MATHS

BOOKS - NAGEEN PRAKASHAN ENGLISH

INTRODUCTION TO TRIGONOMETRY

Solved Examples

1. In $\Delta ABC, \angle B = 90^\circ$, if $AB = 5cm, BC = 12$ cm , then find the vlaues of the following :

(a) Sin A

(b) Cos A

(c) cot A

(d)cosec C

(e) sec C

(f) tan C

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2. In $\Delta ABC, \angle B = 90^\circ$ and $\sin A = \frac{4}{5}$, then find the values of all other trigonometric ratios for $\angle A$.

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3. If $\cos\theta = \frac{8}{17}$, find the other five trigonometric ratios.

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4. Given $\tan\alpha = \frac{5}{12}$, find other trigonometric ratios

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5. In $\Delta ABC \angle C = 90^\circ$ and $\cos esA = \frac{13}{12}$, find the values of all other trigonometric ratios for $\angle A$,

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6. In ΔABC , $\angle A$ is right - angled . If AB= 1 cm , AC =3 cm and BC = $\sqrt{10}$ cm , then find the values of cos B and sin C.

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7. If cos $A = \frac{1}{3}$,then find the values of sin A and tan A.

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8. In ΔABC, tan B $= \sqrt{3}$, find the values of cosec B and cos B.

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9. If $\cos\theta = \frac{4}{5}$ then find the value of $\left(\sin\theta\cos\theta + \tan^2\theta\right)$.

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10. If sec A= 2, then find the value of $\frac{1}{\cot A} + \frac{\cos A}{1 + \sin A}$

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11. InDeltaABC, $< B = 90^\circ$, $\tan A = \frac{3}{4}$and length of BC =180 m, ten find the length of hypotenuse of ΔABC.

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12. If $\cot A = \frac{b}{a}$,then prove that :

$$\frac{a \sin A - b \cos A}{a \sin A + b \cos A} = \frac{a^2 - b^2}{a^2 + b^2}$$

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13. In the adjoining figure , AM =BM and $\angle B = 90^\circ$. If $\angle BCM = \theta$, then find the values of the following :

(i) $\sin \theta$ (ii) $\tan \theta$ (iii) $\sec \theta$

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14. In ΔPQR , right - angled at Q , PR +QR = 25 cm and PQ = 5cm . Determine the values of sin P , cos P and tan P.

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15. In $DelatOPQ$, right - angled at P , OP = 7 cm and OQ - PQ =1 cm . Determine the values of sinQ and cos Q .

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16. In the adjoining figure , $\angle BCD = \angle ADB$ (each 90°) . angle BC= 3 cm and length of side opposite $\angle C$ in ΔBCD is 5 cm , then find the squre root of length of side opposite to $\angle D$ in ΔADB.

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17. Evaluate : $\sin^2 60^\circ \tan 45^\circ - \cos^2 45^\circ \sec 60^\circ$

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18. Find the value of $\cos 60^\circ \times \cos 30^\circ + \sin 60^\circ \times \sin 30^\circ$.

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19. Show that : $\cos 60^\circ = 2\cos^2 30^\circ - 1$

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20. If A=30, then show that $\sin 3A = 3\sin A - 4\sin^3 A$

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21. If A $= A = 30^\circ$, then evaluate tan 2A.

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22. If $= 60^\circ$ and $B = 30^\circ$, then show that : sin A cos B+ cos A sin B= sin (A+B)

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23. If A $= 15^\circ$, then find the value of sec 2A.

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24. If sin $x = 1$, then find the value of tan $\frac{x}{3}$.

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25. If$\sin(A + B) = 1$ and $\cos(A - B) = \frac{\sqrt{3}}{2}$, then find the values of A and B.

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26. In an acute angled ΔABC , if tan (A+B-C) = 1 and sec (B+C-A)=2 , then find the value of cos (4B-3A) .

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27. If $\sin A = \cos A,$ then evaluate $\tan A + \sin^2 A + 1.$

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28. Show that : $\sin 30^\circ = \sqrt{\frac{1 - \cos 60^\circ}{2}}$

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29. given that $\tan(\theta_1 + \theta_2) = \frac{\tan\theta_1 + \tan\theta_2}{1 - \tan\theta_1 \cdot \tan\theta_2}$ find $(\theta_1 + \theta_2)$ when $\tan\theta_1 = \frac{1}{2}, \tan\theta_2 = \frac{1}{3}$

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30. $\cos 1^\circ . \cos 2^\circ . \cos 3^\circ \ldots\ldots\ldots \cos 179^\circ$ is equal to :

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31. In the adjoining frgure ,a right - angled triangle ABC is shown un which AM=CM=3m . If $\angle ACM = 15^\circ$, then find AC.

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32. Simplify $\left(1 + \tan^2 \theta\right)(1 - \sin\theta)(1 + \sin\theta)$

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33. Prove that $\cos^2 \theta \cos ec\theta + \sin\theta = \cos ec\theta$

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34. Prove that : $\sec^4\theta - \tan^4\theta = 1 + 2\tan^2\theta$

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35. Prove that : $\frac{1 + \cos\theta - \sin^2\theta}{\sin\theta + \sin\theta\cos\theta} = \cot\theta$

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36. If $\tan\theta = \frac{4}{3}$, then find the value of $\frac{3\sin\theta - 2\cos\theta}{3\sin\theta + 5\cos\theta}$

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37. Prove that : $(\sec A + \tan A)(1 - \sin A) = \cos A$

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38. Prove that : $\cos ecA - \cot A = \frac{1}{\cos ecA + \cot A}$

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39. Prove that : $\frac{\sec A + 1}{\tan A} = \frac{\tan A}{\sec A - 1}$

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40. Prove that : $\frac{\tan \theta}{\sec \theta + 1} - \frac{\tan \theta}{1 - \sec \theta} = 2 \cos ec\theta$

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41. Prove that : $\frac{1 - \cos \theta}{1 + \cos \theta} = (\cot \theta - \cos ec\theta)^2$

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42. Prove that : $\sin \theta(1 + \tan \theta) + \cos \theta(1 + \cot \theta) = \cos ec\theta + \sec \theta$

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43. If $\sec\theta + \tan\theta = p$ then prove that $\frac{p^2 - 1}{p^2 + 1} = \sin\theta$

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44. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta,$ then $\cos\theta - \sin\theta =$

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

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46. Prove the following identity, where the angles involved are acute angles for which the expressions are defined.(iv) $\frac{1 + \sec A}{\sec A} = \frac{\sin^2 A}{1 - \cos A}$

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47. Prove that $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \cos ecA + \cot A$ using the identity $\cos ec^2 A = 1 + \cot^2 A$.

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48. Porve that : (cosecA-sinA)(secA-cosA) $= \frac{1}{\tan A + \cot A}$

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49. prove that $\left(\frac{1 - \tan A}{1 - \cot A}\right)^2 = \tan^2 A$

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50. If $x = r \sin A \cos C$, $y = r \sin A \sin C$ and $z = r \cos A$, prove that $r^2 = x^2 + y^2 + z^2$

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51. If $p\sin^3\alpha + q\cos^3\alpha = \sin\alpha\cos\alpha$ and $p\sin\alpha - q\cos\alpha = 0$, then prove that : $p^2 + q^2 = 1$

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52. if $3\cos\theta - 5\sin\theta = 3$ then prove that $3\sin\theta + 5\cos\theta = 5$

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53. If $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0$ then prove that $a^2 + 2ac = b^2$

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54. If $\sec\alpha - \tan\alpha = p$ and $\cos ec\alpha + \cot\alpha = q$, then express p in terms of q and also q in terms p.

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55. if $x = a\cos^3\theta\sin^2\theta$ and $y = a\cos^2\theta\sin^3\theta$ and $\frac{(x^2+y^2)^p}{(xy)^q}$ is independent of θ, then (A) $4p = 5q$ (B) $5p = 4q$ (C) $p + q = 9$ (D) $pq = 20$

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56. If $\sin x + \sin^2 x + \sin^3 x = 1$ then find the value of $\cos^6 x - 4\cos^4 x + 8\cos^2 x$

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57. Check whether the equation $\frac{\tan\phi + \sin\phi}{\tan\phi - \sin\phi} = \frac{\sec\phi + 1}{\sec\phi - 1}$ is an identity or not ?

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58. Check whether the following equation $\tan^4\theta + \tan^6\theta = \tan^3\theta \sec^2\theta$ is an identity or not ?

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59. Solve : $2\sin^2\theta = \frac{1}{2}, 0^\circ < \theta < 90^\circ$.

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60. Find the vlaue of θ if $2\cos 3\theta = 1$ and $0^\circ < \theta < 90^\circ$.

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61. Find the value of θ if $\sec^2\theta + \tan^2\theta = \frac{5}{3}$ andθ lies in first quadrant.

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62. If $0^\circ < \alpha < 90^\circ$, then solve the equation $\frac{\sin\alpha}{1-\cos\alpha} + \frac{\sin\alpha}{1+\cos\alpha} = 4.$

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63. If $0^\circ \angle \theta \angle 90^\circ$, then find the value of θ from the equation $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3.$

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64. Evaluate the following :

(i) $\frac{\sin 58^\circ}{\cos 32^\circ}$

(ii) $\frac{\sec 42^\circ}{\text{cosec}48^\circ}$

(iii) $\frac{\tan 37^\circ}{\cot 53^\circ}$

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65. Evaluate :

(i)$\tan 42^\circ - \cot 48^\circ$

(ii)$\sec 36^\circ - \text{cosec}54^\circ$

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66. Prove that : (i) $\sin 42^\circ \cos 48^\circ + \sin 48^\circ \cos 42^\circ = 1$

(ii)$\cos 70^\circ \cos 20^\circ - \sin 70^\circ \sin 20^\circ = 0$

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67. Prove that : $\text{cosec} \quad 65^\circ \cos 25^\circ + \text{cosec}20^\circ \cos 70^\circ = 2$

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68. Without using trigonometric tables , evaluate :

$$\left(\frac{\tan 20^\circ}{\cos ec70^\circ}\right)^2 + \left(\frac{\cot 20^\circ}{\sec 70^\circ}\right)^2 + 2\tan 15^\circ \tan 37^\circ \tan 53^\circ \tan 60^\circ \tan 75^\circ$$

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69. Without using trigonometric table, evaluate the following:

$$\frac{\cos ec^2(90-\theta)-\tan^2\theta}{4(\cos^2 48^\circ+\cos^2 42^\circ)}-\frac{2\tan^2 30^\circ \sec^2 52^\circ \sin^2 38^\circ}{\cos ec^2 70^\circ-\tan^2 20^\circ}$$

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70. Without using trigonometric tables , evaluate the following :

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

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71. Prove that

(i)$\sin(40^\circ-\theta)-\cos(50^\circ+\theta)=0$

(ii) $\sec(65^\circ+\theta)-\operatorname{cosec}(25^\circ-\theta)=0$

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72. Express each of the following in terms of trigonometric ratios of angles between 0° and 45°

(i) $\sin 70^\circ + \sec 70^\circ$ " " (ii) $\tan 65^\circ + \text{cosec } 65^\circ$ " " (iii) cos81^(@)+cot80^(@)`

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73. If $\tan 2A = \cot(A - 21^\circ)$where 2A is an acute angel , then find the value of A.

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

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75. If $\sin(\theta + 24^\circ) = \cos\theta$ and $\theta + 24^\circ$ is an acute angle , then find the value of θ .

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76. If A and B are acute angles such that $\tan A = \cot B$, then show that A+B $= 90^\circ$.

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77. If A, B and C are interior angles of a triangle ABC, then show that $\sin\left(\frac{B+C}{2}\right) = \cos\left(\frac{A}{2}\right)$.

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78. Using the formula $\cos(A+B) = \cos A \cos B - \sin A \sin B$. find the value of sin 15°.

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79. If $\sin 36^\circ = p$, then find sin 54° in terms of p.

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80. If $\tan 1^\circ \tan 2^\circ \tan 3^\circ \tan 4^\circ \ldots \tan 89^\circ = x^2 - 8$, then find the value of x.

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Problems From Ncert Exemplar

1. If $\tan A = \frac{3}{4}$, then show that sin A cos A`=(12)/(25)

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

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3. given : $15\cot A = 8$ find $\sin A$ and $\sec A$

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4. If $s \in A = \frac{3}{4}$, calculate cos A and tan A.

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5. If $\angle A$and $\angle B$are acute angles such that $\cos A = \cos B$. then show that $\angle A = \angle B$.

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6. Evaluate:

$$\frac{\cos 45}{\sec 30 + \cos ec30}$$

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7. solve : $\frac{2\tan 30^\circ}{1 + \tan^2 30^\circ}$

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8. If $\tan(A + B) = \sqrt{3}$ and $tan(AB) = \frac{1}{\sqrt{3}}$; `0o B ,` find A and B.

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9. In ΔABC , right-angled at B, $AB\backslash = \backslash 5\backslash cm$ and $\angle ACB = 30o$

(see figure). Determine the lengths of the sides BC and AC.

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10. In PQR , right-angled at Q, $PQ = 3cm$ and $PR = 6cm$. Determine $\angle P$ and $\angle R$.

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11. Prove that : $\sqrt{(1-\cos^2\theta)\sec^2\theta} = \tan\theta$

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12. Prove $(\tan\theta + 2)(2\tan\theta + 1) = 5\tan\theta + 2\sec^2\theta.$

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

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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. Show that $1+\cot^2\alpha \ / \ (1+\cos ec\,\alpha)=\cos ec\,\alpha$

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16. $(\sin\alpha + \cos\alpha)(\tan\alpha + \cot\alpha) = \sec\alpha + \cos ec\alpha$

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

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19. if $\tan\theta + \sec\theta = l$ then prove that $\sec\theta = \frac{l^2+1}{2l}$

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

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

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22. Prove that : $\tan\theta + \tan(90^\circ - \theta) = \sec\theta \cdot \sec(90^\circ - \theta)$

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23. Shown that : $\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ = 1$

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24. If tan A= cot B. prove that : A+B $= 90^\circ$

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25. Express $\sin 67^\circ + \cos 75^\circ$ in terms of trigononmertic ratios of angles between 0° and 45°.

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26. If tan A $= \cot(A - 18^\circ)$ where 2A is an acute angle , find the value of A.

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27. If $sec4A = \cos ec(A20o)$, where 4A is an acute angle, find the value of A.

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28. The value of the expression cosec $(75^\circ + \theta) - \sec(15^\circ) - \theta) - \tan(55^\circ + \theta) + \cot(35^\circ - \theta)$ is

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29. If $\cos(\alpha + \beta) = 0$, then $\sin(\alpha - \beta)$ can be reduced to

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Exercise 8 A

1. In $\Delta ABC, \angle B = 90^\circ$ and $\sin A = \frac{3}{5}$, then find all other trigonometric ratios for $\angle A$.

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2. In $\Delta ABC, \angle B = 90^\circ$ and $\cos A = \frac{9}{41}$, then find all other trigonometric ratios for $\angle A$.

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3. In $\Delta ABC, \angle A = 90^\circ$ and $\tan B = \frac{5}{6}$, then find all other trigonometric ratios for $\angle B$.

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4. In $\Delta PQR, \angle R = 90^\circ$ and $\text{cosec} P = \frac{13}{5}$, then find all trigonometric ratios for $\angle Q$.

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5. In $\Delta ABC, \angle C = 90^\circ$ and $\sec B = \frac{5}{4}$, then find all other trigonometric ratios for $\angle B$.

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6. In $\Delta ABC, \angle A = 0 = 90^\circ, AB = 6cm$ and $AC = 8cm$, then find the values of the following :

(i) sinB

(ii)sinA

(iii) tanB

(iv)secB

(v)cotC

(vi) "cosec" C

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7. In $\Delta ABC, \angle B = 90^\circ, AB = 24cm$ and AC=26cm` then find the values of the following :

(i) tanA

(ii) cot C

(iii) cosC

(iv) sinC

(v) cosecA

(vi) sec A

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8. If $\tan\theta = 2$, then the find the value of $\frac{2\sin\theta\cos\theta}{\cos^2\theta - \sin^2\theta}$.

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9. If $\sec\theta = \frac{3}{2}$,then find value of $\frac{2\cos\theta - \tan^2\theta}{\sin^2\theta + 1}$.

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10. If $\sin\theta = \frac{1}{3}$,then find the value of $\sin\theta \cdot \cos^2\theta + \text{cosec}\theta$.

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11. If $\sin\theta = \frac{a}{b}$,then find the value of (i) $\cos\theta$, (ii) $\tan\theta$

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12. (i) If $\tan\theta = \frac{a}{b}$,then find the value of $\frac{2\sin\theta - 3\cos\theta}{2\sin\theta + 3\cos\theta}$

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13. If $\sec\theta = \frac{13}{5}$,then show that $\frac{\tan\theta}{1+\tan^2\theta} = \frac{\sin\theta}{\sec\theta}$.

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14. If $\tan\theta = \frac{3}{4}$,then find the value of $\sec\theta + \tan\theta$.

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15. If $\tan\theta = \sqrt{2} - 1$,then find the value of $\cot\theta$.

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16. If $\tan A = \frac{1}{\sqrt{3}}$ and $\tan B = \sqrt{3}$,then find the value of $\cos A \cos B - \sin A \sin B$

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17. If $\cos\theta = \frac{3}{4}$,then find the value of $\sin\theta$ and $\tan\theta$.

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18. If $\cot\theta = \frac{12}{5}$,then find the value of$\sin\theta \cdot \sec\theta + \cos\theta \cdot \text{cosec}\theta$.

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19. If $\sin\theta = \frac{7}{25}$,then find the value of $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$.

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20. $\sin\theta = \frac{1}{\sqrt{2}}$,then find the value of $3\sin^2\theta - 4\sin^3\theta \cdot \cos\theta$.

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Exercise 8 B

1. Find the value of $\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$.

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2. Find the vlaue of $\frac{2\tan 30^\circ}{1-\tan^2 30^\circ}$.

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3. Find the value of $2\sin 30^\circ \cos 30^\circ$.

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4. Show that : $2\tan^2 60^\circ - 6\left(\sin^2 45^\circ - \tan^2 30^\circ\right) = 5$

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5. Find the vlaue of $4\sin^2 30^\circ + \tan^2 60^\circ + \sec^2 45^\circ$.

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6. Find the value of $\frac{\sin 30^\circ}{\cos^2 45^\circ} - \tan^2 60^\circ + 3\cos 90^\circ + \sin 0^\circ$.

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7. Evaluate : $\frac{\sin^2 30^\circ + \sin^2 45^\circ - 4\cot^2 60^\circ}{2\sin 30^\circ \cos 30^\circ + \frac{1}{2}\tan 60^\circ}$

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8. $\frac{2\tan 30^\circ}{1 - \tan^2 30^\circ}$

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9. Show that : $\cos^2 60^\circ - \sin^2 60^\circ = -\sin 30^\circ$

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10. $\frac{2\tan 30^\circ}{1 - \tan^2 30^\circ}$

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11. Show that : $\cos 30^\circ = \sqrt{\frac{1+\cos 60^\circ}{2}}$

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12. Evaluate : $\frac{\tan 45^\circ}{2\sin 30^\circ - \cos 60^\circ}$

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13. If $A = 30^\circ$ verify that $\cos 3A = 4\cos^3 A - 3\cos A$

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14. If A $= 45^\circ$,then show that : $\cos 2A = \cos^2 A - \sin^2 A$

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15. Given $A = 60^\circ$ and $B = 30^\circ$, prove that :

$\cos(A + B) = \cos A \cos B - \sin A \sin B$

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16. If A $= 30^\circ$,then show that : $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

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17. If $\tan A = 1$,then find the value of $\sin^2 A + \cos^2 A + \cot A$.

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18. If $\cos\theta = \dfrac{\sqrt{3}}{3}$, then find the value of $\sin 3\theta$.

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19. If $\tan(A+B)=\sqrt{3}$ and $\sin(A-B)=\frac{1}{2}$,then find the value of $\tan(2A-3B)$.

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20. If $\cos(A+B)=0$ and $\sin(A-B)=\frac{\sqrt{3}}{2}$then find the value of $\tan(A-3B)$.

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21. If $A+B=90^\circ$ and $\tan A=\sqrt{3}$, then find the value of B.

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22. If $A-B=30^\circ$ and $\sin A=\frac{\sqrt{3}}{2}$,then find the value of B.

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Exercise 8 C

1. Prove that :

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

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

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2. If $\cos\theta=\frac{15}{17}$, then find the value of $\sin\theta$.

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3. Prove that : (i) $1+\frac{\cos^2\theta}{\sin^2\theta}-\text{cosec}^2\theta=0$

(ii) $\frac{1+\tan^2\theta}{\text{cosec}^2\theta}=\tan^2\theta$

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4. Prove that $1 + \frac{\tan^2 A}{1 + \sec A} = \sec A$

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5. Prove that :

$$\frac{\cot A - 1}{2 - \sec^2 A} = \frac{\cot A}{1 + \tan A}$$

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6. Prove that $\tan^2 \theta + \cot^2 \theta + 2 = \sec^2 \theta \cos ec^2 \theta$

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7. Prove that

$(\tan A + \cot A)^2 = \text{cosec}^2 A + \sec^2 A.$

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8. Prove that : $\left(\sec^2 A - 1\right)\left(\operatorname{cosec}^2 A - 1\right) = 1$

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9. Prove the following identities: $\cos ec^4 A - \sec^2 A = \tan^4 A + \tan^2 A$

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10. Prove that : (i) $\tan^2 A - \sin^2 A = \tan^2 A \cdot \sin^2 A$

(ii) $\cot^2 \theta - \cos^2 \theta = \cot^2 \theta \cdot \cos^2 \theta.$

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11. Prove that : $\frac{1 - \tan^2 \theta}{\cot^2 \theta - 1} = \tan^2 \theta$

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12. Prove that : $(\sec\theta - \tan\theta)^2 = \dfrac{1-\sin\theta}{1+\sin\theta}$

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13. Prove that : $\sec^2\theta + \operatorname{cosec}^2\theta = \sec^2\theta \cdot \operatorname{cosec}^2\theta$

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14. Prove that : $(\sin A + \cos A)^2 + (\sin A - \cos A)^2 = 2$

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15. Prove that : $\sin^4\theta - \cos^4\theta = 2\sin^2\theta - 1$

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16. Prove that : (i) $\frac{1-\cos A}{\sin A}=\frac{\sin A}{1+\cos A}$

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

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17. Prove that : $\frac{1+\sin\theta}{\cos\theta}+\frac{\cos\theta}{1+\sin\theta}=2\sec\theta$

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18. Prove that : $\frac{1-\cos\theta}{\sin\theta}+\frac{\sin\theta}{1-\cos\theta}=2\text{cosec}\ \ \theta$

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19. Prove that : (i) $\frac{1}{1-\cos A}+\frac{1}{1+\cos A}=2\text{cosec}^2A$ $(ii)\frac{1}{1-\sin A}-\frac{1}{1+\sin A}=2\,\text{se}$

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20. Prove that : (i) $\frac{1}{\sec\theta - \tan\theta} + \frac{1}{\sec\theta + \tan\theta} = 2\sec\theta$ $(ii)\frac{\text{cosec}\ \theta + \cot\theta}{\text{cosec}\ \theta - \cot\theta} = (\text{cosec}$

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21. Prove that : $\sin^6 A + \cos^6 A + 3\sin^2 A\cos^2 A = 1$

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22. Prove that : $(1 + \cot\theta + \text{cosec}\theta)(1 + \cot\theta - \text{cosec}\theta) = 2\cot\theta$

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23. Prove that : $\frac{\sec A + 1}{\tan A} = \frac{\tan A}{\sec A - 1}$

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24. Prove the identity (sin θ + cos θ)(tan θ + cot θ) = sec θ + cosec θ

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25. Prove that : $(\sin A - \cos A)(\cot A + \tan A) = \sec A - \operatorname{cosec} A$

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26. If sec θ + tan θ = 7, then evaluate sec θ – tan θ

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27. Prove that : $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \sec A \operatorname{cosec} A$

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28. $\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$

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29. If $\tan A + \sin A = m$ and $\tan A - \sin A = n$, then prove that $m^2 - n^2 = 4\sqrt{mn}$.

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30. If $x = a\cos\theta - b\sin\theta$ and $y = a\sin\theta + b\cos\theta$, then show that : $x^2 + y^2 = a^2 + b^2$

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31. $(\sin A + \cos ecA)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

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32. Prove that : $(1 - \tan A)^2 + (1 - \cot A)^2 = (\sec A - \operatorname{cosec} A)^2$

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33. Prove that : $\frac{\sec A - \tan A}{\sec A + \tan A} = 1 - 2\sec A \tan A + 2\tan^2 A$

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34. Prove that :

$$\sqrt{\frac{1+\cos A}{1-\cos A}} + \sqrt{\frac{1-\cos A}{1+\cos A}} = 2 \quad \text{cosec} A$$

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35. If

$(1-\sin A)(1-\sin B)(1-\sin C) = (1+\sin A)(1+\sin B)(1+\sin C)$

, then show that each side is equal to $\pm\cos A \cos B \cos C$.

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36. If $\tan^2\theta = 1 - e^2$ prove that $\sec\theta + \tan^3\theta \operatorname{cosec}\theta = \left(2 - e^2\right)^{\frac{3}{2}}$

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37. Prove that $\dfrac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \dfrac{1}{\sec\theta - \tan\theta}$, using the identity $\sec^2\theta = 1 + \tan^2\theta$

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38. If $\dfrac{\cos\alpha}{\sin\beta} = n$ and $\dfrac{\cos\alpha}{\cos\beta} = m$, then find $\cos^2\beta$?

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39. If $\sec\theta = x + \dfrac{1}{4x}$,prove that $\sec\theta + \tan\theta = 2x$ or $\dfrac{1}{2x}$.

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40. If $x = a\sec\theta\cos\phi$,$y = \sec\theta\sin\phi$ 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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41. Prove: $\left(1+\tan^2 A\right) + \left(1 + \frac{1}{\tan^2 A}\right) = \frac{1}{\sin^2 A - \sin^4 A}$

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

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43. Eliminate α from $x = a\sin\alpha + b\cos\alpha$ and $y = a\cos\alpha - b\sin\alpha.$

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44. If $7(\text{cosec}\ \theta - 1) = 3\cot\theta$,then prove that : $3(\text{cosec}\ \theta + 1) = 7\cot\theta$

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45. If $x = \dfrac{1+\sin\theta}{\cos\theta}$, prove that : $\sin\theta = \dfrac{x^2-1}{x^2+1}$

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46. If $x = \cot A + \cos A, y = \cot A$,prove that : $\left(\dfrac{x-y}{x+y}\right)^2 + \left(\dfrac{x-y}{2}\right)^2 = 1$

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47. If $\dfrac{\cos A}{\cos B} = p, \dfrac{\sin A}{\sin B} = q$,then show that $\dfrac{p^2(1-q^2)}{p^2-q^2} = \cos^2 A.$

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48. If $\cot\alpha + \tan\alpha = m$ and $\frac{1}{\cos\alpha} - \cos\alpha = n$, then show that $m(mn^2)^{1/3} - n(nm^2)^{1/3} = 1$.

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49. If $a\cos^3\theta + 3a\cos\theta\sin^2\theta = m$ and $a\sin^3\theta + 3a\cos^2\theta\sin\theta = n$, then prove that: $(m+n)^{2/3} + (m-n)^{2/3} = 2a^{2/3}$

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50. If $x = \frac{2\sin\theta}{1+\cos\theta+\sin\theta}$, $then \frac{1-\cos\theta+\sin\theta}{1+\sin\theta}$ is equal to $1+x$ (b) $1-x$ (c) x (d) $\frac{1}{x}$

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Exercise 8 D

1. Prove that:

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

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

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

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2. Solve the following equations for $0^\circ \leq \theta \leq 90^\circ$:

(i) $2\cos^2\theta = \dfrac{1}{2}$

(ii) $4\sin^2\theta - 3 = 0$

(iii) $\sin^2\theta - \dfrac{1}{2}\sin\theta = 0$

(iv) $\tan^2\theta - \left(\sqrt{3}+1\right)\tan\theta + \sqrt{3} = 0$

(v) $\sin\theta - \cos\theta = 0$

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3. If $0^\circ \leq \theta \leq 90^\circ$, then solve the following equations :

(i) $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$

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

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

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4. If $\tan\theta = \sin\theta$ and $0^\circ \leq \theta \leq 90^\circ$,then find the value of θ.

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5. If $2\sin^2 A = \sin^2 60^\circ + \sin^2 45^\circ$, then find the value of sin A.

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6. If $\cos^2 30^\circ + \cos^2 45^\circ + \cos^2 60^\circ = x$, then find the value of 'x'

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Exercise 8 E

1. Without using trigonometric tables , evaluate :

(i) $\frac{\sin 11^\circ}{\cos 79^\circ}$

(ii) $\frac{\sec 15^\circ}{\text{cosec}75^\circ}$

(iii) $\frac{\tan 54^\circ}{\cot 36^\circ}$

(iv) $\frac{\cos 68^\circ}{\sin 22^\circ}$

(v) $\frac{\text{cosec}24^\circ}{\sec 66^\circ}$

(vi) $\frac{\cot 18^\circ}{\tan 72^\circ}$

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2. Without using trigonometric tables , evaluate :

(i) $\frac{\sin 40^\circ}{\cos 50^\circ} + \frac{3\tan 50^\circ}{\cot 40^\circ}$

(ii) $\frac{\sec 37^\circ}{\text{cosec}\ \ 53^\circ} - \frac{\tan 20^\circ}{\cot 70^\circ}$

(iii) $\frac{\cos 74^\circ}{\sin 16^\circ} + \frac{\sin 12^\circ}{\cos 78^\circ} - \sin 18^\circ \sec 72^\circ$

(iv) $\sin 35^\circ \sec 55^\circ + \frac{4\sec 32^\circ}{\text{cosec}\ \ 58^\circ}$

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3. Without using trigonometric tables , prove that :

(i) $\sin 50^\circ - \cos 40^\circ = 0$

(ii) $\tan 36^\circ - \cot 54^\circ = 0$

(iii) $\sec 25^\circ - \text{cosec}\ \ 65^\circ = 0$

(iv) $\sin^2 32^\circ + \sin^2 58^\circ = 1$

(v) $\text{cosec}^2 39^\circ - \tan^2 51^\circ = 1$

(vi) $\sec^2 10^\circ - \cot^2 80^\circ = 1$

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4. Prove that :

(i) $\sin\theta \cos(90^\circ - \theta) + \sin(90^\circ - \theta)\cos\theta = 1$

(ii) $\sec\theta \ \ \text{cosec}(90^\circ - \theta) - \tan\theta \cot(90^\circ - \theta) = 1$

(iii) $\dfrac{\sin\theta \cdot \sec(90^\circ - \theta)\cot(90^\circ - \theta)}{\text{cosec}(90^\circ - \theta) \cdot \cos\theta \cdot \tan\theta} - \dfrac{\tan(90^\circ - \theta)}{\cot\theta} = 0$

(iv) $\dfrac{1 + \sin(90^\circ - \theta)}{\cos(90^\circ - 0)} + \dfrac{\cos(90^\circ - \theta)}{1 + \sin(90^\circ - 0)} = 2\text{cosec}\theta$

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5. Without using trigonometric tables , prove that :

(i) $\tan 20^\circ \tan 40^\circ \tan 45^\circ \tan 50^\circ \tan 70^\circ = 1$

(ii) $\tan 1^\circ \tan 2^\circ \tan 60^\circ \tan 88^\circ \tan 89^\circ = \sqrt{3}$

(iii) $\cot 5^\circ \cot 10^\circ \cot 30^\circ \cot 80^\circ \cot 85^\circ = \sqrt{3}$

(iv) $4\sin 10^\circ \sin 20^\circ \sin 30^\circ \sec 70^\circ \sec 80^\circ = 2$

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6. Express each of the following in terms of trigonometric ratios of angles lying between 0° and 45°.

(i) $\sin 70^\circ + \cos 70^\circ$

(ii) $\sec 76^\circ \tan 48^\circ$

(iii) $\cot 68^\circ + \text{cosec} 62^\circ$

(iv) $\sin 85^\circ + \text{cosec} 82^\circ$

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7. Evaluate :

$$\sin^2 25^\circ + \sin^2 65^\circ + \sqrt{3}\tan 5^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 85^\circ$$

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8. Evaluate :

$$\tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ + \frac{\cot 54^\circ}{\tan 36^\circ} + \sin 20^\circ \sec 70^\circ - 2$$

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9. The value of $\cot 18^\circ \left(\cot 72^\circ \cos^2 22^\circ + \frac{1}{\tan 72^\circ \sec^2 68^\circ} \right)$ is

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10. Evaluate : $\frac{3\tan 25^\circ \tan 40^\circ \tan 50^\circ \tan 65^\circ - \frac{1}{2}\tan^2 60^\circ}{4\left(\cos^2 29^\circ + \cos^2 61^2\right)}$

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11. Evaluate : $\frac{\sec^2\theta - \cot^2(90^\circ - \theta)}{\text{cosec}^2 67^\circ - \tan^2 23^2} + \left(\sin^2 40^\circ + \sin^2 50^\circ\right)$

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12. Evaluate :

$2\left(\frac{\cos 65^\circ}{\sin 25^\circ}\right) - \frac{\tan 20^\circ}{\cot 70^\circ} - \sin 90^\circ + \tan 5^\circ \tan 35^\circ \tan 60^\circ \tan 55^\circ \tan 85^\circ$

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13. If $\sin 2A = \cos(A - 12^\circ)$ and $2A$ is an acute angle , find the value of A.

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14. If $\tan 3A = \cot(A - 10^\circ)$ where 3A is an angle , find A.

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15. If $\sec 5A = \operatorname{cosec}(4A - 18^\circ)$ and $5A$ is an acute angle , find the vlaue of A.

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Revision Exercise Very Short Answer Questions

1. If $\tan\theta = \frac{3}{4}$,then find the value of $\cos\theta$.

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2. If $\sec\theta = \frac{13}{12}$,then find the value of $\cot\theta$.

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3. if $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is

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4. If $\sin\theta = \frac{3}{4}$,then find the value of $\left(2\cos^2\theta - 3\sin^2\theta\right)$.

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5. If $\tan\theta = \sqrt{3}$,then find the value of $\sin\theta$.

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6. If $\cos\theta = \frac{1}{\sqrt{2}}$,then find the value of $\left(\tan^2\theta + 1\right)$.

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7. If $\sin A = \frac{\sqrt{3}}{2}$ and $\sin B = \frac{1}{2}$, then find the value if sin AcosB +cosAsinB.

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8. If $\cos\theta = \frac{1}{2}$,then find the value of $4\cos^3\theta - 3\cos\theta$.

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9. If $\sin\theta = \frac{7}{25}$,then find the value of $\tan^2\theta$.

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

B. $\frac{49}{576}$

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

D. $\frac{49}{625}$

Answer: B

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10. If $\text{cosec}\theta = \sqrt{2}$,then find the value of $\left(\tan^2\theta - 1\right)$.

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11. If $\sin\theta = \frac{1}{2}$, then find the value of $\sin 2\theta$

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12. If $\cos\theta = \frac{1}{\sqrt{2}}$,then find the value of $\cos 2\theta$.

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13. Find the value of $\left(1 - 2\sin^2 30^\circ\right)$.

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14. If sinA=cosA,then find the value of sin 2A.

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15. If $\sec\theta = \frac{2}{\sqrt{3}}$,then find the value of$\sec 2\theta$.

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16. If $\text{cosec}\theta = 2$,then find the value of $\text{cosec}3\theta$

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17. Evaluate $\cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ$.

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18. Evaluate $\frac{\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \tan 30^\circ}$.

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19. Find the value of $\left(1-\sin^2 A\right)\left(1+\tan^2 A\right)$.

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20. Find the value of $\sin^2\theta \cdot \sec^2\theta$.

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21. Find the value of $\left(1-\cos^2 A\right) \cdot \operatorname{cosec}^2 A$.

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22. Find the value of $\left(\operatorname{cosec}^2 A-1\right) \cdot \tan^2 A$.

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23. Find the value of $\left(\sec^2 A - 1\right)$.

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24. Find the value of $\cot\theta \cdot \sin\theta \cdot \sec\theta$.

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25. Find the value of $\sqrt{1 - \cos^2 A}$.

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26. If $\sin A + \sin^2 A = 1$, then the value of $\cos^2 A + \cos^4 A$ is

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

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28. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$,then find the value of $\frac{\cos\theta - \sin\theta}{\sin\theta}$.

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29. Find the value of $\frac{\tan 25^\circ}{\cot 65^\circ}$.

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30. Find the value of $\sin 50^\circ - \cos 40^\circ$.

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31. Evaluate $\sin 10^\circ \sec 80^\circ + 4\tan 45^\circ$.

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32. Evaluate $\frac{\sin 35^\circ}{\cos 55^\circ} + \frac{\sec 20^\circ}{\text{cosec}70^\circ}$.

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33. Evaluate $\sin^2 26^\circ + \sin^2 64^\circ$.

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34. Evaluate $\tan 20^\circ \tan 25^\circ \tan 65^\circ \tan 70^\circ$.

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35. Evaluate $\text{cosec}^2 57^\circ - \tan^2 33^\circ$.

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36. Evaluate $2\left(\cos^2 28^\circ - \sin^2 62^\circ\right)$.

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37. Evaluate $\sin(30^\circ + \theta) - \cos(60^\circ - \theta)$.

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38. Evaluate $\sin\theta\cos(90^\circ - \theta) + \cos\theta\sin(90^\circ - \theta)$.

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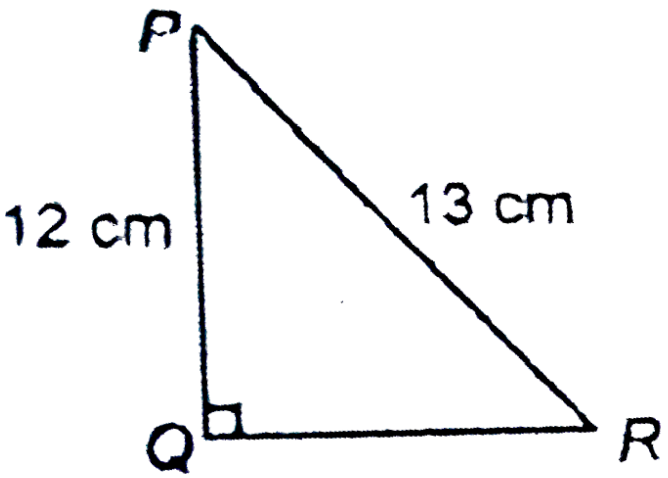
Short Answer Questions

1. In the adjoining figure , find tan P -cot R.



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Revision Exercise Short Answer Questions

1. If $3\cot A = 4$, check whether $\frac{1-\tan^2 A}{1+\tan^2 A} = \cos^2 A - \sin^2 A$ or not.

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2. In $\Delta ABC, \angle C = 90^\circ$ and $\tan A = \frac{1}{\sqrt{3}}$,find the value of sin A cosB+cosAsinB.

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3. If $\text{cosec}\theta = 2$, show that $\left(\cot\theta + \frac{\sin\theta}{1+\cos\theta}\right) = 2.$

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4. If $\sin\theta = 0.8$,show that $5\sin\theta - 3\tan\theta = 0.$

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5. If $\cos\theta = \frac{8}{17}$,verify that $\frac{3 - 4\sin^2\theta}{4\cos^2\theta - 3} = \frac{3 - \tan^2\theta}{1 - 3\tan^2\theta}.$

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6. If $\sin\theta = \frac{3}{5}$,verify that $\frac{\tan\theta}{1+\tan^2\theta} = \sin\theta\cos\theta.$

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

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8. find the value of $\sin 60^\circ \cos 30^\circ + \sin 30^\circ \cos 60^\circ$

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9. Verify that : $\sin 60^\circ = 2\sin 30^\circ \cos 30^\circ$

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10. If A $= 30^\circ$,verify that cos2A $= \cos^2 A - \sin^2 A.$

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11. if A= 45^o then verify sin2A=2sinAcosA ,$\cos 2A = 1 - \sin^2 A$

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12. Using the formula cos A $= \sqrt{\frac{1+\cos 2A}{2}}$, find the value of $\cos 30^\circ$, it is given that $\cos 60^\circ = \frac{1}{2}$.

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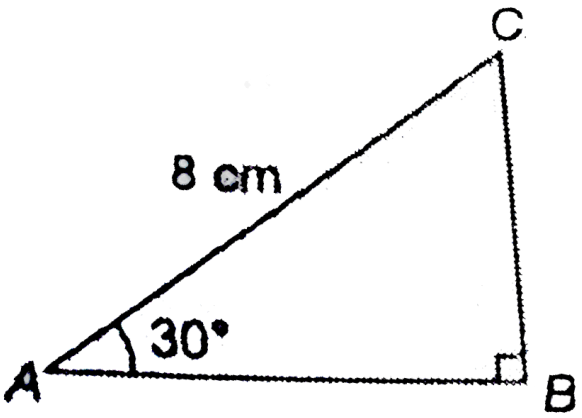
13. In the adjoining figure , ΔABC is a right - angled triangle , right - angled at B. If $\angle A = 30^\circ$ and $AC = 8cm$, Find (i)BC (ii)AB.



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14. If $\sin(A-B)=\frac{1}{2}$, $\cos(A+B)=\frac{1}{2}$, `0o B`, find A and B.

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15. Find the value of $\sin 30^\circ$ geometrically.

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16. Find the value of $\sin 60^\circ$ geometrically.

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17. Prove that $\sqrt{\sec^2\theta + \cos ec^2\theta} = \tan\theta + \cot\theta.$

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18. Prove that : $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \text{cosec}\theta + \cot\theta$

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19. $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$ is equal to

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20. Prove that : $\tan^2\theta - \sin^2\theta = \tan^2\theta\sin^2\theta$

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21. Prove that : $\frac{\tan A + \sin A}{\tan A - \sin A} = \frac{\sec A + 1}{\sec A - 1}$

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22. Prove that : $\sin^2 A \cos^2 B - \cos^2 A \sin^2 B = \sin^2 A - \sin^2 B$

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23. Prove that : $\sin^2 \theta + \cos^4 \theta = \cos^2 \theta + \sin^4 \theta$

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24. Prove that : $\sin^2 \theta + \frac{1}{1 + \tan^2 \theta} = 1$

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25. Prove that : $(1-\cos\theta)(1+\cos\theta)\left(1+\cot^2\theta\right)=1$

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26. Prove that : $\frac{\tan^2\theta}{1+\tan^2\theta}+\frac{\cot^2\theta}{1+\cot^2\theta}=1$

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27. If $\tan 3A=\cot(A-10^\circ)$ where 3A is an angle , find A.

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28. If $\cos 5A=\sin(A-30^\circ)$ where 5A is an acute angle , find A.

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29. Show that : $\frac{\cot(90^\circ-\theta)\cdot\sin(90^\circ-\theta)}{\sin\theta}+\frac{\cot 50^\circ}{\tan 40^\circ}=2$

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30. The value of $\frac{\cos\left(90^0-\theta\right)\sec\left(90^0-\theta\right)\tan\theta}{\cos ec\left(90^0-\theta\right)\sin\left(90^0-\theta\right)\cot\left(90^0-\theta\right)}+\frac{\tan\left(90^0-\theta\right)}{\cot\theta}$ i s 1 (b) -1 (c) 2 (d) -2

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31. Show that : $\cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \sin 30^\circ \operatorname{cosec} 75^\circ = \frac{1}{2}$

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32. Express $\cos 70^\circ + \sin 70^\circ + \tan 65^\circ$ in terms of trigonometric ratios of angles lying between 0° and 45°

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33. Evaluate : $\sin 50^\circ \cos 40^\circ + \cos 40^\circ + \cos 50^\circ \sin 40^\circ$

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Revision Exercise Long Answer Questions

1. Prove that: $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta \cos ec\theta$

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2. Prove that : $\frac{\cos^2\theta}{1-\tan\theta} + \frac{\sin^3\theta}{\sin\theta-\cos\theta} = 1 + \sin\theta\cos\theta$

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3. Prove that : $\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta} + \frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta} = \frac{2}{2\sin^2\theta-1}$

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4. Prove that : $\frac{\sin\theta}{\sec\theta+\tan\theta-1}+\frac{\cos\theta}{\text{cosec}\theta+\cot\theta-1}=1$

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5. 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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