

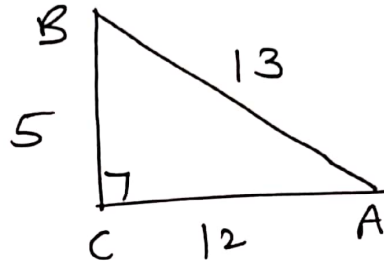
TRIGONOMETRI RATIOS ①

Class: 7th. Mathematics (F⁺)

SOLUTIONS

Teaching Task

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



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

Ans: A

02. $\cot \theta = \frac{7}{8}$

$$\frac{(1 + \sin \theta)(1 - \sin \theta)}{(1 + \cos \theta)(1 - \cos \theta)} = \frac{1 - \sin^2 \theta}{1 - \cos^2 \theta} = \frac{\cos^2 \theta}{\sin^2 \theta} = \cot^2 \theta = \frac{49}{64}$$

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. $\cos 7A = \sin (A - 6^\circ)$
 $\Rightarrow 7A + A - 6^\circ = 90^\circ$
 $\Rightarrow 8A = 96^\circ$
 $\Rightarrow A = 12^\circ$

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

Ans: A

05. $\sin A = \cos B = \sin (90^\circ - B)$
 $\therefore A = 90^\circ - B$
 $\Rightarrow A + B = 90^\circ$

Ans: B

(2)

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

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

$$\Rightarrow \cot^2 A = \operatorname{cosec}^2 A - 1 = 10 - 1 = 9$$

$$\Rightarrow \cot A = 3$$

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. $\tan 135^\circ = \tan (180^\circ - 45^\circ) = -\tan 45^\circ = -1$

Ans: D

09. $\tan \theta = -\frac{4}{3}$

$$\Rightarrow \theta \in Q_2 \text{ or } Q_4$$

$$\text{Given } \theta \notin Q_4 \Rightarrow \theta \in Q_2$$



$$\begin{aligned} & 5 \sin \theta + 10 \cos \theta + 9 \sec \theta + 16 \operatorname{cosec} \theta + 4 \cot \theta \\ &= 5 \left(\frac{4}{5} \right) + 10 \left(-\frac{3}{5} \right) + 9 \left(-\frac{5}{3} \right) + 16 \left(\frac{5}{4} \right) + 4 \left(-\frac{3}{4} \right) \\ &= 0 \end{aligned}$$

Ans: D

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

↓
0

Ans: B

11. $\csc \theta = \sin(90^\circ + \theta) = \sin(90^\circ - \theta)$

Ans: A, D

12. $\sin 0 = \cos(90^\circ - 0) = \cos(270^\circ + 0)$

Ans. A, C (3)

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

Let $A = B = 45^\circ$

$\therefore \cot A \cdot \cot B = \cot 45^\circ \cdot \cot 45^\circ$
 $= 1 \times 1$

$= 1 \neq 2$ (False)

Statement II:

$\cot \frac{\pi}{20} \cdot \cot \frac{5\pi}{20} \cdot \cot \frac{7\pi}{20} \cdot \cot \frac{9\pi}{20}$

$= \cot \frac{\pi}{20} \cdot \cot \frac{5\pi}{20} \cdot \cot \left(\frac{\pi}{20} + \frac{3\pi}{20} \right) \cdot \cot \left(\frac{\pi}{20} - \frac{\pi}{20} \right)$

$= \cot \frac{\pi}{20} \cdot \cot \frac{5\pi}{20} \cdot \tan \frac{3\pi}{20} \cdot \tan \frac{\pi}{20}$

$= \cot \frac{5\pi}{20} \cdot \tan \frac{3\pi}{20} \neq 1$ (False)

Ans. B

14. Statement I: $8^2 + 6^2 = 5^2 + k^2$

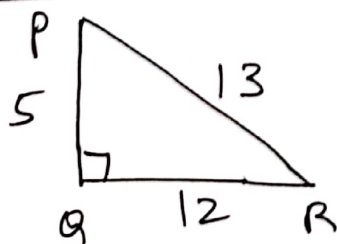
$\Rightarrow 100 - 25 = k^2$

$\Rightarrow k = \pm 5\sqrt{3}$ (True)

Statement II: Conceptual (True)

Ans: A

15.



$QR = 12$

Ans: B

16)

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

Ans: D

$$17. \sec\left(\frac{13\pi}{3}\right) = \sec(780^\circ) = \sec(2 \times 360^\circ + 60^\circ) \text{ (4)}$$

$$= \sec 60^\circ$$

$$= 2$$

Ans: 2

$$18. \cot \frac{\pi}{16} \cdot \cot \frac{2\pi}{16} \cdot \cot \frac{3\pi}{16} \cdot \cot \frac{4\pi}{16} \cdot \cot \frac{5\pi}{16} \cdot \cot \frac{6\pi}{16} \cdot \cot \frac{7\pi}{16}$$

$$= \cot \frac{\pi}{16} \cdot \cot \frac{2\pi}{16} \cdot \cot \frac{3\pi}{16} \cdot \cot \frac{\pi}{4} \cdot \cot\left(\frac{\pi}{2} - \frac{3\pi}{16}\right) \cdot \cot\left(\frac{\pi}{2} - \frac{2\pi}{16}\right)$$

$$\cdot \cot\left(\frac{\pi}{2} - \frac{\pi}{16}\right)$$

$$= \cot \frac{\pi}{16} \cdot \cot \frac{2\pi}{16} \cdot \cot \frac{3\pi}{16} \cdot 1 \cdot \tan \frac{3\pi}{16} \cdot \tan \frac{2\pi}{16} \cdot \tan \frac{\pi}{16}$$

$$= \left(\cot \frac{\pi}{16} \tan \frac{\pi}{16}\right) \left(\cot \frac{2\pi}{16} \tan \frac{2\pi}{16}\right) \left(\cot \frac{3\pi}{16} \tan \frac{3\pi}{16}\right)$$

$$= (1 \times 1 \times 1)$$

$$= 1$$

Ans: 1

$$19. a) \cos(40^\circ + x) = \sin 30^\circ$$

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

$$\Rightarrow x = 20^\circ$$

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

$$\Rightarrow 3x + 15^\circ = 45^\circ$$

$$\Rightarrow x = 10^\circ$$

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

$$3x - 15^\circ = 60^\circ$$

$$x = 25^\circ$$

$$d) \tan 3x = 1$$

$$\tan 3x = \tan 45^\circ$$

$$3x = 45^\circ$$

$$x = 15^\circ$$

Ans: 5, 10, 25, 15



$$20 \text{ a) } \sin 45^\circ = \frac{1}{\sqrt{2}}$$

$$b) \tan 45^\circ = 1$$

$$c) \tan 60^\circ = \sqrt{3}$$

$$d) \sec 30^\circ = \frac{2}{\sqrt{3}}$$

(6)
(5)

Ans: r, s, p, q

Learner's Task

CUQ'S

01. Conceptual

Ans: C

02. Conceptual

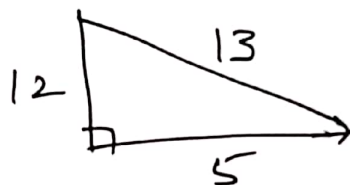
Ans: C

$$03 \quad \begin{aligned} \sec A - \tan A &= 5 \\ \sec A + \tan A &= \frac{1}{5} \end{aligned}$$

$$2\sec A = \frac{26}{5}$$

$$\Rightarrow \sec A = \frac{13}{5}$$

$$\therefore \sin A = \frac{12}{13}$$



Ans: C

$$04. \quad \begin{aligned} \sin 0^\circ + \cos 60^\circ - \tan 45^\circ \\ = 0 + \frac{1}{2} - 1 = -\frac{1}{2} \end{aligned}$$

Ans: B

05. Conceptual

Ans: D

$$06. \quad A + B = 90^\circ$$

$$\tan(A+B) = \tan 90^\circ$$

$$\Rightarrow \frac{\tan A + \tan B}{1 - \tan A \tan B} = \text{Not defined}$$

$$\Rightarrow 1 - \tan A \cdot \tan B = 0$$

$$\Rightarrow \tan A \cdot \tan B = 1$$

Ans: C

07. $\tan 130^\circ, \tan 140^\circ$

(7)

$= \tan(130^\circ + 140^\circ) = \tan 270^\circ$

$\Rightarrow \tan(130^\circ + 140^\circ) = \tan 270^\circ$

$\Rightarrow \frac{\tan 130^\circ + \tan 140^\circ}{1 - \tan 130^\circ \cdot \tan 140^\circ} = \text{Not defined}$

$\Rightarrow 1 - \tan 130^\circ \cdot \tan 140^\circ = 0$

$\Rightarrow \tan 130^\circ \cdot \tan 140^\circ = 1$

Ans : C

08.

$a \cos \theta + b \sin \theta = c \rightarrow (1)$

$a \sin \theta - b \cos \theta = k \rightarrow (2)$

$(1)^2 + (2)^2 \Rightarrow a^2 + b^2 = c^2 + k^2$

Ans : D

09.

$a \csc \theta + b \cot \theta = c \rightarrow (1)$

$a \cot \theta + b \csc \theta = k \rightarrow (2)$

$(1)^2 - (2)^2 \Rightarrow a^2 - b^2 = c^2 - k^2$

Ans : C

10

$\sin \theta + \sin(\pi + \theta) + \sin(2\pi + \theta) + \dots + \sin(100\pi + \theta) = \sin \theta$

Sin n

$\sin \theta + \sin(\pi + \theta) + \sin(2\pi + \theta) + \dots + \sin(n\pi + \theta) = \sin \theta$

if n is even.

JEE MAINS LEVEL

01. $\sqrt{2} \sin(60^\circ - \alpha) = 1$

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

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

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

$\Rightarrow \alpha = 15^\circ$

Ans : B



02.

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

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

$$\Rightarrow A = 60^\circ, B = 30^\circ$$

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

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

Ans: A

03.

$$\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$$

$$= \frac{3\tan\theta + 2}{3\tan\theta - 2}$$

$$= \frac{3\left(\frac{4}{3}\right) + 2}{3\left(\frac{4}{3}\right) - 2} = \frac{6}{2} = 3$$

Ans: C

04.

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

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

$$= 4 - 4 + \frac{3}{4} + 0$$

$$= \frac{3}{4}$$

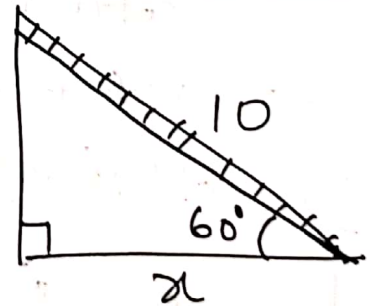
Ans: C

05.

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

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

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



Ans: C

06.

$$\tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdot \dots \cdot \tan 89^\circ$$

$$= \tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdot \dots \cdot \tan(90^\circ - 2^\circ) \cdot \tan(90^\circ - 1^\circ)$$

$$= \tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdot \dots \cdot \cot 2^\circ \cdot \cot 1^\circ$$

$$= (\tan 1^\circ \cdot \cot 1^\circ) (\tan 2^\circ \cdot \cot 2^\circ) \cdot \dots$$

$$= 1 \times 1 \times 1 \cdot \dots = 1$$

Ans: B

07.

$$\frac{5\sin\theta - 3\cos\theta}{\sin\theta + 2\cos\theta}$$

$$= \frac{5\tan\theta - 3}{\tan\theta + 2}$$

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

$$= 1 \times \frac{5}{14}$$

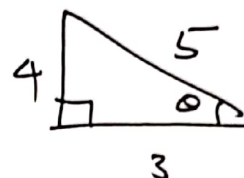
$$> \frac{5}{14}$$

Ans: A

08.

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

$$\Rightarrow \theta \in Q_2 \text{ or } Q_4$$



$$\therefore \text{If } \theta \in Q_2, \text{ then } \sin\theta = \frac{4}{5}$$

$$\text{If } \theta \in Q_4, \sin\theta = -\frac{4}{5}$$

Ans: B

09.

$$\cos\theta + \cos(\pi+\theta) + \cos(2\pi+\theta) + \dots + \cos(299\pi+\theta) = 0$$

We know

$$\cos\theta + \cos(\pi+\theta) + \cos(2\pi+\theta) + \dots + \cos(n\pi+\theta) = 0 \text{ if } n \text{ is odd}$$

Ans: C

10

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

$$= \left[\cos\theta + \sin\theta \right]^2 + \left[-\cancel{\cos\theta} + \cos\theta \right]^2$$

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

$$= 2$$

Ans: B

11.

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

$$\sin(\alpha - \beta) = \frac{1}{2} \Rightarrow \alpha - \beta = 30^\circ$$

$$\alpha = 60^\circ$$

$$\beta = 30^\circ$$

Ans: A, C



12. Statement I: $\sec \theta = \frac{m+n}{2\sqrt{mn}}$

(10)

$$\Rightarrow \cos \theta = \frac{2\sqrt{mn}}{m+n}$$

$$\begin{aligned} \sin^2 \theta &= 1 - \frac{4mn}{(m+n)^2} = \frac{(m+n)^2 - 4mn}{(m+n)^2} \\ &= \left(\frac{m-n}{m+n} \right)^2 \end{aligned}$$

$$\therefore \sin \theta = \pm \left(\frac{m-n}{m+n} \right)$$

(True)

~~S~~ $\sin \theta = \frac{m-n}{m+n}$ $\sin \theta \in \mathbb{Q}$,

Statement II:

$$\begin{aligned} \text{LHS} &= \tan^2 45^\circ + \frac{1}{\tan^2 0} = \tan^2 45^\circ + \frac{1}{\tan^2 45^\circ} \\ &= 1 + \frac{1}{1} = 2 \text{ (True)} \\ \text{Ans: A} \end{aligned}$$

$$\begin{aligned} 13 \quad \sin(A+B) &= \frac{\sqrt{3}}{2} \Rightarrow A+B = 60^\circ \\ \cos(A-B) &= \frac{\sqrt{3}}{2} \Rightarrow A-B = 30^\circ \end{aligned} \quad \left. \begin{array}{l} A+B = 60^\circ \\ A-B = 30^\circ \end{array} \right\} \begin{array}{l} A = 45^\circ \\ B = 15^\circ \end{array}$$

$$\begin{aligned} &6 \sin 2A + \cos 2A \\ &= \sin 90^\circ + \cos 30^\circ \\ &= 1 + \frac{\sqrt{3}}{2} \end{aligned}$$

14

$$3 \sin \theta + 4 \cos \theta = 5$$

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

$$\Rightarrow 3^2 + 4^2 = 5^2 + x^2$$

$$\Rightarrow 9 + 16 = 25 + x^2$$

$$\Rightarrow x = 0$$

Ans: 0

15

$$a) A + B = 90^\circ$$

$$\Rightarrow \tan(A+B) = \tan 90^\circ$$

$$\Rightarrow \frac{\tan A + \tan B}{1 - \tan A \cdot \tan B} = \text{not defined}$$

$$\Rightarrow \tan A \cdot \tan B = 1$$

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

$$\Rightarrow \cot(A+B) = \cot 180^\circ$$

$$\Rightarrow \frac{\cot A \cot B - 1}{\cot A + \cot B} = \text{Not defined}$$

$$\Rightarrow \cot A + \cot B = 0$$

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

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

Ans: q, p, r, s

$\Rightarrow$ THE END $\Leftarrow$