\right)$.

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35. If $5x = \sec\theta$ and $\frac{5}{x} = \tan\theta$, find the value of $5\left(x^2 - \frac{1}{x^2}\right)$.

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36. If $\operatorname{cosec}\theta = 2x$ and $\cot\theta = \frac{2}{x}$, find the value of $2\left(x^2 - \frac{1}{x^2}\right)$

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37. If $\sec\theta + \tan\theta = x$, find the value of $\sec\theta$.

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38. Choose the correct answer in each of the following questions:

$$\frac{\cos 38^\circ \operatorname{cosec} 52^\circ}{\tan 18^\circ \tan 35^\circ \tan 60^\circ \tan 72^\circ \tan 55^\circ} = ?$$

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39. If $\sin\theta = x,$ write the value of $\cot\theta.$

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40. If $\sec\theta = x,$ write the value of $\tan\theta.$

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Multiple Choice Questions Mcq

1. Choose the correct answer in each of the following questions:

$$\frac{\sec 30^\circ}{\text{cosec}60^\circ} = ?$$

A. $\frac{2}{\sqrt{3}}$

B. $\frac{\sqrt{3}}{2}$

C. $\sqrt{3}$

D. 1

Answer: D

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2. $\frac{\tan 35^\circ}{\cot 55^\circ} + \frac{\cot 78^\circ}{\tan 12^\circ} = ?$

A. 0

B. 1

C. 2

D. none of these

Answer: C

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3. Choose the correct answer in each of the following questions:

$\tan 10^\circ \tan 15^\circ \tan 75^\circ \tan 80^\circ = ?$

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. -1

D. 1

Answer: D

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4. Evaluate each of the following: $\cot 12^\circ \cot 38^\circ \cot 52^\circ \cot 60^\circ \cot 78^\circ$

$\tan 5^\circ \tan 25^\circ \tan 30^\circ \tan 65^\circ \tan 85^\circ$

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. 1

D. none of these

Answer: B

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5. $\cos 1^\circ \times \cos 2^\circ \times \cos 3^\circ \times \ldots \times \cos 180^\circ = ?$

A. -1

B. 1

C. 0

D. $\frac{1}{2}$

Answer: C

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6. Evaluate : $\frac{2\sin^2 63^\circ + 1 + 2\sin^2 27^\circ}{3\cos^2 17^\circ - 2 + 3\cos^2 73^\circ}$

A. $\frac{3}{2}$

B. $\frac{2}{3}$

C. 2

D. 3

Answer: D

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7. Choose the correct answer in each of the following questions:

$\sin 47^\circ \cos 43^\circ + \cos 47^\circ \sin 43^\circ = ?$

A. $\sin 4^\circ$

B. $\cos 4^\circ$

C. 1

D. 0

Answer: C

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8. $\sec 70^\circ \sin 20^\circ + \cos 20^\circ \operatorname{cosec} 70^\circ = ?$

A. 0

B. 1

C. -1

D. 2

Answer: D

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9. If $\sin 3A = \cos(A - 10^\circ)$ where 3A is an acute angle , then find the value of A.

A. 35°

B. 25°

C. 20°

D. 45°

Answer: B

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10. If $\sec 4A = \text{cosec}(A - 10^\circ)$ and $4A$ is acute then $\angle A = ?$

A. 20°

B. 30°

C. 40°

D. 50°

Answer: A

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11. Choose the correct answer in each of the following questions:

If A and B are acute angles such that $\sin A = \cos B$ then $(A + B) = ?$

A. 45°

B. 60°

C. 90°

D. 180°

Answer: C

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12. Choose the correct answer in each of the following questions:

If $\cos(\alpha+\beta)=0 \quad \text{then} \quad \sin(\alpha-\beta)=?$

A. $\sin\alpha$

B. $\cos\beta$

C. $\sin 2\alpha$

D. $\cos 2\beta$

Answer: D

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13. Choose the correct answer in each of the following questions:

$\sin(45^\circ + \theta) - \cos(45^\circ - \theta) = ?$

A. $2\sin\theta$

B. $2\cos\theta$

C. 0

D. 1

Answer: C

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14. Choose the correct answer in each of the following questions:

$\sec^2 10^\circ - \cot^2 80^\circ = ?$

A. 1

B. 0

C. $\frac{3}{2}$

D. $\frac{1}{2}$

Answer: A

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15. Choose the correct answer in each of the following questions:

$\text{cosec}^2 57^\circ - \tan^2 33^\circ = ?$

A. 0

B. 1

C. -1

D. 2

Answer: B

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16. Choose the correct answer in each of the following questions:

$$\frac{2\tan^2 30^\circ \sec^2 52 \sin^2 38^\circ}{\text{cosec}^2 70^\circ - \tan^2 20^\circ} = ?$$

A. 2

B. $\frac{1}{2}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: C

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17. Find the value of

$$\left[\frac{\sin^2 22^\circ + \sin^2 68^\circ}{\cos^2 22^\circ + \cos^2 68^\circ} + \sin^2 63^\circ + \cos 63^\circ \sin 27^\circ\right]$$

A. 0

B. 1

C. 2

D. 3

Answer: C

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18. Without using trigonometric tables , evaluate the following :

$$\frac{\cot(90^\circ - \theta) \cdot \sin(90^\circ - \theta)}{\sin\theta} + \frac{\cot 40^\circ}{\tan 50^\circ} - \left(\cos^2 20 + \cos^2 70^\circ\right)$$

A. 0

B. 1

C. -1

D. none of these

Answer: B

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19. Choose the correct answer in each of the following questions:

$$\frac{\cos 38^\circ \operatorname{cosec} 52^\circ}{\tan 18^\circ \tan 35^\circ \tan 60^\circ \tan 72^\circ \tan 55^\circ} = ?$$

A. $\sqrt{3}$

B. $\frac{1}{3}$

C. $\frac{1}{\sqrt{3}}$

D. $\frac{2}{\sqrt{3}}$

Answer: C

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20. If $2\sin 2\theta = \sqrt{3}$ then $\theta = ?$

A. 30°

B. 45°

C. 60°

D. 90°

Answer: A

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21. Choose the correct answer in each of the following questions:

If $2\cos 3\theta = 1 \quad \text{then} \quad \theta = ?$

A. 10°

B. 15°

C. 20°

D. 30°

Answer: C

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22. Choose the correct answer in each of the following questions:

If $\sqrt{3}\tan 2\theta - 3 = 0 \quad \text{then} \quad \theta = ?$

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B

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23. If $\tan x = 3\cot x \quad \text{then} \quad x = ?$

A. 45°

B. 60°

C. 30°

D. 15°

Answer: B

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24. Choose the correct answer in each of the following questions:

If $x\tan 45^\circ \cos 60^\circ = \sin 60^\circ \cot 60^\circ$ then $x = ?$

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{3}$

Answer: A

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25. Choose the correct answer in each of the following questions: If $\tan^2 45^\circ - \cos^2 30^\circ = x\sin 45^\circ \cos 45^\circ$ then $x = ?$

A. 2

B. -2

C. $\frac{1}{2}$

D. $\frac{-1}{2}$

Answer: C

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26. Choose the correct answer in each of the following questions:

$\sec^2 60^\circ - 1 = ?$

A. 2

B. 3

C. 4

D. 0

Answer: B

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27. Choose the correct answer in each of the following questions:

$(\cos 0^\circ + \sin 30^\circ + \sin 45^\circ)(\sin 90^\circ + \cos 60^\circ - \cos 45^\circ) = ?$

A. $\frac{5}{6}$

B. $\frac{5}{8}$

C. $\frac{3}{5}$

D. $\frac{7}{4}$

Answer: D

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28. Choose the correct answer in each of the following questions:

$\sin^2 30^\circ + 4\cot^2 45^\circ - \sec^2 60^\circ = ?$

A. 0

B. $\frac{1}{4}$

C. 4

D. 1

Answer: B

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29. Choose the correct answer in each of the following questions:

$3\cos^2 60^\circ + 2\cot^2 30^\circ - 5\sin^2 45^\circ = ?$

A. $\frac{13}{6}$

B. $\frac{17}{4}$

C. 1

D. 4

Answer: B

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30. Choose the correct answer in each of the following questions:

$\cos^2 30^\circ \cos^2 45^\circ + 4\sec^2 60^\circ + \frac{1}{2}\cos^2 90^\circ - 2\tan^2 60^\circ = ?$

A. $\frac{73}{8}$

B. $\frac{75}{8}$

C. $\frac{81}{8}$

D. $\frac{83}{8}$

Answer: D

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31. Choose the correct answer in each of the following questions:

If $\text{cosec}\theta = \sqrt{10}$ then $\sec\theta = ?$

A. $\frac{3}{\sqrt{10}}$

B. $\frac{\sqrt{10}}{3}$

C. $\frac{1}{\sqrt{10}}$

D. $\frac{2}{\sqrt{10}}$

Answer: B

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32. Choose the correct answer in each of the following questions:

If $\tan\theta = \frac{8}{15}$ then $\text{cosec}\theta = ?$

A. $\frac{17}{8}$

B. $\frac{8}{17}$

C. $\frac{17}{15}$

D. $\frac{15}{17}$

Answer: A

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33. Choose the correct answer in each of the following questions:

If $\sin\theta = \frac{a}{b}$ then $\cos\theta = ?$

A. $\frac{b}{\sqrt{b^2 - a^2}}$

B. $\frac{\sqrt{b^2 - a^2}}{b}$

C. $\frac{a}{\sqrt{b^2 - a^2}}$

D. $\frac{b}{a}$

Answer: B

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34. Choose the correct answer in each of the following questions:

If $\tan\theta = \sqrt{3}$ then $\sec\theta = ?$

A. $\frac{2}{\sqrt{3}}$

B. $\frac{\sqrt{3}}{2}$

C. $\frac{1}{2}$

D. 2

Answer: D

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35. Choose the correct answer in each of the following questions:

If $\sec\theta = \frac{25}{7}$ then $\sin\theta = ?$

A. $\frac{7}{24}$

B. $\frac{24}{7}$

C. $\frac{24}{25}$

D. none of these

Answer: C

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36. Choose the correct answer in each of the following questions:

If $\sin\theta = \frac{1}{2}$ then $\cot\theta = ?$

A. $\frac{1}{\sqrt{3}}$

B. $\sqrt{3}$

C. $\frac{\sqrt{3}}{2}$

D. 1

Answer: B

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37. Choose the correct answer in each of the following questions:

If $\cos\theta = \frac{4}{5}$ then $\tan\theta = ?$

A. $\frac{3}{4}$

B. $\frac{4}{3}$

C. $\frac{3}{5}$

D. $\frac{5}{3}$

Answer: A

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38. If $3x = \cos ec\theta$ and $\frac{3}{x} = \cot\theta$ find the value of $3\left(x^2 - \frac{1}{x^2}\right)$

A. $\frac{1}{27}$

B. $\frac{1}{81}$

C. $\frac{1}{3}$

D. $\frac{1}{9}$

Answer: C

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39. Choose the correct answer in each of the following questions:

If $2x = \sec A$ and $\frac{2}{x} = \tan A$ then $2\left(x^2 - \frac{1}{x^2}\right) = ?$

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer: A

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40. Choose the correct answer in each of the following questions:

If $\tan\theta = \frac{4}{3}$ then $(\sin\theta + \cos\theta) = ?$

A. $\frac{7}{3}$

B. $\frac{7}{4}$

C. $\frac{7}{5}$

D. $\frac{5}{7}$

Answer: C

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41. If $\tan\theta + \cot\theta = 5$ then $\tan^2\theta + \cot^2\theta =$

A. 27

B. 25

C. 24

D. 23

Answer: D

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42. Choose the correct answer in each of the following questions:

If $(\cos\theta + \sec\theta) = \frac{5}{2}$ then $\left(\cos^2\theta + \sec^2\theta\right) = ?$

A. $\frac{21}{4}$

B. $\frac{17}{4}$

C. $\frac{29}{4}$

D. $\frac{33}{4}$

Answer: B

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43. If $\tan\theta = \frac{1}{\sqrt{7}}$,then $\frac{cosec^2\theta - \sec^2\theta}{cosec^2\theta + \sec^2\theta} = ?$

A. $\frac{-2}{3}$

B. $\frac{-3}{4}$

C. $\frac{2}{3}$

D. $\frac{3}{4}$

Answer: D

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44. Choose the correct answer in each of the following questions:

If $7\tan\theta = 4$ then $\frac{(7\sin\theta - 3\cos\theta)}{(7\sin\theta + 3\cos\theta)} = ?$

A. $\frac{1}{7}$

B. $\frac{5}{7}$

C. $\frac{3}{7}$

D. $\frac{5}{17}$

Answer: A

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45. Choose the correct answer in each of the following questions:

If $3\cot\theta = 4$ then $\dfrac{(5\sin\theta + 3\cos\theta)}{(5\sin\theta - 3\cos\theta)} = ?$

A. $\dfrac{1}{3}$

B. 3

C. $\dfrac{1}{9}$

D. 9

Answer: D

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46. If $\tan\theta = \dfrac{a}{b}$ then $\dfrac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta} =$

A. $\dfrac{(a^2 + b^2)}{(a^2 - b^2)}$

B. $\dfrac{(a^2 - b^2)}{(a^2 + b^2)}$

C. $\dfrac{a^2}{(a^2 + b^2)}$

D. $\frac{b^2}{(a^2+b^2)}$

Answer: B

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47. Choose the correct answer in each of the following questions:

If $\sin A + \sin^2 A = 1$ then $\cos^2 A + \cos^4 A = ?$

A. $\frac{1}{2}$

B. 1

C. 2

D. 3

Answer: B

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48. If $\cos A + \cos^2 A = 1$, then prove that $\sin^2 A + \sin^4 A = 1$.

A. 1

B. 2

C. 4

D. 3

Answer: A

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49. Choose the correct answer in each of the following questions:

$$\sqrt{\frac{1-\sin A}{1+\sin A}} = ?$$

A. $\sec A + \tan A$

B. $\sec A - \tan A$

C. $\sec A \tan A$

D. none of these

Answer: B

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50. $\sqrt{\frac{1+\cos A}{1-\cos A}} =$

A. $\operatorname{cosec} A - \cot A$

B. $\operatorname{cosec} A + \cot A$

C. $\operatorname{cosec} A \cot A$

D. none of these

Answer: B

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51. If $\tan\theta = \frac{a}{b}$ then find the value of $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$

A. $\frac{a+b}{a-b}$

B. $\frac{a-b}{a+b}$

C. $\frac{b+a}{b-a}$

D. $\frac{b-a}{b+a}$

Answer: C

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52. Choose the correct answer in each of the following questions:

$(\text{cosec}\theta - \cot\theta)^2 = ?$

A. $\frac{1+\cos\theta}{1-\cos\theta}$

B. $\frac{1-\cos\theta}{1+\cos\theta}$

C. $\frac{1+\sin\theta}{1-\sin\theta}$

D. none of these

Answer: B

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53. $(\sec A + \tan A)(1 - \sin A) = ?$

A. sin A

B. cos A

C. sec A

D. cosec A

Answer: B

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Test Yourself

1. $\frac{\cos^2 56^\circ + \cos^2 34^\circ}{\sin^\circ 56^\circ + \sin^2 34^\circ} + 3\tan^2 56^\circ \tan^2 34^\circ = ?$

A. $3\frac{1}{2}$

B. 4

C. 6

D. 5

Answer: B

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2. $\left(\sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin^2 90^\circ + \frac{1}{8}\cot^2 60^\circ\right) = ?$

A. $\frac{3}{8}$

B. $\frac{5}{8}$

C. 6

D. 2

Answer: D

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3. If $\cos A + \cos^2 A = 1$, then $\sin^2 A + \sin^4 A = ?$.

A. $\frac{1}{2}$

B. 2

C. 1

D. 4

Answer: C

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4. If $\sin\theta = \frac{\sqrt{3}}{2}$ then $(\text{cosec}\theta + \cot\theta) = ?$

A. $\left(2 + \sqrt{3}\right)$

B. $2\sqrt{3}$

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: D

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5. If $\cot A = \frac{4}{5}$, then $\frac{(\sin A + \cos A)}{(\sin A - \cos A)} = ?$

A. 10

B. 9

C. 5

D. 3

Answer: B

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6. If $2x = \sec A$ and $\frac{2}{x} = \tan A$, prove that $\left(x^2 - \frac{1}{x^2}\right) = \frac{1}{4}$.

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7. If $\sqrt{3}\tan\theta = 3\sin\theta$, prove that $\left(\sin^2\theta - \cos^2\theta\right) = \frac{1}{3}$.

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8. Prove that $\frac{\left(\sin^2 73^\circ + \sin^2 17^\circ\right)}{\left(\cos^2 28^\circ + \cos^2 62^\circ\right)} = 1.$

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9. If $2\sin 2\theta = \sqrt{3}$,then the value of θ is :

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10. Prove that $\sqrt{\frac{1+\cos A}{1-\cos A}} = (\text{cosec}A + \cot A).$

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11. If $\cos ec\theta + \cot\theta = p, \cos\theta = ?$

A. $\frac{(1-p^2)}{(p^2+1)}$

B. $\frac{(p^2+1)}{(p^2-1)}$

C. $\frac{(p^2-1)}{(p+1)}$

D. $\frac{(p-1)}{(p^2+1)}$

Answer: A

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12. Prove that $(\text{cosec}A - \cot A)^2 = \frac{(1-\cos A)}{(1+\cos A)}$.

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13. If $5\cot\theta = 3$. find the value of $\frac{5\sin\theta - 3\cos\theta}{4\sin\theta + 3\cos\theta}$

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14. Prove that $(\sin 32^\circ \cos 58^\circ + \cos 32^\circ \sin 58^\circ) = 1.$

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15. If

$x = a\sin\theta + b\cos\theta$ and $y = a\cos\theta - b\sin\theta,$ prove that $x^2 + y^2 = a^2$

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16. $\dfrac{(1+\sin\theta)}{(1-\sin\theta)} = ?$

A. $(\sec\theta - \tan\theta)^2$

B. $(\sec\theta + \tan\theta)^2$

C. $\dfrac{1}{(\sec\theta + \tan\theta)^2}$

D. none of these

Answer: B

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17. Prove that

$$\frac{1}{(\sec\theta-\tan\theta)}-\frac{1}{\cos\theta}=\frac{1}{\cos\theta}-\frac{1}{(\sec\theta+\tan\theta)}.$$

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18. $\frac{(\sin A-2\sin^3 A)}{(2\cos^3 A-\cos A)}=?$

A. $\tan A$

B. $\cot A$

C. $\frac{1}{\cot A}$

D. both (a) and (c)

Answer: D

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19. Prove that $\frac{\tan A}{(1-\cot A)}+\frac{\cot A}{(1-\tan A)}=(1+\tan A+\cot A)$.

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20. If $\sec 5A=\operatorname{cosec}(A-36^\circ)$ and $5A$ is an acute angle, show that $A=21^\circ$.

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