FOUNDATION+

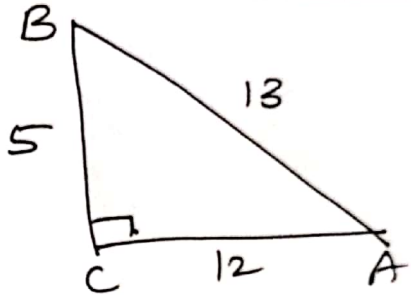
Class: 7th. MATHEMATICS

5. TRIGONOMETRIC RATIOS

Teaching Task (JEE main)

01. $\cos A = \frac{12}{13}$

$\therefore \sin A = \frac{5}{13}$



Ans: A

02 $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)} = \frac{1-\sin^2\theta}{1-\cos^2\theta} = \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta = \left(\frac{7}{8}\right)^2 = \frac{49}{64}$

Ans: A

03 $\frac{2\tan 30^\circ}{1+\tan^2 45^\circ} = \frac{2\left(\frac{1}{\sqrt{3}}\right)}{1+(1)^2} = \frac{1}{\sqrt{3}} = \tan 30^\circ$ Ans: C

04. $\cos 7A = \sin(A-6^\circ)$

$\Rightarrow 7A + A - 6^\circ = 90^\circ$

$\Rightarrow A = 12^\circ$

$\sin A = \cos B \Leftrightarrow A+B = 90^\circ$

Ans. A

05 $\sin A = \cos B = \sin(90^\circ - B)$

$\Rightarrow A = 90^\circ - B \Rightarrow A+B = 90^\circ$ Ans. B

06 $\operatorname{cosec} A = \sqrt{10}$

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

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

$= 10 - 1 = 9$

$\therefore \cot A = 3$

Ans. D

07 $\sin 45^\circ + \cos 45^\circ = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$ Ans. B

08 $\tan 180^\circ = 0$ Ans. B

09.

09. $\cos^2\theta - \sin^2\theta$

Let $\theta = 30^\circ$

$\cos^2 30^\circ - \sin^2 30^\circ$

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

$= \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$

opt: C $\Rightarrow \cos 2\theta = \cos 2\times 30^\circ$

$= \cos 60^\circ = \frac{1}{2}$

Ans: C

10 $\cos 1^\circ . \cos 2^\circ . \cos 3^\circ \ldots \boxed{\cos 90^\circ} \ldots \cos 180^\circ = 0$

$\cos 90^\circ = 0$

Ans: B

JEE ADVANCED

11. $\cos\theta = \sin(90^\circ + \theta) = \sin(90^\circ - \theta)$ Ans: A, D

12 $\sin\theta = \sin\cos(90^\circ - \theta) = \cos(270^\circ + \theta)$ Ans: A, C

13. Statement I: $A + B = 90^\circ$

Let $A = B = 45^\circ$

Now, $\cot A \cdot \cot B = \cot 45^\circ . \cot 45^\circ = 1\times 1 = 1$ (False)

Statement II: $\sin 2\theta = \sin 2\times 30^\circ = \sin 60^\circ = \frac{\sqrt{3}}{2}$

$\cos 30^\circ = \frac{\sqrt{3}}{2}$ (True) Ans: D

14. Statement I: Conceptual (True)

Statement II: Conceptual (True) Ans: A

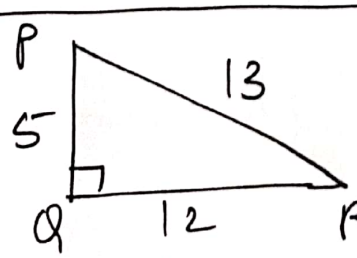
15. Assertion: $\sec(-180^\circ) = \sec 180^\circ = -1$ (True)

Reason: Conceptual (False) Ans: C

16. Assertion: $\cot 45^\circ = 1$ (True)

Reason: $\cot\theta = \frac{\cos\theta}{\sin\theta}$ (False) Ans: C

17.



QR = 12 cm

Ans: B

18 $\sin P = \frac{12}{13}$ Ans: D

19. $\sin(-45^\circ) = -\sin 45^\circ = \frac{-1}{\sqrt{2}}$ Ans: B

20. $\tan(-45^\circ) = -\tan 45^\circ = -1$ Ans: B

21 $\sec 60^\circ = 2$ Ans: 2

22 $\cot\frac{\pi}{2} \cdot \cot\frac{2\pi}{2} \cdots \cot\frac{7\pi}{2}$

$= \cot 90^\circ \cdot \cot 180^\circ \cdots \cot 630^\circ$

$= 0 \times$ ~~finite~~ value $= 0$ Ans: 0

23 A) $\cos(40^\circ + x) = \sin 30^\circ$

$\Rightarrow 40^\circ + x + 30^\circ = 90^\circ$

$\Rightarrow x = 20^\circ$ (s)

B) $\tan^2(3x + 15^\circ) - 1 = 0$

$\Rightarrow \tan^2(3x + 15^\circ) = 1 = \tan^2 45^\circ$

$\Rightarrow 3x + 15 = 45^\circ \Rightarrow x = 10^\circ$ (p)

C) $\sin(3x - 15^\circ) = \frac{\sqrt{3}}{2} = \sin 60^\circ$

$\Rightarrow 3x - 15^\circ = 60^\circ \Rightarrow x = 25^\circ$ (q)

D) $\tan 3x = 1 \Rightarrow \tan 3x = \tan 45^\circ \Rightarrow 3x = 45^\circ$

$\Rightarrow x = 15^\circ$ (r)

Ans: s, p, q, r

24 A) $\sin 45^\circ = \frac{1}{\sqrt{2}}$ (r)

B) $\tan 45^\circ = 1$ (s)

C) $\tan 60^\circ = \sqrt{3}$ (p)

D) $\sec 30^\circ = \frac{2}{\sqrt{3}}$ (q)

Ans: r, s, p, q

LEARNERS TASK (CUCETS)

01. $\theta = 0^\circ$ — Ans: A

02 $\cot 0^\circ$ = not defined, $= \cot 180^\circ = \cot 360^\circ$ — Ans: D

03

$\sec A - \tan A = 1$

$\sec A + \tan A = 1$

$2 \sec A = 2$

$\Rightarrow \sec A = 1$

$\cos A = 1$

$\sin^2 A = 1 - \cos^2 A = 1 - 1 = 0$

$\therefore \sin A = 0.$

Short cut method

$\sec A - \tan A = 1$

Clearly $A = 0^\circ$, satisfies the above eqn.

$\therefore \sin A = \sin 0^\circ = 0$ — Ans: B

04 $\sin 0^\circ + \cos 60^\circ - \tan 45^\circ$

$= 0 + \frac{1}{2} - 1 = \frac{-1}{2}$ — Ans: B

05 Conceptual — Ans: D

06 $A + B = 90^\circ$

Let $A = B = 45^\circ$

$\tan A \cdot \tan B = \tan 45^\circ \cdot \tan 45^\circ = 1 \cdot 1 = 1$ — Ans: C

07 $\tan 90^\circ \times \tan 0^\circ$

$=$ (not defined) $\times 0 =$ not defined — Ans: D

08 Conceptual — Ans: C

09 Conceptual — Ans: B

10. Conceptual — Ans: C

JEE MAINS LEVEL

01 $\sin(60^\circ - \alpha) = \frac{1}{r_2}$

$\Rightarrow \sin(60^\circ - \alpha) = \sin 45^\circ$

$\Rightarrow 60^\circ - \alpha = 45^\circ$

$\alpha = 60^\circ - 45^\circ$

$\therefore \alpha = 15^\circ$

Ans: B

02 $\sin(A+B) = 1$

$\Rightarrow A + B = 90^\circ$

$\cos(A-B) = \frac{\sqrt{3}}{2}$

$\Rightarrow A - B = 30^\circ$

$\therefore A = 60^\circ, \; B = 30^\circ$

Ans: A

03 $$\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta} = \frac{3\tan\theta + 2}{3\tan\theta - 2} = \frac{3\left(\frac{4}{3}\right) + 2}{3\left(\frac{4}{3}\right) - 2} = 3$$

Ans: C

04. $$4\cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + \cos^2 90^\circ$$

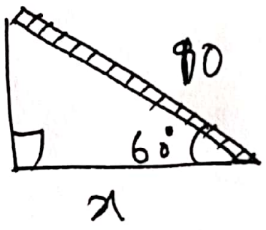
$$= 4(1)^2 - (2)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + (0)^2 = 4 - 4 + \frac{3}{4} = \frac{3}{4}$$

Ans: C

05 $\cos 60^\circ = \frac{x}{10}$

$\Rightarrow \frac{1}{2} = \frac{x}{10}$

$\Rightarrow x = 5\text{mt}$



Ans: C

06. $\tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdots \boxed{\tan 90^\circ} \cdots$ $\tan 360^\circ$ = Not defined

$\tan 90^\circ$ → Not defined

Ans: D

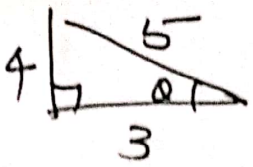
07 $\tan\theta = \frac{4}{5}$

$$\frac{5\sin\theta - 3\cos\theta}{\sin\theta + 2\cos\theta} = \frac{5\tan\theta - 3}{\tan\theta + 2} = \frac{5\left(\frac{4}{5}\right) - 3}{\frac{4}{5} + 2}$$

$$= \frac{5}{14}$$

Ans. A

08 $\tan\theta = \frac{4}{3}$



$\therefore \sin\theta = \frac{4}{5}$

Ans: D

09 $\sin\theta \cdot \sin(\pi+\theta) \cdot \sin(2\pi+\theta) \cdots \sin(299\pi+\theta)$

put $\theta = 0^\circ$

$\sin 0^\circ \cdot \sin\pi \cdot \sin 2\pi \cdots \sin 299\pi = 0$

Ans: C

10 $\left[\sin\left(\frac{\pi}{2}-\theta\right)+\sin(\pi-\theta)\right]^2 + \sin\left[\cos\left(\frac{3\pi}{2}-\theta\right)+\sin(2\pi-\theta)\right]^2$

put $\theta = 0^\circ$

$= \left[\sin\frac{\pi}{2}+\sin\pi\right]^2 + \sin\left[\cos\frac{3\pi}{2}+\sin 2\pi\right]^2$

$= [1+0]^2 + \sin(0+0)^2$

$= 1 + \sin 0 = 1+0 = 1$

Ans: 1

JEE ADVANCED

11. $\sin(\alpha+\beta) = 1 \Rightarrow \alpha+\beta = 90^\circ$

$\sin(\alpha-\beta) = \frac{1}{2} \Rightarrow \alpha-\beta = 60^\circ$

$\alpha = 60^\circ$, $\beta = 30^\circ$

Ans: A, C

12 A) $\sec(-60^\circ) = \sec 60^\circ = 2$ ✓

B) $\cot(-45^\circ) = -\cot 45^\circ = -1$ ✓

C) $\sec(-180^\circ) = \sec 180^\circ = -1$ ✓

D) $\cot(-90^\circ) = -\cot 90^\circ = 0$ ✓

Ans. A, B, C, D

13. $\sin^2\theta = 1 - \left(\frac{2\sqrt{mn}}{m+n}\right)^2 = \left(\frac{m-n}{m+n}\right)^2 \Rightarrow \sin\theta = \frac{m-n}{m+n}$ (True)

Statement II: $\tan^2 45^\circ + \frac{1}{\tan^2 45^\circ} = 1 + \frac{1}{1} = 2$ (True)

Ans. A

14. Statement I: $\sec(-180^\circ) = \sec 180^\circ = -1$ (True)

Statement II: Conceptual (True) Ans. A

15 Assertion: $\sec 60^\circ = 2$ (True)

Reason: Conceptual (False) Ans: C

16. Assertion: $\sec 0^\circ = 1$ (True)

Reason: Conceptual (True) Ans. A

17. $\sin(A+B) = \frac{\sqrt{3}}{2} \Rightarrow A+B = 60^\circ$

$\cos(A-B) = \frac{\sqrt{3}}{2} \Rightarrow A-B = 30^\circ$

$\Rightarrow A = 45^\circ, B = 15^\circ$

$\sin 2A + \cos 4B = \sin 2\times 45^\circ + \cos 4\times 15^\circ$

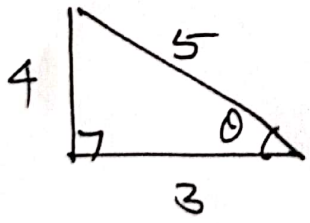
$= \sin 90^\circ + \cos 60^\circ$

$= 1 + \frac{1}{2} = \frac{3}{2}$ Ans. D

18 $\sin A - \cos 3B = \sin 45^\circ - \cos 3\times 15^\circ$

$= \sin 45^\circ - \cos 45^\circ = 0$ Ans: A

19.



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

Ans. A

20 $\cot\theta = \frac{3}{4}$ Ans: A

21. $3\sin\theta + 4\cos\theta = 4$

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

$\Rightarrow 3^2 + 4^2 = 4^2 + x^2 \Rightarrow x = 3$ Ans 3

22 $\cot 270^\circ = 0$ Ans: 0

25 a) $A+B=90^\circ \Rightarrow \tan A \cdot \tan B = 1$ (q)

b) $A+B=180^\circ$

Let $A=B=90^\circ$

$\cos 90^\circ + \cos 90^\circ = 0+0 = 0$ (p)

c) $\cot(90^\circ - \theta) = \tan\theta$ (r)

d) $\operatorname{cosec}(90^\circ - \theta) = \sec\theta$ (s)

Ans: q, p, r, s

24. a) $\sec 60^\circ = 2$ (r)

b) $\cot 45^\circ = 1$ (p)

c) $\sec 180^\circ = -1$ (q)

d) $\cot(-45^\circ) = -1$ (q)

Ans: r, p, q, q

⇒ THE END ⇐