MATHS

BOOKS - MODERN PUBLISHERS MATHS (HINGLISH)

TRIGONOMETRY

Illustrative Examples

1. (a) Find the radian measure corresponding to the following measures:

(i) (I) 35° (ii) $-45^\circ 30'$ (iii) (I) 150^g (iv) $70^g 50'$

(b) Find the degree measure corresponding to the following radian measures:

(i) 6

(ii) $\frac{5\pi}{3}$

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2. If G,D and θ be the number of grades, degrees and radians respectively in any angle,prove that:

(i) $\frac{D}{90} = \frac{G}{100} = \frac{2\theta}{\pi}$ (ii) $G - D = \frac{20\theta}{\pi}$

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3. Express the angular measurement of the angle of a grades and radians.

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4. A wheel rotates making 20 revolutions per second,If the radius of the wheel is 35 cm,what linear distance does a point of its rim traverse in three minutes?

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5. The perimeter of a certain sector of a circle is equal to the length of the arc of semi circle having the same radius. Express the angle of the sector

in degrees, minutes and seconds.

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

(i) 10 cm (ii) 15 cm (iii) 21 cm.

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7. Find the angle between the minute hand and the hour hand of a clock when the time is 7:20 AM.

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8. Kartarpur is 64 kilometers from Amritsar.Find to the nearest second the angle subtended at the centre of the earth by the arc joining these two towns, earth being regarded as a sphere of 6400 kilometer radius.

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9. The distance of the moon from the centre of the earth is 385,000 kilometres and moon's diameter subtends an angle of 31 at the eye of the observer.Find the diameter of the moon.

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10. Prove that:

(i) $\sec^4 A - \sec^2 A = \tan^4 A + \tan^2 A$

(ii) $\sin^8\theta - \cos^8\theta = \left(\sin^2\theta - \cos^2\theta\right)\left(1 - 2\sin^2\theta\cos^2\theta\right).$

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11. $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \{\sec\theta - \tan\theta,$ if $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$ and $-\sec\theta + \tan\theta,$ $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$

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12. Prove that:

$$\frac{\text{cosec}\theta}{\text{cosec}\theta - 1} + \frac{\text{cosec}\theta}{\text{cosec}\theta + 1} = 2\sec^2\theta$$

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13. Prove that:

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

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14. If $\frac{\cos^4\alpha}{\cos^2\beta} + \frac{s\in^4\alpha}{s\in^2\beta} = 1$ prove that

$$s\in^4\alpha + s\in^4\beta = 2s\in^2\alpha s\in^2\beta\frac{\cos^4\beta}{\cos^2\alpha} + \frac{s\in^4\beta}{s\in^2\alpha} = 1$$

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15. If

$2tan^2\alpha tan^2\beta tan^2\gamma + 2tan^2\alpha tan^2\beta + tan^2\beta tan^2\gamma + tan^2\gamma tan^2\alpha = 1,$

prove that $s \in^2 \alpha + s \in^2 \beta + s \in^2 \gamma = 1$.

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16. Given that:

$(1+\cos\alpha)(1+\cos\beta)(1+\cos\gamma) = (1-\cos\alpha)(1-\cos\beta)(1-\cos\gamma).$

Show that one of the values of each member of this equality is $s \in \alpha s \in \beta s \in \gamma.$

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17. if $m = \tan x + \sin x$ and $n = \tan x - \sin x$ then prove that $m^2 - n^2 = 4\sqrt{mn}$

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18. If $m^2 + m'^2 + 2mm'\cos\theta = 1$ and $n^2 + n'^2 + 2nn'\cos\theta = 1$, $(mn + m'n' + (mn' + m'n)\cos\theta = 0$ prove that $m^2 + n^2 = \cos ec^2\theta$

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19. If $10s \in^4 \alpha + 15\cos^4\alpha = 6$, find the value of $27\cos ec^6\alpha + 8sec^6\alpha$.

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20. In a school, there are equal number of male and female teachers.If the total salary of the male members is "sin"e of the number of male members and the total salary of the female members is cosine of the number of female members.Represent the information in trigonometric form,if the total salary of all teachers is Rs2,25,000.

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21. If $\cot\theta = -\frac{12}{5}$ and θ lies in the second quadrant,find the values of the other five functions.

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22. If θ lies in the fourth quadrant and $\cos = \frac{5}{13}$,find the value of:

(i) $\sin\theta$ and $\tan\theta$ (ii) $\frac{13\sin\theta + 5\sec\theta}{5\tan\theta + 6\text{cosec}\theta}$

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23. Prove that $\sec^2\theta + \cos^2\theta$ can never be less than 2.

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24. Show that no value of $\sec\theta$ can satisfy the equation:

$6\sec^2\theta - 5\sec\theta + 1 = 0.$

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25. Show that the equation $\sin\theta = x + \frac{1}{x}$ is not possible if x is real.

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26. The equation $\sin^2\theta = \frac{x^2 + y^2}{2xy}$, $x, y \neq 0$ is possible if

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27. Prove that:

$$= \frac{(\sin 0^\circ + \cos 30^\circ)(\sin 30^\circ + \tan 45^\circ)}{(\tan 30^0 + \cot 60^\circ)(\sec 60^\circ - \text{cosec} 90^\circ)} = \frac{9}{8}$$

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

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29. Prove that $\sin^2 30^\circ, \sin^2 45^\circ, \sin^\circ 60^\circ$ are in A.P.

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30. Find 'x' from the equation:

$\text{cosec}(90^\circ - \theta) - x\sin(90^\circ - \theta)\tan(180^\circ + \theta) = \sin(90^\circ + \theta).$

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31. If A, B, C, D are angles of a cyclic quadrilateral, then prove that

$\cos A + \cos B + \cos C + \cos D = 0$

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32. Show that the function:

$f(x) = \tan\left(3x + \frac{\pi}{4}\right)$ is periodic and find its period.

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33. Prove that:

$$\sin\frac{\pi}{5}\sin\frac{2\pi}{5}\sin\frac{3\pi}{5}\sin\frac{4\pi}{5} = \frac{5}{16}$$

$$\sin 36^\circ \sin 72^\circ \sin 108^\circ \sin 144^\circ = \frac{5}{16}.$$

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34. If $A + B + C = 180^\circ$, prove that:

$$\sin^2 A + \sin^2 B + \sin^2 C = 2(1 + \cos A \cos B \cos C).$$

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35. If $A + B + C = \pi$ then prove that

$$\cos^2\left(\frac{A}{2}\right) + \cos^2\left(\frac{B}{2}\right) - \cos^2\left(\frac{C}{2}\right) = 2\cos\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right)$$

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36. cotBcotC+cotCcotA+cotAcotB=1

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37. $\cot\left(\frac{A}{2}\right)+\cot\left(\frac{B}{2}\right)+\cot\left(\frac{C}{2}\right)=\cot\left(\frac{A}{2}\right)\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right)$

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38. Find the values of $\sin 34^\circ+\cos 64^\circ-\cos 4^\circ$.

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39. Find the angle θ, $0<\theta\leq 90^\circ$,If

(i) $\sin\theta=0.5373$ (ii) $\cos\theta=0.0087$ (iii) $\cot\theta=0.5750$ (iv) $\log\sin\theta=-0.5$.

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40. Draw the graph of $y = 3\sin 2x$

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41. Draw the graph of:

$y = f(x) = 3\sin(2x - 1).$

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42. Draw the graph of the functions on the same axes:

$y = \sin x$ and $y = \sin 2x$

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Frequently Asked Questions

1. If $A+B+C=\pi$, the value of $\sin 2A+\sin 2B+\sin 2C=k\sin A\sin B\sin C$ then value of k is

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2. If $A+B+C=\pi$, prove that

$\cos 2A+\cos 2B+\cos 2C=-1-4\cos A\cos B\cos C.$

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3. If $A+B+C=\pi$, prove that:

$\sin A+\sin B-\sin C=4\sin\frac{A}{2}\sin\frac{B}{2}\cos\frac{C}{2}.$

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4. Prove that: $\frac{\sin(x+\theta)}{\sin(x+\varphi)}=\cos(\theta-\varphi)+\cot(x+\varphi)\sin(\theta-\varphi)\cdot$

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5. If $0 + \phi = 45^\circ$,prove that: $(1 + \tan\theta)(1 + \tan\phi) = 2$.

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6. Prove that $\tan 56^\circ = \dfrac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ}$

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7. Prove that:

$\tan 3\theta \tan 2\theta \tan\theta = \tan 3\theta - \tan 2\theta - \tan\theta.$

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8. Prove that: $\dfrac{\cos^2 33^0 - \cos^2 57^0}{\frac{\sin^2(21^0)}{2} - \frac{\sin^2(69^0)}{2}} = -\sqrt{2}$

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9. Prove that $\tan 70^\circ = \tan 20^\circ + 2\tan 50^\circ$

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10. Prove that

$\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B = \cos^2 B - \cos^2 A$

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11. If $2\tan\beta + \cot\beta = \tan\alpha$, prove that $\cot\beta = 2\tan(\alpha - \beta)$.

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12. If

$\tan n = \frac{1}{\sqrt{x(x^2+x+1)}}$. $\tan\beta = \frac{\sqrt{x}}{\sqrt{x^2+x+1}}$ and $\tan y = \left(x^{-3} + x\right.$

then for $x > 0$

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13. If $\tan(\alpha+\theta)=n\tan(\alpha-\theta)$,ahow that:

$(n+1)\sin 2\theta=(n-1)\sin 2\alpha$

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14. If $\tan(\pi\cos\theta)=\cot(\pi\sin\theta)$, then $\cos\left(\theta-\frac{\pi}{4}\right)=\pm\frac{1}{2\sqrt{2}}$.

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15. If $\sin\theta=\frac{3}{5},\cos\phi=-\frac{12}{13}$, where θ and ϕ both lie in second quadrant, find the value of $\sin(\theta+\phi)$.

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16. If A and B are positive acute angles and $\cos A=\frac{1}{7},\cos B=\frac{13}{14}$, then show that $A-B=60^0$.

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17. Find the maximum and minimum values of $7\cos\theta + 24\sin\theta$

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18. Prove that $5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right) + 3$ lies between $-4 and 10.$

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19. Prove that:

$$\cos 2\theta \cos\frac{\theta}{2} - \cos 3\theta \cos\left(\frac{9\theta}{2}\right) = \sin 5\theta \sin\left(\frac{5\theta}{2}\right).$$

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20. Prove that $\frac{2\cos 2A + 1}{2\cos 2A - 1} = \tan\left(60^0 + A\right)\tan\left(60^0 - A\right).$

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21. $\sin\ (150^\circ + x) + \ \sin\ \ (150^\circ - x)\ = \cos\ \mathrm{x}$

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22. If the angles A,B,C are in A.P., prove that $\cot B = \dfrac{\sin A - \sin C}{\cos C - \cos A}$

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23. $(\cos\alpha + \cos\beta)^2 + (\sin\alpha - \sin\beta)^2 = 4\dfrac{\cos^2(\alpha+\beta)}{2}$

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24. If $\sin\theta + \sin\phi = \sqrt{3}(\cos\phi - \cos\theta)$,prove that:

$\sin 3\theta + \sin 3\phi = 0.$

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25. prove that $\left(\frac{\cos A+\cos B}{\sin A-\sin B}\right)^n+\left(\frac{\sin A+\sin B}{\cos A-\cos B}\right)^n=2\cot^n\left(\frac{A-B}{2}\right)$, n is even

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26. If $\sin x+\sin y=a$ and $\cos x+\cos y=b$, find the values of:

(i) $\tan\frac{x+y}{2}$ (ii) $\tan\frac{x-y}{2}$.

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27. Prove that $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = .\frac{\sqrt{3}}{16}$

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

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

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

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31. Prove that

$\cos\alpha + \cos\beta + \cos\gamma + \cos(\alpha + \beta + \gamma) = 4\cos\left(\frac{\alpha + \beta}{2}\right)\cos\left(\frac{\beta + \gamma}{2}\right)\cos($

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32. If $s\int h\eta = n\sin(\theta + 2\alpha)$, prove that $\tan(\theta + \alpha) = \frac{1+n}{1-n}\tan\alpha$.

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33. If $\alpha + \beta + 90^0$, find the maximum and minimum values of $s \in \alpha s \in \beta$.

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34. Prove that $\frac{\tan 5\theta + \tan 3\theta}{\tan 5\theta - \tan 3\theta} = 4\cos 2\theta \cos 4\theta$

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35. Find $\sin 2\theta$ when $\sin\theta + \cos\theta = 1$.

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36. Prove that:

$\tan A + \cot A = 2\text{cosec}2A$ and deduce that $\tan 75^\circ + \cot 75^\circ = 4$.

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37. Prove that

(i) $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$

(ii) $\frac{\cos A + \sin A}{\cos A - \sin A} - \frac{\cos A - \sin A}{\cos A + \sin A} = 2\tan 2A$

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38. If $\tan(\alpha - \beta) = (\sin 2\beta)(3 - \cos 2\beta)$, then

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39. Prove that: $\cos A \cos 2A \cos 2^2 A \cos 2^3 A. \ldots\ldots \cos 2^{n-1} A = \frac{\sin 2^n A}{2^n \sin A}$.

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40. If $\sin A = \frac{1}{2}\left(x + \frac{1}{x}\right)$, prove that:

$\sin 3A + \frac{1}{2}\left(x^3 + \frac{1}{x^3}\right) = 0.$

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41. Prove that:

$$\frac{\cos^2 \pi}{8} + \frac{\cos^2(3\pi)}{8} + \frac{\cos^2(5\pi)}{8} + \frac{\cos^2(7\pi)}{8} = 2$$

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42. Prove that:

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

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43. $\sqrt{2} + \sqrt{3} + \sqrt{4} + \sqrt{6}$ is equal to

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44. Find the value of $\tan 22^\circ 30'$.

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45. Prove that: $\tan 4x = \dfrac{4\tan x\left(1-\tan^2 x\right)}{1-6\tan^2 x+\tan^4 x}$

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46. If $\sin\theta+\sin\phi=a$ and $\cos\theta+\cos\phi=b$ find:

(i) $\sin(\theta+\phi)$

(ii) $\cos(\theta+\phi)$

(iii) $\cos(\theta-\phi)$

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47. If $\tan x=\dfrac{3}{4}, \pi<x<\dfrac{3\pi}{2}$, find the values of $\sin\dfrac{x}{2}, \cos\dfrac{x}{2}$ and $\tan\dfrac{x}{2}$

.

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48. If $\alpha and \beta$ are distict roots of $a\cos\theta + bs\int h\eta = c,$ prove that $\sin(\alpha+\beta) = \dfrac{2ab}{a^2+b^2}$

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Ncert Examples

1. If $A = \cos^2\theta + s\in^4\theta,$ prove that $\dfrac{3}{4} \leq 1$ for all values of $\theta\cdot$

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2. If $2\dfrac{\sin\alpha}{1+\cos\alpha+\sin\alpha} = y$ then value of $\dfrac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}$ is

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3. If $\tan x = \dfrac{b}{a}$, then find the value of $\sqrt{\dfrac{a+b}{a-b}} + \sqrt{\dfrac{a-b}{a+b}}.$

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4. Solve $2\tan^2 x + \sec^2 x = 2f \text{ or } 0 < x^2\pi$

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5. Show that

$2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos 2(\alpha+\beta) = \cos 2\alpha.$

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6. If $x \cdot \cos\theta = y \cdot \cos\left(\theta + \frac{2\pi}{3}\right) = 2.\cos\left(\theta + \frac{4\pi}{3}\right)$,then evaluate $xy + yz + zx.$

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Exercise 3 A Short Answer Type Question

1. Find the radian measure corresponding to the (a) following degree measure: $40^\circ 20$

following grade measure : (i) 50^g (ii)150^(g)

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2. Find the degree measure corresponding to the following measaure (Use $\pi = \frac{22}{7}$),

(i) $\frac{11}{16}$ (ii) $\frac{7\pi}{6}$

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3. The angle of a traingle are $3x^\circ \left(\frac{4x}{3}\right)^8$ and $\frac{2\pi x}{75}$ radian. Find all the angle in degrees.

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4. Express in radian the fourth angle of a quadrilateral which has three angle $46^\circ 30' 10''$, $75^\circ 44' 45''$ and $123^\circ 9' 35''$ respectively, taking $\pi = \frac{355}{113}$

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5. The sum of two angles is 80 grades and their differnce is 18°. Find the angles.

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6. The angle of a triangle are in the ration 1: 2: 3. Find the angle in radians.

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7. The verticle angle of an isosceles triangle is $\frac{2}{3}$ of each od its base angle. Find it in radians.

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8. In a right- angled traingle, the differnce between two acute angles is $\frac{\pi}{9}$ in circular measure. Express the angle in degrees.

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9. The wheel of a carriage is 91 cm in diameter and make 5 revolution per second. How fast is the carrige running ?

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10. Find the length of the arc of a circle of radius 5 cm subending an angle mesure 45°.

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11. Find the radius of a circle in which a central angle of 60° intercepts an arc of 37.4 cm

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12. If the arcs of the same length in two circle subtend angle(i)65° and 110°

(ii)60° and 75° at the center,

Find the ration of their radii

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13. (a) Show that the minute hand of a watch gains 5° 30' on the hour han d in a minute .

(b) Find the angle between the hour-hand and minute-hand of a clock at half -past three.

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Exercise 3 A Long Answer Type Question Ii

1. A horse is tied to a post by a rope. If the horse moves along a circular path always keeping the rope tight, and describes 88 metres when it traces 72° at the centre, find the length of the rope.

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Exercise 3 A Long Answer Type Question I

1. If G,D and θ be the number of grade , degree and radius in any angle prove that: (i) $\frac{D}{9} = \frac{G}{10} = \frac{20\theta}{\pi}$

(ii) G=$D + \frac{D}{9}$

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2. Find the circular mesure of an internal angle of a regular: (i) pentagon (ii) hexagon (iii) polygo of 40 sides.

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3. (i) The angle of a triangle are in A.P and the greatest angle of the triangle is double the least angle , find the greatest angle in radians.(ii) The angle of a traingle are in A.P and the number of degree in the least to the number of radian in the greatest is as 60^{π} find the angles in degree and radians.

(iii) The angles of a traingle are in A.P and one of them is 80°. Find all the angle in sexagesimal system.

(iv)The angle of a traingle are in A.P and the greatest is 84°. Find all the three angle in radians.

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4. The angles of a quadrilateral are in AP, and the greatest angle is doublethe least. Express the least angle in radians.

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5. 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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6. A railway emgine is travellings alongs a circular railway track of radius 1500 metres with aa speed of 66 km/hour. Find the angle truned by the engine in 10 seconds.

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7. At what distance does a man, whose hieght is 2 metres, subtend an angle of 10 ?

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8. Assuming that a person of normal sight can read print at such a distance that the letters subtend an angle of 5' at his eye. Find what is the height of the letters that he can read at a distance of 756 meteres ?

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9. Assuming that the earth radius is 6400 km and that it subtends an angle of 57 at the center of the moon from the earth. find the distance between earth and moon center.

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Exercise 3 B Short Answer Type Question

1. (i) $\sin\theta \cot\theta + \sin\theta \cos ec\theta = 1 + \cos\theta$

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

(iii)$\sin\theta(1 + \tan\theta) + \cos\theta(1 + \cot\theta) = \sec\theta + \cos ec\theta$

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

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

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Exercise 3 B Long Answer Type Question I

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

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

(ii) $(\sin\theta + \sec\theta)^2 + (\cos\theta + \cos ec\theta)^2 = (1 + \sec\theta \cos ec\theta)^2$

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

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

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4. $(1 + \cot A + \tan A)(\sin A - \cos A) = \dfrac{\sec A}{\cos ec^2 A} - \dfrac{\cos ecA}{\sec^2 A}$

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5. (a) Eliminat θ between the equation:

(i) $x = h + a\cos\theta, y = k + b\sin\theta$

(ii) $x = a\cos\theta + b\sin\theta, y = a\sin\theta - b\cos\theta$

(iii) $x = a\sec\theta, y = b\tan\theta$

(b) Eliminate A between the equation:

(i)$\sec A + \tan A = m, \sec A - \tan A = n$

(ii)$a \cos ecA + b \cot A = x^2, b \cos ecA + a \cot A = y^2$

(iii)$p \sec A + q \tan A = x, p \tan A + q \sec A = y.$

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Exercise 3 B Long Answer Type Question Ii

1. If $\tan\alpha = n \tan\beta$ and $\sin\alpha = m \sin\beta$ prove that :

$$\cos^2 \alpha = \frac{m^2 - 1}{n^2 - 1}$$

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Exercise 3 C Short Answer Type Question

1. Which of trigonometric ratios are positive for the angles,

(i) 210° (ii) -405°

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2. If $\sin\theta = -\frac{1}{\sqrt{2}}$ and $\tan\theta = 1$ then θ lies in which quadrant

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3. Prove that : (i) $\sec\theta + \cos\theta$ can never be equal to $\frac{3}{2}$ (ii) $\cos ec^2\theta + \sin^2\theta$ can never be less than 2.

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4. (i) Is the equation $2\cos^2\theta + \cos\theta$ -6 =0 possible ?

(ii) Is the equation $2\sin^2\theta - \cos\theta + 4 = 0$ can never be less than 2.

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5. Find the value of the remainig(all) function in each of the following :

(i) $\sin\theta\theta = \frac{3}{5}, \theta$ in quadrient II

(ii) $\cos\theta = -\frac{3}{5}, \theta$ in quadrient III

(iii) $\tan\theta = \frac{4}{3}, \theta$ in quadrant III

(iv) $\cot\theta = -\frac{5}{12}, \theta$ in quadrant IV

(vi) $\sin\theta \sec\theta = -1, \theta$ in quadant II.

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6. If $\cos A = \frac{21}{29}$ and A lies in the fourth quadrant , find $\sin A$ and $\tan A$.

If $\sin A = \frac{21}{29}$ and A lies in the second quadrant prove that $\sec A + \tan A = \frac{-5}{2}$

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7. (i) If sin the $\sec\theta \sec\theta$ =-1 and theta lies in the second quadrant find $\sin\theta$ and $\sec\theta$

(ii) If $\cos\theta \cos ec\theta$ =- 1 and theta lies in the in the fourth quadrient find $\cos\theta$ and $\cos ec\theta$

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Exercise 3 C Long Answer Type Question I

1. Show that the equation $\sec^2\theta = \frac{4xy}{(x+y)^2}$ is only possible when x=y

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2. Find the value of the following:

(i)$\sin^2 30^\circ + \sin^2 45^\circ + \sin^2 60^\circ + \sin^2 90^\circ$

(ii)$2\sin^2 30^\circ - 3\cos^2 45^\circ + \cos^2 60^\circ$

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3. $\cot^2 60^0 + \sin^2 45^0 + \sin^2 30^0 + \cos^2 90^0 = \frac{13}{12}$

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4. Prove that:

(i)$\cos^2 30^\circ, \cos^2 45^\circ, \cos^2 60^\circ$ are in A.P.

(ii)$\cot^2 30^\circ, \cot^2 45^\circ, \cot^2 60^\circ$ are in G.P.

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5. If A=45°, verify that:

(i) sin 2A=2 sin A cos A

(ii) $\cos 2A = \cos^2 A - \sin^2 A.$

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6. If A=30° and $B = 60^\circ$ verify that:

sin (A+B)= sin A cos B +cosA sin B.

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Exercise 3 C Long Answer Type Question Ii

1. (a) If $\sin\theta = \frac{21}{29}$, prove that $\sec\theta + \tan\theta = 2\frac{1}{2}$ If lies betwwen 0 and $\pi/2$

(b) What will be the value of the expression when θ lies:

(i) between $\frac{\pi}{2}$ and π (ii) between π and $\frac{3\pi}{2}$?

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2. If A, B, C are positive acute angles and $\sin(B+C-A) = \cos(C+A-B) = \tan(A+B-C) = 1$ then A, B, C are

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Exercise 3 D Short Answer Type Question

1. Find the value of:

(i) $\cos 210^\circ$

(ii)$\sin 225^\circ$

(iii)$\tan 330^\circ$

(iv)$\cot(-315^\circ)$

(v) $\sec\frac{11\pi}{4}$

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2. Prove that: $\sin 420^\circ \cos 390^\circ + \cos(-660^\circ)\sin(-390^\circ) = \frac{1}{2}.$

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3. Simplify the following: (i)

$\sin(90^\circ + \theta)\tan(270^\circ + \theta)\cot(90^\circ + \theta)\cos ec(270^\circ + \theta)$

(ii) $\frac{\sin(-\theta)\tan(180^\circ + \theta)\tan(90^\circ + \theta)}{\cot(90^\circ - \theta)\cos(360^\circ - \theta)\sin(180^\circ - \theta)}$

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4. Prove that: $2\frac{\sin\pi}{6}sec\frac{\pi}{3}-4\frac{\sin(5\pi)}{6}\frac{\cos\pi}{4}=1$

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5. 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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6. Find the value of x:

i) $x\cot(90^\circ+\theta)+\tan(90^\circ+\theta)\sin\theta+\text{cosec}(90^\circ+\theta)=0$

ii) $\text{cosec}(90^\circ+\theta)+x\cos\theta\cot(90^\circ+\theta)=\sin(90^\circ+\theta)$

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7. If any quadrilateral ABCD, prove that $\sin(A+B)+\sin(C+D)=0$

$\cos(A+B)=\cos(C+D)$

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8. Find all the value of θ satisfying $0 < \theta < \pi$ and $\tan^2\theta + \cot^2\theta = 2$

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9. Find the period of the following fuctions:

(i) sin2x (ii)cos3x (iii) tan2x

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Exercise 3 D Long Answer Type Question I

1. If A, B, C, D be the angles of a cyclic quadrilateral, taken in order, prove that:

$$\cos(180^0 - A) + \cos(180^0 + B) + \cos(180^0 + C) - \sin(90^0 + D) = 0$$

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2. (i) If $x = \frac{11\pi}{4}$, prove that:

$\sin^2 x - \cos^2 x + 2\tan x - \sec^2 x = -4.$

(ii) If $8\theta = \pi$, prove that $\cos\theta + \cos 7\theta = 0$

(iii)If B+C=60°, show that: $\sin(120^\circ - B) = \sin(120^\circ - C).$

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3. Prove (i)$\sin^2\frac{\pi}{8} + \sin^2\frac{3\pi}{8} + \sin^2\frac{5\pi}{8} + \sin^2\frac{7\pi}{8} = 2$

(ii) $\left[1 + \cot\alpha - \sec\left(\frac{\pi}{2} + \alpha\right)\right]$

$\left[1 + \cot\alpha + \sec\left(\frac{\pi}{2} + \alpha\right)\right] = 2\cot\alpha$

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4. In any triangle ABC,prove that:

(i) $\sin(A + B) = \sin C$

(ii)$\cos\left(\frac{A+B}{2}\right) = \sin\frac{C}{2}$

(iii)$\tan\left(\frac{B+C-A}{2}\right) = \cot A.$

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5. If $\cot A = \tan(n-1)A$,show that one value of A is $\frac{\pi}{2n}$

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6. (a) Show that the function f(x)=cos 2x is periodic and find its period.

Show that the function f(x) =$\cos\left(\frac{x}{2}+\frac{\pi}{4}\right)$ is periodic and find its period.

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Exercise 3 E Short Answer Type Question

1. Evalute: $\sin 15^\circ$

$\cos 15^\circ$, $\tan 15^\circ$

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2. Prove that :

(i)$\sin 105^\circ + \cos 105^\circ = \frac{1}{\sqrt{2}}$

(ii) $\cos 105^\circ + \cos 15^\circ = \sin 75^\circ - \sin 15^\circ$

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3. Find $\tan 15^\circ$ and hence show that $\tan 15^\circ + \cot 15^\circ = 4$.

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4. Write down the value of: $\cos 68^\circ \cos 8^\circ + \sin 68^\circ \sin 8^\circ$

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5. $\sin(40+\theta).\cos(10+\theta) - \cos(40+\theta)\sin(10+\theta) = \frac{1}{2}$

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6. Prove that:

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

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7. Evaluate: $\tan\left(\frac{13\pi}{12}\right)$

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Exercise 3 E Long Answer Type Question I

1. Prove that: $\frac{\sin(B-C)}{\cos B \cos C} + \frac{\sin(C-A)}{\cos C \cos A} + \frac{\sin(A-B)}{\cos A \cos B} = 0$

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2. If $\cos(\alpha-\beta) + \cos(\beta-\gamma) + \cos(\gamma-\alpha) = -\frac{3}{2}$, prove that $\cos\alpha + \cos\beta + \cos\gamma = s \in \alpha + s \in \beta + s \in \gamma = 0$

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3. If $\theta + \phi = 45^\circ$,prove that $(\cot\theta - 1)(\cot\phi - 1) = 2$

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4. If $(1 + \tan\theta)(1 + \tan\phi) = 2$ then $\theta + \phi =$

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5. Prove that:(i)$\tan 69^\circ + \tan 66^\circ + 1 = \tan 69^\circ \tan 66^\circ$

(ii)$\dfrac{\cos 13^\circ + \sin 13^\circ}{\cos 13^\circ - \sin 13^\circ} = \tan 58^\circ$

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6. Prove that :

(i)$\tan 3A - \tan 2A - \tan A = \tan 3A \tan 2A \tan A$

(ii) $\tan 7A - \tan 5A - \tan 2A = \tan 7A \tan 5A \tan 2A$

(iii) $\tan 13A - \tan 9A - \tan 4A = \tan 13A \tan 9A \tan 4A.$

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7. If $ys \in \varphi = xs \in (\gamma + \delta) = \cos(\alpha - \beta)\sin(\gamma - \delta)$, prove that $\cot \alpha \cot \beta \cot \gamma = \cot \delta$

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

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9. Prove that: (i) $\tan 50^\circ = \tan 40^\circ + 2\tan 10^\circ$

(ii) $2\tan 70^\circ = \tan 80^\circ - \tan 10^\circ$

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10. If cos A $= \frac{5}{13}$, and sin $B = \frac{4}{5}$, find sin (A+B), where A,B,(A+B) are positive acute angles.

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11. If $\tan x = \frac{a}{a+1}$ and $\tan y = \frac{1}{2a+1}$ then show that one of the values of $x + y = \frac{\pi}{4}; a \in R, a \neq -1, a \neq -\frac{1}{2}$

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12. In any quadrilateral ABCD, show that:

$\cos A \cos B - \cos C \cos D = \sin A \sin B - \sin C \sin D.$

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13. Find a and b such that $a < 3\cos\theta + 5\sin\left(\theta - \frac{\pi}{6}\right) < b$, holds good for all values of θ.

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Exercise 3 E Long Answer Type Question Ii

1. If $\sin\alpha = \frac{15}{17}$ and $\cos\beta = \frac{12}{13}$ find the values of:

(i)$\sin(\alpha+\beta)$

(ii)$\cos(\alpha-\beta)$

(iii)$\tan(\alpha+\beta)$

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2. It $\cos(\alpha+\beta) = \frac{4}{5}, \sin(\alpha-\beta) = \frac{5}{13} and \alpha, \beta$ lie between $0 and \frac{\pi}{4}$, prove that $\tan 2\alpha = \frac{56}{33}$

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3. Find the value of $\tan(\alpha+\beta)$given that: $\cot\alpha = \frac{1}{2}, \alpha i\left(\pi, \frac{3\pi}{2}\right)$ and $\sec\beta = -\frac{5}{3}, \beta \in \left(\frac{\pi}{2}, \pi\right)$ and state the quadrant in which $(\alpha+\beta)$

terminates

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4. If $\theta + \phi = \alpha$ and tan θ =k tan ϕ, prove that: sin $\alpha = \frac{k+1}{k-1}\sin(\theta - \phi)$

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Exercise 3 F Short Answer Type Question

1. Prove the following:

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

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

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2. Prove the following:

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

(ii) $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x.$

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3. Prove that :$\sin A s \in (60^0 - A) s \in (60^0 + A) = \frac{1}{4}\sin 3A$

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4. $\sin 10^\circ + \sin 20^\circ + \sin 40^\circ + \sin 50^\circ = \sin 70^\circ + \sin 80^\circ.$

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5. $\sin 51^\circ + \cos 81^\circ = \cos 21^\circ.$

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Exercise 3 F Long Answer Type Question I

1. Prove the following:

(i) $\sin 10^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{8}$

(ii) $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$

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2. Prove the following:

(i) $\tan 20^\circ \tan 40^\circ \tan 60^\circ \tan 80^\circ = 3$

(ii) $\tan 20^\circ \tan 40^\circ \tan 80^\circ = \tan 60^\circ$.

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3. Prove the following:

$$\sin\alpha + \sin\beta + \sin\gamma - \sin(\alpha + \beta + \gamma) = 4\sin\frac{\alpha + \beta}{2}\sin\frac{\beta + \gamma}{2}\sin\frac{\gamma + \alpha}{2}$$

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4. $\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta = 4\cos\theta\cos 2\theta\cos 6\theta.$

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5. Prove the following:

$\sin\theta + \sin 3\theta + \sin 5\theta + \sin 7\theta = 4\cos\theta\cos 2\theta\sin 4\theta.$

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6. Prove the following:

(i) $\sin\alpha + \sin\left(\alpha + \frac{2\pi}{3}\right) + \sin\left(\alpha + \frac{4\pi}{3}\right) = 0$

(ii) $\cos A + \cos(120^\circ - A) + \cos(120^\circ + A) = 0.$

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7. Prove the following:

$$\frac{\sin 11A\sin A + \sin 7A\sin 3A}{\cos 11A\sin A + \cos 7A\sin 3A} = \tan 8A.$$

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8. Prove the following:

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

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9. Prove that:

$$\cot 4x \left(\sin 5x + \sin 3x\right) = \cot x \left(\sin 5x\right.$$

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10. If $A + B = 90^\circ$, show that the maximum value of: $\cos A \cos B$ is $\frac{1}{2}$.

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Exercise 3 F Long Answer Type Question Ii

1. If $\frac{\sin(\theta+\alpha)}{\cos(\theta-\alpha)}=\frac{1-m}{1+m}$, prove that $\tan\left(\frac{\pi}{4}-\theta\right)\tan\left(\frac{\pi}{4}-\alpha\right)=m$

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2. If $\frac{\cos\ (A+B)}{\cos\ (A-B)}=\frac{\sin\ (C+D)}{\sin\ (C-D)}$, prove that tan A tan B tan C + tan D=0

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Exercise 3 G Short Answer Type Question

1. Prove that:

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

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2. Prove that:

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

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

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4. Prove that:

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

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

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Exercise 3 G Long Answer Type Question I

1. Prove that:

$\sin 4A = 4\sin A\cos^3 A - 4\cos A\sin^3 A.$

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2. If $\cos\theta = \frac{1}{2}\left(\alpha + \frac{1}{\alpha}\right)$, prove that:

(i) $2\cos 2\theta = \alpha^2 + \frac{1}{\alpha^2}$ (ii) $2\cos 4\theta = \alpha^4 + \frac{1}{\alpha^4}$.

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3. If $x + \frac{1}{x} = 2\cos\theta$, then find the valueof $x^3 + \frac{1}{x^3}$.

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4. Prove that:

(i) $\cos A\cos(60^\circ - A)\cos(60^\circ + A) = \frac{1}{4}\cos 3A$

(ii) $\tan A + \tan(60^\circ + A) - \tan(60^\circ - A) = 3\tan 3A.$

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5. $\cos^2\alpha + \cos^2(\alpha + 120^0) + \cos^2(\alpha - 120^0) = \frac{3}{2}$

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6. If $\tan^2\theta = 1 + 2\tan^2\phi$ then show that $\cos 2\theta + \sin^2\phi = 0$

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7. Find $\sin\frac{x}{2}$, $\cos\frac{x}{2}$ and $tan\frac{x}{2}$ of the following : $s \in \quad x \quad = \frac{1}{4}$, x in quadrant II.

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8. (i) If $\tan\frac{x}{2} = \frac{m}{n}$,prove that m sin x+n cos x=n.

(ii) If $\tan\theta = \frac{a}{b}$, prove that $a\sin 2\theta + b\cos 2\theta = b$.

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

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10. Evaluate:

(i) $\sin\frac{3\pi}{8}$ (ii) $\sin\frac{5\pi}{24}$ (iii) $\tan\frac{\pi}{8}.$

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11. Prove that: $s \in^4 \frac{\pi}{8} + s \in^4 \frac{3\pi}{8} + s \in^4 \frac{5\pi}{8} + s \in^4 \frac{7\pi}{8} = \frac{3}{2}$

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12. Prove 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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13. Find $\sin 7\frac{1^\circ}{2}$, $\cos 7\frac{1^\circ}{2}$ and $\tan 11\frac{1^\circ}{4}$.

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14. Prove that: $\tan 142\frac{1^\circ}{2} = 2 + \sqrt{2} - \sqrt{3} - \sqrt{6}$.

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

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16. Prove that:

(i) $\sin 3x + \sin 2x - \sin x$

$=4\sin x\cos\left(\frac{x}{2}\right)\cos\left(\frac{3x}{2}\right)$

(ii) $(\sin 3x+\sin x)\sin x+(\cos 3x-\cos x)\cos x=0.$

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17. Prove 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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18. If $\cos\theta=\frac{\cos\phi-e}{1-e\cos\phi}$,show that:

$\tan\frac{\theta}{2}=\pm\sqrt{\frac{1+e}{1-e}}\tan\frac{\phi}{2}.$

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Exercise 3 H Short Answer Type Question

1. Prove that: $s\in\frac{\pi}{10}+s\in\frac{13\pi}{10}=-\frac{1}{2}$

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2. Prove that:

(i)$\sin^2 24^\circ - \sin^2 6^\circ = \frac{1}{8}(\sqrt{5}-1)$

(ii)$\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ = 4.$

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3. The roots of the equation $4x^2 - 2\sqrt{5}x + 1 = 0$ are .

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Exercise 3 H Long Answer Type Question I

1. $\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{16\pi}{15} = \frac{1}{16}$

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Exercise 3 H Long Answer Type Question Ii

1. Prove that:

$$\left(1+\frac{\cos\pi}{8}\right)\left(1+\frac{\cos(3\pi)}{8}\right)\left(1+\frac{\cos(5\pi)}{8}\right)\left(1+\frac{\cos(7\pi)}{8}\right)=\frac{1}{8}$$

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Exercise 3 I Long Answer Type Question I

1. Theorem 3 :$\cos A+\cos B+\cos C=1+4\frac{\sin A}{2}\frac{\sin B}{2}\frac{\sin C}{2}$

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2. if $A+B+C=\pi$ then $\frac{\cos A}{\sin B\sin C}+\frac{\cos B}{\sin C\sin A}+\frac{\cos C}{\sin A\sin B}=$

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3. If $A+B+C=\frac{\pi}{2}$,prove that:

$\sin 2A+\sin 2B+\sin 2C=4\cos A\cos B\cos C.$

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Exercise 3 I Long Answer Type Question Ii

1. If A+ B+C =π, then prove that

$\sin(B+2C)+\sin(C+2A)+\sin(A+2B)=$

$4\sin\left(\frac{B-C}{2}\right)\sin\left(\frac{C-A}{2}\right)\sin\left(\frac{A-B}{2}\right)$

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Exercise 3 J Long Answer Type Question I

1. If A+B+C=180° , prove that:

(i) $\sin^2+\sin^2 B-\sin^2 C=2\sin A\sin B\cos C$

(ii)$\sin^2 A - \sin^2 B + \sin^2 C = 2 \sin A \cos B \sin C.$

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2. In a right angled triangle ABC ,if $\angle A = 90^\circ$, $\sin B = \frac{4}{5}$, then $\cos C$ =

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3. If A+B+C=$\frac{\pi}{2}$,prove that:

(i)$\cos^2 A + \cos^2 B + \cos^2 C = 2 + 2 \sin A \sin B \sin C$

(ii)$\sin^2 + \sin^2 B + \sin^2 C = 1 - 2 \sin A \sin B \sin C.$

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Exercise 3 J Long Answer Type Question Ii

1. If A+B+C=360° ,prove that:

$1 - \cos^2 A - \cos^2 B - \cos^2 C + 2 \cos A \cos B \cos C = 0$

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Exercise 3 K Short Answer Type Question I

1. If A + B + C = 180°, then prove that tan A + tan B + tan C = tan A tan B tan C.

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2. $\tan\left(\frac{A}{2}\right)\tan\left(\frac{B}{2}\right)+\tan\left(\frac{B}{2}\right)\tan\left(\frac{C}{2}\right)+\tan\left(\frac{C}{2}\right)\tan\left(\frac{A}{2}\right)=1$

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Exercise 3 K Long Answer Type Question I

1. If $A+B+C=180^\circ$, prove that:

$\tan 2A+\tan 2B+\tan 2C=\tan 2A\tan 2B\tan 2C$

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2. If A+B+C=$\frac{\pi}{2}$ prove that:m

(i) $\tan A \tan B + \tan B \tan C + \tan C \tan A = 1$

(ii) $\cot A + \cot B + \cot C = \cot A \cot B \cot C.$

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Exercise 3 L Short Answer Type Question

1. Find the value of the following:

(a) (i) sin 48° (ii) sin23° 26'

(b)(i)cos20° 10' (ii) cos16° 11'

(c) (i) tan54° 30' (ii) tan42° 6'

(d) (i) cot 131° 20' (ii) cot46° 26'.

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Exercise 3 L Long Answer Type Question I

1. Find θ, $0 < \theta < 90^\circ$, if (i) sinθ=0.7071 (ii)cos θ= 0.9604

(iii) tanθ=34.37 (iv) cotθ= 3.018

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2. Find the angle whose $\sin e$ is 0.6479.

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Exercise 3 M Long Answer Type Question I

1. Sketch the graphs of the following function:

(i) $y = 2\sin x$

(ii) $y = 3\sin(x + 1)$

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

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2. Sketch the graphs of the following function:

(i) $y = \cos\frac{x}{2}$ (ii) y=3 cos 2x

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3. Sketch the graphs of the following function:

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

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4. Sketch the graphs of the following function:

(i) $y - \tan 3x (ii) y = 2\tan x$

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5. Sketch the curve $y = \sin^2 x$.

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6. Sketch the graphs of the following function:

$y = \cos^2 x$

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Exercise 3 M Long Answer Type Question Ii

1. Draw the graph of $y = \sin x$ and $y = \cos x, 0 \leq x \leq 2\pi$

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2. Draw the graph of the functions on the same axes:

$y = \sin x$ and $y, \cos x, 0 \leq x \leq 2\pi$

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3. Sketch the graphs of the following pairs of equations on the same axes:

$y = \tan x, y = \tan(x - 45^\circ)$

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4. Sketch the graphs of the following pairs of equations on the same axes:y=cos 2x, y=cos$(2x - \pi)$

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5. $2 \sin 3x = \sqrt{3}$

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6. Draw the graph of cos x from 0 to π and hence find cos 45° from the graph.

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7. Draw the graph of tan x as x increase from 0 to 2 π and use it to find a solution of the equation tan x =1, where $0 < x < \pi$

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Exercise 3 N Short Answer Type Question

1. Find the principle solution of the following, (i)$\sin x = \frac{\sqrt{3}}{2}$

(ii)$\tan x = -\frac{1}{\sqrt{3}}$

(iii)$\cot x = -\sqrt{3}$

(iv)cosec x=-2

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2. Solve the following trigonometric equations,(i)$\sin\theta = -1$

(ii)$\cos\theta = \frac{1}{2}$ (iii)$\tan\theta = \sqrt{3}$

(iv)$\sec x = 2$ (v) cotx=-$\sqrt{3}$

(vi)cosec x=-2

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3. Solve the following trigonometric equations,(i)$\sin\theta\cos\theta = \frac{\sqrt{3}}{4}$ (ii) $\sin x = \tan x$

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Exercise 3 N Long Answer Type Question I

1. Solve the following trigonometric equations,(i)$\sin m\theta + \sin\theta = 0$ (ii) $\cos m\theta - \cos n\theta = 0$

(iii)$\sin 2\theta + \cos\theta = 0$

(iv)$\sin 3\theta + \cos 2\theta = 0$

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2. Solve the following trigonometric equations,

(ii)$\cos 3\theta + \cos\theta - 2\cos\theta = 0$

(iii)$\cos 3\theta + 8\cos^3\theta = 0$

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3. Solve the following trigonometric equations,

(i) $4\cos^2 x + 6\sin^2 x = 5$

(ii)$7\sin^2 x + 3\cos^2 x = 4.$

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4. Solve the following trigonometric equations,

(i)$2\cos^2\theta - 5\sin\theta + 1 = 0$

(ii)$2\sin^2\theta - 5\sin\theta + 1 = 0$

(ii)$2\sin^2\theta + \sqrt{3}\cos\theta + 1 = 0$

(iii)$2\cos^2\theta = 3\sin\theta.$

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5. Solve the following trigonometric equations,

(i)$\cos ec^2\theta = 2\cot\theta$ (ii)$\tan\theta + \cot\theta = 2$

(iii)$\tan^2\theta + \cot^2\theta = 2$

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6. Solve the following trigonometric equations,

(i)$\cot^2 x + \frac{3}{\sin x} + 3 = 0$

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

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

(iv)$\tan\left(\frac{\pi}{4}+\theta\right) + \tan\left(\frac{\pi}{4}-\theta\right) = 4$

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7. Solve the following trigonometric equations, (i)

$\sin x\tan x - 1 = \tan x - \sin x$

(ii) $4\cos x - 3\sec x = \tan x$

(iii) $\cot x + \tan x = 2\cos ecx.$

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8. Solve the following trigonometric equations,

(i)$\sec^2 2x = 1 - \tan 2x$

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9. Solve the following trigonometric equations,

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

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10. Find the most general value of θ which satisfies both the equations,

(i)$\sin\theta = -\frac{1}{2}, \cos\theta = -\frac{\sqrt{3}}{2}$

(ii)$\cos ec\theta = 2, \cot\theta = -\sqrt{3}$

(iii)$\cot\theta = -\frac{1}{\sqrt{3}}, \cos ec\theta = -\frac{2}{\sqrt{3}}$

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Exercise 3 O Long Answer Type Question I

1. In any triangle ABC, prove that (i)$\frac{a-b}{c} = \frac{\sin\frac{A-B}{2}}{\cos\frac{C}{2}}$ (ii) $\frac{b-c}{a} = \frac{\sin\frac{B-C}{2}}{\cos\frac{A}{2}}$

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2. In any triangle ABC, prove that: $a\cos\left(\frac{B+C}{2}\right) = (b+c)\frac{\sin A}{2}$

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3. In any triangle ABC , prove that:

$a\cos A + b\cos B + osC = 2as \in Bs \in C$

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4. In any triangle ABC, if $a = \backslash\ 18, b = \backslash\ 24, c = \backslash\ 30$, find cosA, cosB, cosC

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5. Find the principal values of the following :

$$\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$$

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6. Prove in any $\triangle$ ABC that

(i)$a(\cos B + \cos C) = 2(b+c)\sin^2\frac{A}{2}$

(ii) $a(\cos C - \cos B) = 2(b-c)\cos^2\frac{A}{2}$

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7. Prove in any $\triangle$ ABC that

(i) $\frac{a\sin(B-C)}{b^2-c^2} = \frac{ab\sin(C-A)}{c^2-a^2} = \frac{c\sin(A-B)}{a^2-b^2}$

(ii) $\left(c^2-a^2+b^2\right)\tan A = \left(a^2-b^2+c^2\right)\tan B = \left(b^2-c^2+a^2\right)\tan C.$

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8. Prove in any $\triangle$ ABC that

(i) $a^2+b^2+c^2 = 2(bc\cos A + ca\cos B + ab\cos C)$

(ii) $(b+c)\cos A + (c+a)\cos B + (a+b)\cos C = a+b+c.$

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9. Prove in any $\triangle$ ABC that

(i) $\frac{\tan C}{\tan A} = \frac{b^2+c^2-a^2}{a^2+b^2-c^2}$

$b^2 \sin 2C + c^2 \sin 2B = 2bc \sin A.$

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10. In any ΔABC, prove that : $(b+c)\frac{\cos(B+C)}{2} = a\frac{\cos(B-C)}{2}$.

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11. In any ΔABC, prove that : $2\left(a\frac{\sin^2 C}{2} + c\frac{\sin^2 A}{2}\right) = a + c - b$

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12. In triangle ABC, prove that $\frac{\tan(B-C)}{2} = \frac{b-c}{b+c}\frac{\cot A}{2}$

$\frac{\tan(C-A)}{2} = \frac{c-a}{c+a}\frac{\cot B}{2}$ $\frac{\tan(A-B)}{2} = \frac{a-b}{a+b}\frac{\cot C}{2}$

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13. In any triangle ABC, $(a+b)^2 \sin^2\left(\frac{C}{2}\right) + (a-b)^2 \cos^2\left(\frac{C}{2}\right) = .$

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14. In ΔABC prove that (i)$a = b\cos C + \cos B$ (ii)$b = \cos A + a\cos C$ (iii) $c = a\cos B + b\cos A$

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15. In triangle ABC, if$a = 18, b = 24$and $c = 30$ then find $(i)\cos A, \cos B, \cos C(ii)\sin A, \sin B, \sin C$

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Objective Type Questions Multiple Choice Questions

1. If $\tan\theta = -\frac{4}{5}$, then $\sin\theta$ is:

A. $-\frac{4}{5}$ but not $\frac{4}{5}$

B. $-\frac{4}{5}$ or $\frac{4}{5}$

C. $\frac{4}{5}$ but not $-\frac{4}{5}$

D. None of these

Answer: b

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2. The greatest value of A= sin x.cos x is

A. 1

B. 2

C. $\sqrt{2}$

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

Answer: d

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3. Find the value:

$\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ$

A. $-\frac{3}{16}$

B. $\frac{5}{16}$

C. $\frac{3}{16}$

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

Answer: C

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4. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$, then the value of $\theta + \phi$ is

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

B. π

C. 0

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

Answer: d

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5. The minimum value of $3\cos x + 4\sin x + 8$ is:

A. 5

B. 9

C. 7

D. 3

Answer: D

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6. Find the value of

(i) sin (765°) (ii) cosec (-1110°) (iii) cot (-600°)

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

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

C. 1

D. 0

Answer: b

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7. If $\sec\theta + \cos\theta = 2$, then the value of $\sec^2\theta + \cos ec^2\theta$is :

A. 1

B. 4

C. 2

D. None of these

Answer: d

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8. $\sin\left(\frac{\pi}{2} - x\right)$ is equal to:

A. $\sin x$

B. $-\sin x$

C. cos x

D. None of these

Answer: C

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

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

B. $\sqrt{3}$

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

D. None of these

Answer: B

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10. Find the value of

(i) sin (765°) (ii) cosec (-1110°) (iii) cot (-600°)

A. $\sqrt{3}$

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

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

D. None of these

Answer: b

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11. The general solution of trigononmetric equation: tan x=0 is:

A. $\frac{n\pi}{2}$

B. $n\pi$

C. $(2n+1)\pi$

D. $(2n+1)\frac{\pi}{2}$

Answer: B

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12. $\sin\left(\frac{-11\pi}{3}\right)$

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

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

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

D. None of these

Answer: C

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13. $\cos\left(\frac{3\pi}{2} - x\right)$ equals:

A. cos x

B. sin x

C. $-\cos x$

D. $-\sin x$

Answer: D

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14. The general solution of the equation $2\sin x + 1 = 0$ is:

A. $x = 2n\pi \pm \frac{\pi}{6}, n\varepsilon Z$

B. $x = n\pi \pm \frac{\pi}{6}, n\varepsilon Z$

C. $x = 2n\pi + (-1)^n \frac{\pi}{6}, n\varepsilon Z$

D. $x = 2n\pi - (-1)^{n+1} \frac{\pi}{6}, n\varepsilon Z$

Answer: d

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15. $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} + \frac{1}{2}$ is:

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

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

C. 1

D. 0

Answer: D

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16. $\cos\left(\frac{\pi}{2}+x\right)$ is equal to:

A. $\sin x$

B. cos x

C. $-\sin x$

D. None of these

Answer: C

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17. $2\cos x\cos y$ is equal to:

A. $\cos(x+y)+\cos(x-y)$

B. $\cos(x+y)-\cos(x-y)$

C. $\sin(x+y)-\sin(x-y)$

D. None of these

Answer: A

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18. The minimum value of $a \sin \theta + b \cos \theta$ is:

A. $\sqrt{a^2 + b^2}$

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

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

D. None of these

Answer: C

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19. If $\sin A + \cos A = 1,$ then $\sin 2A$ is equal to

A. 1

B. 2

C. 0

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

Answer: c

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20. The Maximum value of $a \sin \theta + b \cos \theta$ is:

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

B. $\sqrt{a^2 + b^2}$

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

D. $\sqrt{b^2 - a^2}$

Answer: B

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21. $\cos\left(\frac{\pi}{2}+x\right)$ is equal to:

A. sin x

B. cos x

C. $-\sin x$

D. None of these

Answer: C

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22. $\sin^2\frac{\pi}{6}+\cos^2\frac{\pi}{3}-\tan^2\frac{\pi}{4}+\frac{1}{2}$ is:

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

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

C. 1

D. 0

Answer: d

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23. $\frac{\cot^2 \pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3\frac{\tan^2 \pi}{6} = 6$

A. $\frac{15}{4}$

B. -6

C. $\frac{1}{6}$

D. $-\frac{1}{6}$

Answer: a

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24. Maximum value of $\sin x + \cos x$ is:

A. 1

B. 2

C. $\sqrt{2}$

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

Answer: C

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25. If $\sec\theta + \cos\theta = 2$, then the value of $\sec^2\theta + \cos ec^2\theta$ is :

A. 1

B. 4

C. 2

D. None of these

Answer: c

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Objective Type Questions Fill In The Blanks

1. The radian measure of 15° is.....

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2. (i) Is the equation $2\cos^2\theta + \cos\theta$ -6 =0 possible ?

(ii) Is the equation $2\sin^2\theta - \cos\theta + 4 = 0$ can never be less than 2.

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3. Prove that $\cdot \dfrac{\cos 135^\circ - \cos 120^\circ}{\cos 135^\circ + \cos 120^\circ} = 3 - 2\sqrt{2}$

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4. (i) $\sin(A + B) =$ .....

(ii) $\cos(A + B)$.....

(iii) $\sin(A - B)$.....

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5. (i) $\sin 2\theta$=.....(in terms of $\tan\theta$).

(ii) $\cos 2\theta$.....(in terms of $\tan\theta$).

(iii) $\tan 2\theta$.....(in terms of $\tan\theta$).

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6. $\sin 70^\circ \cos 10^\circ - \cos 70^\circ \sin 10^\circ =$ _____

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7. Maximum and minimum values of $15\cos\theta - 8\sin\theta$ are..... and .....

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8. $\tan 15^\circ + \cot 15^\circ$=.....

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9. The value of $\sin\frac{\pi}{10}\sin\frac{13\pi}{10}$ is

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10. General solution of sin x=0 is.....

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Objective Type Questions True False Questions

1. The equation $2\cos^2\theta+\cos\theta-6=0$ is possible.

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2. Prove that $3\cos^2\frac{\pi}{4}+\sec^2\left(\frac{\pi}{3}\right)+5\tan^2\frac{\pi}{3}=\frac{41}{2}$.

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3. $\sin 150^\circ . \cos 120^\circ + \cos 330^\circ . \sin 660^\circ = -1$

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4. Prove that

$(i)\ \sin 80^\circ \cos 20^\circ - \cos 80^\circ \sin 20^\circ = \frac{\sqrt{3}}{2}$

$(ii)\ \cos 45^\circ \cos 15^\circ - \sin 45^\circ \sin 15^\circ = \frac{1}{2}$

$(iii)\ \cos 75^\circ \cos 15^\circ + \sin 75^\circ \sin 15^2 = \frac{1}{2}$

$(iv)\ \sin 40^\circ \cos 20^\circ + \cos 40^\circ \sin 20^\circ = \frac{\sqrt{3}}{2}$

$(v)\ \cos 130^\circ \cos 40^\circ l + \sin 130^\circ \sin 40^\circ = 0$

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5. Show that :- $4 \sin \beta \sin(60^\circ + \beta)\sin(60^\circ - \beta) = \sin 3\beta.$

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Objective Type Questions Very Short Answer Type Questions

1. $\tan. \frac{19\pi}{3}$

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2. $\cos 24^\circ + \cos 55^\circ + \cos 125^\circ + \cos 204^\circ + \cos 300^\circ = ?$

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3. 41. If $\sin x + \sin^2 x = 1$, then the value of expression $\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x - 1$ is equal to

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4. Prove that

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

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5. Write the maximum value of $\sin(\cos x)$.

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6. Find the value of:

$$2\left(\sin^6 x+\cos^6 x\right)-3\left(\sin^4 x+\cos^4 x\right)+2.$$

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7. Evaluate : $\sin^2\left(15^0+A\right)-\sin^2\left(15^0-A\right)$

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8. If $A + B = C$, then write the value of $tanA\ tanB\ tanC$.

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9. If $a = b\dfrac{\cos(2\pi)}{3} = \dfrac{\cos(4\pi)}{3}$, then write the value o $ab + bc + ca$.

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10. $\dfrac{\sin 7x - \sin 5x}{\cos 7x + \cos 5x} = \tan x$

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11. If $s \in A + s \in B = \alpha\ and \cos A + \cos B = \beta$, then write the value of $\tan\left(\dfrac{A+B}{2}\right)$.

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12. If $\frac{\pi}{2} < x < \frac{3\pi}{2}$, then write the value of $\sqrt{\frac{1+\cos 2x}{2}}$.

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13. Write the value of $\cos^2 76^\circ + \cos^2 16^\circ - \cos 76^\circ \cos 16^\circ$

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14. If $\tan A = \frac{1-\cos B}{\sin B}$, then $\tan 2A$ is equal to

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15. If $\sin x + \cos x = a$ then $|\sin x - \cos x| =$

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16. Find the principal value of $\tan^2\theta = 1$.

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17. In a ABC, if $b = 20,\ c = 21\ and \sin A = \frac{3}{5}$ find a.

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18. If in a $\text{Delta}ABC$, $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$, then find the measures of angles $A,\ B,\ C$.

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Ncert Exercise 3 1

1. Find the radian measures corresponding to the following degree measures:

A. 25°

B. $-47^\circ 30^\circ$

C. 240°

D. 520°

Answer: $\frac{26}{9}\pi$

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2. Find the degree measures corresponding to the following measures :

$\frac{7\pi}{6}$

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

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

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5. In a circle of diameter 40cm the length of a chord is 20 cm Find the length of the minor arc

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6. If in two circles, arcs of the same length subtend angles $60^o$and 75^oat the centre, find the ratio of their radii.

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7. Find the angle in radian through which a pendulum swings if its length is 75cm and the tip describes an arc of length: 10cm

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Ncert Exercise 3 2

1. Find the value of other five trigonometric function $\cos x = -\frac{1}{2}$, x lies in third quadrant.

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2. Find the value of other five trigonometric function $\sin x = \frac{3}{5}$, x lies in second quadrant.

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3. Find the value of other five trigonometric function $\cot x = \frac{3}{4}$, x lies in third quadrant.

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4. Find the value of other five trigonometric function $\sec x = \frac{13}{5}$, x lies in fourth quadrant.

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5. Find the value of other five trigonometric function $\tan x = -\frac{5}{12}$, x lies in second quadrant.

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6. Find the values of the trigonometric function sin $765o$

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7. $\cos ec(-1410^\circ)$

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8. Find the values of the trigonometric function $\tan \frac{19\pi}{3}$

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9. Find the values of the trigonometric function $\sin\left(-\frac{11\pi}{3}\right)$

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10. The values of the trigonometric function $\cot\left(-\frac{15\pi}{4}\right)$ is

A. 1

B. -1

C. 0

D. None

Answer: A

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Ncert Exercise 3 3

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

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2. Prove that: $2s\in^2\frac{\pi}{6}+\cos ec^2\frac{7\pi}{6}\frac{\cos^2\pi}{3}=\frac{3}{2}$

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3. $\frac{\cot^2\pi}{6}+\operatorname{cosec}\frac{5\pi}{6}+3\frac{\tan^2\pi}{6}=6$

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4. $2\sin^2\frac{3\pi}{4}+2\cos^2\frac{\pi}{4}+2\sec^2\frac{\pi}{3}=10$

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5. Find the value of:

$\sin 75^\circ$

$\tan 15^\circ$

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6. Prove the following

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

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

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

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

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

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11. Prove that:

$$\cos\left(\frac{3\pi}{4}+A\right)-\cos\left(\frac{3\pi}{4}-A\right)=-\sqrt{2}\sin A$$

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

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13. Prove the following $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$

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14. Prove the following $\sin 2x + 2\sin 4x + \sin 6x = 4\cos^2 x \sin 4x$

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15. Prove that:

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

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16. $\dfrac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = \dfrac{-\sin 2x}{\cos 10x}$

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17. Prove the following $\frac{\sin 5x + \sin 3x}{\cos 5x - \cos 3x} = \tan 4x$

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18. Prove the following $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan \frac{x - y}{2}$

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19. Prove the following $\frac{\sin x + \sin 3x}{\cos x - \cos 3x} = \tan 2x$

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20. Prove the following $\frac{\sin x - \sin 3x}{\sin^2 x - \cos 3x} = 2\sin x$

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21. Prove that: $\frac{\cos 4x + \cos 3x + \cos 2x}{s \in 4x + s \in 3x + s \in 2x} = \cos 3x$

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22. $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$

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23. Prove that:$\tan 4x = \dfrac{4\tan x\left(1-\tan^2 x\right)}{1-6\tan^2 x+\tan^4 x}$

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24. Prove the following $\cos 4x = 1 - 8\sin^2 x \cos^2 x$

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

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Ncert Exercise 3 4

1. Find the principal and general solution of $\tan x = \sqrt{3}$

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2. Find the principal and general solution of $\cos ecx = 2$

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

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4. Find the general solution for each of the following equations :

(i) $\cos 4x = \cos 2x$

(ii) $\cos 3x = \sin 2x$

(iii) $\sin 3x + \cos 2x = 0$

(iv) $\sin mx + \sin nx = 0$

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5. Find the general solution of the trigonometric equation: $\cos 3x + \cos x - 2\cos x = 0$

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

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7. Find the principal and general solutions of the following equations $\sin x + \sin 3x + \sin 5x = 0$

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Miscellaneous Exercise On Chapter 3

1. $2\cos\left(\frac{\pi}{13}\right)\cos\left(9\frac{\pi}{13}\right)+\cos\left(3\frac{\pi}{13}\right)+\cos\left(5\frac{\pi}{13}\right)=0$

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2. Prove that:

$(\sin 3x+\sin x)\sin x+(\cos 3x-\cos x)\cos x=0$

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

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4. Prove that sin x + sin 3x + sin 5x + sin 7x=4 sin 4x cos 2x cos x.

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

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6. Prove that: $s \in 3x + s \in 2x \quad s \in x = 4 \quad s \in x \cos\frac{x}{2}\cos\frac{3x}{2}$

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7. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ of the following : $\tan x = -\frac{4}{3}, x$ in quadrant II

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8. Find $\sin\left(\frac{x}{2}\right), \cos\left(\frac{x}{2}\right)$ and $\tan\left(\frac{x}{2}\right)$ in each of the following if $\cos x = -\frac{1}{3}$

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9. Find $\sin\frac{x}{2}$, $\cos\frac{x}{2}$ and $tan\frac{x}{2}$ of the following : $s \in \quad x \quad = \frac{1}{4}$, x in quadrant II.

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Exerise

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

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2. If $\frac{2\sin\alpha}{\{1 + \cos\alpha + \sin\alpha\}} = y$, then $\frac{\{1 - \cos\alpha + \sin\alpha\}}{1 + \sin\alpha} =$

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3. Prove that

$$\cos\theta\cos\left(\frac{\theta}{2}\right)-\cos 3\theta\cos\left(\frac{9\theta}{2}\right)=\sin\left(\frac{7\theta}{2}\right)\sin 4\theta$$

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4. Find the value of tan $22^\circ 30'$

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5. If $\tan\theta+\sin\theta=m$ and $\tan\theta-\sin\theta=n$.

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

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7. Find the general values of θ which satisfies the equation $\tan\theta = -1$ and $\cos\theta = \frac{1}{\sqrt{2}}$

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8. If $\sin(\theta+\alpha) = a and \sin(\theta+\beta) = b,$ prove that $\cos 2(\alpha-\beta) - 4ab\cos(\alpha-\beta) = 1 - 2a^2 - 2b^2$

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9. If $a\cos 2\theta + b\sin 2\theta = c$ has α and β as its roots, then prove that $\tan\alpha + \tan\beta = \frac{2b}{a+c}.$

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10. $\cos^4\left(\frac{\pi}{8}\right) + \cos^4\left(\frac{3\pi}{8}\right) + \cos^4\left(\frac{5\pi}{8}\right) + \cos^4\left(\frac{7\pi}{8}\right) =$

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11. Find the general solution of the equation $(\sqrt{3}-1)\cos\theta+(\sqrt{3}+1)\sin\theta=2.$

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Revision Exerise

1. Prove that (1) the area of a sector of circle with radius r and central angle θ° is $\frac{1}{2}r^2\theta$

(ii) the area of a sector of a circle of radius r and an arc of length s is $\frac{1}{2}rs$

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2. The greatest angle of a cyclic quadrilateral is three times the least. The other two angles are in the ratio 4:5. Find all the angles in radians,

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3. A wire of length 121 cm is bent so as to lie along the arc of a circle of radius 180 cm. Find in degrees, the angle subtended at the centre by the arc.

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

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5. Eliminate α between the equations :

$\frac{\sin^2\alpha}{\cos\alpha}=a^3 \text{and} \frac{\cos^2\alpha}{\sin\alpha}=b^3$

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6. $3(\sin x-\cos x)^4+6(\sin x+\cos x)^2+4\left(\sin^6 x+\cos^6 x\right)=$

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7. Given, $\sin x = -\frac{3}{7}$ and x belongs to the third quadrant, obtain the value of $\tan x - \sec x$

(ii) If $7\sin A = 24\cos A$ and $0 < A < \frac{\pi}{2}$ find $14\tan A - 25\cos A - 7\sec A$

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8. If $\sec A = x + \frac{1}{4x}$ prove that:

$\sec A + \tan A = 2x$ or $\frac{1}{2x}$

(b) If $\tan\theta = \frac{p}{q}$, show that :

$$\frac{p\sin\theta - q\cos\theta}{p\sin\theta + q\cos\theta} = \frac{p^2 - q^2}{p^2 + q^2}$$

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9. If $\sin x + \sin^2 x = 1$ show that:

$\cos^4 x + \cos^2 x = 1$

(ii) If $\sin x + \cos x = \sqrt{2}\cos x$ show that:

$\sqrt{2}\sin x = \cos x - \sin x$

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10. 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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11. Prove that $\sin\frac{\pi}{14}\sin\frac{3\pi}{14}\sin\frac{5\pi}{14}\sin\frac{7\pi}{14} = \frac{1}{8}$

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12. Prove that: $\cos^2 A + \cos^2\left(A + \frac{\pi}{3}\right) + \cos^2\left(A - \frac{\pi}{3}\right) = \frac{3}{2}$

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13. If $\frac{s \in^4 \theta}{a} + \frac{\cos^4 \theta}{b} = \frac{1}{a+b}$, prove that $\frac{s \in^8 \theta}{a^3} + \frac{\cos^4 \theta}{b^3} = \frac{1}{(a+b)^3}$

$\frac{s \in^{4n} \theta}{a^{2n-1}} + \frac{\cos^{4n} \theta}{b^{2n-1}} = \frac{1}{(a+b)^{2n-1}}, n \in N$

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14. If $atan\alpha + btan\beta = (a+b)\tan\left(\frac{\alpha+\beta}{2}\right)$, where $\alpha \neq \beta$, prove that $a\cos\beta = b\cos\alpha$.

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15. If $\alpha and \beta$ are the solutions of $a\cos\theta + bs\int h\eta = c,$ then show that $\cos(\alpha+\beta) = \frac{a^2-b^2}{a^2+b^2}$ (ii) $\cos(\alpha-\beta) = \frac{2c^2-(a^2+b^2)}{a^2+b^2}$

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16. If α and β are the solution of the equation, $a\tan\theta + b\sec\theta = c$ then show that $\tan(\alpha+\beta) = \dfrac{2ac}{a^2 - c^2}$

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17. If $\tan\beta = \dfrac{Q\sin\alpha}{P + Q\cos\alpha}$

Prove that $\tan(\alpha - \beta) = \dfrac{P\sin\alpha}{Q + P\cos\alpha}$

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18. Prove that: $\cot\theta\cot 2\theta + \cot\theta 2\cot 3\theta + 2 = \cot\theta(\cot\theta - \cot 3\theta)$

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19. Prove that: $\dfrac{\cos 2A\cos 3A - \cos 2A\cos 7A + \cos A\cos 10A}{\sin 4A\sin 3A - \sin 2A\sin 5A + \sin 4A\sin 7A}$

$= \cot 6A\cot 5A$

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20. If $\theta_1, \theta_2, \theta_3, \ldots\ldots, \theta_n$ are in AP whose common difference is d, then show that

$\sin d\{\sec\theta_1 \sec\theta_2 \sec\theta_2 \sec\theta_3 + \ldots\ldots + \sec\theta_{n-1} \sec\theta_n\} = \tan\theta_n - \tan\theta_1$

.

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21. If $A + B + C = \pi$ prove that

$\cos 4A + \cos 4B + \cos 4C = -1 + 4\cos 2A \cos 2B \cos 2C$

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22. If $A + B + C = \pi$, prove that :

$\sin, \frac{B+C}{2} + \sin, \frac{C+A}{2} + \sin, \frac{A+B}{2} = 4\cos, \frac{\pi - A}{4} \cos, \frac{\pi - B}{4} \cos,$

.

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23. If $A+B+C=180^\circ$ prove that:

(i) $\sin(B+C-A)+\sin(C+A-B)$

$+\sin(A+B-C)=4\sin A\sin B\sin C$

(ii) $\cos(-A+B+C)+\cos(A-B+C)$

$+\cos(A+B-C)=1+4\cos A\cos B\cos C$

(iii) $\tan(B+C-A)+\tan(C+A-B)$

$+\tan(A+B-C)$

$=\tan(B+C-A)\tan(C+A-B)\tan(A+B-C)$

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24. Prove that the triangle ABC is equilateral if $\cot A+\cot B+\cot C=\sqrt{3}$

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25. If $A+B+C+D=2\pi$, prove that: $\cos A+\cos B+\cos C+\cos D$

$=-4\cos\frac{A+B}{2}\cos\frac{A+C}{2}\cos\frac{A+D}{2}$

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26. If $x+y+z=xyz$ prove that $\frac{2x}{1-x^2}+\frac{2y}{1-y^2}+\frac{2z}{1-z^2}=\frac{2x}{1-x^2}\frac{2y}{1-y^2}\frac{2z}{1-z^2}$.

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27. If $xy+yz+xz=1$,then prove that $\frac{x}{1-x^2}+\frac{y}{1-y^2}+\frac{z}{1-z^2}=\frac{4xyz}{(1-x^2)(1-y^2)(1-z^2)}$

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28. Find the solutions $x \in [0, 2\pi]$ of:$\sin 2x - 12(\sin x - \cos x) + 12 = 0$

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29. Solve : (i)$\cos 3\theta + 8\cos^3\theta = 0$

(ii) $\tan(\pi\cot x) = \cot(\pi\tan x)$

(iii) $4\cos^2 x\sin x - 2\sin^2 x = 3\sin x$

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30. Prove that the values of the function $\frac{\sin x\cos 3x}{\cos x\sin 3x}$ do not lie between $\frac{1}{3}$ and 3

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31. If p_1, p_2, p_3 are the altitues of a triangle from the vertieces A,B,C and Δ is the area of the triangle then prove that

$$\frac{1}{p_1} + \frac{1}{p_2} + \frac{1}{p_3} = \frac{2ab}{(a+b+c+)\Delta}\cos^2\frac{C}{2}$$

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Check Your Unders Tan Ding

1. Define Radian.

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2. What is the area of a sector of circle with radius r and central angle θ?

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3. If $\sin\theta = \frac{3}{5}$, θ lies in second quadrant, find $\cos\theta$ and $\cot\theta$.

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4. The value of $\cos(-1710^\circ)$ is

A. 0

B. 1

C. -1

D. 1/2

Answer: A

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5. 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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6. Solve the eqution $\frac{\cos 7x+\cos 5x}{\sin 7x-\sin 5x}$.

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7. Find $\sin 2\theta$ when $\sin\theta+\cos\theta$=1.

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8. Prove that : $\sin^2(72^\circ) - \sin^2(60^\circ) = \frac{\sqrt{5}-1}{8}$

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9. Find the principal and general solution of $\tan x = \sqrt{3}$

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10. Find the solution of $\sin x = -\frac{\sqrt{3}}{2}$.

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Competition File

1. If p and q are positive real numbers such that $p^2 + q^2 = 1$ then find the maximum value of $(p + q)$

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

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

C. $\sqrt{2}$

D. 2

Answer: C

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2. Let A and B denote the statements

$A: \cos\alpha + \cos\beta + \cos\gamma = 0$

$B: \sin\alpha + si \in \beta + \sin\gamma = 0$

If $\cos(\beta - \gamma) + \cos(\gamma - \alpha) + \cos(\alpha - \beta) = -\frac{3}{2}$,

then

A. A is true and B is false

B. A is false and B is true

C. both A and B are true

D. both A and B are false

Answer: C

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3. Let $\cos(\alpha+\beta)=\frac{4}{5}$ and let $\sin(\alpha-\beta)=\frac{5}{13}$, where $0\leq\alpha,\beta=\frac{\pi}{4}$.

Then $\tan 2\alpha=$

A. $\frac{25}{16}$

B. $\frac{56}{33}$

C. $\frac{19}{12}$

D. $\frac{20}{7}$

Answer: C

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4. If $A = \sin^2 x + \cos^4 x$ then for all realx :

A. $\frac{3}{4} \leq A \leq 1$

B. $\frac{13}{16} \leq A \leq 1$

C. $1 \leq A \leq 2$

D. $\frac{3}{4} \leq A \leq \frac{13}{16}$

Answer: A

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5. The possible values of $\theta \in (0, \pi)$ such that $\sin(\theta) + \sin(4\theta) + \sin(7\theta) = 0$ are:

A. $\frac{\pi}{4}, \frac{5\pi}{12}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{8\pi}{9}$

B. $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{35\pi}{36}$

C. $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{\pi}{2}, \frac{2\pi}{3}, \frac{3\pi}{4}, \frac{8\pi}{9}$

D. $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{4\pi}{9}, \frac{\pi}{2}, \frac{3\pi}{4}, \frac{8\pi}{9}$

Answer: D

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6. The solution of the equation $e^{\sin x} - e^{-\sin x} - 4 = 0$

A. infinite number of real roots

B. no real roots

C. exactly one real root

D. exactly four real roots

Answer: B

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7. If a ΔPQR if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then $\angle R$ is equal to

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

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

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

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

Answer: B

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8. The expression $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}$ can be written as :

A. sec A cosec A+ 1

B. $\tan A+\cot A$

C. $\sec A+\cos ecA$

D. $\sin A\cos A+1.$

Answer: A

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9. Let $f_k(x) = \frac{1}{k}\left(\sin^k x + \cos^k x\right)$ where $x \in \mathbb{R}$ and $k \geq 1$. Then $f_4(x) - f_6(x)$ equals

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

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

C. $\frac{1}{12}$

D. $\frac{1}{6}$

Answer: C

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10. If $0 \leq x \leq 2\pi$, then the number of real values of x, which satisfy the equation $\cos x + \cos 2x + \cos 3x + \cos 4x = 0$, is

A. 5

B. 7

C. 9

D. 3

Answer: B

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11. If $5\left(\tan^2 x - \cos^2 x\right) = 2\cos 2x + 9$, then the value of cos4x is

A. $\frac{2}{9}$

B. $-\frac{7}{9}$

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

D. $-\frac{1}{3}$

Answer: B

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12. For a regular polygon, let r and R be the radii of the inscribed and the circumscribed circles. A false statement among the following is There is a regular polygon with $\frac{r}{R} = \frac{1}{\sqrt{2}}$ (17) There is a regular polygon with $\frac{r}{R} = \frac{2}{3}$ (30) There is a regular polygon with $\frac{r}{R} = \frac{\sqrt{3}}{2}$ (47) There is a regular polygon with $\frac{r}{R} = \frac{1}{2}$ (60)

A. There is a regular polygon with $\frac{r}{R} = \frac{1}{2}$

B. There is a regular polygon with $\frac{r}{R} = \frac{1}{\sqrt{2}}$

C. There is a regular polygon with $\frac{r}{R} = \frac{2}{3}$

D. There is a regular polygon with $\frac{r}{R} = \frac{\sqrt{3}}{2}$

Answer: C

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13. ABCD is a trapezium such that AB and CD are parallel and $BC \perp CD$. If $\angle ADB = \theta$, $BC = p$ and $CD = q$, then AB is equal to

A. $\frac{p^2 + q^2 \cos\theta}{p\cos\theta + q\sin\theta}$

B. $\frac{p^2 + q^2}{p^2\cos\theta + q^2\sin\theta}$

C. $\frac{(p^2 + q^2)\sin\theta}{(p\cos\theta + q\sin\theta)^2}$

D. $\frac{(p^2 + q^2)\sin\theta}{p\cos\theta + q\sin\theta}$

Answer: D

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14. If the sum of all the solutions of the equation $8\cos x.\left(\cos\left(\frac{\pi}{6} + x\right)\cos\left(\frac{\pi}{6} - x\right) - \frac{1}{2}\right) = 1$ in $[0, \pi]$ is $k\pi$ then k is equal to

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

B. $\frac{13}{9}$

C. $\frac{8}{9}$

D. $\frac{20}{9}$

Answer: B

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15. The maximum values of $3\cos\theta + 5\sin\left(\theta - \frac{\pi}{6}\right)$ for any real value of θ is:

A. $\sqrt{34}$

B. $\sqrt{19}$

C. $\frac{\sqrt{79}}{2}$

D. $\sqrt{31}$

Answer: B

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16. $\cos^2 10^\circ + \cos^2 50^\circ - \cos 10^\circ \cos 50^\circ$ is equal to

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

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

C. $\frac{3}{2}(\cos 20^\circ + 1)$

D. $\frac{3}{4}(\cos 20^\circ + 1)$

Answer: B

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17. Let $S = \{\theta \in [-2\pi, 2\pi] : 2\cos^2\theta + 3\sin\theta = 0\}$, then the sum of the equations elements of S is .

A. (-4π)

B. 3π

C. π

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

Answer: A

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Chapter Test 3

1. The Maximum value of $3\cos x + 4\sin x + 8$ is:

A. 5

B. 10

C. 7

D. 13

Answer: D

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2. The value of $\sin 765^\circ$ is:

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

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

C. 1

D. 0

Answer: B

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3. The value of : $\sin^2(15^\circ + x) - \sin^2(15^\circ - x)$=.....

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4. Prove that: $\sin 51^\circ + \cos 81^\circ = \cos 21^\circ$.

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5. General solution of : $\cos\theta = \frac{1}{2}$

A. $\theta = 2n\pi \pm \frac{\pi}{3} \forall n \in \mathbb{Z}$

B. $\theta = 2n\pi \pm \frac{\pi}{6} \forall n \in \mathbb{Z}$

C. $\theta = 2n\pi \pm \frac{\pi}{4} \forall n \in \mathbb{Z}$

D. none of these

Answer: A

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6. If in two circle arcs of the same length subtend angle of 60° and 75° at the center , find the ratio of their radii.

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7. If $\tan(\alpha + \theta) = n\tan(\alpha - \theta)$,show that: $(n+1)\sin 2\theta = (n-1)\sin 2\alpha$

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8. Prove that $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = . \frac{\sqrt{3}}{16}$

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9. If $\alpha and \beta$ are distict roots of $a\cos\theta + bs\int h\eta = c,$ prove that $\sin(\alpha+\beta) = \frac{2ab}{a^2+b^2}$

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10. Solve

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

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11. If $s\int h\eta = n\sin(\theta+2\alpha)$, prove that $\tan(\theta+\alpha) = \frac{1+n}{1-n}\tan\alpha$.

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12. If $\tan x = \frac{3}{4}$ and $\pi < x < . \frac{3\pi}{2}$ find the value of

$(i)\sin. \frac{x}{2}, (ii)\cos. \frac{x}{2}, (iii)\tan. \frac{x}{2}$

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