



MATHS

BOOKS - V PUBLICATION

TRIGNOMETRC FUNCTIONS

Question Bank

1. Convert the following degree measure into radian measure.

$$40^\circ 20'$$



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2. Convert the following radian measure into degree measure.

$$6$$



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3. Find the radius of the circle in which a central angle of 60° intercepts an arc of length 37.4cm (use $\pi = \frac{22}{7}$)

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4. The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes ? (use $\pi = 3.14$)

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5. If the arcs of the same lengths in the two circles subtend angles 65° and 110° at the centre, find the ratio of their radii.

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6. Find the radian measure corresponding to the following degree measures: 25°

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7. Convert the following degree measure into radian measure.

$-47^\circ 30'$

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8. Convert the following degree measure into radian measure.

240°

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9. Find the radian measure corresponding to the following degree measures: 520°



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10. Find the degree measures corresponding to the following radian measures $\left(use \pi = \frac{22}{7} \right) \frac{7\pi}{6}$

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11. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?

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12. Find the degree measures of the angle subtended at the centre of a circle of radius 100 cm by an arc of length 22 cm $\left(use \pi = \frac{22}{7} \right)$

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

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14. If two circles arc of the same length subtend angles 60° and 75° at the centre , Find the ratio of their radii.

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15. Find the angle in radian through which a pendulum swings if its length is 75cm and the tip describes an arc of length 15cm

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16. Find the values of the other five trigonometric functions in the following :

$\cos x = -\frac{3}{5}$, x lies in the third quadrant.

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17. Find the value of

$$\sin\left(\frac{31\pi}{3}\right)$$

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18. Find the value of $\cos(-1710^\circ)$.

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19. Find the value of the other five trigonometric functions if $\cos x = \left(-\frac{1}{2}\right)$

, x lies in 3rd quadrant.

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20. If $\sin x = \frac{3}{5}$ and x lies in the second quadrant, find the values of $\cos x$, $\tan x$ and $\sec x$.

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21. If $\cot x = \frac{3}{4}$ and x lies in the 3rd quadrant find the values of the other five trigonometric functions.

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22. If $\sec x = \frac{13}{5}$ and x lies in fourth quadrant then find the values of the other five trigonometric functions.

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23. If $\tan x = -\frac{5}{12}$, x lies in second quadrant. Find all trigonometric functions.

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24. Find the value of $\sin 765^\circ$

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25. Find the value of $\cos ec(-1410^\circ)$

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26. Find the value of $\tan\left(\frac{19\pi}{3}\right)$

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27. Find the value of $\tan\left(\frac{19\pi}{3}\right)$

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28. Find the value of $\sin\left(\frac{-11\pi}{3}\right)$



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29. Find the value of the trigonometric functions.

$$\cot\left(-\frac{15\pi}{4}\right)$$



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30. Show that

$$\cos(x - y) = \cos^2 x \cos^2 y + \sin x \cdot \sin y$$



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31. Show that

$$\cos\left(\frac{\pi}{2} - x\right) = \sin x$$



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32. Show that

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x$$



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33. $\sin(x+y) = \sin x \cos y + \cos x \sin y$ We know that



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34.

$$\sin(x + y) = \cos\left(\frac{\pi}{2} - (x + y)\right) = \cos\left(\left(\frac{\pi}{2} - x\right) - y\right)' = \cos\left(\frac{\pi}{2} - x\right)$$



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35. $\frac{\tan x + \tan y}{1 - \tan x \tan y} = \dots\dots\dots$



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36. Show that $\tan(x - y) = \frac{\tan x - \tan y}{1 + \tan x \tan y}$



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37. If none of the angles x, y and $(x + y)$ is a multiple of π , then

$$\cot(x + y) = \frac{\cot x \cot y - 1}{\cot y + \cot x}$$



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38. Show that

$$\cot(x - y) = \frac{\cot x \cot y + 1}{\cot y - \cot x}$$



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39. Show that

$$\cos 2x = \cos^2 x - \sin^2 x = 2\cos^2 x - 1 = 1 - 2\sin^2 x = \frac{1 - \tan^2 x}{1 + \tan^2 x}$$





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40. Show that

$$\sin 2x = 2 \sin x \cos x = \frac{2 \tan x}{1 + \tan^2 x}$$



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41. Show that

$$\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$$



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42. Show that

$$\sin 3x = 3 \sin x - 4 \sin^3 x$$



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43. Show that

$$\cos 3x = 4 \cos^3 x - 3 \cos x$$

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44. Show that $\tan 3x = \frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x}$

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45. Show that

(i) $\cos x + \cos y = 2 \frac{\cos(x+y)}{2} \frac{\cos(x-y)}{2}$

(ii) $\cos x - \cos y = -2 \frac{\sin(x+y)}{2} \frac{\sin(x-y)}{2}$

(iii) $\sin x + \sin y = 2 \frac{\sin(x+y)}{2} \frac{\cos(x-y)}{2}$

(iv) $\sin x - \sin y = 2 \frac{\cos(x+y)}{2} \frac{\sin(x-y)}{2}$

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46. Prove that

(i) $2 \cos x \cos y = \cos(x + y) + \cos(x - y)$

(ii) $-2 \sin x \sin y = \cos(x + y) - \cos(x - y)$

(iii) $2 \sin x \cos y = \sin(x + y) + \sin(x - y)$

(iv) $2 \cos x \sin y = \sin(x + y) - \sin(x - y)$



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47. Find the value of

$\sin 15^\circ$.



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48. Find :the value of

' $\tan(13\pi / 12)$ ' .



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49. Prove that $(\sin(x+y)) / (\sin(x-y)) = (\tan x + \tan y) / (\tan x - \tan y)$

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50. Show that $\tan^3 x \tan^2 x \tan x = \tan^3 x - \tan^2 x - \tan x$

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51. Prove that $\cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) = \sqrt{2} \cos x$

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52. Prove that $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x$

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53. Prove that $\frac{\sin 5x - 2 \sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

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54. Prove that $\sin^2\left(\frac{\pi}{6}\right) + \cos^2\left(\frac{\pi}{3}\right) - \tan^2\left(\frac{\pi}{4}\right) = -\frac{1}{2}$

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55. Prove that $2\sin^2\left(\frac{\pi}{6}\right) + \operatorname{cosec}^2\left(\frac{7\pi}{6}\right)\cos^2\left(\frac{\pi}{3}\right) = \frac{3}{2}$

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56. Prove that $\cot^2\left(\frac{\pi}{6}\right) + \operatorname{cosec}\left(\frac{5\pi}{6}\right) + 3\tan^2\left(\frac{\pi}{6}\right) = 6$

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57. Prove that $2\sin^2\left(\frac{3\pi}{4}\right) + 2\cos^2\left(\frac{\pi}{4}\right) + 2\sec^2\left(\frac{\pi}{3}\right) = 10$

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58. Find the value of

$$\sin 75^\circ$$

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59. Find the value of the following:

$$\tan 15^\circ$$

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60. Prove that

$$\cos\left(\frac{\pi}{4} - x\right)\cos\left(\frac{\pi}{4} - y\right) - \sin\left(\frac{\pi}{4} - x\right)\sin\left(\frac{\pi}{4} - y\right) = \sin(x + y)$$

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61. prove that

$$\frac{\tan\left(\frac{\pi}{4} + x\right)}{\tan\left(\frac{\pi}{4} - x\right)} = \left(\frac{1 + \tan x}{1 - \tan x}\right)^2$$



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62. Prove that
$$\frac{\cos(\pi + x)\cos(-x)}{\sin(\pi - x)\cos\left(\frac{\pi}{2} + x\right)} = \cot^2 x$$



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63. Prove that

$$\cos\left(\frac{3\pi}{2} + x\right)\cos(2\pi + x)\left[\cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x)\right] = 1$$



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64. Prove that

$$\sin(n + 1)x \sin(n + 2)x + \cos(n + 1)x \cos(n + 2)x = \cos x$$



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65. Prove that $\cos\left(\frac{3\pi}{4} + x\right) - \cos\left(\frac{3\pi}{4} - x\right) = -\sqrt{2}\sin x$



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66. prove the following

$$\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$$



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67. Prove that $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$



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68. Prove that

$$\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$$



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69. Prove that

$$\cot 4x(\sin 5x + \sin 3x) = \cot x(\sin 5x - \sin 3x)$$



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70. Prove that

$$\frac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = -\frac{\sin 2x}{\cos 10x}$$



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71. Prove that

$$\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$$



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72. Prove that

$$\frac{\sin x - \sin y}{\cos x + \cos y} = \frac{\tan(x - y)}{2}$$



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73. Prove that

$$\frac{\sin x + \sin 3x}{\cos x + \cos 3x} = \tan 2x$$



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74. Prove that

$$\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$$



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75. Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x.$



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76. Prove that $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$



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77. Prove that $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

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78. Prove that $\cos 4(x) = 1 - 8 \sin^2(x) \cos^2(x)$

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79. Prove that $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

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80. Find the principle and general solutions of $\sin x = -\frac{\sqrt{3}}{2}$

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81. Find the principle and general solutions of $\sin x = -\frac{\sqrt{3}}{2}$

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82. Find the principal and general solution of $\cos x = \frac{1}{2}$

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83. Solve $\tan 2x = -\cot\left(x + \frac{\pi}{3}\right)$

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84. Solve:

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

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85. Solve $2 \cos^2 x + 3 \sin x = 0$

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86. Find the principle and general solution of the following.

$$\tan x = \sqrt{3}$$

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87. Find the principal and general solutions of the following equations

$$\sec x = 2$$

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88. Find the principal and general solutions of the following equations

$$\cot x = -\sqrt{3}$$

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89. Find the principle and general solution of the following.

$$\cos ecx = -2$$



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90. Find the general solution of the following equations

$$\cos 4x = \cos 2x$$



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91. Find the general solution of the following equations

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



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92. Find the general solution of the following equations

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

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93. Find the general solutions for each of the following equations

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

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94. Find the principal and general solution of the following equation

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

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95. If $\sin x = \frac{3}{5}$, $\cos y = -\frac{12}{13}$, where 'x' and 'y' both lie in second quadrant, find the value of ' $\sin(x+y)$ '

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96. Prove that $\cos 2x \cos\left(\frac{x}{2}\right) - \cos 3x \cos\left(\frac{9x}{2}\right) = \sin 5x \sin\left(\frac{5x}{2}\right)$

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97. Find the value of $\tan\left(\frac{\pi}{8}\right)$

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98. If $\tan x^\circ = \frac{3}{4}$, $\pi < x < \frac{3\pi}{2}$, find the value of $\frac{\sin(x)}{2}$, $\frac{\cos(x)}{2}$ and $\frac{\tan(x)}{2}$.

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99. Show that $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

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100. Prove that $2 \cos\left(\frac{\pi}{13}\right) \cos\left(\frac{9\pi}{13}\right) + \cos\left(\frac{3\pi}{13}\right) + \cos\left(\frac{5\pi}{13}\right) = 0$

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101. Prove that $(\sin 3x + \sin x)\sin x + (\cos 3x - \cos x)\cos x = 0$

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102. Prove that $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2\left(\frac{x+y}{2}\right)$

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103. Prove that $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2\left(\frac{x-y}{2}\right)$

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104. Prove that

$$\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$$

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105. Prove that
$$\frac{(\sin 7x + \sin 5x) + (\sin 9x + \sin 3x)}{(\cos 7x + \cos 5x) + (\cos 9x + \cos 3x)} = \tan 6x$$

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106. Show that
$$\sin 3x + \sin 2x - \sin x = 4 \sin x \cos\left(\frac{x}{2}\right) \cos\left(\frac{3x}{2}\right)$$

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107. Find $\sin\left(\frac{x}{2}\right)$, $\cos\left(\frac{x}{2}\right)$, and $\tan\left(\frac{x}{2}\right)$ if $\tan x = -\frac{4}{3}$ and x is in the second quadrant.

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108. Find $\sin\left(\frac{x}{2}\right)$, $\cos\left(\frac{x}{2}\right)$ and $\tan\left(\frac{x}{2}\right)$ if $\cos x = \left(-\frac{1}{3}\right)$ and x lies in the 3rd quadrant.

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109. Find $\sin\left(\frac{x}{2}\right)$, $\cos\left(\frac{x}{2}\right)$ and $\tan\left(\frac{x}{2}\right)$ if $\sin x = \frac{1}{4}$ and x lies in the second quadrant.

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110. Prove that $\frac{\sin x}{1 + \cos x} = \tan\left(\frac{x}{2}\right)$ Find the domain and range of $f(x) = \cos 2x$.

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111. Hence write the value of $\cos 75^\circ$.

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112. If $\frac{\sin(x + y)}{\sin(x - y)} = \frac{a + b}{a - b}$, show that $a \tan y = b \tan x$

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113. Prove that

$$\cos 24^\circ + \cos 55^\circ + \cos 125^\circ + \cos 204^\circ + \cos 300^\circ = \frac{1}{2}$$

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114. Prove that $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2 \cos 8\theta}}} = 2 \cos \theta$

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115. Solve the following equations $2 \tan \theta - \cot \theta = -1$

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116. If $A + B = 45^\circ$, prove that $(\cot A - 1)(\cot B - 1) = 2$

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117. Show that $\frac{\sin(180^\circ + A)\cos(90^\circ - A)\tan(270^\circ + A)}{\sec(540^\circ - A)\cos(360^\circ + A)} = -1$

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118. Prove that $\frac{\cos^4(\pi)}{8} + \frac{\cos^4(3\pi)}{8} + \frac{\cos^4(5\pi)}{8} + \frac{\cos^4(7\pi)}{8} = \frac{3}{2}$

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119. Prove that $(\sin 3x + \sin x)\sin x + (\cos 3x - \cos x)\cos x = 0$

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120. If an arc of length l of a circle of radius r subtends an angle θ radians at the centre what is the relation connecting l, r, θ



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121. A cow is tied to a post with a rope of $20m$ long .If it moves along a circular path by keeping the rope always tight. Find how far it will have gone when the rope has reached an angle of 90°



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122. Three points A, B, C are marked in the stem of a coconut trees so that the distance of these points from its foot are in A.P. If the angles of elevation of these points from a point on the ground are x, y, z respectively. then.

i) Draw a rough sketch of the situation..

ii) Show that $\cot y \cot z, \cot z \cot x$ and $\cot x \cot y$ are also in AP .



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123. Prove that

$$\sin^2 A \cos^2 B + \cos^2 A \sin^2 B + \cos^2 A \cos^2 B + \sin^2 A \sin^2 B = 1$$

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124. Prove that $\sqrt{\frac{1 + \cos A}{1 - \cos A}} = \operatorname{cosec} A + \cot A$

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125. Prove that $2 \sec^2 \theta - 2 \operatorname{cosec}^2 \theta - \sec^4 \theta + \operatorname{cosec}^4 \theta = \cot^4 \theta - \tan^4 \theta$

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126. Prove that

$$(\sec A - \operatorname{cosec} A)(1 + \tan A + \cot A) = \tan A \sec A + \cot A \operatorname{cosec} A$$

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

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128. If $\tan^2 \theta = 1 - k^2$, show that $\sec \theta + \tan^3 \theta \operatorname{cosec} \theta = (2 - k^2)^{\frac{3}{2}}$

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129. If $a \cos \theta + b \sin \theta = c$, show that
 $a \sin \theta - b \cos \theta = \pm \sqrt{(a)^2 + (b)^2 - (c)^2}$

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130. If $T_n = \sin^n \theta + \cos^n \theta$. prove that $\frac{T_3 - T_5}{T_1} = \frac{T_5 - T_7}{T_3}$.

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131. Find the quadrant in which $\cos \theta$ is negative and $\tan \theta$ is positive.

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132. Show that $\sec^2 \theta + \cos ec^2 \theta \geq 4$

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133. Prove that $\cos \theta + \sec \theta$ can never be equal to $\frac{3}{2}$

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134. If x be real, show that $\cos \theta$ cannot be equal to $x + \frac{1}{x}$.

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135. Show that

(i) $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$

(ii) $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$



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136. If x and y be real, show that the equation $\sec^2 \theta = \frac{4xy}{(x+y)^2}$ is

possible only when $x = y$



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137. If $\cot \alpha \cot \beta = 2$, show that $\frac{\cos(\alpha + \beta)}{\cos(\alpha - \beta)} = \frac{1}{3}$



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138. show that : $\tan 75^\circ + \cot 75^\circ = 4$



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139. Prove that $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$



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140. Show that

(i) $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$

(ii) $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$



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