4. ANGLES IN QUADRANTS

Class: VIII . MATHEMATICS ①

FOUNDATION + SOLUTIONS

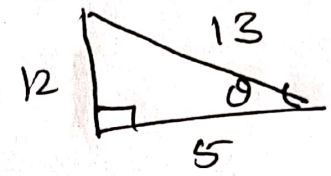
2025-26

-TEACHING TASK

JEE MAINS LEVEL

01. $\cot\theta = \frac{5}{12}$

$\therefore \operatorname{cosec}\theta = \frac{13}{12}$

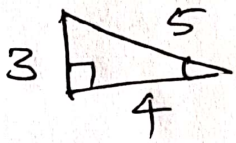


Ans: B

02 $\operatorname{cosec} A = 2 \Rightarrow \sin A = \frac{1}{2}$

Ans: A

03 $\cos\theta = \frac{4}{5}$



$\therefore \sec^2\theta - \tan^2\theta$

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

Ans: A

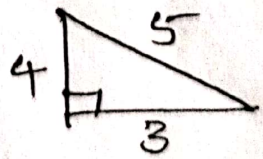
04 $\sin\theta = 0.8 = \frac{8}{10} = \frac{4}{5} \Rightarrow \operatorname{cosec}\theta = \frac{5}{4} = 1.25$ Ans: A

05 $\sin\theta \neq \sqrt{2} = 1.414$, $\sin\theta \ -1 \leq \sin\theta \leq 1$ Ans: C

06 $\sin\theta = \frac{4}{5} \Rightarrow \sin\theta$ is positive $\Rightarrow \theta \in Q_1$ or Q_2

$\sin\alpha \ \theta \notin Q_1$ $\therefore \theta \in Q_2$.

$\therefore \cos\theta = -\frac{3}{5}$



Ans: C

07. Complement of $\theta \rightarrow \frac{\pi}{2} - \theta$

Supplement of $\theta \rightarrow \pi - \theta$

Sum $= \frac{\pi}{2} - \theta + \pi - \theta = \frac{3\pi}{2} - 2\theta$ Ans: D

08 $$\frac{\sin\left(-\frac{11\pi}{3}\right) \cdot \tan\left(\frac{35\pi}{6}\right) \cdot \sec\left(-\frac{7\pi}{3}\right)}{\cos\left(\frac{5\pi}{4}\right) \cdot \operatorname{cosec}\left(\frac{7\pi}{4}\right) \cdot \cos\left(\frac{17\pi}{6}\right)}$$

$$= \frac{-\sin\left(4\pi - \frac{\pi}{3}\right) \cdot \tan\left(6\pi - \frac{\pi}{6}\right) \cdot \sec\left(2\pi + \frac{\pi}{3}\right)}{\cos\left(\pi + \frac{\pi}{4}\right) \cdot \operatorname{cosec}\left(2\pi - \frac{\pi}{4}\right) \cdot \cos\left(2\pi + \frac{3\pi}{6}\right)}$$

$$= \frac{\sin\frac{\pi}{3} \cdot \left(-\tan\frac{\pi}{6}\right) \cdot \left(\sec\frac{\pi}{3}\right)}{\left(-\cos\frac{\pi}{4}\right)\left(-\operatorname{cosec}\frac{\pi}{4}\right)\left(\cos\frac{\pi}{2}\right)}$$

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

Ans: A

09 $a\cos\theta - b\sin\theta = c \rightarrow (1)$

$a\sin\theta + b\cos\theta = x \rightarrow (2)$

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

$\Rightarrow x = \pm\sqrt{a^2 + b^2 - c^2}$

Ans: D

10 $\tan A = -\frac{15}{8}$

$\Rightarrow A \in Q_2$ or Q_4

Given $A \notin Q_4$

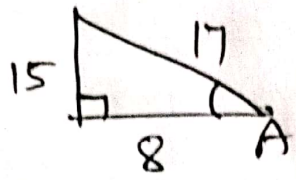
$\therefore A \in Q_2$

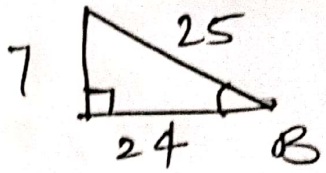
$\sin\alpha \ \sin B = -\frac{7}{25}$

$\therefore B \in Q_3$ or Q_4

Given $B \notin Q_3$

$\therefore B \in Q_4$.





$\therefore \sin A\cos B + \cos A \cdot \sin B$

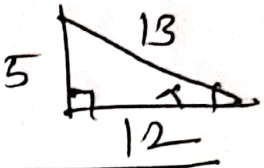
$= \frac{15}{17} \cdot \frac{24}{25} + \left(\frac{-8}{17}\right)\left(\frac{7}{25}\right)$

$= \frac{-304}{425}$

Ans: C

11. $\frac{\sec\alpha + \tan\alpha}{\operatorname{cosec}\alpha - \cot\alpha}$

$\sin\alpha = \frac{5}{13}$



$\alpha \in Q_2$

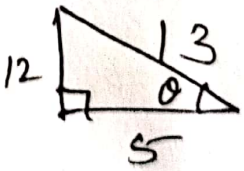
$= \frac{\left(\frac{-13}{12}\right) + \left(\frac{-5}{12}\right)}{\left(\frac{13}{12}\right) - \left(\frac{-12}{5}\right)}$

$= -0.3$

Ans: C

JEE ADVANCED

01 $\cot\theta = \frac{5}{12}$



A) $\tan\theta = \frac{12}{5}$ (True)

B) $\sin\theta = \frac{12}{13}$ (True)

C) $\cos\theta = \frac{5}{13}$ (True)

D) $\operatorname{cosec}\theta = \frac{13}{12}$ (True)

Ans: A, B, C, D

02 $\cos\theta = \sin(90^\circ + \theta) = \sin(90^\circ - \theta)$

Ans: A, D

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

$\Rightarrow \sin^2\theta = 1-\cos^2\theta = \sin^2\theta$ (True)

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

$\Rightarrow \cos^2\theta = 1-\sin^2\theta = \cos^2\theta$ (True) Ans: A, B

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04 Statement I: $\tan(180^\circ+\theta) = \tan\theta$ (True)

Statement II: Conceptual (True)

Ans: A

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05 Statement I: Conceptual (True)

Statement II: $\frac{D}{90^\circ} = \frac{2C}{\pi}$

$\Rightarrow \frac{45^\circ}{90^\circ} = \frac{2C}{\pi}$

$\Rightarrow C = \frac{\pi}{4} = \frac{22}{7\times 4} = \frac{11}{14}$ (False)

Ans: C

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06 Statement I: $A+B = 90^\circ \Rightarrow \cot A \cdot \cot(90^\circ - A)$

$= \cot A \cdot \tan A = 1$ (false)

Statement II:

$= \left(\cot\frac{\pi}{20}\cdot\cot\frac{9\pi}{20}\right)\left(\cot\frac{5\pi}{20}\cdot\cot\frac{7\pi}{20}\right)$

$= \left[\cot\frac{\pi}{20}\cdot\cot\left(\frac{\pi}{2}-\frac{\pi}{20}\right)\right]\left[\cot\frac{5\pi}{20}\cdot\cot\left(\frac{\pi}{2}-\frac{3\pi}{20}\right)\right]$

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

$= 1\times 1\times \tan\frac{3\pi}{20}\cdot\tan\frac{3\pi}{20}$ (false)

Ans: B

07. Assertion: Conceptual (True) (5)

Reason: Since $\cos(-\theta) = \cos\theta$

$\cos\theta$ is an Even function (True)

Ans: A

08 Assertion: $\tan 225^\circ = \tan(180^\circ + 45^\circ)$

$= \tan 45^\circ$

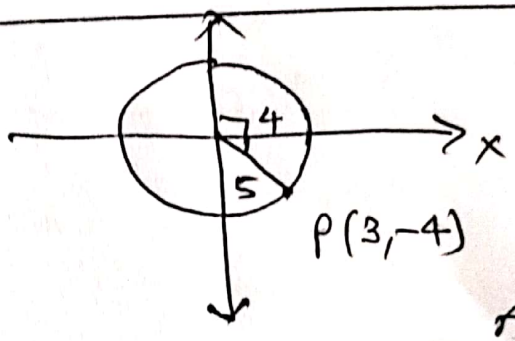
$= 1$ (True)

Reason: Conceptual (True)

Ans: A

09 $P(3, -4) \in Q_4$

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



Ans: A

10 $\theta \in Q_4$

Ans: D

11 $\theta = \frac{7\pi}{6} = \frac{7 \times 180^\circ}{6} = 7 \times 30^\circ = 210^\circ$

Ans: A

12 $\cos\theta = \cos 210^\circ$

$210^\circ \in Q_3$

$\therefore \cos\theta < 0$

Ans: B

13 $\cos\theta = -\frac{4}{5}$; $\theta \in (90^\circ, 180^\circ)$ $\therefore \theta \in Q_2$

$\therefore \tan\theta = -\frac{3}{4} \Rightarrow \tan^2\theta = \frac{9}{16}$

$\therefore 100 \tan^2\theta = 100 \times \frac{9}{16} = 5.6$

Integral value = 5

Ans: 5

14. $\cos\theta = \frac{15}{17}$

$100\cos\theta = \frac{15}{17} \times 100 = 88.8$

Integral value = 88

Ans: 88

15 a) $\sin(180^\circ - \theta) = \sin\theta$; b) $\cos(180^\circ - \theta) = -\cos\theta$

c) $\tan(180^\circ + \theta) = \tan\theta$; d) $\sin(360^\circ - \theta) = -\sin\theta$

Ans: S, Q, R, P

16 a) $\sin 150^\circ = \sin(180^\circ - 30^\circ) = \sin 30^\circ$

b) $\cos 210^\circ = \cos(180^\circ + 30^\circ) = -\cos 30^\circ$

c) $\tan 225^\circ = \tan(180^\circ + 45^\circ) = \tan 45^\circ$

d) $\sin 330^\circ = \sin(360^\circ - 30^\circ) = -\sin 30^\circ$

Ans: P, Q, R, S

LEARNERS TASK (CUQ's

01. Conceptual — Ans: C

02 Conceptual — Ans: B

03 Conceptual — Ans: B

04 Conceptual — Ans: D

05 Conceptual — Ans: A

06. -1 — Ans: D

07. $\operatorname{cosec}\theta - \cot\theta = \frac{1}{15} \Rightarrow \cot\theta - \operatorname{cosec}\theta = -\frac{1}{15}$

Ans: B

08 $\operatorname{Cosec}\theta = \pm\sqrt{1+\cot^2\theta}$ (9) Ans: C

09 $\sin\theta\left(\frac{\cos\theta}{\sin\theta}\right) + \cos\theta\left(\frac{\sin\theta}{\cos\theta}\right)$

$= \cos\theta + \sin\theta$ Ans: A

10. $\sin(30^\circ + 60^\circ) = 1$ Ans: B

JEE MAINS LEVEL

01. $\sin 270^\circ = \sin(180^\circ + 90^\circ) = -\sin 90^\circ = -1$ Ans: C

02 $\tan(360^\circ + \theta) = \tan\theta$ Ans: A

03 $\cot\theta = \frac{3}{4} \Rightarrow \tan\theta = \frac{4}{3}$ Ans: A

04 $\sec A = \frac{13}{12} \Rightarrow \cos A = \frac{12}{13}$ Ans: A

05 $\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{0.6}{0.8} = \frac{6}{8} = \frac{3}{4} = 0.75$ Ans: A

06 $\cot\frac{\pi}{16} \cdot \cot\frac{2\pi}{16} \cdot \cot\frac{3\pi}{16} \cdot \cot\frac{4\pi}{16} \cdot \ldots\ldots \cot\frac{7\pi}{16} \cdot$

$= \left(\cot\frac{\pi}{16} \cdot \cot\frac{7\pi}{16}\right)\left(\cot\frac{2\pi}{16} \cdot \cot\frac{6\pi}{16}\right)\cdot\left(\cot\frac{3\pi}{16} \cdot \cot\frac{5\pi}{16}\right)\cot\frac{4\pi}{16}$

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

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

$= \left(\cot\frac{\pi}{16} \cdot \tan\frac{\pi}{16}\right)\left(\cot\frac{2\pi}{16} \cdot \tan\frac{2\pi}{16}\right)\left(\cot\frac{3\pi}{16} \cdot \tan\frac{3\pi}{16}\right) \times 1$

$= 1 \times 1 \times 1 \times 1 = 1$ Ans: A

07 $$\frac{\cos(\pi - A)\cdot\cot\left(\frac{\pi}{2}+A\right)\cdot\cos(-A)}{\tan(\pi+A)\cdot\tan\left(\frac{3\pi}{2}+A\right)\cdot\sin(2\pi-A)}$$

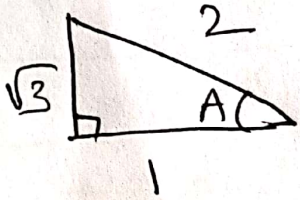
$$= \frac{(-\cos A)(-\tan A)(\cos A)}{(\tan A)(-\cot A)(\sin A)}$$

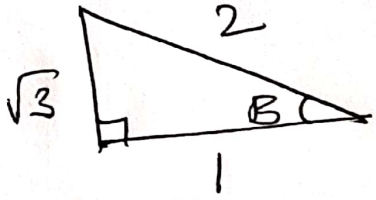
$$= \frac{-\sin A\cos A}{\sin A} = -\cos A$$

~~Ans. A~~

08 $\cos A = -\frac{1}{2} \Rightarrow A \in Q_2$ or $Q_3 \Rightarrow A \in Q_3$ since $A \notin Q_2$

$\cos B = -\frac{1}{2} \Rightarrow B \in Q_2$ or $Q_3 \Rightarrow B \in Q_2$ since $B \notin Q_3$





$$\frac{4\sin B - 3\tan A}{\tan B + \sin A} = \frac{4\left(\frac{\sqrt{3}}{2}\right) - 3\left(\frac{\sqrt{3}}{1}\right)}{\left(\frac{-\sqrt{3}}{1}\right) + \left(\frac{-\sqrt{3}}{2}\right)} = \frac{2}{3}$$

Ans. B

09 $\left.\begin{aligned} 3\sin\theta + 4\cos\theta &= 5 \\ 4\sin\theta - 3\cos\theta &= x \end{aligned}\right\}$ $3^2 + 4^2 = 5^2 + x^2 \Rightarrow x = 0$

Ans: C

10 $$(m^2 - n^2)\sin^2 B = \left(\frac{\sin^2 A}{\sin^2 B} - \frac{\cos^2 A}{\cos^2 B}\right)\sin^2 B$$

$$= \frac{\sin^2 A\cdot\cos^2 B - \cos^2 A\sin^2 B}{\cos^2 B}$$

$$= \frac{(1-\cos^2 A)\cos^2 B - \cos^2 A(1-\cos^2 B)}{\cos^2 B} = \frac{\cos^2 B - \cos^2 A}{\cos^2 B}$$

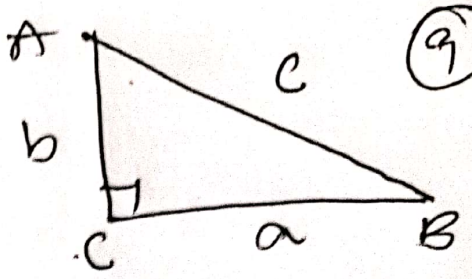
$$= 1 - n^2$$

Ans: A

11. $\tan A + \tan B$

$= \frac{a}{b} + \frac{b}{a}$

$= \frac{a^2+b^2}{ab} = \frac{c^2}{ab}$



Ans: B

12 1 minute $\longrightarrow$ 360 revolutions

60 seconds $\longrightarrow$ 360 revolutions

1 sec $\longrightarrow$ 6 revolutions

Now, 1 revolution $\longrightarrow 2\pi$ radians

6 revolutions $\longrightarrow 12\pi$ radians Ans. D

13. $\frac{2\sin\theta}{1+\cos\theta+\sin\theta} = x.$

Let $\theta = 90^\circ$

$\Rightarrow \frac{2(1)}{1+0+(1)} = x \Rightarrow x = 1$

Now opt A: $\frac{1-\cos\theta+\sin\theta}{1+\sin\theta} = \frac{1-0+1}{1+1} = 1 = x$ Ans. A

14 Let $\alpha = 60^\circ$

$\left(\frac{1}{2}\right)^4 + 2\left(\frac{1}{2}\right)^2\left(2^2-1\right) = \frac{25}{16}$

Option: A : $1+\sin^4\alpha$

$= 1+\left(\frac{\sqrt{3}}{2}\right)^4 = \frac{25}{16}$ Ans. A

15. $\dfrac{\tan(180^\circ - 20^\circ) - \tan(90^\circ + 20^\circ)}{1 + \tan(180^\circ - 20^\circ)\cdot\tan(90^\circ + 20^\circ)}$ (10)

$= \dfrac{-\tan 20^\circ + \cot 20^\circ}{1 + \tan 20^\circ \cdot \cot 20^\circ}$

$= \dfrac{-n + \frac{1}{n}}{2} = \dfrac{1-n^2}{2n}$ Ans. C

16. Let $\theta = 45^\circ$

$\therefore m = 1 + \frac{1}{\sqrt{2}}, \quad n = 1 - \frac{1}{\sqrt{2}}$

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

opt c: $\Rightarrow 4\sqrt{mn}$

$= 4\sqrt{\left(1+\frac{1}{\sqrt{2}}\right)\left(1-\frac{1}{\sqrt{2}}\right)} = 2\sqrt{2}$ Ans: C

17 JEE ADVANCED

01. Conceptual All options are true

Ans: A, B, C, D

02. D) $\cot 30^\circ = \sqrt{3}$, $\cot 150^\circ = \cot(180^\circ - 30^\circ)$ (11)

$= -\cot 30^\circ$

$= -\sqrt{3}$ (True)

Ans.. D

03 A) $\sin\theta = \sin 150^\circ = \sin(180^\circ - 30^\circ) = \sin 30^\circ$ (True)

B) $\cos\theta = \cos 150^\circ = \cos(180^\circ - 30^\circ) = -\cos 30^\circ$ (True)

C) $\tan\theta = \tan 150^\circ = \tan(180^\circ - 30^\circ) = -\tan 30^\circ$ (True)

D) $\cot\theta = \cot 150^\circ = \cot(180^\circ - 30^\circ) = -\cot 30^\circ$

$= \frac{-1}{\tan 30^\circ}$ (False)

Ans: A, B, C

04 Statement I: Conceptual (True)

Statement II: Conceptual (True)

Ans: A

05 Statement I: $\cos 150^\circ = \cos(180^\circ - 30^\circ)$

$= -\cos 30^\circ$ (True)

Statement II: Conceptual (True)

Ans: A

06 Assertion: Since $\sin\theta$ and $\operatorname{cosec}\theta$ are belongs to same quadrant (True)

Reason: Conceptual (True)

Ans.. A

07. Assertion: Conceptual (True)

Reason: Conceptual (True)

Ans: A

08 $\sin(720^\circ + \theta) = \sin(2 \times 360^\circ + \theta)$

$= \sin\theta$

Ans: A

09. Since, $\tan(180^\circ + \theta) = \tan\theta$ Ans: C

10. $\sin 150^\circ = \sin(180^\circ - 30^\circ)$
$= \sin 30^\circ = \frac{1}{2} > 0$ Ans: A

11. $\tan 150^\circ = \tan(180^\circ - 30^\circ)$
$= -\tan 30^\circ$
$= \frac{1}{\sqrt{3}} < 0$ Ans: B

12 NOTE! Please, change the question.

$\cos\theta = -\frac{5}{13}$

Now, $100 \times \cos\theta = -\frac{5}{13} \times 100 = -38.46$

Integral value $= -38$. Ans: -38

13 $\cot A = \frac{3}{4}$

$\frac{\sin A + \cos A}{\sin A - \cos A} = \frac{1 + \cot A}{1 - \cot A} = \frac{1 + \frac{3}{4}}{1 - \frac{3}{4}} = 7$ Ans: 7

14 a) $\tan\theta = \frac{\sin\theta}{\cos\theta}$ (p)

b) $\cot\theta = \frac{\cos\theta}{\sin\theta}$ (r)

c) $\sec\theta = \frac{1}{\cos\theta}$ (q)

d) $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$ (s) Ans: p, r, q, s

15 a) $\sec 60^\circ = 2$ (p) ; b) $\operatorname{cosec} 30^\circ = 2$ (q) (13)

c) $\sec 30^\circ = \frac{2}{\sqrt{3}}$ (r) ; $\operatorname{cosec} 60^\circ = \frac{2}{\sqrt{3}}$ (s)

Ans: p, q, r, s

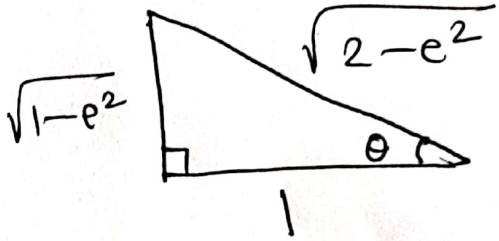
ADDITIONAL PRACTICE QUESTIONS

01. $\sec A + \tan A = 3 \Rightarrow \sec A - \tan A = \frac{1}{3}$

$2\sec A = 3 + \frac{1}{3} \Rightarrow \sec A = \frac{5}{3}$ Ans: B

02 $\tan^2\theta = 1 - e^2$

$\Rightarrow \tan\theta = \frac{\sqrt{1-e^2}}{1}$



$\sec\theta + \tan^3\theta \cdot \operatorname{cosec}\theta$

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

Ans: ___

03 $\tan\theta = -\frac{4}{3} \Rightarrow \theta \in Q_2$ or Q_4

$\theta \in Q_2 \Rightarrow \sin\theta = \frac{4}{5}$

$\theta \in Q_4 \Rightarrow \sin\theta = -\frac{4}{5}$

Ans. B

04 $4\left[\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^4\right] - 3\left[\left(\frac{1}{\sqrt{2}}\right)^2 - (1)^2\right]$

$= 4\left[\frac{1}{8}\right] - 3\left[\frac{-1}{2}\right] = \frac{1}{2} + \frac{3}{2} = 2$ Ans. 2

$\Rightarrow$ THE END $\Leftarrow$