

JEE MAIN TRIGONOMETRIC FUNCTIONS — PYQS

Max. Marks: 112

Questions: 28

Section A (MCQ) — 23 questions

- Q.1** Let $S = \{\theta \in (-2\pi, 2\pi) : \cos \theta + 1 = \sqrt{3} \sin \theta\}$.
Then $\sum_{\theta \in S} \theta$ is equal to :

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) $-\frac{2\pi}{3}$ (2) $-\frac{4\pi}{3}$ (3) $\frac{2\pi}{3}$ (4) $\frac{4\pi}{3}$

Scan or tap for the full solution



- Q.2** Let $\tan A, \tan B$, where $A, B \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, be the roots of the quadratic equation $x^2 - 2x - 5 = 0$. Then $20\sin^2\left(\frac{A+B}{2}\right)$ is equal to :

[JEE Main 2026 (Online) 5th April Morning Shift]

- (1) $10 + \sqrt{10}$ (2) $10 - 2\sqrt{10}$
(3) $10 - 3\sqrt{10}$ (4) $10 - \sqrt{10}$

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- Q.3** The sum of all the integral values of p such that the equation $3\sin^2 x + 12\cos x - 3 = p$, $x \in \mathbb{R}$, has at least one solution, is:

[JEE Main 2026 (Online) 5th April Morning Shift]

- (1) -54 (2) -60 (3) -75 (4) -84

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- Q.4** If $\sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right) = K$, then the value of $\sin\left(\frac{10K\pi}{3}\right)$ is :

[JEE Main 2026 (Online) 2nd April Morning Shift]

- (1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ (2) $\frac{\sqrt{3}-1}{\sqrt{2}}$
(3) $\frac{\sqrt{3}}{2}$ (4) $\frac{1}{2}$

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- Q.5** The value of $\operatorname{cosec} 10^\circ - \sqrt{3} \sec 10^\circ$ is equal to :

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 2 (2) 6 (3) 8 (4) 4

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- Q.6** Let $S = \{x \in [-\pi, \pi] : \sin x(\sin x + \cos x) = a, a \in \mathbb{Z}\}$.
Then $n(S)$ is equal to :

[JEE Main 2026 (Online) 2nd April Morning Shift]

- (1) 3 (2) 6 (3) 7 (4) 9

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- Q.7** Let $P = \{\theta \in [0, 4\pi] : \tan^2 \theta \neq 1\}$ and $S = \{a \in \mathbb{Z} : 2(\cos^8 \theta - \sin^8 \theta) \sec 2\theta = a^2, \theta \in P\}$.
Then $n(S)$ is:

[JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) 0 (2) 1 (3) 2 (4) 3

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- Q.8** If $\frac{\tan(A-B)}{\tan A} + \frac{\sin^2 C}{\sin^2 A} = 1$, $A, B, C \in \left(0, \frac{\pi}{2}\right)$, then

[JEE Main 2026 (Online) 28th January Morning Shift]

- (1) $\tan A, \tan C, \tan B$ are in A.P.
(2) $\tan A, \tan C, \tan B$ are in G.P.
(3) $\tan A, \tan B, \tan C$ are in G.P.
(4) $\tan A, \tan B, \tan C$ are in A.P.

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- Q.9** The sum of all the elements in the range of $f(x) = \operatorname{Sgn}(\sin x) + \operatorname{Sgn}(\cos x) + \operatorname{Sgn}(\tan x) + \operatorname{Sgn}(\cot x)$, $x \neq \frac{n\pi}{2}, n \in \mathbb{Z}$, where

$$\operatorname{Sgn}(t) = \begin{cases} 1, & \text{if } t > 0 \\ -1, & \text{if } t < 0 \end{cases}$$

is : [JEE Main 2026 (Online) 28th January Evening Shift]

- (1) 4 (2) 0 (3) 2 (4) -2

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- Q.10** The value of $\frac{\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ}{\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ}$ is equal to [JEE Main 2026 (Online) 24th January Morning Shift]

- (1) 32 (2) 64 (3) 12 (4) 16

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Q.11 If $\cot x = \frac{5}{12}$ for some $x \in \left(\pi, \frac{3\pi}{2}\right)$, then $\sin 7x \left(\cos \frac{13x}{2} + \sin \frac{13x}{2}\right) + \cos 7x \left(\cos \frac{13x}{2} - \sin \frac{13x}{2}\right)$ is equal to

[JEE Main 2026 (Online) 24th January Morning Shift]
 (1) $\frac{5}{\sqrt{13}}$ (2) $\frac{6}{\sqrt{26}}$ (3) $\frac{4}{\sqrt{26}}$ (4) $\frac{1}{\sqrt{13}}$



Q.12 Number of solutions of $\sqrt{3} \cos 2\theta + 8 \cos \theta + 3\sqrt{3} = 0$, $\theta \in [-3\pi, 2\pi]$ is :

[JEE Main 2026 (Online) 23rd January Morning Shift]
 (1) 5 (2) 4 (3) 3 (4) 0



Q.13 Let α and β respectively be the maximum and the minimum values of the function

$$f(\theta) = 4 \left(\sin^4 \left(\frac{7\pi}{2} - \theta \right) + \sin^4 (11\pi + \theta) \right) - 2 \left(\sin^6 \left(\frac{3\pi}{2} - \theta \right) + \sin^6 (9\pi - \theta) \right), \theta \in \mathbb{R}.$$

Then $\alpha + 2\beta$ is equal to :

[JEE Main 2026 (Online) 23rd January Morning Shift]
 (1) 6 (2) 5 (3) 4 (4) 3



Q.14 The least value of $(\cos^2 \theta - 6 \sin \theta \cos \theta + 3 \sin^2 \theta + 2)$ is

[JEE Main 2026 (Online) 23rd January Evening Shift]
 (1) $4 - \sqrt{10}$ (2) -1
 (3) $4 + \sqrt{10}$ (4) 1



Q.15 Let $\frac{\pi}{2} < \theta < \pi$ and $\cot \theta = -\frac{1}{2\sqrt{2}}$. Then the value of $\sin \left(\frac{15\theta}{2} \right) (\cos 8\theta + \sin 8\theta) + \cos \left(\frac{15\theta}{2} \right) (\cos 8\theta - \sin 8\theta)$ is equal to :

[JEE Main 2026 (Online) 23rd January Evening Shift]

(1) $\frac{\sqrt{2}-1}{\sqrt{3}}$ (2) $\frac{\sqrt{2}}{\sqrt{3}}$
 (3) $\frac{1-\sqrt{2}}{\sqrt{3}}$ (4) $-\frac{\sqrt{2}}{\sqrt{3}}$



Q.16 If for $\theta \in \left[-\frac{\pi}{3}, 0\right]$, the points

$$(x, y) = \left(3 \tan \left(\theta + \frac{\pi}{3} \right), 2 \tan \left(\theta + \frac{\pi}{6} \right) \right) \text{ lie on}$$

$xy + \alpha x + \beta y + \gamma = 0$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to :

[JEE Main 2025 (Online) 7th April Morning Shift]

(1) 75 (2) 96 (3) 80 (4) 72

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Q.17 The number of solutions of the equation

$$\cos 2\theta \cos \frac{\theta}{2} + \cos \frac{5\theta}{2} = 2 \cos^3 \frac{5\theta}{2} \text{ in } \left[-\frac{\pi}{2}, \frac{\pi}{2} \right] \text{ is :}$$

[JEE Main 2025 (Online) 7th April Evening Shift]

(1) 5 (2) 7 (3) 6 (4) 9

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Q.18 If $10 \sin^4 \theta + 15 \cos^4 \theta = 6$, then the value of $\frac{27 \operatorname{cosec}^6 \theta + 8 \sec^6 \theta}{16 \sec^8 \theta}$ is

[JEE Main 2025 (Online) 4th April Morning Shift]

(1) $\frac{2}{5}$ (2) $\frac{3}{5}$ (3) $\frac{1}{5}$ (4) $\frac{3}{4}$

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Q.19 The number of solutions of the equation

$$2x + 3 \tan x = \pi, x \in [-2\pi, 2\pi] - \left\{ \pm \frac{\pi}{2}, \pm \frac{3\pi}{2} \right\} \text{ is :}$$

[JEE Main 2025 (Online) 3rd April Morning Shift]

(1) 4 (2) 5 (3) 3 (4) 6

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Q.20 The number of solutions of the equation

$$(4 - \sqrt{3}) \sin x - 2\sqrt{3} \cos^2 x = -\frac{4}{1 + \sqrt{3}}, x \in \left[-2\pi, \frac{5\pi}{2} \right] \text{ is}$$

[JEE Main 2025 (Online) 3rd April Evening Shift]

(1) 4 (2) 3 (3) 6 (4) 5

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Q.21 If $\theta \in [-2\pi, 2\pi]$, then the number of solutions of $2\sqrt{2} \cos^2 \theta + (2 - \sqrt{6}) \cos \theta - \sqrt{3} = 0$, is equal to:

[JEE Main 2025 (Online) 2nd April Morning Shift]

(1) 8 (2) 6 (3) 10 (4) 12

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Q.22 If $\theta \in \left[-\frac{7\pi}{6}, \frac{4\pi}{3} \right]$, then the number of solutions of $\sqrt{3} \operatorname{cosec}^2 \theta - 2(\sqrt{3} - 1) \operatorname{cosec} \theta - 4 = 0$, is equal to

[JEE Main 2025 (Online) 2nd April Evening Shift]

(1) 7 (2) 10 (3) 6 (4) 8

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Q.23 If $\sum_{r=1}^{13} \left\{ \frac{1}{\sin \left(\frac{\pi}{4} + (r-1) \frac{\pi}{6} \right) \sin \left(\frac{\pi}{4} + \frac{r\pi}{6} \right)} \right\} = a\sqrt{3} + b$, $a, b \in \mathbb{Z}$, then $a^2 + b^2$ is equal to :

[JEE Main 2025 (Online) 28th January Evening Shift]

(1) 10 (2) 4 (3) 8 (4) 2

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**Section B (Numerical) — 5 questions**

Q.24 If $S = \{\theta \in [-\pi, \pi] : \cos \theta \cos \frac{5\theta}{2} = \cos 7\theta \cos \frac{7\theta}{2}\}$, then $n(S)$ is equal to _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

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Q.25 If $A = \frac{\sin 3^\circ}{\cos 9^\circ} + \frac{\sin 9^\circ}{\cos 27^\circ} + \frac{\sin 27^\circ}{\cos 81^\circ}$ and $B = \tan 81^\circ - \tan 3^\circ$, then $\frac{B}{A}$ is equal to _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

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Q.26 The number of elements in the set $\{x \in [0, 180^\circ] : \tan(x + 100^\circ) = \tan(x + 50^\circ) \tan x \tan(x - 50^\circ)\}$ is _____.

[JEE Main 2026 (Online) 24th January Evening Shift]

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Q.27 If $\frac{\cos^2 48^\circ - \sin^2 12^\circ}{\sin^2 24^\circ - \sin^2 6^\circ} = \frac{\alpha + \beta\sqrt{5}}{2}$, where $\alpha, \beta \in \mathbb{N}$, then $\alpha + \beta$ is equal to _____.

[JEE Main 2026 (Online) 22nd January Morning Shift]

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Q.28 Let $\cos(\alpha + \beta) = -\frac{1}{10}$ and $\sin(\alpha - \beta) = \frac{3}{8}$, where $0 < \alpha < \frac{\pi}{3}$ and $0 < \beta < \frac{\pi}{4}$. If $\tan 2\alpha = \frac{3(1 - r\sqrt{5})}{\sqrt{11}(s + \sqrt{5})}$, $r, s \in \mathbb{N}$, then $r + s$ is equal to _____.

[JEE Main 2026 (Online) 22nd January Evening Shift]

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**ANSWER KEY****Section A (MCQ) — 23 questions**

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	2	3	3	1	4	4	1	2	3	2	4
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	1	2	1	3	1	2	1	2	4	1	3
Ques.	23										
Ans.	3										

Section B (Numerical) — 5 questions

Ques.	24	25	26	27	28						
Ans.	19	2	4	4	20						