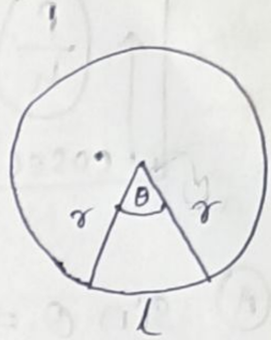
Trigonometry :→

1 degree = 60 mins (60′)

1 min = 60 secs (60″)

1 degree = 3600 secs. (3600″)



$$\boxed{\theta^c = \frac{l}{r}}$$

$$\boxed{1 \text{ straight angle} = \frac{\pi r}{r} = \pi^c}$$

$$\pi^c = 180^\circ$$

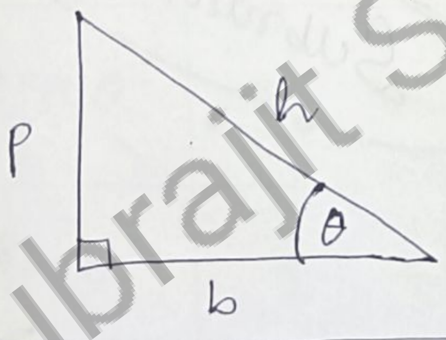
$$1^c = \left(\frac{180}{\pi}\right)^\circ$$

$$1^\circ = \left(\frac{\pi}{180}\right)^c$$

$$\boxed{1^c = \left(\frac{180}{\pi}\right)^\circ = 57^\circ 16' 22''}$$

Subrajit sir

#



$$\boxed{p^2 + b^2 = h^2}$$

$\sin\theta = \frac{p}{h}$, $\operatorname{cosec}\theta = \frac{h}{p}$.

$\cos\theta = \frac{b}{h}$. , $\sec\theta = \frac{h}{b}$.

$\tan\theta = \frac{p}{b}$. , $\cot\theta = \frac{b}{p}$.

$\sin\theta$	$\cos\theta$	$\tan\theta$
$\frac{p}{h}$	$\frac{b}{h}$	$\frac{p}{b}$
$\operatorname{cosec}\theta$	$\sec\theta$	$\cot\theta$.

(A) $\sin\theta = \frac{1}{\operatorname{cosec}\theta}$ $\boxed{\text{or}}$ $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$

so $\boxed{\sin\theta \times \operatorname{cosec}\theta = 1}$

(B) $\cos\theta = \frac{1}{\sec\theta}$ $\boxed{\text{or}}$ $\sec\theta = \frac{1}{\cos\theta}$

so $\boxed{\cos\theta \times \sec\theta = 1}$

(C) $\tan\theta = \frac{1}{\cot\theta}$ $\boxed{\text{or}}$ $\cot\theta = \frac{1}{\tan\theta}$

so $\boxed{\tan\theta \times \cot\theta = 1}$

Subrajit Sir

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\tan\theta = \sin\theta \times \sec\theta$.

$\cot\theta = \frac{\cos\theta}{\sin\theta}$

$\cot\theta = \cos\theta \times \operatorname{cosec}\theta$.

Value of T-Ratios :→

	0°	30°	45°	60°	90°
$\sin\theta \longrightarrow$	$\sqrt{\frac{0}{4}}$	$\sqrt{\frac{1}{4}}$	$\sqrt{\frac{2}{4}}$	$\sqrt{\frac{3}{4}}$	$\sqrt{\frac{4}{4}}$
$\cos\theta \longrightarrow$	$\sqrt{\frac{4}{4}}$	$\sqrt{\frac{3}{4}}$	$\sqrt{\frac{2}{4}}$	$\sqrt{\frac{1}{4}}$	$\sqrt{\frac{0}{4}}$

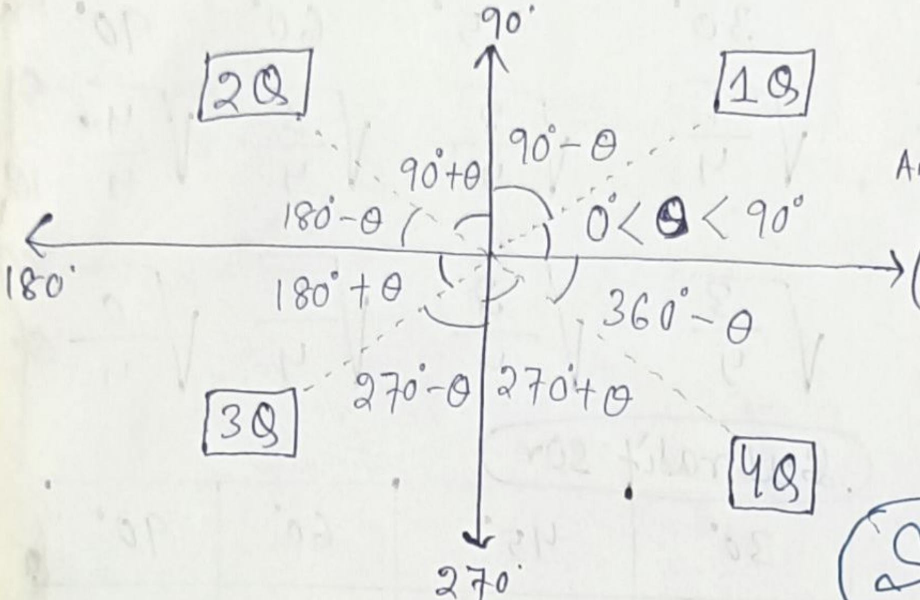
Subrajit Sir

θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞
$\mathrm{cosec}\,\theta$	∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞
$\cot\theta$	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

→ From $(0-90^\circ)$, $\sin\theta$ increasing nature
$\cos\theta$ decreasing nature
$\tan\theta$ increasing nature.

→ Before 45°, $\sin\theta < \cos\theta$.
At 45°, $\sin\theta = \cos\theta$.
from 45° to 90°, $\sin\theta > \cos\theta$.

Sign convention :→



Angle

Clockwise → −ve
Anticlockwise → +ve.

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Add	Sugar	to	coffee
1Q	2Q	3Q	4Q
(All +ve)	(sin/cosec +ve)	(tan/cot +ve)	(cos/sec +ve)

→ Remaining are −ve in 2nd, 3rd & 4th Quadrant.

Quadrant	sin	cos	tan	cot	sec	cosec
1Q (0−90)	+	+	+	+	+	+
2Q (90−180)	+	−	−	−	−	+
3Q (180−270)	−	−	+	+	−	−
4Q (270−360)	−	+	−	−	+	−

Conversion Rule (θ must be acute angle) :→

$\sin(-\theta) = -\sin\theta$	$\mathrm{cosec}(-\theta) = -\mathrm{cosec}\theta$
$\cos(-\theta) = \cos\theta$	$\sec(-\theta) = \sec\theta$
$\tan(-\theta) = -\tan\theta$	$\cot(-\theta) = -\cot\theta$

* $\sin(90-\theta) = \cos\theta$
$\cos(90-\theta) = \sin\theta$
$\tan(90-\theta) = \cot\theta$
$\cot(90-\theta) = \tan\theta$
$\sec(90-\theta) = \operatorname{cosec}\theta$
$\operatorname{cosec}(90-\theta) = \sec\theta$

complementary Rule

(since all are lie in 1Q so all are +ve)

change

$\sin(90+\theta) = \cos\theta$
$\cos(90+\theta) = -\sin\theta$
$\tan(90+\theta) = -\cot\theta$
$\cot(90+\theta) = -\tan\theta$
$\sec(90+\theta) = -\operatorname{cosec}\theta$
$\operatorname{cosec}(90+\theta) = \sec\theta$

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* $\sin(180-\theta) = \sin\theta$
$\cos(180-\theta) = -\cos\theta$
$\tan(180-\theta) = -\tan\theta$
$\cot(180-\theta) = -\cot\theta$
$\sec(180-\theta) = -\sec\theta$
$\operatorname{cosec}(180-\theta) = \operatorname{cosec}\theta$

$\sin(180+\theta) = -\sin\theta$
$\cos(180+\theta) = -\cos\theta$
$\tan(180+\theta) = \tan\theta$
$\cot(180+\theta) = \cot\theta$
$\sec(180+\theta) = -\sec\theta$
$\operatorname{cosec}(180+\theta) = -\operatorname{cosec}\theta$

* $\sin(270+\theta) = -\cos\theta$
$\cos(270+\theta) = \sin\theta$
$\tan(270+\theta) = -\cot\theta$
$\cot(270+\theta) = -\tan\theta$
$\sec(270+\theta) = \operatorname{cosec}\theta$
$\operatorname{cosec}(270+\theta) = -\sec\theta$

change

$\sin(270-\theta) = -\cos\theta$
$\cos(270-\theta) = -\sin\theta$
$\tan(270-\theta) = \cot\theta$
$\cot(270-\theta) = \tan\theta$
$\sec(270-\theta) = -\operatorname{cosec}\theta$
$\operatorname{cosec}(270-\theta) = -\sec\theta$

* $\sin(360-\theta) = -\sin\theta$
$\cos(360-\theta) = \cos\theta$
$\tan(360-\theta) = -\tan\theta$
$\cot(360-\theta) = -\cot\theta$
$\sec(360-\theta) = \sec\theta$
$\operatorname{cosec}(360-\theta) = -\operatorname{cosec}\theta$

$\sin(360+\theta) = \sin\theta$
$\cos(360+\theta) = \cos\theta$
$\tan(360+\theta) = \tan\theta$
$\cot(360+\theta) = \cot\theta$
$\sec(360+\theta) = \sec\theta$
$\operatorname{cosec}(360+\theta) = \operatorname{cosec}\theta$

Identities :→

* $\sin^2\theta + \cos^2\theta = 1$

$\left\{\sin^n\theta = (\sin\theta)^n\right\}$

$\sin^2\theta = 1 - \cos^2\theta$

$= (1+\cos\theta)(1-\cos\theta)$

$\sin\theta = \sqrt{1-\cos^2\theta}$

$\boxed{\cos^2\theta - \sin^2\theta = (2\cos^2\theta - 1) \text{ or } (1 - 2\sin^2\theta)}$

$\cos^2\theta = 1 - \sin^2\theta$

$= (1+\sin\theta)(1-\sin\theta)$

$\cos\theta = \sqrt{1-\sin^2\theta}$

Subrajit Sir

* $1 + \tan^2\theta = \sec^2\theta$

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

$\sec\theta = \sqrt{1+\tan^2\theta}$

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

$\tan^2\theta = (\sec\theta + 1)(\sec\theta - 1)$

$\tan\theta = \sqrt{\sec^2\theta - 1}$

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

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

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

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

* $1 + \cot^2\theta = \mathrm{cosec}^2\theta$

$\boxed{\cot^2\theta + \mathrm{cosec}^2\theta = 1 + 2\cot^2\theta = 2\mathrm{cosec}^2\theta - 1}$

$\mathrm{cosec}\,\theta = \sqrt{1+\cot^2\theta}$

$\cot^2\theta = \mathrm{cosec}^2\theta - 1$

$\cot^2\theta = (\mathrm{cosec}\,\theta + 1)(\mathrm{cosec}\,\theta - 1)$

$\cot\theta = \sqrt{\operatorname{cosec}^2\theta - 1}$

$\operatorname{cosec}^2\theta - \cot^2\theta = 1$

$(\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta) = 1$

$(\operatorname{cosec}\theta + \cot\theta) = \dfrac{1}{(\operatorname{cosec}\theta - \cot\theta)}$

$(\operatorname{cosec}\theta - \cot\theta) = \dfrac{1}{(\operatorname{cosec}\theta + \cot\theta)}$

Subrajit sir

Relation among T- Ratios :→

↓→	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\cot\theta$	$\sec\theta$	$\operatorname{cosec}\theta$
$\sin\theta$	$\sin\theta$	$\sqrt{1-\cos^2\theta}$	$\dfrac{\tan\theta}{\sqrt{1+\tan^2\theta}}$	$\dfrac{1}{\sqrt{1+\cot^2\theta}}$	$\dfrac{\sqrt{\sec^2\theta-1}}{\sec\theta}$	$\dfrac{1}{\operatorname{cosec}\theta}$
$\cos\theta$	$\sqrt{1-\sin^2\theta}$	$\cos\theta$	$\dfrac{1}{\sqrt{1+\tan^2\theta}}$	$\dfrac{\cot\theta}{\sqrt{1+\cot^2\theta}}$	$\dfrac{1}{\sec\theta}$	$\dfrac{\sqrt{\operatorname{cosec}^2\theta-1}}{\operatorname{cosec}\theta}$
$\tan\theta$	$\dfrac{\sin\theta}{\sqrt{1-\sin^2\theta}}$	$\dfrac{\sqrt{1-\cos^2\theta}}{\cos\theta}$	$\tan\theta$	$\dfrac{1}{\cot\theta}$	$\sqrt{\sec^2\theta-1}$	$\dfrac{1}{\sqrt{\operatorname{cosec}^2\theta-1}}$
$\sec\theta$	$\dfrac{1}{\sqrt{1-\sin^2\theta}}$	$\dfrac{1}{\cos\theta}$	$\sqrt{1+\tan^2\theta}$	$\dfrac{\sqrt{1+\cot^2\theta}}{\cot\theta}$	$\sec\theta$	$\dfrac{\operatorname{cosec}\theta}{\sqrt{\operatorname{cosec}^2\theta-1}}$
$\operatorname{cosec}\theta$	$\dfrac{1}{\sin\theta}$	$\dfrac{1}{\sqrt{1-\cos^2\theta}}$	$\dfrac{\sqrt{1+\tan^2\theta}}{\tan\theta}$	$\sqrt{1+\cot^2\theta}$	$\dfrac{\sec\theta}{\sqrt{\sec^2\theta-1}}$	$\operatorname{cosec}\theta$

Applications :→

→ If $\sin\theta + \operatorname{cosec}\theta = 2$ then $\sin^n\theta + \operatorname{cosec}^n\theta = 2$
(It is possible when $\theta = 90°$)

→ If $\cos\theta + \sec\theta = 2$ then $\cos^n\theta + \sec^n\theta = 2$
(It is possible when $\theta = 0°$)

→ If $\tan\theta + \cot\theta = 2$ then $\tan^n\theta + \cot^n\theta = 2$
(It is possible when $\theta = 45°$)

→ If $\sin\theta + \operatorname{cosec}\theta = \sqrt{3}$ then $\sin^3\theta + \operatorname{cosec}^3\theta = 0$
so $\sin^6\theta + 1 = 0$ $\boxed{\text{or}}$ $\sin^6\theta = -1$

→ If $\cos\theta + \sec\theta = \sqrt{3}$ then $\cos^3\theta + \sec^3\theta = 0$
so $\cos^6\theta = -1$ $\boxed{\text{or}}$ $\cos^6\theta + 1 = 0$

→ If $\tan\theta + \cot\theta = \sqrt{3}$ then $\tan^3\theta + \cot^3\theta = 0$
so $\tan^6\theta + 1 = 0$ $\boxed{\text{or}}$ $\tan^6\theta = -1$

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

$\operatorname{cosec}^4\theta - \cot^4\theta = \operatorname{cosec}^2\theta + \cot^2\theta$

$\operatorname{cosec}^4\theta - \operatorname{cosec}^2\theta = \cot^2\theta + \cot^4\theta$

$\sec^4\theta - \tan^4\theta = \sec^2\theta + \tan^2\theta$

$\sec^4\theta - \sec^2\theta = \tan^2\theta + \tan^4\theta$

$\sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta\cos^2\theta$

$\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$

$(\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2 = 2.$

$\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} = \sec\theta + \tan\theta$

$\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

$\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} = 2\sec\theta$

$\sqrt{\dfrac{1+\sin\theta}{1-\sin\theta}} - \sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}} = 2\tan\theta$

$\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}} + \sqrt{\dfrac{1-\cos\theta}{1+\cos\theta}} = 2\operatorname{cosec}\theta$

$\sqrt{\dfrac{1+\cos\theta}{1-\cos\theta}} - \sqrt{\dfrac{1-\cos\theta}{1+\cos\theta}} = 2\cot\theta.$

Complementary Rule :→ Subrajit Sir

$\theta_1 + \theta_2 = 90°$ (complementary angles)

$\boxed{R_1 \rightarrow \sin(90-\theta) = \cos\theta \text{ (See previous page)}}$

→ If $x+y = 90°$ then,

$\sin x = \cos y$

$\tan x = \cot y$

$\sec x = \operatorname{cosec} y$ and vice-versa.

→ If $x+y = 90°$ then,

$\sin^2 x + \sin^2 y = 1$

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

$\sec^2 x - \cot^2 y = 1$

$\operatorname{cosec}^2 x - \tan^2 y = 1$ and vice-versa.

→ If $x + y = 90°$ then

$\sin x \times \sec y = 1$

$\cos x \times \operatorname{cosec} y = 1$

$\tan x \times \tan y = 1$

$\cot x \times \cot y = 1$ and vice versa.

Elemination of θ :→

* If $a\sin\theta + b\cos\theta = c$, 1st check the relation among a^2, b^2 and c^2, If $a^2+b^2=c^2$ then a = perpendicular (as multiplied to $\sin\theta$), b = base (as multiplied to $\cos\theta$) and c = hypotenuse. → (sometimes if it is not possible then divide $\cos\theta$ & $\sin\theta$, to get $\tan\theta$ & $\cot\theta$ Respectively)

If $x = a\sin\theta$ and $y = a\cos\theta$ then

$$\boxed{x^2+y^2=a^2}$$

If $x = a\cos\theta + b\sin\theta$

$y = a\sin\theta - b\cos\theta$

Subrajit Sir

[or] $x = a\sin\theta + b\cos\theta$

$y = a\cos\theta - b\sin\theta$

then $\boxed{x^2+y^2 = a^2+b^2}$ {squaring and adding both the sides}

If $x\sec\theta + y\tan\theta = p$ and

$x\tan\theta + y\sec\theta = q$ then,

$$\boxed{x^2-y^2 = p^2-q^2}$$

If $a\operatorname{cosec}\theta + b\cot\theta = p$ and

$a\cot\theta + b\operatorname{cosec}\theta = q$ then,

$$\boxed{a^2-b^2 = p^2-q^2}$$

If $\tan\theta + \sin\theta = m$ and
$\tan\theta - \sin\theta = n$ then,
$$\boxed{m^2 - n^2 = 4\sqrt{mn}}$$

If $\cot\theta + \cos\theta = m$ and
$\cot\theta - \cos\theta = n$ then,
$$\boxed{m^2 - n^2 = 4\sqrt{mn}}$$

Subrajit Sir

Compound angle $(A > B)$:→

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

multiple angle :→

$\sin 2A = 2\sin A \cos A$

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

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$= 1 - 2\sin^2 A$$

$$= 2\cos^2 A - 1$$

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

$$\boxed{\sin^2\theta = \frac{1-\cos 2\theta}{2}}$$

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

$$\boxed{\tan A = \frac{1-\cos 2A}{\sin 2A}}$$

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

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

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

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

$\sin\theta \sin 2\theta \sin 4\theta = \frac{1}{4}\sin 3\theta$

$$\cos\theta \cos 2\theta \cos 4\theta = \frac{1}{4}\cos 3\theta$$

$$\tan\theta \tan 2\theta \tan 4\theta = \tan 3\theta$$

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

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

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

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

Maximum and minimum value:-

For any angle

$-1 \le \sin\theta \le 1$

$0 \le \sin^2\theta \le 1$

$-1 \le \cos\theta \le 1$

$0 \le \cos^2\theta \le 1$

$-\infty < \tan\theta < \infty$

$-\infty < \cot\theta < \infty$

$-1 \le \operatorname{cosec}\theta < \infty$

$\boxed{\text{or}}$ $-\infty < \operatorname{cosec}\theta \le -1$

$-\infty < \sec\theta \le -1$

$\boxed{\text{or}}$ $1 \le \sec\theta < \infty$

For acute angle

$0 \le \sin\theta \le 1$

$0 \le \cos\theta \le 1$

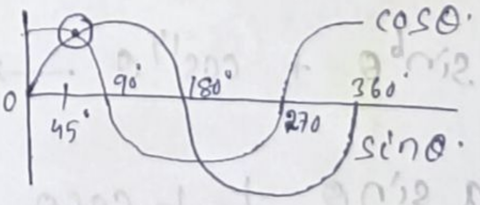
$0 \le \tan\theta < \infty$

$0 < \cot\theta < \infty$

$1 \le \sec\theta \le \infty$

$1 \le \operatorname{cosec}\theta \le \infty$.

Subrajit Sir



For acute angle,

$\sin\theta\cos\theta$ — $\frac{1}{2}$ (max) $\{\theta = 45°\}$
— 0 (min) $\{\theta = 0°/90°\}$.

For any angle

$\sin\theta\cos\theta$ — $\frac{1}{2}$ (max) $\{\theta = 45°\}$
— $-\frac{1}{2}$ (min)

* $\sin^2\theta \cos^2\theta$ — $\frac{1}{4}$ (max)
  — 0 (min)

→ what ever the power of sin and cos except 2, the maximum value will be 1 and the minimum value cannot be determined due to decreasing order, and $0 \leq \theta \leq 90°$.

→ in any expression $\sin^n\theta + \cos^n\theta$, $n \geq 2$ and $0 \leq \theta \leq 90°$ then its maximum value will be 1.

→ in any expression if there is either of $\tan\theta$, $\cot\theta$, $\sec\theta$ and $\csc\theta$ present, we cannot find out their maximum values.

* $\sin^2\theta + \cos^4\theta$
  $\cos^2\theta + \sin^4\theta$ — max value = 1
  — min value = $\frac{3}{4}$.

* $\sin^4\theta + \cos^4\theta$ — 1 (max)
  — $\frac{1}{2}$ (min)

Subrajit sir

* $\sin^6\theta + \cos^6\theta$ — 1 (max)
  — $\frac{1}{4}$ (min)

* $\sin^6\theta + \cos^{14}\theta$ ⟶ max value = 1.

* $a\sin\theta \pm b\cos\theta$ — max value = $\sqrt{a^2+b^2}$
  — min value = $-\sqrt{a^2+b^2}$

* $a\sin^2\theta + b\cos^2\theta$

  Or

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

  (where $a \neq b$)

  } maximum value is the greater value between a & b and minimum value is the smaller value between a and b.

* $a\sin^2\theta - b\cos^2\theta$ $\boxed{or}$ $a\cos^2\theta - b\sin^2\theta$ } max value = (+ve value)
min value = (−ve value)

* $a\sin^2\theta + b\,\mathrm{cosec}^2\theta$
$a\cos^2\theta + b\sec^2\theta$
$a\tan^2\theta + b\cot^2\theta$
(where $a \neq b$)

→ max value can not be determined.
→ min value $= 2\sqrt{ab}$.
$\boxed{or}$ $= (a+b)$

minimum value = ① $2\sqrt{ab}$ (where ab is a perfect sq)
② $(a+b)$ {where ab is not a perfect sq)

* $a\sec^2\theta + b\,\mathrm{cosec}^2\theta$.

Subrajit sir

minimum value:→

① $(a+b) + 2\sqrt{ab}$ (If ab is a perfect square)

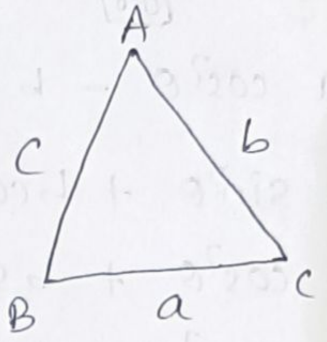
② $2(a+b)$ {If ab is not a perfect square}.

* $m\sin\theta \pm n\sin\theta$, max value $= \sqrt{m^2+n^2}$

* $m\cos\theta \pm n\cos\theta$, max value $= \sqrt{m^2+n^2}$

HEIGHT & Distance

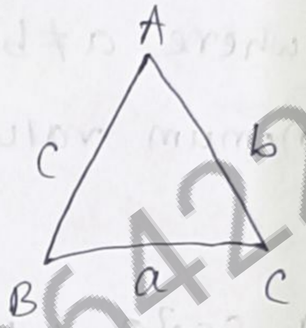
Sine Rule :→



$BC : AC : AB = \sin A : \sin B : \sin C$

$a : b : c = \sin A : \sin B : \sin C$

cosine Rule :→



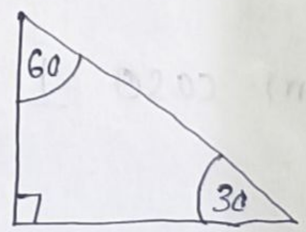
$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos B = \frac{c^2 + a^2 - b^2}{2ac}$$

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}.$$

For Right angled triangle :→.

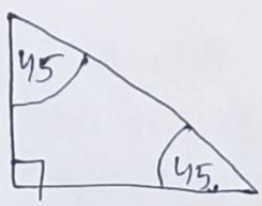
* from figure 1 ;



(fig - 1)

$30° = 1$ unit
$60° = \sqrt{3}$ unit
$90° = 2$ unit.

* from figure 2 ;

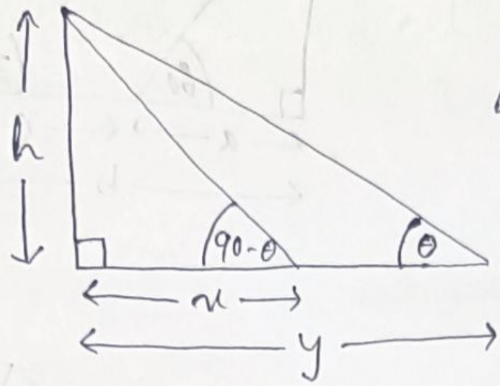


(fig - 2)

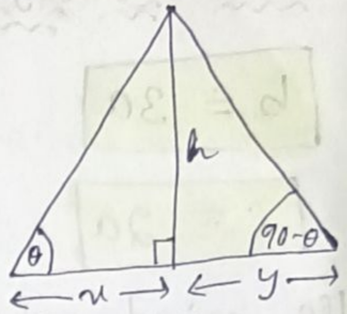
$45° = 1$ unit
$90° = \sqrt{2}$ unit.

Special cases :→

(A)



Or



from above two figures,

$$\boxed{h^2 = xy} \quad \text{or} \quad \boxed{h = \sqrt{xy}}$$

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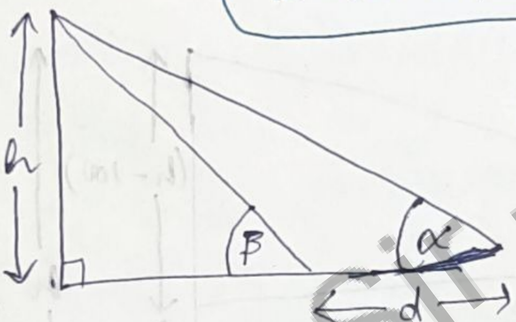
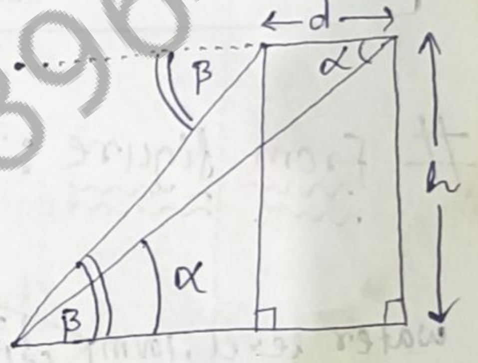
(B)



Also



from above two figures, $\boxed{h = \dfrac{d}{\cot\alpha - \cot\beta}}$

(C) from the figure,

$$\boxed{(x+y) = d(\sec\theta + \tan\theta)}$$