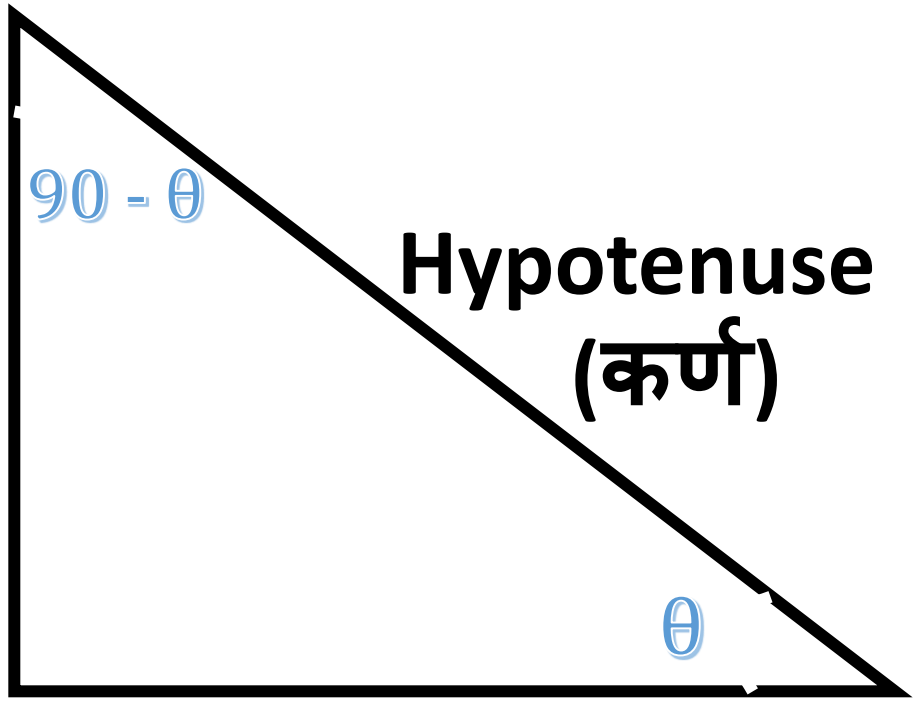
Trigonometry
(त्रिकोणमिति)



Perpendicular
(लंब)

Hypotenuse
(कर्ण)

Base
(आधार)

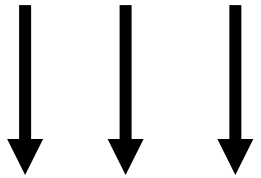
Pythagoras Theorem ➔ $H^2 = P^2 + B^2$

Pythagoras Triplets

(3, 4, 5) (5, 12 ,13) (7, 24 ,25)
(8, 15 ,17) (9, 40 ,41) (11, 60 ,61)
(16, 63 ,65) (12, 35 ,37) (20, 21 ,29) (28, 45 ,53) (39, 80 ,89)

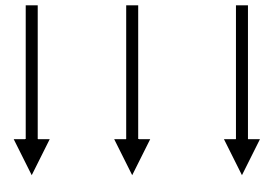
Pythagoras Triplets

(3, 4, 5)



(6, 8, 10)

(20, 21, 29)



(10, 10.5, 14.5)

$\sin\theta = P/H$

$\cos\theta = B/H$

$\tan\theta = P/B$

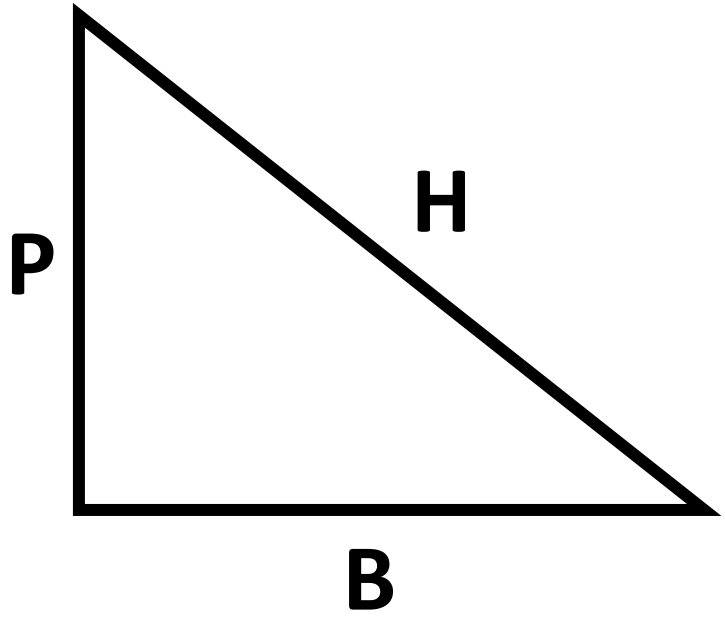
$\cot\theta = 1/\tan\theta = B/P$

$\sec\theta = 1/\cos\theta = H/B$

$\text{Cosec}\,\theta = 1/\sin\theta = H/P$

$\tan\theta = \sin\theta/\cos\theta$

$\cot\theta = \cos\theta/\sin\theta$



$\cot\theta = 1/\tan\theta \rightarrow \tan\theta \cdot \cot\theta = 1$

$\sec\theta = 1/\cos\theta \rightarrow \cos\theta \cdot \sec\theta = 1$

$\operatorname{cosec}\theta = 1/\sin\theta \rightarrow \sin\theta \cdot \operatorname{cosec}\theta = 1$

Trigonometric Identities
(त्रिकोणमिति सर्वसमिका)

$$Sin^2\,\theta + Cos^2\,\theta = 1$$

$$1 - Sin^2\,\theta = Cos^2\,\theta$$

$$1 - Cos^2\,\theta = Sin^2\,\theta$$

Trigonometric Identities
(त्रिकोणमिति सर्वसमिका)

$$1 + tan^2\,\theta = Sec^2\,\theta$$

$$tan^2\,\theta = Sec^2\,\theta - 1$$

$$Sec^2\,\theta - tan^2\,\theta = 1$$

Trigonometric Identities
(त्रिकोणमिति सर्वसमिका)

$$1 + Cot^2\ \theta = Cosec^2\ \theta$$

$$Cot^2\ \theta = Cosec^2\ \theta - 1$$

$$Cosec^2\ \theta - Cot^2\ \theta = 1$$

$$Sec^2\ \theta\ + Cosec^2\ \theta = Sec^2\ \theta \times Cosec^2\ \theta$$

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

2. $\sin(A - B) = \sin A\cos B - \cos A\sin B$

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

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

Formulae

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

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

7. $\cos(A + B) + \cos(A - B) = 2 \cos A \cos B$

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

(OR)

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

9. $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$

10. $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$

11. $\cot(A + B) = \frac{\cot A \cot B - 1}{\cot A + \cot B}$

12. $\cot(A - B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$

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

14. $\cos 2A = \cos^2 A - \sin^2 A = 1 - 2\sin^2 A = 2\cos^2 A - 1$

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

15. $\tan 2A = \frac{2\tan A}{1-\tan^2 A}$

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

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

18. $\tan 3A = \frac{3\tan A - \tan^3 A}{1-3\tan^2 A}$

19. $\sin C + \sin D = 2 \sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$

20. $\sin C - \sin D = 2 \cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$

21. $\cos C + \cos D = 2 \cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$

22. $\cos C - \cos D = -2 \sin\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$

$= 2 \sin\left(\frac{C+D}{2}\right)\sin\left(\frac{D-C}{2}\right)$

23. $\sin(60-\theta)\sin\theta\sin(60+\theta) = \frac{1}{4}\sin 3\theta$

24. $\cos(60-\theta)\cos\theta\cos(60+\theta) = \frac{1}{4}\sin 3\theta$

25. $\tan(60-\theta)\tan\theta\tan(60+\theta) = \tan 3\theta$

- If $\alpha + \beta = 90°$, then

  $\tan\alpha . \tan\beta = 1$ & $\cot\alpha . \cot\beta = 1$

Vice versa is also true

- If $\alpha + \beta = 90°$, then

$\sin\alpha = \cos\beta$; $\operatorname{cosec}\alpha = \sec\beta$;

$\sin\alpha.\sec\beta = 1$; $\operatorname{cosec}\alpha.\cos\beta = 1$

Vice versa is also true

	0°	30°	45°	60°	90°
Sin θ	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
Cos θ	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
tan θ	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not defined
Cosec θ	Not defined	2	$\sqrt{2}$	$2/\sqrt{3}$	1
Sec θ	1	$2/\sqrt{3}$	$\sqrt{2}$	2	Not defined
Cot θ	Not defined	$\sqrt{3}$	1	$1/\sqrt{3}$	0

Questions

Q.1 If $\cos\theta = \frac{105}{145}$, then $\tan\theta = ?$

Q.2 If $\sin\theta = \frac{3}{5}$, then find the value of $\cos\theta$ and $\tan\theta$

यदि $\sin\theta = \frac{3}{5}$ हो , तो $\cos\theta$ और $\tan\theta$ का मान बताइये

Q.3 If in a triangle $\sin\theta = \frac{5}{13}$, then find the value of $\operatorname{cosec}\theta$

यदि किसी त्रिभुज में $\sin\theta = \frac{5}{13}$, तो $\operatorname{cosec}\theta$ का मान ज्ञात कीजिये

a) 13/5
b) 12/5
c) 12/13
d) 5/13

Q.4 If $\tan\theta + \cot\theta = \sqrt{3}$, then find the value of $tan^2\,\theta + cot^2\,\theta$?

यदि $\tan\theta + \cot\theta = \sqrt{3}$ हो , तो $tan^2\,\theta + cot^2\,\theta$ का मान बताइये ?

a) 0
b) 1
c) -1
d) 2

Q.5 If cosec A = 2 , then find the value of $\frac{1}{tan\ A} + \frac{sin\ A}{1+cosA}$?

यदि cosec A = 2 हो , तो $\frac{1}{tan\ A} + \frac{sin\ A}{1+cosA}$ का मान बताइये ?

a) 0
b) 1
c) -1
d) 2

Q.6 If $\sin A = \frac{1}{2}$, then cot A ?

a) $\frac{1}{\sqrt{3}}$

b) $\sqrt{3}$

c) $\frac{\sqrt{3}}{2}$

d) 1

Q.7 If $\tan\theta = \frac{8}{15}$, then $\text{cosec}\,\theta$ = ?

a) $\frac{17}{8}$

b) $\frac{8}{17}$

c) $\frac{17}{15}$

d) $\frac{15}{17}$

Q.8 If $\sin\theta = \frac{\sqrt{3}}{2}$, then $(\operatorname{cosec}\theta + \cot\theta) = ?$

a) $2\sqrt{3}$

b) $\frac{2\sqrt{3}}{3}$

c) $(2 + \sqrt{3})$

d) $\sqrt{3}$

Q.9 If $3 \cot \theta = 4$, then $\left(\frac{5 \sin \theta + 3 \cos \theta}{5 \sin \theta - 3 \cos \theta}\right)$ = ?

a) 1/3
b) 3
c) 1/9
d) 9

Q.10 If $\tan\theta = \frac{a}{b}$, then $\left(\frac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta}\right)$ = ?

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

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

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

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

Q.11 In ΔABC , whose angle B is right angle, AB = 24 semi and BC = 7 semi, find the value of the following ?

ΔABC में , जिसका कोण B समकोण है , AB = 24 सेमि और BC = 7 सेमि है निम्नलिखित का मान ज्ञात कीजिये

(i) Sin A , cos A

(ii) sin C , cos C

Q.12 If $\sin A = \frac{3}{4}$, then find the value of $\cos A$ and $\tan A$

यदि $\sin A = \frac{3}{4}$ हो , तो $\cos A$ और $\tan A$ का मान बताइये

Q.13 If 15 cot $A = 8$, then find the value of sin A and sec A

यदि 15 cot $A = 8$ हो , तो sin A और sec A का मान बताइये

Q.14 If $\sec\theta = \frac{13}{12}$, then Calculate all other trigonometric ratios ?

यदि $\sec\theta = \frac{13}{12}$, **हो तो अन्य सभी त्रिकोणमितीय अनुपात परिकलित कीजिये ?**

Q.15 If $\sin\theta = \sqrt{\frac{1}{6}\sqrt{\frac{1}{6}\sqrt{\frac{1}{6}}}} \ldots\ldots\ldots\ldots\ldots\ldots\infty$ **then**

$\tan\theta + \cot\theta = ?$

Q16. $(1 + \tan^2\theta)(1+\sin\theta)(1-\sin\theta)$

(a) 0
(b) 1
(c) 2
(d) None

Q17. $(1 + \cot^2\theta)\,(1+\cos\theta)(1-\cos\theta)$

(a) 0
(b) 1
(c) 2
(d) None

Q18. If $x = a\cos^3\theta$, $y = b\sin^3\theta$ then find $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}}$?

Q19. If $\alpha+\beta= 30^\circ$ then find ; $(\sqrt{3}+ \tan\alpha)\ (\sqrt{3}+ \tan\beta)$

(a) 2

(b) 3

(c) 4

(d) None

Q20. Find the value of :

$3\,(\sin x - \cos x)^2 + 6\,(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x)$

(a) 13

(b) 10

(c) 12

(d) None

Q21. If $X_n = \cos^n\theta + \sin^n\theta$; find $2x_6 - 3x_4 + 1$

(a) 0
(b) 1
(c) 2
(d) 3

Q22. If A+B = 45° then find
tan A + tan B + tanAtanB - 1

(a) 1
(b) 0
(c) 2
(d) None

Q23. $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}}$

(a) $\sin\theta$
(b) $\cos\theta$
(c) $\tan\theta$
(d) $2\cos\theta$

Q24. $\text{cosec}\theta - \sin\theta = l$ and $\sec\theta - \cos\theta = m$ then find $l^2m^2(l^2 + m^2 + 3)$

(a) 1
(b) 2
(c) 3
(d) None

Q25. If $\cos^4\theta - \sin^4\theta = \frac{2}{13}$; find $\cos^2\theta - \sin^2\theta + 1$

(a) $\frac{15}{13}$

(b) $\frac{12}{13}$

(c) $\frac{11}{13}$

(d) None

Q26. If $3\sin\theta + 4\cos\theta = 5$ then find $\tan\theta$?

(a) $\frac{3}{4}$

(b) $\frac{1}{4}$

(c) $\frac{4}{3}$

(d) None

Q27. If $(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2 + b^2$ then find $\tan\theta$?

(a) $\frac{a^2-b2}{2ab}$

(b) $\frac{2ab}{a^2-b2}$

(c) $\frac{a^2+b2}{2ab}$

(d) None

Q28. $x \sin^3\theta + y \cos^3\theta = \sin\theta\cos\theta \neq 0$;
$x\sin\theta - y\cos\theta = 0$; find $x^2 + y^2$?

(a) 1
(b) 2
(c) 3
(d) None

Q29. If $x \sin^3\theta + y \cos^3\theta = 4 \sin\theta\cos\theta$ then find $x^2 + y^2$?

(a) 4
(b) 12
(c) 16
(d) None

Q30. If $r\sin\theta = 1$, $r\cos\theta = \sqrt{3}$, then find $\sqrt{3}\tan\theta$?

(a) 0
(b) 1
(c) 2
(d) None

Q31. If $5\sin^2\theta + 3\cos^2\theta = 4$; find $\sin\theta$

(a) $\pm \frac{1}{2}$

(b) $\pm \frac{1}{\sqrt{2}}$

(c) $\pm \frac{\sqrt{3}}{2}$

(d) None

Q32. $\sin^4\theta + \sin^2\theta\cos^2\theta + 4 + \cos^2\theta$?

(a) 5
(b) 3
(c) 4
(d) None

Q33. If $\sec^2\theta + \tan^2\theta = 7$ find θ ?

(a) 45°

(b) 60°

(c) 30°

(d) None

Q34. If $\sec^2\theta + \tan^2\theta = 7$ find $\sin\theta$?

Q35. If $2\sec^2\theta + \tan^2\theta = 17$ find $\cot\theta$?

Q36. If $\sec^2\theta + \tan^2\theta = \frac{7}{12}$ find $\sec^4\theta - \tan^4\theta$?

(a) $\frac{7}{12}$

(b) $\frac{5}{12}$

(c) $\frac{11}{12}$

(d) None

Q37. If $\operatorname{cosec}\theta + \cot\theta = 3$; find $\operatorname{cosec}\theta$?

Q38. If $\text{cosec}^2\theta + 2\cot^2\theta = 10$; find $\sin\theta + \cos\theta$?

(a) $\frac{\sqrt{3}+1}{2}$

(b) $\frac{\sqrt{3}-1}{2}$

(c) $\frac{2}{\sqrt{3}+1}$

(d) None

Q39. If A , B , C and D are angles of cyclic quadrilateral then find cos A + cos B + cos C + cos D ?

यदि A, B, C और D चक्रीय चतुर्भुज के कोण हैं तो cos A + cos B + cos C + cos D ज्ञात करे ?

(a) 0
(b) 1
(c) 2
(d) None

Q40. If sin(x+y) = cos $[3(x+y)]$ then find $\tan[2(x+y)]$?

(a) 0
(b) 1
(c) $\sqrt{3}$
(d) None

Q41. If $\sin 5\theta = \cos 20^\circ$ find θ

(a) 14° (b) 28°

(c) 45° (d) None

Q42. If sin3A = cos(A-26) then find A ?

(a) 29

(b) 58

(c) 45

(d) None

Q43. If $\sin\alpha \sec(30+\alpha) = 1$ then find $\sin\alpha + \cos 2\alpha$

(a) 1 (b) 1/2

(c) 3/4 (d) None

Q44. $\frac{\cos 80}{\sin 10}$ + cos59cosec31 + 1

(a) 2

(b) 1

(c) 3

(d) None

Q45. $\frac{\sin 39^\circ}{\cos 51^\circ}$ + 2 tan11° tan31° tan45° tan59° tan79° - 3 ($\sin^2 21^\circ + \sin^2 69^\circ$) ?

Q46. If $\tan 2\theta \times \tan 3\theta = 1$ then find $2\left(\cos^2 \frac{5\theta}{2} - 1\right)$?

(a) 1

(b) -1

(c) 0

(d) None

Q47. If tan(x+y) tan(x-y) = 1 then find $\tan\frac{2x}{3}$

(a) $\sqrt{3}$

(b) 1

(c) $\frac{1}{\sqrt{3}}$

(d) None

Q48. Sin 10 + sin 20 + ……. + sin 340 + sin 350 ?

(a) 0

(b) 1

(c) 2

(d) None

Q49. $\cot 18\left[\cos^2 68\cot 72 + \frac{1}{\sec^2 22 \tan 72}\right]$?

(a) 0

(b) 1

(c) 2

(d) None

Q50. If $\sin\theta_1 = \cos 26$ and $\cos\theta_2 = \sin 53$ then find $\theta_1+\theta_2$?

(a) 100

(b) 101

(c) 102

(d) None

Q51. tan15tan25tan45tan65tan75 ?

(a) $2\frac{1}{2}$

(b) $3\frac{1}{2}$

(c) 1

(d) None

Q52. $\sin^2 2 + \sin^2 4 + \sin^2 6 + \ldots \sin^2 88$?

(a) 22

(b) 23

(c) 24

(d) None

Q53. $\sin^2 1 + \sin^2 5 + \sin^2 9 + \ldots\ldots \sin^2 89$?

(a) 22

(b) $11\frac{1}{2}$

(c) $22\frac{1}{2}$

(d) None

Q54. $\sin^2 10 + \sin^2 20 + \ldots\ldots \sin^2 80$?

(a) 2

(b) $2\frac{1}{2}$

(c) 4

(d) None

Q55. $\cos^2 2 + \cos^2 4 + \cos^2 6 + \ldots + \cos^2 88$?

(a) 2

(b) $2\frac{1}{2}$

(c) 4

(d) None

Q56. $\sin 17 = \frac{x}{y}$ find $\sec 17 - \sin 73$?

(a) $\frac{x}{y\sqrt{y^2-x^2}}$

(b) $\frac{x}{y\sqrt{y^2+x^2}}$

(c) $\frac{x}{y\sqrt{x^2-y^2}}$

(d) None

Q57. If $\frac{\sin\theta}{x} = \frac{\cos\theta}{y}$ then find $\sin\theta - \cos\theta$?

(a) $\frac{y-x}{\sqrt{x^2+y^2}}$

(b) $\frac{x-y}{\sqrt{x^2+y^2}}$

(c) $\frac{x-y}{\sqrt{x^2-y^2}}$

(d) None

Concept:

$a\sin\theta + b\cos\theta = m$ and $b\sin\theta - a\cos\theta = n$ then find a^2+b^2

Q58. $p\sin\theta + q\cos\theta = 3$ and $q\sin\theta - p\cos\theta = 2$ then find p^2+q^2

(a) 13
(b) 14
(c) 15
(d) None

Q59. $3\sin\theta + 5\cos\theta = 3$ and $5\sin\theta - 3\cos\theta = n$ then find n ?

(a) 5
(b) 4
(c) 3
(d) None

Q60. If $\sin\theta + \cos\theta = \sqrt{2}\sin\theta$ then find $\sin\theta - \cos\theta$ =?

(a) $\sqrt{2}\cos\theta$

(b) 1

(c) $\sqrt{2}\sin\theta$

(d) None

Q61. If $\frac{x}{a}\sin\theta + \frac{y}{b}\cos\theta = \frac{1}{2}$ then find

$\frac{y}{b}\sin\theta - \frac{x}{a}\cos\theta$?

(a) $\sqrt{\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{1}{4}}$

(b) $\sqrt{\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{1}{4}}$

(c) $\sqrt{\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{1}{2}}$

(d) None

Q62. In triangle ABC , $\angle A = 90$ then find :

त्रिभुज ABC में , $\angle A = 90$, तो ज्ञात कीजिये :

(a) $\sin^2 A + \sin^2 B + \sin^2 C$

(b) $\cos^2 A + \cos^2 B + \cos^2 C$

Q63. If A+B+C = 180 then find tanA + tanB + tanC ?

(a) tanAtanBtanC (b) cotAcotBcotC

(c) sinAsinBsinC (d) None

Q64. If A+B+C = 180 then find :

cotA cotB + cotB cotC + cotC cotA

(a) 0

(b) 1

(c) $\sqrt{3}$

(d) None

Q65. If cosx + cosy = 2 then find sinx + siny ?

(a) 0 (b) 2

(c) 1 (d) None

Q66. cos10cos30cos50cos 70 ?

(a) 3/8

(b) 3/16

(c) 5/8

(d) None

Q67. sin10sin50sin30sin70 ?

(a) 5/8

(b) 1/8

(c) 7/8

(d) None

Q68. Find :
cos12cos24cos36cos48cos60cos72cos84

if cos36 = $\frac{\sqrt{5}+1}{4}$ & sin 18 = $\frac{\sqrt{5}-1}{4}$

(a) 1/64 **(b) 1/128**

(c) 1/32 **(d) None**

Q70. Solve: sin12sin48sin54

(a) 1/4

(b) 1/8

(c) 1/16

(d) None

Q71. In a triangle XYZ , $\angle Y = 90^\circ$, XZ-YZ = 2
XY= $2\sqrt{6}$ find secx + tanx ?

त्रिभुज XYZ में $\angle Y = 90^\circ$, XZ-YZ = 2 XY= $2\sqrt{6}$,
तो secx + tanx ज्ञात करे ?

(a) $\sqrt{6}$ (b) 6

(c) $1/\sqrt{6}$ (d) None

Q72. If $\sec\theta = a + \frac{1}{4A}$ then find $\tan\theta + \sec\theta$

(a) a

(b) 2a

(c) 3a

(d)4a

Q73. If $1+\sin\theta + \sin^2\theta + \sin^3\theta + \ldots\infty = 4 + 2\sqrt{3}$ where $(0<\theta< 90^\circ)$ find θ ?

(a) 30°

(b) 60°

(c) 45°

(d) None

Q74. If $\tan^5\theta + \cot^5\theta = 2525$ then find $\sec\theta\operatorname{cosec}\theta$?

(a) 4

(b) 5

(c) 3

(d) None

Q75. If $\cos A + \cos^2 A = 1$ then find $\sin^2 A + \sin^4 A$

(a) 0

(b) 1

(c) 2

(d) None


Maxima
&
Minima

Q76. Find maximum and minimum value of :

$$15 \sin^2\theta + 10 \cos^2\theta$$

Q77. Find maximum and minimum value of :

$$12 \sin^2\theta + 17 \cos^2\theta$$

Q78. Find maximum and minimum value of :

$\sin^2\theta + \cos^2\theta$

Q79. Find maximum and minimum value of :

$\sin^4\theta + \cos^4\theta$

Q80. Find maximum and minimum value of :

$\sin^6\theta + \cos^6\theta$

Q81. Find maximum value of :

$\sin^8\theta + \cos^{14}\theta$

Q82. Find maximum value of :

$\sin^{88}\theta + \cos^{114}\theta$

Q83. Find maximum and minimum value of :

$$5\sin\theta + 4\cos\theta$$

Q84. Find maximum and minimum value of :

$$8\sin\theta + 15\cos\theta$$

Q85. Find maximum and minimum value of :

$\sin\theta + \cos\theta$

Q86. Find maximum and minimum value of :

$$\sin\left(\frac{\theta+\pi}{6}\right) + \cos\left(\frac{\theta+\pi}{6}\right)$$

Q87. Find maximum and minimum value of :

$27^{\sin x} \times 81^{\cos x}$

Q88. Find minimum value of :

$9\tan^2\theta + 25\cot^2\theta$

Q89. Find minimum value of :

$4 \sin^2\theta + 10 \operatorname{cosec}^2\theta$

Q90. Find minimum value of :

$$\sin^2\theta + \text{cosec}^2\theta + \cos^2\theta + \sec^2\theta + \tan^2\theta + \cot^2\theta$$