



MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

TRIGONOMETRIC EQUATIONS

Solved Examples And Exercises

1. Write the number of solutions of the equation

$$4 \sin x - 3 \cos x = 7.$$



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2. Solve that following equations :

$$5 \cos^2 \theta + 7 \sin^2 \theta - 6 = 0$$

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3. Solve that following equations :

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

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4. Write the set of values of a for which the equation

$$\sqrt{3} \sin x - \cos x = a \text{ has no solution.}$$

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5. Solve that following equations : $\cot \theta - \tan \theta = 2$

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6. Solve that following equations : $\sec x \cos 5x + 1 = 0$,

$0 < x \leq \frac{\pi}{2}$ find the value of x

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7. Solve that following equations :

$2 \sin^2 \theta = 3 \cos \theta, 0 \leq \theta \leq \frac{\pi}{2}$

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8. Solve the following equations:

$$\tan \theta + \tan 2\theta + \tan 3\theta = \tan \theta \tan 2\theta \tan 3\theta$$

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9. Solve the following equations :

$$\tan \theta + \tan 2\theta + \sqrt{3} \tan \theta \tan 2\theta = \sqrt{3}$$

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10. Solve: $\sqrt{2} \sec \theta + \tan \theta = 1$

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11. Solve that following equations :

$$\tan \theta + \tan 2\theta + \tan \theta \tan 2\theta = 1$$

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12. If $\sec x \cos 5x + 1 = 0$, where θ

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13. If $3 \tan(\theta - 15^\circ) = \tan(\theta + 15^\circ)$

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14. Solve that following equations :

$$\tan\theta + \tan\left(\theta + \frac{\pi}{3}\right) + \tan\left(\theta + \frac{2\pi}{3}\right) = 3$$

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15. If $\tan p\theta - \tan q\theta = 0$, then the values of θ form a series in

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16. The equation $3\cos x + 4\sin x = 6$ has solution.
finite (b) infinite (c) one (d) no

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17. Solve that equation : $\sin m\theta + \sin n\theta = 0$.

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18. Solve: $4 \sin x \sin 2x \sin 4x = \sin 3x$

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19. Solve:

$\sin 3\alpha = 4 \sin \alpha \sin(x + \alpha) \sin(x - \alpha)$, where $\alpha \neq n\pi$, $n \in \mathbb{Z}$

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20. Solve: $2 \sin^2 x + \sin^2 2x = 2$

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21. Solve: $7 \cos^2 \theta + 3 \sin^2 \theta = 4$

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22. Write the solution set of the equation $(2 \cos \theta + 1)(4 \cos \theta + 5) = 0$ in the interval $[0, 2\pi]$

A. $\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$.

B. $\theta = \frac{\pi}{3}, \frac{4\pi}{3}$.

C. $\theta = \frac{2\pi}{3}, \frac{\pi}{3}$.

D. $\theta = \frac{\pi}{3}, \frac{5\pi}{3}$.

Answer: A

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23. Find the general solution : $\sec^2 2x = 1 - \tan 2x$

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24. Solve that following equations :

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

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25. Solve that following equations : $4 \cos \theta - 3 \sec \theta = \tan \theta$

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26. Solve that following equations : $2 \tan \theta - \cot \theta = -1$

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27. Solve that following equations : $\cot^2 \theta + \frac{3}{\sin \theta} + 3 = 0$

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28. Solve that following equations : $2 \cos^2 \theta + 3 \sin \theta = 0$

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29. If $e^{\sin x} - e^{-\sin x} - 4 = 0$, then $x = 0$ (b)

$\sin^{-1}\{(\log)_e(2 + \sqrt{5})\}$ (c) 1 (d) none of these

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30. Solve that following equations : $\operatorname{cosec}\theta = 1 + \cot\theta$

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31. Solve that following equations :

$$(\sqrt{3} - 1)\cos\theta + (\sqrt{3} + 1)\sin\theta = 2$$

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32. The number of values of $\theta \in [0, 2\pi]$ that satisfy the equation $\sin^2 \theta - \cos \theta = \frac{1}{4}$

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33. Solve that following equations : $\cot \theta + \tan \theta = 2$

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34. Solve that following equations : $\sqrt{3} \cos \theta + \sin \theta = 1$

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35. Solve that equation : $\sin \theta + \sin 3\theta + \sin 5\theta = 0$.

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36. Solve that equation : $\cos \theta + \cos 3\theta - 2 \cos 2\theta = 0$

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37. Solve: $\cot \theta + \operatorname{cosec} \theta = \sqrt{3}$

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38. Prove that: $\sin^2 \theta = \sin^2 \alpha$, then $\theta = n\pi \pm \alpha$, $n \in \mathbb{Z}$

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39. Write the values of $x \in [0, \pi]$ for which $\sin 2x$, $\frac{1}{2}$ and $\cos 2x$ are in A.P.

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40. Prove that: $\tan^2 \theta = \tan^2 \alpha$, $\theta = n\pi \pm \alpha$, $n \in \mathbb{Z}$

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41. Prove that: $\cos^2 \theta = \cos^2 \alpha$ then $\theta = n\pi \pm \alpha$, $n \in \mathbb{Z}$

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42. Find the general solutions of the following equations:

(i) $\sin 2\theta = 0$ (ii) $\sin\left(\frac{3\theta}{2}\right) = 0$ (iii) $\sin^2 2\theta = 0$

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43. Find the general solutions of the following equations:

(i) $\cos 3\theta = 0$ (ii) $\cos\left(\frac{3\theta}{2}\right) = 0$ (iii) $\cos^2 3\theta = 0$

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44. Find the general solutions of the following equations:

$\tan 2\theta = 0$ (ii) $\tan\left(\frac{\theta}{2}\right) = 0$ (iii) $\frac{\tan(3\theta)}{4} = 0$

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45. Prove that the general solution of $\sin \theta = \sin \alpha$ is given by :

$$\theta = n\pi + (-1)^n \alpha, n \in \mathbb{Z}.$$

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46. Prove that the general solution of $\cos \theta = \cos \alpha$ is given by : $\theta = 2n\pi \pm \alpha$, where $n \in \mathbb{Z}$.

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47. Prove that the general solution of $\tan \theta = \tan \alpha$ is given by : $\theta = n\pi + \alpha, n \in \mathbb{Z}$.

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48. Solve the following trigonometric equations:

$$s \int h \frac{\eta}{2} = -1 \quad \text{(ii)} \quad \frac{\cos(3\theta)}{2} = \frac{1}{2} \quad \text{(iii)} \quad \tan\left(\frac{2}{3}\theta\right) = \sqrt{3}$$

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49. Solve that following equation: $\cot \theta + \tan \theta = 2$

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50. Write the number of solutions of the equation

$$\tan x + \sec x = 2 \cos x \text{ in the interval } [0, 2\pi].$$

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51. The number of values of x in the interval $0, 5\pi$ satisfying the equation $3 \sin^2 x - 7 \sin x + 2 = 0$ is 0 (b) 5 (c) 6 (d) 10

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52. If a is any real number, the number of roots of $\cot x - \tan x = a$ in the first quadrant is (are). 2 (b) 0 (c) 1 (d) none of these

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53. Solve: $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$

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54. If $\cos x = k$ has exactly one solutions in $[0, 2\pi]$, then write the values of k .

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55. Write the number of points in intersection of the curves
 $2y = -1$ and $y = \cos ecx$

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56. Find the general solutions of the following equation:

$$\sin \theta = \frac{\sqrt{3}}{2}$$

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57. Find the general solutions of the following equation:

$$2 \sin \theta + 1 = 0$$

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58. Find the general solutions of the following equation:

$$\operatorname{cosec} \theta = 2$$

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59. Find the general solutions of the following equation:

$$\cos \theta = \frac{1}{2}$$

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60. Find the general solutions of the following equation:

$$\cos 3\theta = -\frac{1}{2}$$

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61. Find the general solutions of the following equation:

$$\sqrt{3} \sec 2\theta = 2$$

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62. Principal Solution of trigonometric equation:

$$\tan \theta = \frac{1}{\sqrt{3}} \text{ are}$$

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

B. $\frac{\pi}{6}, \frac{5\pi}{6}$

C. $\frac{\pi}{6}, \frac{7\pi}{6}$

D. $\frac{5\pi}{6}, \frac{7\pi}{6}$

Answer: C

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63. Solve the following trigonometric equation:

$$\tan 2\theta = \sqrt{3}$$

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64. Solve the following trigonometric equation:

$$\tan 3\theta = -1$$



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65. Solve the following equation: $\sin 2\theta + \cos \theta = 0$



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66. Solve the following equation: $\sin 3\theta + \cos 2\theta = 0$



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67. Solve the following equation:

$$\sin 2\theta + \sin 4\theta + \sin 6\theta = 0$$

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68. Find the general solutions of the following equation:

$$\sin \theta = \frac{1}{2}$$

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69. Find the general solutions of the following equation:

$$\cos x = -\frac{\sqrt{3}}{2}$$

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70. Find the general solutions of the following equation:

$$\operatorname{cosec}\theta = -\sqrt{2}$$

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71. Find the general solutions of the following equation:

$$\sec\theta = \sqrt{2}$$

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72. Find the general solutions of the following equation:

$$\tan\theta = -\frac{1}{\sqrt{3}}$$

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73. Find the general solutions of the following equation:

$$\sqrt{3} \sec \theta = 2$$

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74. Find the general solutions of the following equation:

$$\sin 2\theta = \frac{\sqrt{3}}{2}$$

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75. Find the general solutions of the following equation:

$$\sin 2\theta = \cos 3\theta$$

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76. Find the general solutions of the following equation:

$$\tan 2\theta \tan \theta = 1$$

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77. Find the general solutions of the following equation:

$$\sin 2\theta + \cos \theta = 0$$

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78. Find the general solutions of the following equation:

$$\cos 3\theta = \frac{1}{2}$$

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79. Find the general solutions of the following equation:

$$\tan\theta + \cot 2\theta = 0$$

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80. Find the general solutions of the following equation:

$$\tan m\theta = \cot n\theta$$

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81. Find the general solutions of the following equation:

$$\sin\theta = \tan\theta$$

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82. Find the general solutions of the following equation:

$$\sin 9\theta = \sin \theta$$



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83. Find the general solutions of the following equation:

$$\tan 3\theta = \cot \theta$$



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84. Find the general solutions of the following equation:

$$\tan p\theta = \cot q\theta$$



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85. Find the general solutions of the following equation:

$$\sin 3\theta + \cos 2\theta = 0$$

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86. Solve the following equation: $\sin^2 \theta - \cos \theta = \frac{1}{4}$

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87. Solve the following equation:

$$2\sin^2 x + \sqrt{3}\cos x + 1 = 0$$

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88. Solve the following equation:

$$\tan^2 x + (1 - \sqrt{3})\tan x - \sqrt{3} = 0$$

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89. Solve the following equation:

$$3 \cos^2 \theta - 2 \sqrt{3} \sin \theta \cos \theta - 3 \sin^2 \theta = 0$$

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90. Solve the following equation:

$$2 \cos^2 \theta - 5 \cos \theta + 2 = 0$$

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91. Solve the following equation: $4 \sin^2 \theta - 8 \cos \theta + 1 = 0$

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92. Solve the following equation: $\cos 4\theta = \cos 2\theta$

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93. Solve the following equation:

$$\cos \theta + \cos 2\theta + \cos 3\theta = 0$$

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94. Solve the following equation: $\sin \theta + \sin 5\theta = \sin 3\theta$



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95. Solve the following equation:

$$\cos \theta + \sin \theta = \cos 2\theta + \sin 2\theta$$



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96. Solve the following equation:

$$\sin \theta + \sin 2\theta + \sin 3\theta + \sin 4\theta = 0$$



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97. Solve the following equation:

$$\sin 3\theta - \sin \theta = 4 \cos^2 \theta - 2$$



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98. Solve the following equation:

$$\cos \theta + \cos 3\theta - \cos 2\theta = 0$$



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99. Solve the following equation: $\cos \theta \cos 2\theta \cos 3\theta = \frac{1}{4}$



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100. Solve the following equation:

$$\sin \theta + \sin 2\theta + \sin 3\theta + \sin 4\theta = 0$$



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101. Solve the following equation:

$$\sin 2\theta - \sin 4\theta + \sin 6\theta = 0$$

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102. Solve the following equation:

$$\tan \theta + \tan 2\theta + \tan 3\theta = 0$$

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103. Write the general solution of $\tan^2 2x = 1$.

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104. Solve the equation $5 \cos^2 \theta + 7 \sin^2 \theta - 6 = 0$

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105. Write the number of values of $\theta \in [0, 2\pi]$ that satisfy the equation $\sin^2 \theta - \cos \theta = \frac{1}{4}$.

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106. If $2 \sin^2 \theta = 3 \cos \theta$, where $0 \leq \theta \leq 2\pi$, then find the value of θ .

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107. The smallest value of θ satisfying the equation $\sqrt{3}(\cot \theta + \tan \theta) = 4$ is $2\pi/3$ b. $\pi/3$ c. $\pi/6$ d. $\pi/12$

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108. If $\cos \theta + \sqrt{3} \sin \theta = 2$, then $\theta =$ a. $\pi/3$ b. $2\pi/3$ c. $4\pi/3$ d. $5\pi/3$

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109. The general solution of the equation $7 \cos^2 \theta + 3 \sin^2 \theta = 4$ is $\theta = 2n\pi \pm \frac{\pi}{6}, n \in \mathbb{Z}$ b. $\theta = 2n\pi \pm \frac{2\pi}{3}, n \in \mathbb{Z}$ c. $\theta = 2n\pi \pm \frac{\pi}{3}, n \in \mathbb{Z}$ d. none of these

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110. A solution of the equation $\cos^2 \theta + \sin \theta + 1 = 0$ lies in the interval a. $(-\pi/4, \pi/4)$ b. $(\pi/4, 3\pi/4)$ c. $(3\pi/4, 5\pi/4)$ d. $(5\pi/4, 7\pi/4)$



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111. The number of solution in $[0, \pi/2]$ of the equation $\cos 3x \tan 5x = \sin 7x$ is 5 b. 7 c. 6 d. none of these



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112. The general value of x satisfying the equation $\sqrt{3} \sin x + \cos x = \sqrt{3}$ is given by

$$x = n\pi + (-1)^n \frac{\pi}{4} + \frac{\pi}{3}, nZ \quad \text{b.}$$

$$x = n\pi + (-1)^n \frac{\pi}{3} + \frac{\pi}{6}, nZ \quad \text{c.} \quad x = n\pi \pm \frac{\pi}{6}, nZ \quad \text{d.}$$

$$x = n\pi \pm \frac{\pi}{3}, nZ$$

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113. The smallest positive angle which satisfies the equation

$$2\sin^2 \theta + \sqrt{3} \cos \theta + 1 = 0 \text{ is } \frac{5\pi}{6} \text{ b. } \frac{2\pi}{3} \text{ c. } \frac{\pi}{3} \text{ d. } \frac{\pi}{6}$$

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114. If $4\sin^2 \theta = 1$, then the values of θ are

$$2n\pi \pm \frac{\pi}{3}, n \in Z \text{ b. } n\pi \pm \frac{\pi}{3}, n \in Z \text{ c. } n\pi \pm \frac{\pi}{6}, n \in Z \text{ d.}$$

$$2n\pi \pm \frac{\pi}{6}, n \in Z$$

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115. If $\cot \theta - \tan \theta = \sec \theta$, then θ is equal to
 $2n\pi + \frac{3\pi}{2}, nZ$ b. $n\pi + (-1)^n \frac{\pi}{6}, nZ$ c. $n\pi + \frac{\pi}{2}, nZ$ d.

none of these

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116. A value of θ satisfying $\cos \theta + \sqrt{3} \sin \theta = 2$ is $\frac{5\pi}{3}$ b.
 $\frac{4\pi}{3}$ c. $\frac{2\pi}{3}$ d. $\frac{\pi}{3}$

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117. If $\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$, then general value of θ is
 $n\pi + (-1)^n \frac{\pi}{4}, nZ$ b. $(-1)^n \frac{\pi}{4} - \frac{\pi}{3}, nZ$ c.

$$n\pi \pm \frac{\pi}{4} - \frac{\pi}{3}, n\mathbb{Z} \text{ d. } n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{3}, n\mathbb{Z}$$

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118. General solution of $\tan 5\theta = \cot 2\theta$ is $\frac{n\pi}{7} + \frac{\pi}{2}, n\mathbb{Z}$

b. $\theta = \frac{n\pi}{7} + \frac{\pi}{3}, n\mathbb{Z}$ c. $\theta = \frac{n\pi}{7} + \frac{\pi}{14}, n\mathbb{Z}$ d.

$\theta = \frac{n\pi}{7} - \frac{\pi}{14}, n\mathbb{Z}$

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119. The solution of the equation $\cos^2 \theta + \sin \theta + 1 = 0$ lies

in the interval $(-\pi/4, \pi/4)$ b. $(\pi/4, 3\pi/4)$ c.

$(3\pi/4, 5\pi/4)$ d. $(5\pi/4, 7\pi/4)$

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120. If $\cos \theta = -\frac{1}{2}$ and $0^\circ < \theta < 360^\circ$ then the solutions are

a. $60^\circ, 240^\circ$, *b.* $120^\circ, 240^\circ$, *c.* $120^\circ, 210^\circ$, *d.* $120^\circ, 300^\circ$



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