TRIGONOMETRY

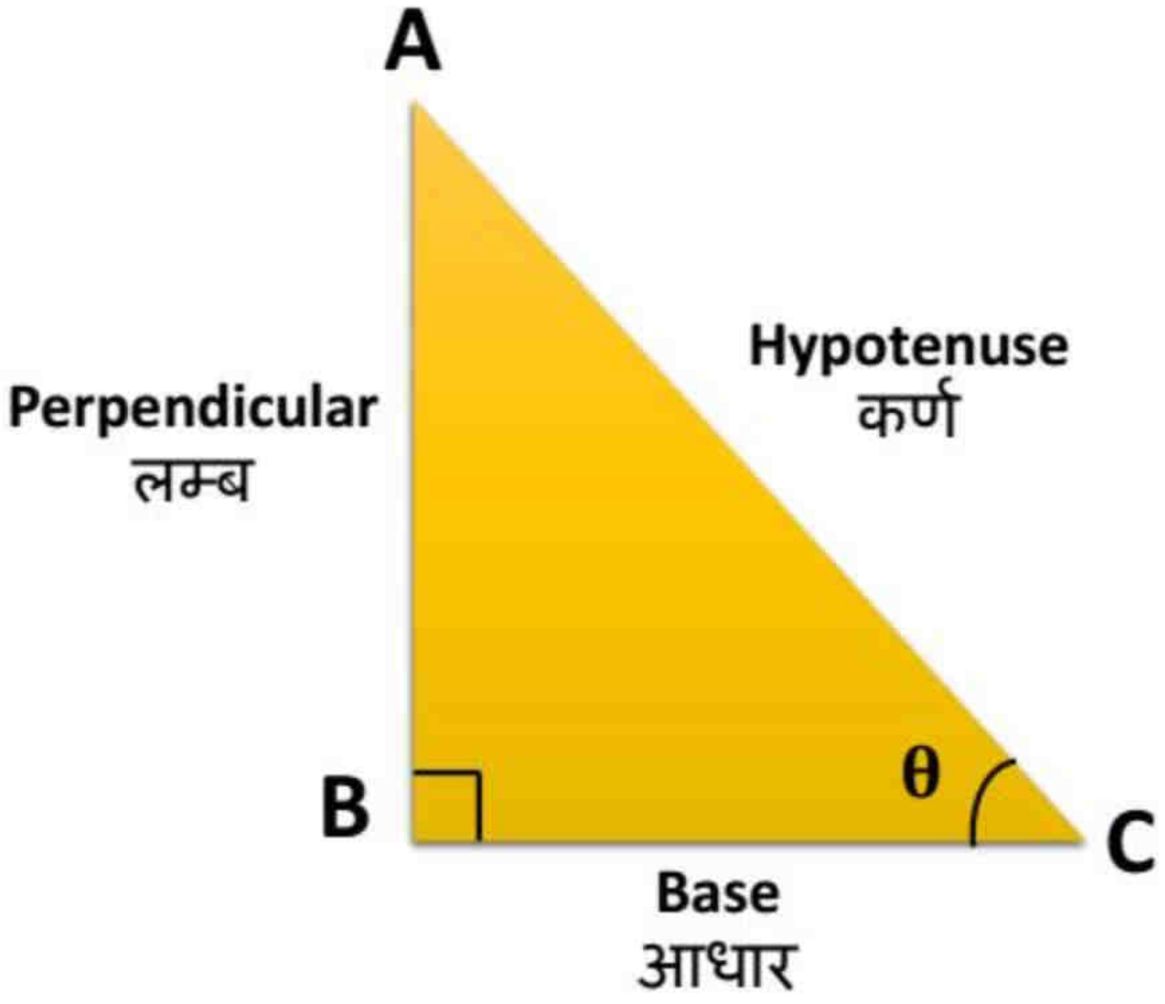
SHEET 01

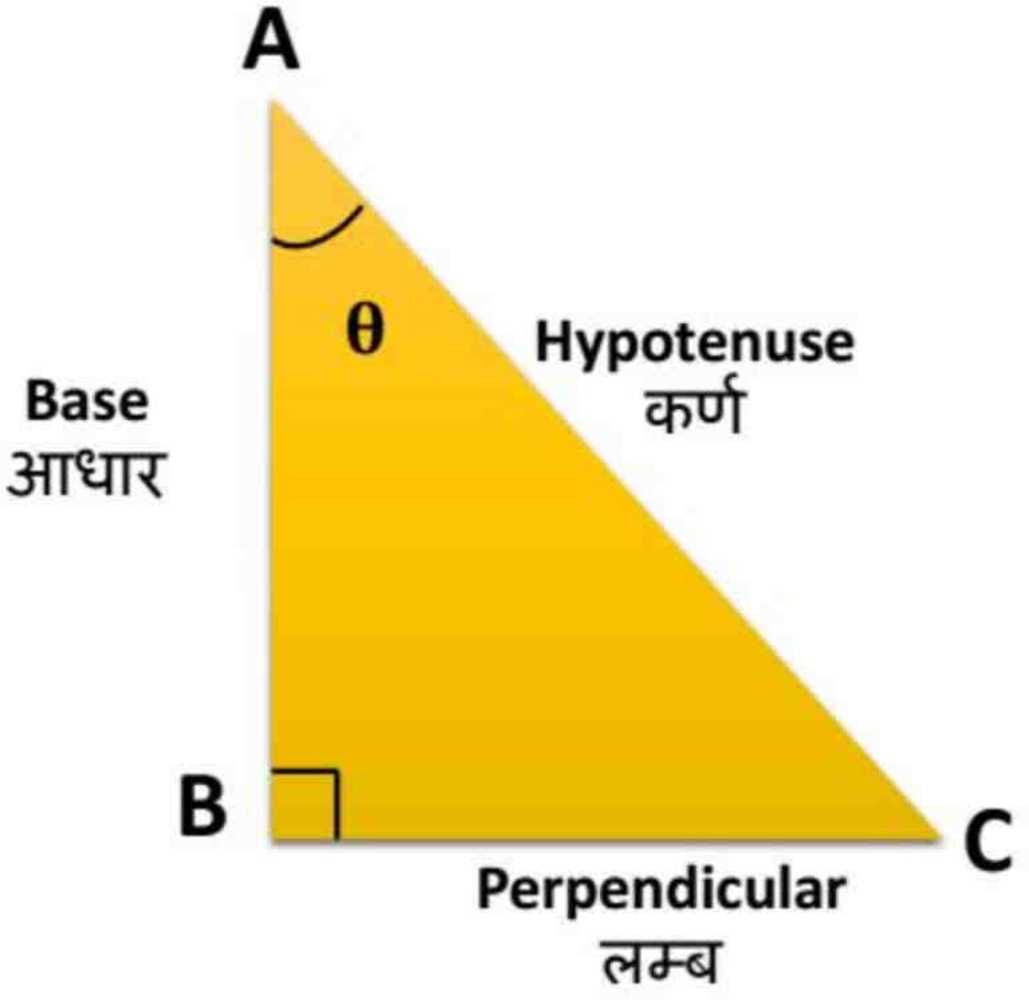
Trigonometric Ratios; Basic Concepts, Pythagoras Theorem

Pre → (2)

Mains → (6-8)

CONCEPT OF BASE AND PERPENDICULAR





HOW MANY TRIGONOMETRIC RATIOS ARE THERE?

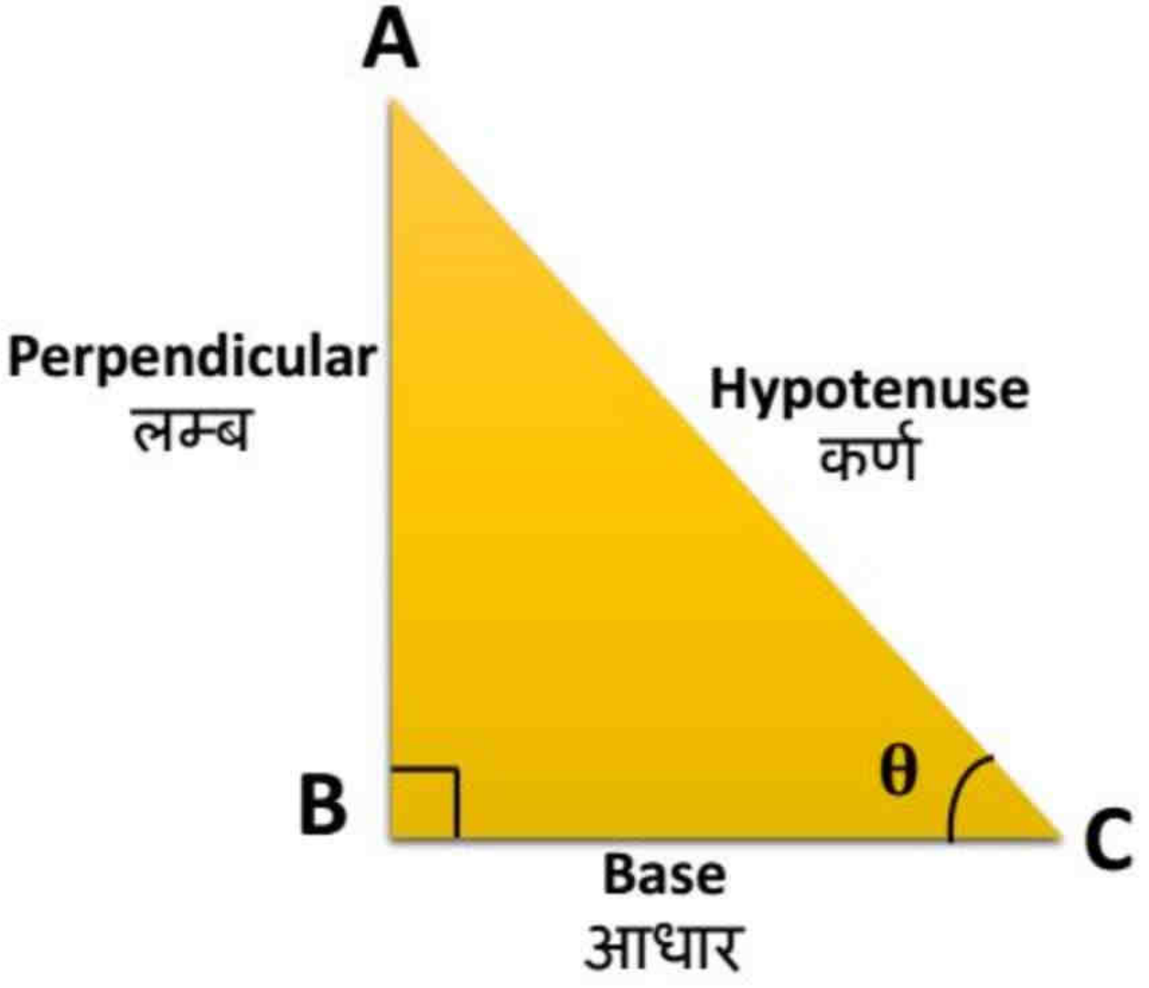
कतने त्रिकोण मतीय अनुपात होते हैं?

B → Base/आधार, P → Perpendicular/ लम्ब H → Hypotenuse/ कर्ण

(a) $\sin\theta = \frac{P}{H}$ (d) $\text{cosec}\theta = \frac{H}{P}$

(b) $\cos\theta = \frac{B}{H}$ (e) $\sec\theta = \frac{H}{B}$

(c) $\tan\theta = \frac{P}{B}$ (f) $\cot\theta = \frac{B}{P}$



* $\sin\theta = \frac{P}{H}$

* $\cos\theta = \frac{B}{H}$

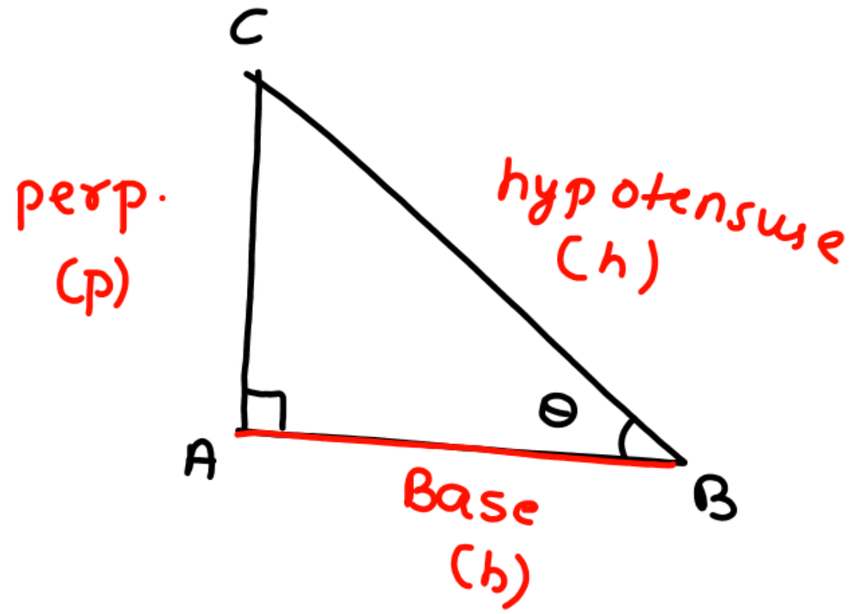
* $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{P}{B}$

$\operatorname{cosec}\theta = \frac{H}{P}$

$\sec\theta = \frac{H}{B}$

$\cot\theta = \frac{B}{P}$

$\frac{P}{H}$ $\frac{B}{H}$ $\frac{P}{B}$



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

* $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$

* $\sec\theta = \frac{1}{\cos\theta}$

* $\cot\theta = \frac{1}{\tan\theta}$

Note: It should be noted that (यह ध्यान दिया जाना चाहिए क):

sin θ is an abbreviation for "sine of angle θ", it is not the product of sin and θ.

sin ≅ "कोण ≅ के ज्या" का सं क्षप्त नाम है, यह **sin** और ≅ का गुणनफल नहीं है।

And $\boldsymbol{\sin^2\theta = (\sin\theta)^2, \sin^3\theta = (\sin\theta)^3, \cos^3\theta = (\cos\theta)^3, etc.}$

$$\text{cosec}\theta = \left(\frac{1}{\sin\theta}\right)$$

$$sec\theta = \left(\frac{1}{\cos\theta}\right)$$

$$\cot\theta = \left(\frac{1}{\tan\theta}\right)$$

$(\sin\theta)^2 = \sin^2\theta^2$

$= \sin^2\theta$

$\sin^3\theta$

* $\sin\theta = \frac{P}{H} = \frac{3}{5}$

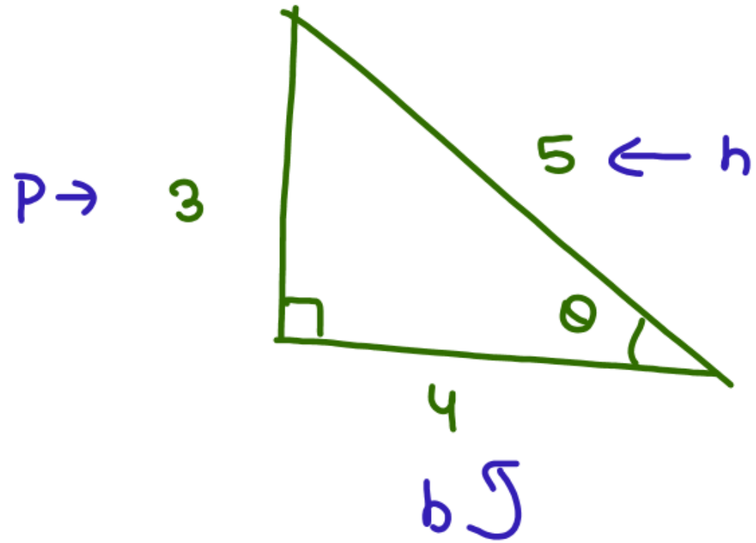
* $\cos\theta = \frac{B}{H} = \frac{4}{5}$

* $\tan\theta = \frac{P}{B} = \frac{3}{4}$

* $\text{cosec}\,\theta = \frac{H}{P} = \frac{5}{3}$

* $\sec\theta = \frac{H}{B} = \frac{5}{4}$

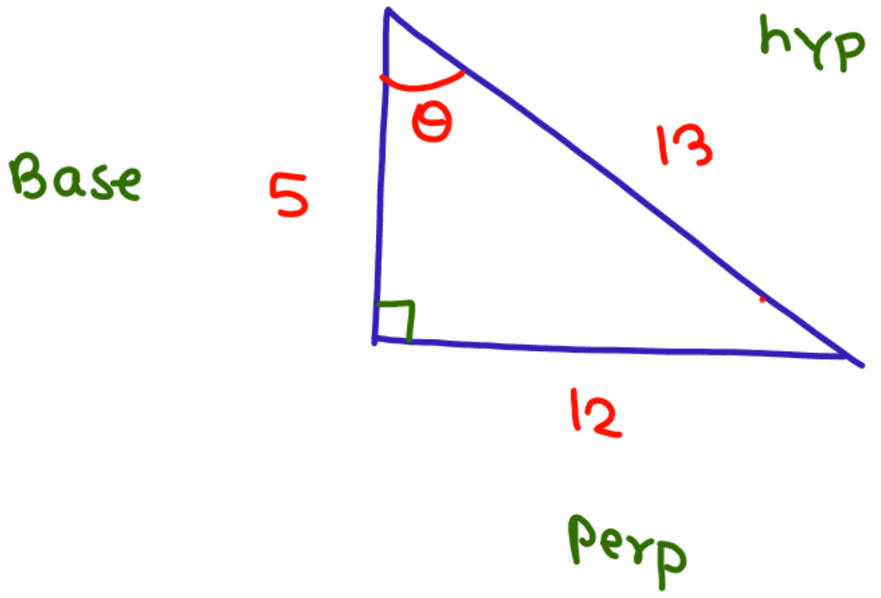
* $\cot\theta = \frac{B}{P} = \frac{4}{3}$



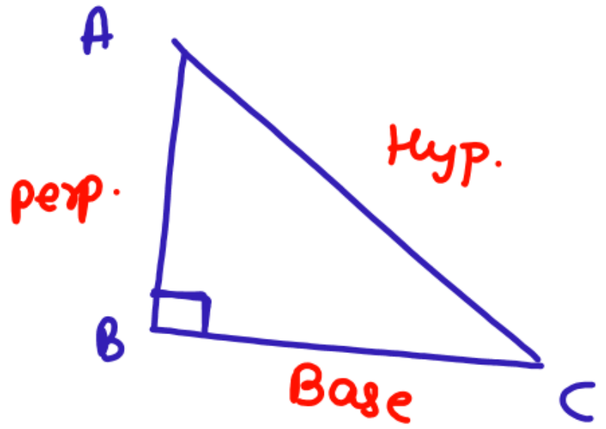
$$\sin\theta = \frac{P}{H} = \frac{12}{13}$$

$$\cos\theta = \frac{B}{H} = \frac{5}{13}$$

$$\tan\theta = \frac{P}{B} = \frac{12}{5}$$



Pythagoras Theorem



$$(\text{Perp.})^2 + (\text{Base})^2 = (\text{Hyp.})^2$$

$$\Rightarrow \quad AB^2 + BC^2 = AC^2$$

Pythagorean Triplet

3, 4, 5 ✓

6, 8, 10 ✓

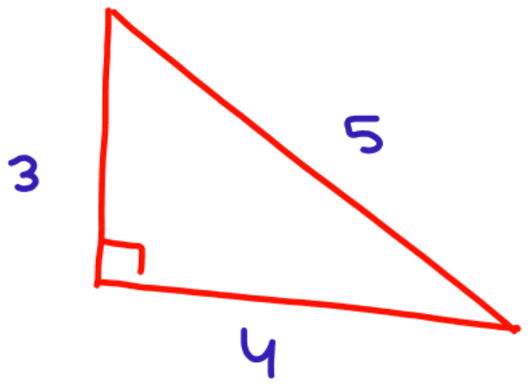
9, 12, 15

5, 12, 13

7, 24, 25

9, 40, 41

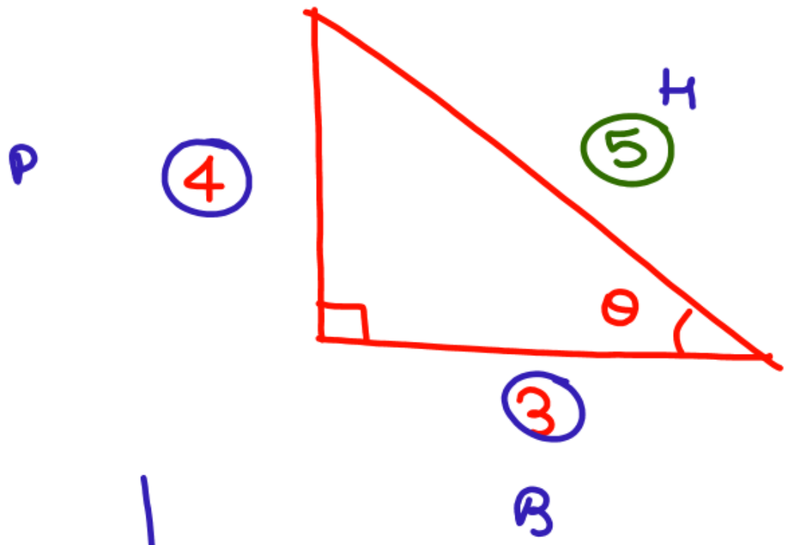
8, 15, 17



$3^2 + 4^2 = 25$

$5^2 = 25$

$\sin\theta = \frac{P}{H} = \frac{4}{5}$



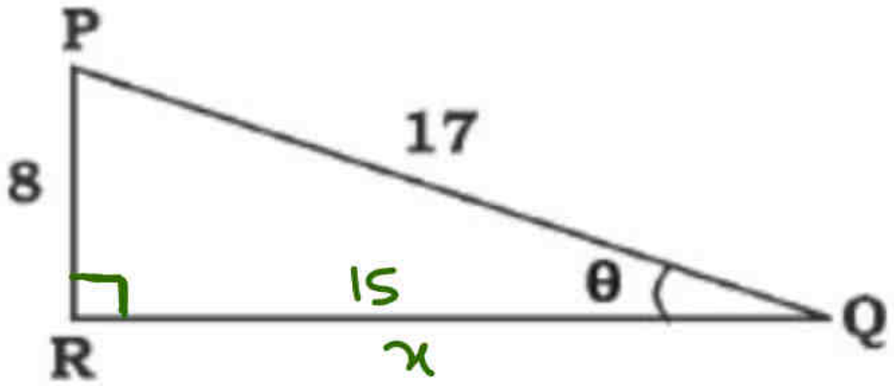
$P^2 + B^2 = H^2$

$4^2 + 3^2 = H^2$

$25 = H^2$

$5 = H$

3, 4, 5



1. In the given figure, what is the value of $\cot\theta$?

SSC CGL 3 March 2020 (Evening)

(a) $\frac{8}{15}$

(b) $\frac{17}{18}$

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

(d) $\frac{15}{8}$

$8^2+x^2=17^2$

$x^2=17^2-8^2$

$x^2=(17-8)(17+8)$

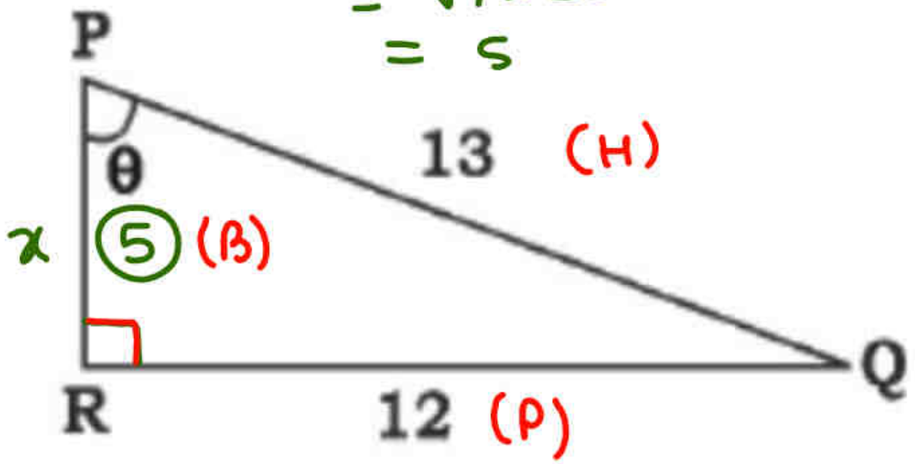
$x^2=9\times25$

$x=3\times5$

$x = \sqrt{13^2 - 12^2}$

$= \sqrt{1 \times 25}$

$= 5$



2. In the given figure, $\cos\theta$ is equal to :

SSC CGL 7 March 2020 (Afternoon)

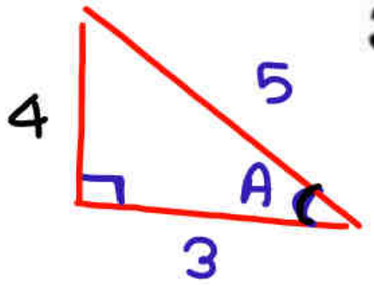
(a) $\frac{5}{13}$

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

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

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

$\cos\theta = \frac{B}{H} = \frac{5}{13}$



3. If sec A = $\frac{5}{3}$, then what is the value of cot A?

CHSL 19/10/2020 (Evening)

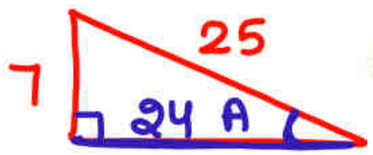
$\cot A = \frac{B}{P} = \frac{3}{4}$

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

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

(c) $\frac{4}{5}$

(d) $\frac{3}{5}$



4. If cosecA = $\frac{25}{7}$ ($\frac{H}{P}$), then what is the value of tanA?

CHSL 17/03/2020 (Afternoon)

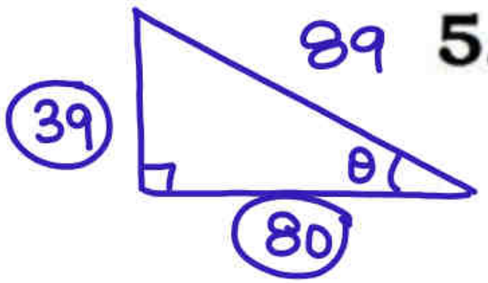
$\tan A = \frac{P}{B} = \frac{7}{24}$

(a) $\frac{7}{24}$

(b) $\frac{25}{24}$

(c) $\frac{7}{25}$

(d) $\frac{24}{25}$



5. If $\cot\theta = \frac{80}{39}$, then find the value of $\text{cosec}\,\theta$.

CHSL 17/03/2020 (Evening)

$\text{Cosec}\theta = \frac{89}{39}$

(a) $\frac{39}{80}$

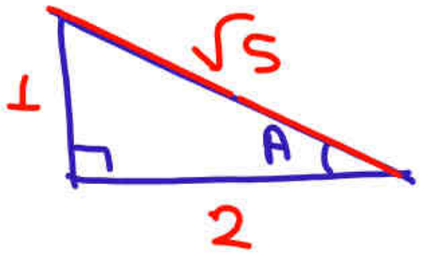
(b) $\frac{89}{39}$

(c) $\frac{39}{89}$

(d) $\frac{80}{39}$

$\frac{1}{2} = \frac{\sin A}{\cos A}$

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



$\text{Cosec}\, A = \frac{\sqrt{5}}{1}$

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

6. If cos A = 2 sin A, then cosec A is equal to:

CHSL 19/10/2020 (Evening)

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

(b) $\frac{1}{\sqrt{5}}$

(c) 2

(d) $\sqrt{5}$

$(p^2 - q^2),\ 2pq,\ (p^2 + q^2)$

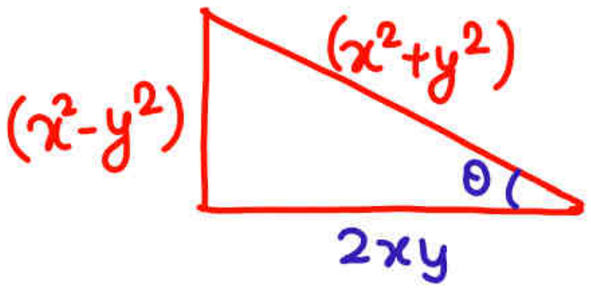
$p=2 \quad q=1$ — 3, 4, 5 ✓

$p=3 \quad q=2$ — 5, 12, 13 ✓

$p=5 \quad q=4$ — 9, 40, 41 ✓

$p=6 \quad q=5$ — 11, 60, 61

$p=5 \quad q=3$ — 16, 30, 34



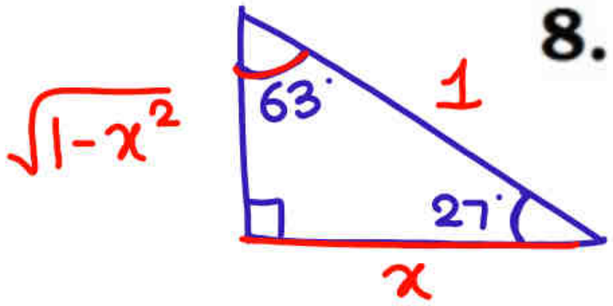
$$\tan\theta = \frac{x^2-y^2}{2xy}$$

7. **If $\text{cosec}\,\theta = \frac{H}{P} = \frac{x^2+y^2}{x^2-y^2}$, then what will be the value of $\tan\theta$?**

CHSL 16/10/2020 (Morning)

(a) $\frac{x^2-y^2}{x^2+y^2}$ **(b)** $\frac{2xy}{x^2-y^2}$

(c) $\frac{x^2-y^2}{2xy}$ **(d)** $\frac{x^2+y^2}{2xy}$



$\tan 63^\circ = \frac{P}{B} = \frac{x}{\sqrt{1-x^2}}$

8. **If $\cos 27^\circ = x$, then the value of $\tan 63^\circ$ is :**

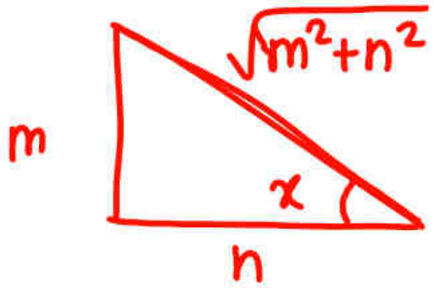
CHSL 26/10/2020 (Evening)

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

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

(c) $\frac{\sqrt{1-x^2}}{x}$

(d) $\frac{x}{\sqrt{1-x^2}}$



$\frac{P}{B}$

9. **If $\tan x = \frac{m}{n}$ and $0° \le x \le 90°$, then the value of $(\sin x + \cos x)$ is :**

CHSL 13/10/2020 (Evening)

$\frac{m}{\sqrt{m^2+n^2}} + \frac{n}{\sqrt{m^2+n^2}}$

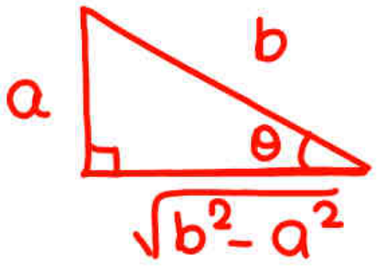
$= \frac{m+n}{\sqrt{m^2+n^2}}$

(a) $\frac{1}{\sqrt{m^2 - n^2}}$

(b) $\frac{1}{\sqrt{m^2 + n^2}}$

(c) $\frac{m+n}{\sqrt{m^2 + n^2}}$

(d) $\sqrt{m^2 - n^2}$



10. If $\operatorname{cosec}\theta = \frac{b}{a}$, then $\frac{\sqrt{3}\cot\theta + 1}{\tan\theta + \sqrt{3}}$ is equal to:

CGL-2019 Tier-II (16/10/2020)

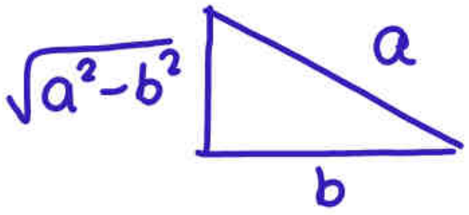
(a) $\frac{\sqrt{b^2 - a^2}}{a}$ (b) $\frac{\sqrt{a^2 + b^2}}{a}$

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

$= \frac{\sqrt{3}\cot\theta + 1}{\tan\theta + \sqrt{3}}$

$= \frac{\sqrt{3}\cot\theta + 1}{\frac{1}{\cot\theta} + \sqrt{3}}$

$= \frac{(\sqrt{3}\cot\theta + 1)}{\frac{1 + \sqrt{3}\cot\theta}{\cot\theta}} = \cot\theta = \frac{\sqrt{b^2 - a^2}}{a}$



11. If $\sec\theta = \frac{a}{b}$, $b \neq 0$, then $\frac{1-\tan^2\theta}{2-\sin^2\theta} = ?$

CGL-2019 Tier-II (15/10/2020)

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

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

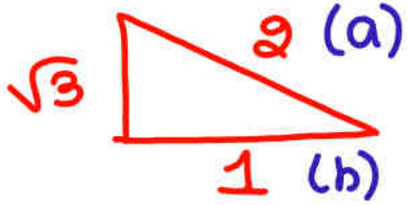
$$= \frac{1-\tan^2\theta}{2-\sin^2\theta}$$

$$= \frac{1-\left(\frac{\sqrt{a^2-b^2}}{b}\right)^2}{2-\left(\frac{\sqrt{a^2-b^2}}{a}\right)^2} = \frac{1-\frac{(a^2-b^2)}{b^2}}{2-\left(\frac{a^2-b^2}{a^2}\right)}$$

$$= \frac{b^2-(a^2-b^2)}{b^2} \Big/ \frac{2a^2-(a^2-b^2)}{a^2} = \frac{(b^2-a^2+b^2)}{b^2} \cdot \frac{a^2}{(2a^2-a^2+b^2)}$$

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

Value - Putting



11. If $\sec\theta = \frac{a}{b}$, $b \neq 0$, then $\frac{1-\tan^2\theta}{2-\sin^2\theta} = ?$

CGL-2019 Tier-II (15/10/2020)

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

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

$\frac{1-\tan^2\theta}{2-\sin^2\theta}$

$= \frac{1-(\sqrt{3})^2}{2-\left(\frac{\sqrt{3}}{2}\right)^2} = \frac{1-3}{2-\frac{3}{4}} = \frac{-2}{\frac{5}{4}}$

$= \frac{-8}{5}$

(a) $\frac{4(2+4)}{1(3)} = \frac{24}{3} = 8$ X

(c) $\frac{4(2-4)}{1\times 5} = \frac{-8}{5}$

12. If $\tan\theta = \frac{p}{q}$, then what is $\frac{p\sec\theta - q\,\mathrm{cosec}\,\theta}{p\sec\theta + q\,\mathrm{cosec}\,\theta}$ equal to :

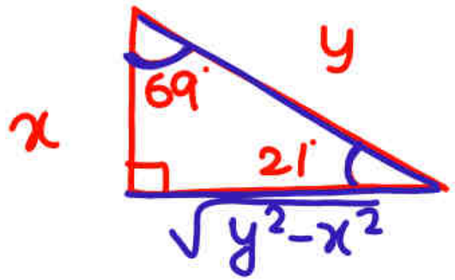
(a) $\frac{p-q}{q+p}$ (b) $\frac{q^2-p^2}{q^2+p^2}$

(c) $\frac{p^2-q^2}{q^2+p^2}$ (d) 1

$\frac{p\sec\theta - q\,\mathrm{cosec}\,\theta}{p\sec\theta + q\,\mathrm{cosec}\,\theta}$

$= \frac{p\tan\theta - q}{p\tan\theta + q} = \frac{p\times\frac{p}{q} - q}{p\times\frac{p}{q} + q}$

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



13. If $\sin 21° = \frac{x}{y}$, then $\sec 21° - \sin 69°$ is equal to :

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

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

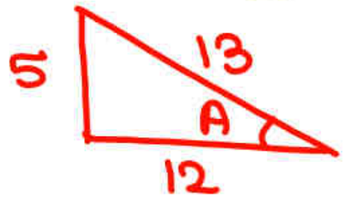
$$\frac{y}{\sqrt{y^2-x^2}} - \frac{\sqrt{y^2-x^2}}{y}$$

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

$$= \frac{x^2}{y\sqrt{y^2-x^2}}$$

$\tan A + 1 = \frac{17}{12}$

$\Rightarrow \tan A = \frac{17}{12} - 1 = \frac{5}{12}$



$= \frac{1 - \frac{12}{13}}{\frac{5}{13}} = \frac{\frac{1}{13}}{\frac{5}{13}} = \frac{1}{5}$

14. If $\frac{\sin A + \cos A}{\cos A} = \frac{17}{12}$, then the value of $\frac{1 - \cos A}{\sin A}$ is :

SSC CGL 7 March 2020 (Afternoon)

(a) – 5

(b) 1

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

(d) $\frac{1}{5}$

15. If $\cos x = \frac{24}{25}$, $0 \leq x \leq 90°$, then the value of $\cot x + \operatorname{cosec} x$ is :

CHSL 14/10/2020 (Morning)

(a) 0 (b) 1

(c) 7 (d) $\frac{7}{2}$

16. If $\cot\theta = \frac{3}{4}$, then $\sin\theta + \cos\theta - \tan\theta$ is equal to :

SSC CGL 11 June 2019 (Morning)

(a) $-\frac{1}{20}$

(b) $\frac{2}{15}$

(c) $\frac{1}{20}$

(d) $\frac{1}{15}$

17. If $\sec\theta = \frac{13}{5}$, then $\tan\theta - \sin\theta + \cos\theta$ is equal to :

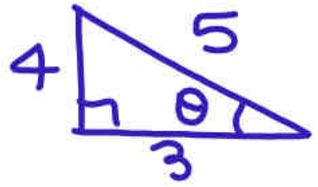
SSC CGL 11 June 2019 (Evening)

(a) $\frac{121}{65}$ (b) $\frac{118}{65}$

(c) $\frac{23}{13}$ (d) $\frac{124}{65}$

$3\sin\theta = 4\cos\theta$

$\Rightarrow \tan\theta = \frac{4}{3}$



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

$= \frac{16}{9} + \frac{4}{5} - \frac{3}{5}$

$= \frac{16}{9} + \frac{1}{5} = \frac{89}{45}$

18. If $3\sin\theta = 4\cos\theta$, then $\tan^2\theta + \sin\theta - \cos\theta$ is equal to :

SSC CGL 12 June 2019 (Afternoon)

(a) $\frac{88}{45}$

(b) 2

(c) $\frac{89}{45}$

(d) $\frac{17}{9}$

19. If $12 \sin\theta = 5 \cos\theta$, then $\sin\theta + \cos\theta - \cot\theta$ is equal to :

SSC CGL 12 June 2019 (Evening)

(a) $\frac{139}{156}$

(b) $-\frac{71}{65}$

(c) $\frac{116}{156}$

(d) $-\frac{16}{65}$

20. If $\tan\theta = \frac{3}{5}$ $0° < \theta < 90°$, then $\sin\theta \cos\theta$ is equal to :

SSC CHSL 11 July 2019 (Evening)

(a) $\frac{14}{\sqrt{34}}$ (b) $\sqrt{17}$

(c) $\frac{16}{\sqrt{34}}$ (d) $\frac{15}{34}$

21. **If $\sin\theta = 4\cos\theta$, then what is the value of $\sin\theta\cos\theta$?**

SSC CGL 6 June 2019 (Afternoon)

(a) $\frac{2}{9}$ (b) $\frac{3}{10}$

(c) $\frac{4}{17}$ (d) $\frac{3}{4}$

22. If $\cos\theta = \frac{5}{13}$, then the value of $\tan^2\theta + \sec^2\theta$ is equal to :

CGL 2019 Tier-II (18/10/2020)

(a) $\frac{323}{25}$ (b) $\frac{313}{25}$

(c) $\frac{303}{25}$ (d) $\frac{233}{25}$

23. If $\cos\theta = \frac{3}{5}$, then the value of $\sin\theta . \sec\theta . \tan\theta$ is :

(a) $\frac{9}{16}$ (b) $\frac{16}{9}$

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

24. If $\operatorname{cosec}\theta = \frac{13}{12}$, then $\sin\theta + \cos\theta - \tan\theta$ is equal to :

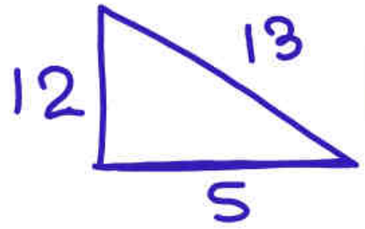
SSC CGL 11 June 2019 (Afternoon)

(a) $\frac{91}{65}$

(b) $\frac{139}{65}$

(c) $\frac{71}{65}$

(d) $-\frac{71}{65}$



25. If $\sin\theta - \cos\theta = \frac{7}{13}$, $0 < \theta < 90°$, then the value of $\sin\theta + \cos\theta$ is :

(a) $\frac{17}{13}$ (b) $\frac{13}{17}$

(c) $\frac{1}{13}$ (d) $\frac{1}{17}$

$\frac{P - B}{H} = \frac{7}{13}$

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

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

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

If $\sec\theta - \tan\theta = p$ | $\sec\theta + \tan\theta = x$

$\sec\theta + \tan\theta = \frac{1}{p}$ | $\sec\theta - \tan\theta = \frac{1}{x}$

$\sec\theta + \tan\theta = \sqrt{5} + 2$

$\sec\theta - \tan\theta = \sqrt{5} - 2$

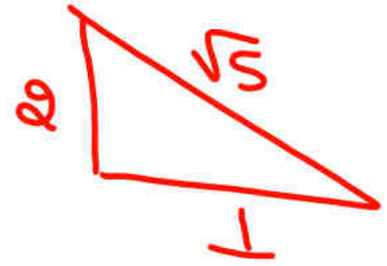
$2\sec\theta = 2\sqrt{5}$

$\sec\theta = \sqrt{5}$

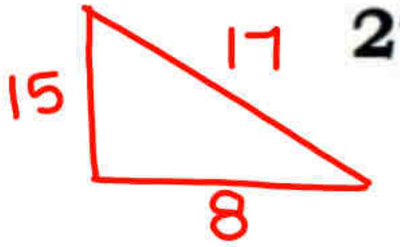
26. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$, then the value of $\sin\theta + \cos\theta$ is :

(a) $\frac{3}{\sqrt{5}}$ (b) $\sqrt{5}$

(c) $\frac{7}{\sqrt{5}}$ (d) $\frac{1}{\sqrt{5}}$



$\frac{2}{\sqrt{5}} + \frac{1}{\sqrt{5}} = \frac{3}{\sqrt{5}}$



27. If $\sin\theta - \cos\theta = \frac{7}{17}$, then find the value of $\sin\theta + \cos\theta$.

SSC CHSL 14/10/2020 (Evening)

(a) $\frac{8}{17}$ (b) $\frac{23}{13}$

(c) $\frac{23}{17}$ (d) $\frac{8}{13}$

$\frac{P}{H} - \frac{B}{H} = \frac{P-B}{H} = \frac{7}{17}$

28. If $\tan\theta = \frac{20}{21}$, then the value of $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$ is :

CHSL 12/10/2020 (Evening)

$\frac{\tan\theta - 1}{\tan\theta + 1}$

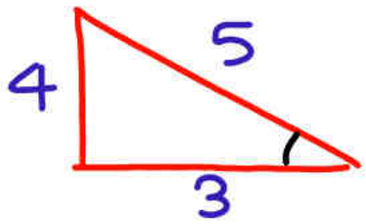
$= \frac{\frac{20}{21} - 1}{\frac{20}{21} + 1}$

$= \frac{-1}{41}$

(a) $\frac{-1}{41}$ (b) $\frac{27}{21}$

(c) $\frac{29}{35}$ (d) $\frac{-29}{31}$

$\text{cosec}\theta = \frac{5}{4}$



29. For θ being an acute angle, if $\text{cosec}\,\theta$ = 1.25, then the value of $\frac{4\tan\theta - 5\cos\theta}{\sec\theta + 4\cot\theta}$ is equal to :

SSC CHSL 4 July 2019 (Morning)

$= \frac{4\times\frac{4}{3} - \cancel{5}\times\frac{3}{\cancel{5}}}{\frac{5}{3} + \cancel{4}\times\frac{3}{\cancel{4}}}$

$= \frac{\frac{16}{3} - 3}{\frac{5}{3} + 3} = \frac{7}{14} = \frac{1}{2}$

(a) $\frac{3}{7}$ (b) $\frac{4}{7}$

(c) $\frac{1}{4}$ (d) $\frac{1}{2}$

30. If $5\cos\theta - 12\sin\theta = 0$, then the value of $\frac{2\sin\theta + \cos\theta}{\cos\theta - \sin\theta}$ is :

SSC CPO 2018, 16 March 2019 (Morning)

(a) $1\frac{75}{119}$ (b) $\frac{2}{3}$

(c) $2\frac{34}{35}$ (d) $3\frac{1}{7}$

31. If $\tan\theta = \frac{2}{3}$, then $\frac{3\sin\theta - 4\cos\theta}{3\sin\theta + 4\cos\theta}$ is equal to :

SSC CGL 10 June 2019 (Afternoon)

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

(c) $-\frac{2}{3}$ (d) $\frac{1}{3}$

32. If $\tan\theta = \frac{3}{4}$, then $\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ is equal to :

SSC CGL 10 June 2019 (Evening)

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

(b) $\frac{3}{5}$

(c) $\frac{2}{5}$

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

$\tan A = \frac{5}{6}$

33. If A lies in the first quadrant and $6\tan A = 5$, then the value of $\frac{8\sin A - 4\cos A}{\cos A + 2\sin A}$ is :

SSC CGL 3 March 2019 (Morning)

(a) – 2 **(b) 1**

(c) 16 **(d) 4**

$5\cot\theta = 3$

$\cot\theta = \frac{3}{5}$

$\tan\theta = \frac{5}{3}$

34. If $5\cot\theta = 3$, then find the value of $\frac{6\sin\theta - 3\cos\theta}{7\sin\theta + 3\cos\theta}$ is :

SSC CGL 9 March 2020 (Afternoon)

$\frac{6\tan\theta - 3}{7\tan\theta + 3}$

$= \frac{6 \times \frac{5}{3} - 3}{7 \times \frac{5}{3} + 3}$

$= \frac{21}{44}$

(a) $\frac{21}{44}$ (b) $\frac{44}{21}$

(c) $\frac{11}{40}$ (d) $\frac{20}{41}$

35. If $\tan x = \frac{3}{2}$, then the value of $\frac{3\sin x + 2\cos x}{3\sin x - 2\cos x}$ is :

CHSL 14/10/2020 (Morning)

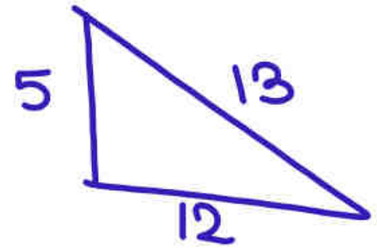
(a) $\frac{1}{5}$ (b) $\frac{5}{13}$

(c) $\frac{13}{5}$ (d) 5

$5\cos\theta - 12\sin\theta = 0$

$\Rightarrow 5\cos\theta = 12\sin\theta$

$\Rightarrow \frac{5}{12} = \frac{\sin\theta}{\cos\theta} = \tan\theta$



$= \frac{1+\sin\theta+\cos\theta}{1-\sin\theta+\cos\theta}$

$= \frac{\frac{13}{13}+\frac{5}{13}+\frac{12}{13}}{\frac{13}{13}-\frac{5}{13}+\frac{12}{13}} = \frac{30}{20}$

36. If $5\cos\theta - 12\sin\theta = 0$, then the value of $\frac{1+\sin\theta+\cos\theta}{1-\sin\theta+\cos\theta}$ is :

SSC CGL 5 March 2019 (Afternoon)

(a) $\frac{3}{2}$ (b) $\frac{3}{4}$

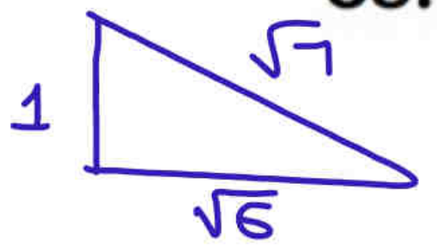
(c) $\frac{5}{4}$ (d) $\frac{5}{2}$

37. If $\cos\theta = \frac{12}{13}$, then the value of $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta}$ is :

CHSL 26/10/2020 (Morning)

(a) 2
(b) 4
(c) 1
(d) N.O.T

38. If $\cot\theta = \frac{\sqrt{6}}{1}$, then the value of $\frac{\text{cosec}^2\theta + \sec^2\theta}{\text{cosec}^2\theta - \sec^2\theta}$ is :



SSC CHSL 3 July 2019 (Morning)

(a) $\frac{49}{36}$ (b) $\frac{43}{36}$

(c) $\frac{7}{5}$ (d) $\frac{48}{35}$

$= \frac{\left(\frac{\sqrt{7}}{1}\right)^2 + \left(\frac{\sqrt{7}}{\sqrt{6}}\right)^2}{\left(\frac{\sqrt{7}}{1}\right)^2 - \left(\frac{\sqrt{7}}{\sqrt{6}}\right)^2}$

$= \frac{7 + \frac{7}{6}}{7 - \frac{7}{6}} = \frac{\frac{49}{6}}{\frac{35}{6}} = \frac{7}{5}$

39. If $\tan\theta = \frac{2}{\sqrt{11}}, 0 < \theta < 90°$, then the value of $\frac{2\text{cosec}^2\theta - 3\sec^2\theta}{3\text{cosec}^2\theta + 4\sec^2\theta}$ is equal to :

CHSL 26/10/2020 (Evening)

(a) $\frac{11}{45}$

(b) $\frac{11}{49}$

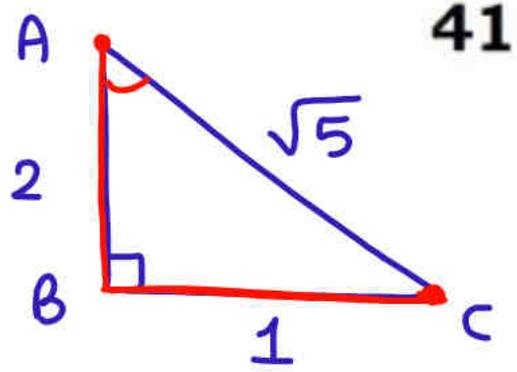
(c) $\frac{13}{49}$

(d) $\frac{10}{49}$

40. If $\tan\alpha = \frac{2}{\sqrt{13}}$, then the value of $\frac{\text{cosec}^2\alpha + 2\sec^2\alpha}{\text{cosec}^2\alpha - 3\sec^2\alpha}$ is :

CHSL 18/03/2020 (Evening)

(a) 21
(b) 14
(c) 32
(d) 16



41. **In ΔABC, $\angle B = 90^\circ$ and AB : BC = 2 : 1. the value of sinA + cot C is :**

(a) $3 + \sqrt{5}$

(b) $\dfrac{2+\sqrt{5}}{2\sqrt{5}}$

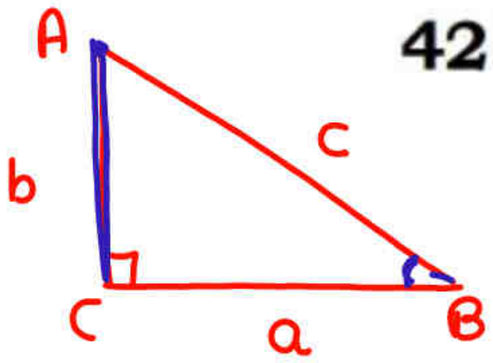
(c) $2 + \sqrt{5}$

(d) $3 - \sqrt{5}$

$\sin A + \cot C$

$= \frac{1}{\sqrt{5}} + \frac{1}{2}$

$= \frac{2+\sqrt{5}}{2\sqrt{5}}$



42. In ΔABC, $\angle C = 90^\circ$ and $AB = c$, $BC = a$, $CA = b$, then the value of $(\text{cosec}B - \cos A)$ is :

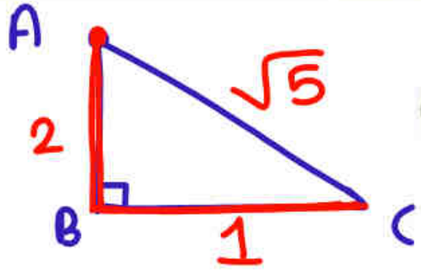
(a) $\frac{c^2}{ab}$ (b) $\frac{b^2}{ac}$

(c) $\frac{a^2}{bc}$ (d) $\frac{bc}{a^2}$

$\text{Cosec}B - \cos A$

$= \frac{c}{b} - \frac{b}{c}$

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



43. In ΔABC, right angled at B, if $\tan A = \frac{1}{2}$, then the value of $\frac{\sin A(\cos C + \cos A)}{\cos C(\sin C - \sin A)}$ is :

SSC CGL 2019, Tier-II (16/10/2020)

(a) $2\sqrt{5}$ (b) 3

(c) 2 (d) 1

$$= \frac{\frac{1}{\sqrt{5}}\left(\frac{1}{\sqrt{5}} + \frac{2}{\sqrt{5}}\right)}{\frac{1}{\sqrt{5}}\left(\frac{2}{\sqrt{5}} - \frac{1}{\sqrt{5}}\right)}$$

$$= \frac{\frac{3}{\sqrt{5}}}{\frac{1}{\sqrt{5}}} = 3$$

44. H.W

In ΔPQR, $\angle Q = 90°$. If $\cot R = \frac{1}{3}$, then what is the value of $\frac{\sec P(\cos R + \sin P)}{\operatorname{cosec} R(\sin R - \operatorname{cosec} P)}$ is

SSC CGL 2019, Tier-II (15/10/2020)

(a) $\frac{2}{7}$

(b) $-\frac{2}{7}$

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

(d) $-\frac{2}{3}$

$$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$$

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

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

45. If $0° < A, B < 45°$, $\cos(A+B) = \frac{24}{25}$ and $\sin(A-B) = \frac{15}{17}$, then $\tan 2A = ?$

SSC CGL 6 March 2020 (Afternoon)

(a) 0 (b) 1

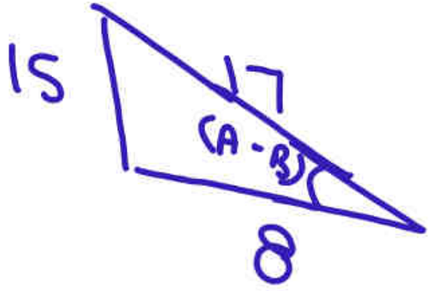
(c) $\frac{416}{87}$ (d) $\frac{213}{4}$

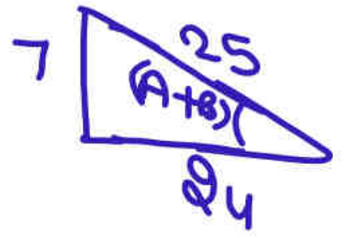
$\tan 2A = \frac{\sin 2A}{\cos 2A}$

$= \frac{\sin(\underbrace{A+B}_{x} + \underbrace{A-B}_{y})}{\cos((A+B)+(A-B))}$

$= \frac{\sin(A+B)\cdot\cos(A-B) + \cos(A+B)\sin(A-B)}{\cos(A+B)\cdot\cos(A-B) - \sin(A+B)\cdot\sin(A-B)}$

$= \frac{\frac{7}{25}\times\frac{8}{17} + \frac{24}{25}\times\frac{15}{17}}{\frac{24}{25}\times\frac{8}{17} - \frac{7}{25}\times\frac{15}{17}} = \frac{56+360}{192-105} = \frac{416}{87}$





$\frac{\sin\theta}{\cos\theta} = \frac{9}{1}$

$\tan\theta = 9$

46. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{5}{4}$, the value of $\frac{\tan^2\theta + 1}{\tan^2\theta - 1}$ is :

$\frac{9^2+1}{9^2-1} = \frac{82}{80} = \frac{41}{40}$

(a) $\frac{25}{16}$

(b) $\frac{41}{9}$

(c) $\frac{41}{40}$

(d) $\frac{40}{41}$

47. If $\frac{2\sin\theta - \cos\theta}{\cos\theta + \sin\theta} = 1$, then the value of $\cot\theta$ is :

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

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

$\Rightarrow \frac{1}{2} = \cot\theta$

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

(c) 3 (d) 2

$\frac{\cos\theta}{\sin\theta} = \frac{9}{7}$

48. If $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} = \frac{8}{1}$, then the valur of $\cot\theta$ is equal to :

SSC CHSL 12/10/2020 (Morning)

(a) $\frac{6}{5}$

(b) $\frac{9}{7}$

(c) $\frac{7}{6}$

(d) $\frac{8}{7}$

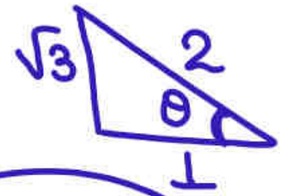
$\frac{\tan\theta}{\cot\theta} = \frac{3}{1}$

$\Rightarrow \tan^2\theta = 3$

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

$\theta = 60^\circ$

$\sin 60^\circ = \frac{\sqrt{3}}{2}$



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

49. If $\frac{\tan\theta + \cot\theta}{\tan\theta - \cot\theta} = 2$, $0^\circ \le \theta \le 90^\circ$, then find the value of $\sin\theta$.

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

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

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

(d) 1

$$\frac{\sec\theta}{\tan\theta} = \frac{8}{2} = \frac{4}{1}$$

$$\Rightarrow \frac{\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}} = \frac{4}{1}$$

$$\Rightarrow \frac{1}{\sin\theta} = \frac{4}{1}$$

$$\Rightarrow \sin\theta = \frac{1}{4}$$

50. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{3}$ then $\sin\theta$ is equal to :

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

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

51. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{3}{1}$ and θ is an acute angle, then the value of $\frac{3\sin\theta + 4\cos\theta}{8\cos\theta - 3\sin\theta}$ is .

CHSL 21/10/2020 (Morning)

$\frac{3\sin\theta + 4\cos\theta}{8\cos\theta - 3\sin\theta}$

$= \frac{3\times2 + 4\times1}{8\times1 - 3\times2}$

$= \frac{10}{2} = 5$

(a) 10 (b) $\frac{1}{2}$

(c) 5 (d) 2

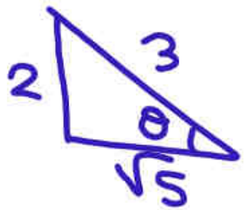
$\frac{\sec\theta}{\tan\theta} = \frac{6}{4} = \frac{3}{2}$

52. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{1}$ and θ is an acute angble, then the value of $\frac{3\cos^2\theta + 1}{3\cos^2\theta - 1}$ is :

CHSL 26/10/2020 (Afternoon)

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

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



$= \frac{3 \times \frac{5}{3} + 1}{3 \times \frac{5}{3} - 1} = \frac{8}{2} = 4$

(a) 3 (b) 2

(c) 1 (d) 4

$\frac{\tan\theta}{\sin\theta} = \frac{k}{1}$

53. If $\frac{\tan\theta + \sin\theta}{\tan\theta - \sin\theta} = \frac{k+1}{k-1}$, then k = ?

SSC CGL 10 June 2019 (Morning)

(a) $\text{cosec}\theta$ (b) $\sec\theta$

(c) $\cos\theta$ (d) $\sin\theta$

$\Rightarrow \frac{\frac{\sin\theta}{\cos\theta}}{\sin\theta} = \frac{k}{1}$

$\Rightarrow \frac{1}{\cos\theta} = k$

$\Rightarrow \sec\theta = k$

$\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta} = \frac{209}{79}$

$\frac{\sec\theta}{\tan\theta} = \frac{288}{130}\ \frac{144}{65}$

$\Rightarrow \frac{\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}} = \frac{144}{65}$

$\Rightarrow \sin\theta = \frac{65}{144}$

54. If $\frac{\sec\theta+\tan\theta}{\sec\theta-\tan\theta} = 2\frac{51}{79}$, then the value of $\sin\theta$ is equal to :

CGL 2019, Tier-II (18/10/2020)

(a) $\frac{65}{144}$ (b) $\frac{35}{72}$

(c) $\frac{91}{144}$ (d) $\frac{39}{72}$