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MATHEMATICS · JEE MAIN

Trigonometry

Previous Year Questions with answers

228 questions · **162** papers · **2002–2026** · newest paper first

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What is in this PDF: every Trigonometry question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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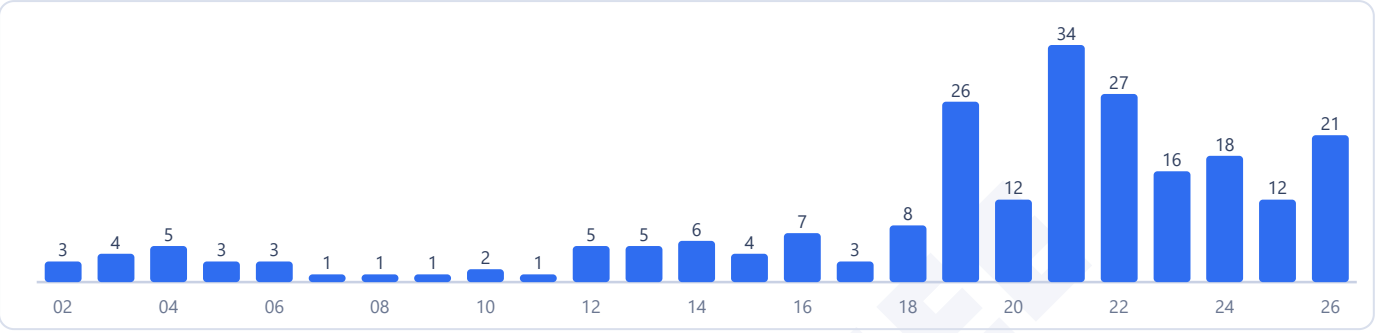
Chapter at a glance

3.6%	228	128 of 162	197 / 31
of Mathematics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Falling: 0.9 questions per paper in 2024–2026 against 1.1 in 2019–2023.

Questions per year



Counts are the questions we hold: 228 in 162 papers. 2 questions in this chapter came back in more than one paper.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Trigonometry serves as the computational alphabet for algebra and calculus under Unit 14: Trigonometry in the Class 11 curriculum, placing it at rank 15 among the 29 chapters in the subject. Between 2019 and 2026, the examination presented 166 questions from this chapter across 162 papers, representing 3.6 percent of all mathematics questions. It appeared in 128 of those 162 papers and has been asked every single year since 2019. Over the recent 2024 to 2026 testing sessions, it contributed 51 questions across 58 papers, averaging 0.9 questions per paper with a 3.3 percent subject share. Comparing the earlier 2002 to 2018 share of 4.7 percent against 2024 to 2026 shows that its long-term share is down, while comparing 2019 to 2026 with 2024 to 2026 indicates that it is about the same. Across the complete historical record from 2002 to 2026 spanning 200 papers, 228 questions were asked in 162 papers, including 31 numerical answer questions between 2019 and 2026.

The annual question tallies for 2024, 2025, and 2026 were 18, 12, and 21 questions respectively, demonstrating sustained examination value.

The scope of this chapter has been refined in modern test cycles. Formal syllabus updates removed Heights & Distances and Properties of Triangles from the active list. Consequently, recent examination sessions focus squarely on compound angle identities, multiple angle transformations, trigonometric series summations, and solving trigonometric equations on bounded intervals.

Most-asked topics

Questions in this chapter organize across four distinct topics:

1. **Ratios & Identities (72 questions, 2019-2026; 93 total, last asked 2026)** The largest subtopic in the chapter. Covers compound angle additions, transformation of products into sums and differences, double and triple angle

identities, trigonometric polynomial evaluations at specific numerical angle fractions, and telescoping trigonometric products.

2. **Trigonometric Equations (55 questions, 2019-2026; 68 total, last asked 2026)** Involves finding general and principal solutions, counting the number of distinct roots satisfying simultaneous trigonometric constraints on bounded intervals, and resolving quadratic or polynomial forms in sine and cosine.

3. **Heights & Distances (26 questions, 2019-2026; 42 total, last asked 2023)** Dealt with classical two-dimensional and three-dimensional surveying problems, angles of elevation and depression, and tower heights. This topic was explicitly excised in recent syllabus updates, which is why it was last asked in 2023.

4. **Properties of Triangles (13 questions, 2019-2026; 25 total, last asked 2024)** Encompassed sine rules, cosine rules, projection formulas, half-angle area formulas, incircle and circumcircle radii relations. This topic was also removed from the current official syllabus.

What the questions look like

Examiners repeatedly use several dependable trigonometric problem templates:

- **Numerical Angle Value Evaluation**: Expressions combining non-standard angle ratios such as differences or quotients of sines and cosines at multiples of ten degrees or twelve degrees. Converting everything to a common denominator and factoring using product-to-sum identities collapses the expression into a clean integer or simple surd.
- **Root Counting on Bounded Intervals**: A non-linear trigonometric equation involving mixed frequencies is given on a specified closed interval. Candidates factor the equation and count the exact number of distinct real solutions.
- **Maximum and Minimum Values**: Expressions of the form a cos theta plus b sin theta, or homogeneous quadratic forms in sine and cosine, evaluated for global extrema using square-completion or auxiliary angle substitutions.
- **Compound Angle Parameter Extraction**: Given values for cosine of alpha plus beta and sine of alpha minus beta, candidates determine tangent of two alpha by expressing two alpha as the sum of alpha plus beta and alpha minus beta.

How to practise it

Mastering trigonometry demands instinctive memory of transformation formulas:

- **Convert tangent and cotangent to sine and cosine**: When faced with expressions featuring secants, cosecants, tangents, or cotangents, immediately rewrite them in terms of sine and cosine over a common denominator. The resulting numerator almost always simplifies via standard compound angle identities.
- **Count roots on intervals methodically**: When counting solutions of an equation like sin(n x) equals a constant on a given interval, compute the exact range traversed by the argument n x. Count the number of intersections of the sine wave with the horizontal line across that extended argument span, checking endpoints carefully.
- **Use the linear combination extremum formula**: Remember that a cos theta plus b sin theta always attains a maximum of the positive square root of a squared plus b squared, and a minimum of the negative square root.
- **Beware of extraneous solutions**: When solving equations by squaring both sides or multiplying by trigonometric factors, check that candidate roots do not cause denominators to vanish or introduce spurious solutions.

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Q1 JEE Main 2026 · 6 Apr · Shift 1 MCQ

Let $S = \{\theta \in (-2\pi, 2\pi) : \cos\theta + 1 = \sqrt{3}\sin\theta\}$.

Then $\sum_{\theta \in S} \theta$ is equal to:

(A) $-\frac{2\pi}{3}$

(B) $-\frac{4\pi}{3}$

(C) $\frac{2\pi}{3}$

(D) $\frac{4\pi}{3}$

Answer: (B) $-\frac{4\pi}{3}$ · Official NTA final key

Q2 JEE Main 2026 · 6 Apr · Shift 1 Numerical

For the functions $f(\theta) = \alpha\tan^2\theta + \beta\cot^2\theta$, and $g(\theta) = \alpha\sin^2\theta + \beta\cos^2\theta$, $\alpha > \beta > 0$, let $\min_{0<\theta<\frac{\pi}{2}} f(\theta) = \max_{0<\theta<\pi} g(\theta)$. If the first term of a G.P. is $\left(\frac{\alpha}{2\beta}\right)$, its common ratio is $\left(\frac{2\beta}{\alpha}\right)$ and the sum of its first 10 terms is $\frac{m}{n}$, $\gcd(m, n) = 1$, then $m + n$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 1279. · Official NTA final key

Q3 JEE Main 2026 · 5 Apr · Shift 1 MCQ

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:

(A) $10 + \sqrt{10}$

(B) $10 - 2\sqrt{10}$

(C) $10 - 3\sqrt{10}$

(D) $10 - \sqrt{10}$

Answer: (C) $10 - 3\sqrt{10}$ · Official NTA final key

Q4 JEE Main 2026 · 5 Apr · Shift 1 MCQ

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:

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(A) -54

(B) -60

(C) -75

(D) -84

Answer: (C) -75 · Official NTA final key

Q5 JEE Main 2026 · 5 Apr · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 19. · Official NTA final key

Q6 JEE Main 2026 · 4 Apr · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 2. · Official NTA final key

Q7 JEE Main 2026 · 4 Apr · Shift 1 Numerical

Let $\vec{a_k} = (\tan\theta_k)\,\hat{i} + \hat{j}$ and $\vec{b_k} = \hat{i} - (\cot\theta_k)\,\hat{j}$, where $\theta_k = \frac{2^{k-1}\pi}{2^n+1}$, for some $n \in \mathrm{N}$, $n > 5$. Then the value of $\frac{\sum_{k=1}^{n} |\vec{a_k}|^2}{\sum_{k=1}^{n} \left|\vec{b_k}\right|^2}$ is _____.

Numerical value type: the answer is a number.

Answer: 3. · Official NTA final key

Q8 JEE Main 2026 · 2 Apr · Shift 1 MCQ

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

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

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

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

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

Answer: (A) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ · Official NTA final key

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Q9 JEE Main 2026 · 2 Apr · Shift 1 MCQ

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

(A) 3
(B) 6
(C) 7
(D) 9

Answer: (D) 9 · Official NTA final key

Q10 JEE Main 2026 · 2 Apr · Shift 2 MCQ

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

(A) 0
(B) 1
(C) 2
(D) 3

Answer: (A) 0 · Official NTA final key

Q11 JEE Main 2026 · 28 Jan · Shift 1 MCQ

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

(A) $\tan A$, $\tan B$, $\tan C$ are in G.P.
(B) $\tan A$, $\tan C$, $\tan B$ are in G.P.
(C) $\tan A$, $\tan B$, $\tan C$ are in A.P.
(D) $\tan A$, $\tan C$, $\tan B$ are in A.P.

Answer: (B) $\tan A$, $\tan C$, $\tan B$ are in G.P. · Official NTA final key

Q12 JEE Main 2026 · 24 Jan · Shift 1 MCQ

The value of $\frac{\sqrt{3}\,\mathrm{cosec}\,20^\circ - \sec 20^\circ}{\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ}$ is equal to

(A) 32
(B) 64
(C) 12
(D) 16

Answer: (B) 64 · Official NTA final key

Q13 JEE Main 2026 · 24 Jan · Shift 1 MCQ

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

(A) $\frac{1}{\sqrt{13}}$
(B) $\frac{4}{\sqrt{26}}$
(C) $\frac{5}{\sqrt{13}}$
(D) $\frac{6}{\sqrt{26}}$

Answer: (A) $\frac{1}{\sqrt{13}}$ · Official NTA final key

Q14 JEE Main 2026 · 24 Jan · Shift 2 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 4. · Official NTA final key

Q15 JEE Main 2026 · 23 Jan · Shift 1 MCQ

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

(A) 4
(B) 0
(C) 3
(D) 5

Answer: (D) 5 · Official NTA final key

Q16 JEE Main 2026 · 23 Jan · Shift 1 MCQ

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

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

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

(A) 4
(B) 3
(C) 5
(D) 6

Answer: (C) 5 · Official NTA final key

Q17 JEE Main 2026 · 23 Jan · Shift 2 MCQ

The least value of $\left(\cos^2\theta - 6\sin\theta\cos\theta + 3\sin^2\theta + 2\right)$ is

(A) -1

(B) $4+\sqrt{10}$

(C) $4-\sqrt{10}$

(D) 1

Answer: (C) $4-\sqrt{10}$ · Official NTA final key

Q18 JEE Main 2026 · 23 Jan · Shift 2 MCQ

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

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

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

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

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

Answer: (C) $\frac{1-\sqrt{2}}{\sqrt{3}}$ · Official NTA final key

Q19 JEE Main 2026 · 22 Jan · Shift 1 Numerical

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 _____.

Numerical value type: the answer is a number.

Answer: 4. · Official NTA final key

Q20 JEE Main 2026 · 22 Jan · Shift 2 Numerical

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 $\tan 2\alpha=\frac{3(1-r\sqrt{5})}{\sqrt{11}(s+\sqrt{5})}$, $r,s\in\mathbf{N}$, then $r+s$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 20. · Official NTA final key

Q21 JEE Main 2026 · 21 Jan · Shift 1 MCQ

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

(A) 8
(B) 2
(C) 6
(D) 4

Answer: (D) 4 · Official NTA final key

Q22 JEE Main 2025 · 7 Apr · Shift 1 MCQ

If for $\theta \in \left[-\frac{\pi}{3}, 0\right]$, the points $(x, y) = \left(3\tan\left(\theta + \frac{\pi}{3}\right), 2\tan\left(\theta + \frac{\pi}{6}\right)\right)$ lie on $xy + \alpha x + \beta y + \gamma = 0$, then $\alpha^2 + \beta^2 + \gamma^2$ is equal to

(A) 72
(B) 80
(C) 75
(D) 96

Answer: (C) 75 · Key from source paper

Q23 JEE Main 2025 · 7 Apr · Shift 2 MCQ

The number of solutions of the equation $\cos 2\theta \cos\frac{\theta}{2} + \cos\frac{5\theta}{2} = 2\cos^3\frac{5\theta}{2}$ in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is :

(A) 5
(B) 7
(C) 9
(D) 6

Answer: (B) 7 · Key from source paper

Q24 JEE Main 2025 · 4 Apr · Shift 1 MCQ

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

(A) $\frac{1}{5}$
(B) $\frac{3}{5}$
(C) $\frac{2}{5}$
(D) $\frac{3}{4}$

Answer: (C) $\frac{2}{5}$ · Key from source paper

Q25 JEE Main 2025 · 3 Apr · Shift 1 MCQ

The number of solutions of the equation $2x + 3\tan x = \pi, x \in [-2\pi, 2\pi] - \left\{\pm\frac{\pi}{2}, \pm\frac{3\pi}{2}\right\}$ is:

(A) 4
(B) 3
(C) 5
(D) 6

Answer: (C) 5 · Key from source paper

Q26 JEE Main 2025 · 3 Apr · Shift 2 MCQ

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

(A) 3
(B) 5
(C) 4
(D) 6

Answer: (B) 5 · Key from source paper

Q27 JEE Main 2025 · 2 Apr · Shift 1 MCQ

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 :

(A) 8
(B) 12
(C) 10
(D) 6

Answer: (A) 8 · Key from source paper

Q28 JEE Main 2025 · 2 Apr · Shift 2 MCQ

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

(A) 7
(B) 10
(C) 6
(D) 8

Answer: (C) 6 · Key from source paper

Q29 JEE Main 2025 · 29 Jan · Shift 2 MCQ

If $\sin x + \sin^2 x = 1, x \in \left(0, \frac{\pi}{2}\right)$, then $\left(\cos^{12} x + \tan^{12} x\right) + 3\left(\cos^{10} x + \tan^{10} x + \cos^8 x + \tan^8 x\right) + \left(\cos^6 x + \tan^6 x\right)$ is equal to :

(A) 4
(B) 1
(C) 3
(D) 2

Answer: (D) 2 · Key from source paper

Q30 JEE Main 2025 · 28 Jan · Shift 2 MCQ

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

(A) 10
(B) 4
(C) 2
(D) 8

Answer: (D) 8 · Key from source paper

Q31 JEE Main 2025 · 23 Jan · Shift 1 MCQ

The value of $(\sin 70^\circ)(\cot 10^\circ \cot 70^\circ - 1)$ is

(A) 2/3
(B) 1
(C) 0
(D) 3/2

Answer: (B) 1 · Key from source paper

Q32 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Let the range of the function $f(x)=6+16\cos x\cdot\cos\left(\frac{\pi}{3}-x\right)\cdot\cos\left(\frac{\pi}{3}+x\right)\cdot\sin 3x\cdot\cos 6x,\ x\in\mathbf{R}$ be $[\alpha,\beta]$. Then the distance of the point (α,β) from the line $3x+4y+12=0$ is :

(A) 11
(B) 8
(C) 10
(D) 9

Answer: (A) 11 · Key from source paper

Q33 JEE Main 2025 · 22 Jan · Shift 2 MCQ

The sum of all values of $\theta\in[0,2\pi]$ satisfying $2\sin^2\theta=\cos 2\theta$ and $2\cos^2\theta=3\sin\theta$ is

(A) 4π
(B) $\frac{5\pi}{6}$
(C) π
(D) $\frac{\pi}{2}$

Answer: (C) π · Key from source paper

Q34 JEE Main 2024 · 9 Apr · Shift 1 MCQ

Let $|\cos\theta\cos(60-\theta)\cos(60+\theta)| \leq \frac{1}{8}$, $\theta\epsilon[0,2\pi]$. Then, the sum of all $\theta\epsilon[0,2\pi]$, where $\cos 3\theta$ attains its maximum value, is :

(A) 15π
(B) 18π
(C) 6π
(D) 9π

Answer: (C) 6π · Key from source paper

Q35 JEE Main 2024 · 9 Apr · Shift 2 MCQ

Let the range of the function $f(x) = \frac{1}{2+\sin 3x+\cos 3x}, x \in \mathbb{R}$ be $[a,b]$. If α and β are respectively the A.M. and the G.M. of a and b, then $\frac{\alpha}{\beta}$ is equal to

(A) π
(B) $\sqrt{\pi}$
(C) 2
(D) $\sqrt{2}$

Answer: (D) $\sqrt{2}$ · Key from source paper

Q36 JEE Main 2024 · 8 Apr · Shift 1 MCQ

If $\sin x = -\frac{3}{5}$, where $\pi < x < \frac{3\pi}{2}$, then $80\left(\tan^2 x - \cos x\right)$ is equal to

(A) 108
(B) 109
(C) 18
(D) 19

Answer: (B) 109 · Key from source paper

Q37 JEE Main 2024 · 8 Apr · Shift 1 Numerical

If the range of $f(\theta) = \frac{\sin^4\theta+3\cos^2\theta}{\sin^4\theta+\cos^2\theta}, \theta \in \mathbb{R}$ is $[\alpha,\beta]$, then the sum of the infinite G.P., whose first term is 64 and the common ratio is $\frac{\alpha}{\beta}$, is equal to _____

Numerical value type: the answer is a number.

Answer: 96. · Key from source paper

Q38 JEE Main 2024 · 8 Apr · Shift 2 MCQ

The sum of all possible values of $\theta \in [-\pi, 2\pi]$, for which $\frac{1+i\cos\theta}{1-2i\cos\theta}$ is purely imaginary, is equal

(A) 3π
(B) 2π
(C) 5π
(D) 4π

Answer: (A) 3π · Key from source paper

Q39 JEE Main 2024 · 8 Apr · Shift 2 MCQ

If the value of $\frac{3\cos 36^\circ + 5\sin 18^\circ}{5\cos 36^\circ - 3\sin 18^\circ}$ is $\frac{a\sqrt{5}-b}{c}$, where a, b, c are natural numbers and $\gcd(a, c) = 1$, then $a + b + c$ is equal to :

(A) 40
(B) 52
(C) 50
(D) 54

Answer: (B) 52 · Key from source paper

Q40 JEE Main 2024 · 6 Apr · Shift 1 MCQ

A circle is inscribed in an equilateral triangle of side of length 12 . If the area and perimeter of any square inscribed in this circle are m and n, respectively, then $m + n^2$ is equal to

(A) 408
(B) 414
(C) 396
(D) 312

Answer: (A) 408 · Key from source paper

Q41 JEE Main 2024 · 6 Apr · Shift 2 Numerical

In a triangle ABC, BC = 7, AC = 8, AB = $\alpha \in N$ and $\cos A = \frac{2}{3}$. If $49\cos(3C) + 42 = \frac{m}{n}$, where gcd(m, n) = 1, then m + n is equal to _____

Numerical value type: the answer is a number.

Answer: 39. · Key from source paper

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Q42 JEE Main 2024 · 5 Apr · Shift 1 MCQ

Suppose $\theta \epsilon \left[0, \frac{\pi}{4}\right]$ is a solution of $4\cos\theta - 3\sin\theta = 1$. Then $\cos\theta$ is equal to :

(A) $\frac{4}{(3\sqrt{6}+2)}$
(B) $\frac{6+\sqrt{6}}{(3\sqrt{6}+2)}$
(C) $\frac{4}{(3\sqrt{6}-2)}$
(D) $\frac{6-\sqrt{6}}{(3\sqrt{6}-2)}$

Answer: (C) $\frac{4}{(3\sqrt{6}-2)}$ · Key from source paper

Q43 JEE Main 2024 · 5 Apr · Shift 2 Numerical

The number of solutions of $\sin^2 x + \left(2 + 2x - x^2\right)\sin x - 3(x-1)^2 = 0$, where $-\pi \leq x \leq \pi$, is _____

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q44 JEE Main 2024 · 1 Feb · Shift 1 MCQ

If $\tan A = \frac{1}{\sqrt{x}\sqrt{x^2+x+1}}$, $\tan B = \frac{\sqrt{x}}{\sqrt{x^2+x+1}}$ and $\tan C = x^{-3} + x^{-2} + x^{-1}{}^{\frac{1}{2}}, 0 < A, B, C < \frac{\pi}{2}$, then $A + B$ is equal to:

(A) C
(B) $\pi - C$
(C) $2\pi - C$
(D) $\frac{\pi}{2} - C$

Answer: (A) C · Key from source paper

Q45 JEE Main 2024 · 1 Feb · Shift 2 MCQ

The number of solutions of the equation $4\sin^2 x - 4\cos^3 x + 9 - 4\cos x = 0;\ x \in -2\pi, 2\pi$ is:

(A) 1
(B) 3
(C) 2
(D) 0

Answer: (D) 0 · Key from source paper

Q46 JEE Main 2024 · 30 Jan · Shift 1 MCQ

If $2\sin^3 x + \sin 2x \cos x + 4\sin x - 4 = 0$ has exactly 3 solutions in the interval $\left[0, \frac{n\pi}{2}\right]$, $n \in \mathrm{N}$, then the roots of the equation $x^2 + nx + (n-3) = 0$ belong to :

(A) $(0, \infty)$
(B) $(-\infty, 0)$
(C) $\left(-\frac{\sqrt{17}}{2}, \frac{\sqrt{17}}{2}\right)$
(D) Z

Answer: (B) $(-\infty, 0)$ · Key from source paper

Q47 JEE Main 2024 · 30 Jan · Shift 2 MCQ

For $\alpha, \beta \in \left(0, \frac{\pi}{2}\right)$ let $3\sin(\alpha+\beta) = 2\sin(\alpha-\beta)$ and a real number k be such that $\tan\alpha = \tan\beta$. Then the value of k is equal to

(A) -5
(B) 5
(C) $\frac{2}{3}$
(D) $-\frac{2}{3}$

Answer: (A) -5 · Key from source paper

Q48 JEE Main 2024 · 29 Jan · Shift 1 MCQ

If $\alpha, -\frac{\pi}{2} < \alpha < \frac{\pi}{2}$ is the solution of $4\cos\theta + 5\sin\theta = 1$, then the value of $\tan\alpha$ is

(A) $\frac{10-\sqrt{10}}{6}$
(B) $\frac{10-\sqrt{10}}{12}$
(C) $\frac{\sqrt{10}-10}{12}$
(D) $\frac{\sqrt{10}-10}{6}$

Answer: (C) $\frac{\sqrt{10}-10}{12}$ · Key from source paper

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Q49 JEE Main 2024 · 29 Jan · Shift 2 MCQ

The sum of the solutions $x \in R$ of the equation $\frac{3\cos 2x + \cos^3 2x}{\cos^6 x - \sin^6 x} = x^3 - x^2 + 6$ is

(A) 0
(B) 1
(C) -1
(D) 3

Answer: (C) -1 · Key from source paper

Q50 JEE Main 2024 · 27 Jan · Shift 1 Numerical

Let the set of all $a \in R$ such that the equation $\cos 2x + a\sin x = 2a - 7$ has a solution be $[p, q]$ and $r = \tan 9^\circ - \tan 27^\circ - \frac{1}{\cot 63^\circ} + \tan 81^\circ$, then pqr is equal to _____.

Numerical value type: the answer is a number.

Answer: 48. · Key from source paper

Q51 JEE Main 2024 · 27 Jan · Shift 2 MCQ

If $2\tan^2\theta - 5\sec\theta = 1$ has exactly 7 solutions in the interval $0, \frac{n\pi}{2}$, for the least value of $n \in N$ then $\sum_{k=1}^{n} \frac{k}{2^k}$ is equal to :

(A) $\frac{1}{2^{15}}2^{14} - 14$

(B) $\frac{1}{2^{14}}2^{15} - 15$

(C) $1 - \frac{15}{2^{13}}$

(D) $\frac{1}{2^{13}}2^{14} - 15$

Answer: (D) $\frac{1}{2^{13}}2^{14} - 15$ · Key from source paper

Q52 JEE Main 2023 · 15 Apr · Shift 1 Numerical

If the line $x = y = z$ intersects the line $x\sin A + y\sin B + z\sin C - 18 = 0 = x\sin 2A + y\sin 2B + z\sin 2C - 9$, where A, B, C are the angles of a triangle ABC, then $80\left(\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}\right)$ is equal to _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q53 JEE Main 2023 · 12 Apr · Shift 1 MCQ

In a triangle ABC, if $\cos A + 2\cos B + \cos C = 2$ and the lengths of the sides opposite to the angles A and C are 3 and 7 respectively, then $\cos A - \cos C$ is equal to

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

(B) $\frac{10}{7}$

(C) $\frac{5}{7}$

(D) $\frac{3}{7}$

Answer: (B) $\frac{10}{7}$ · Key from source paper

Q54 JEE Main 2023 · 11 Apr · Shift 1 MCQ

The number of elements in the set $S = \theta \in [0, 2\pi] : 3\cos^4\theta - 5\cos^2\theta - 2\sin^6\theta + 2 = 0$ is

(A) 10

(B) 8

(C) 12

(D) 9

Answer: (D) 9 · Key from source paper

EdLoop JEE

Q55 JEE Main 2023 · 11 Apr · Shift 2 MCQ

The angle of elevation of the top P of a tower from the feet of one person standing due south of the tower is 45° and from the feet of another person standing due west of the tower is 30°. If the height of the tower is 5 meters, then the distance (in meters) between the two persons is equal to

(A) $\frac{5}{2}\sqrt{5}$
(B) 10
(C) 5
(D) $5\sqrt{5}$

Answer: (B) 10 · Key from source paper

Q56 JEE Main 2023 · 10 Apr · Shift 1 MCQ

$96\ \cos\frac{\pi}{33}\ \cos\frac{2\pi}{33}\ \cos\frac{4\pi}{33}\ \cos\frac{8\pi}{33}\ \cos\frac{16\pi}{33}$ is equal to

(A) 3
(B) 1
(C) 4
(D) 2

Answer: (A) 3 · Key from source paper

Q57 JEE Main 2023 · 10 Apr · Shift 2 MCQ

Let $S = x \in -\frac{\pi}{2}, \frac{\pi}{2} : 9^{1-\tan^2 x} + 9^{\tan^2 x} = 10$ and $\beta = \sum_{x\in S} \tan^2\frac{x}{3}$, then $\frac{1}{6}(\beta - 14)^2$ is equal to

(A) 16
(B) 8
(C) 64
(D) 32

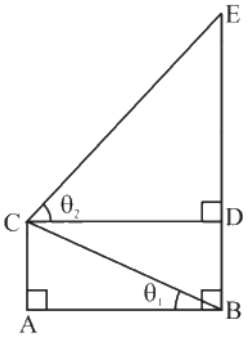
Answer: (D) 32 · Key from source paper

Q58 JEE Main 2023 · 10 Apr · Shift 2 Numerical

In the figure, $\theta_1 + \theta_2 = \frac{\pi}{2}$ and $\sqrt{3}\,BE = 4AB$. If the area of ΔCAB is $2\sqrt{3} - 3$ unit^2, when $\frac{\theta_2}{\theta_1}$ is the largest, then the perimeter (in unit) of ΔCED is equal to _____

(see the figure above)

Q86. In the figure, $\theta_1 + \theta_2 = \frac{\pi}{2}$ and $\sqrt{3}\,BE = 4AB$. If the area of ΔCAB is $2\sqrt{3}$ - 3 unit^2, when $\frac{\theta_2}{\theta_1}$ is the largest, then the perimeter (in unit) of ΔCED is equal to



Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q59 JEE Main 2023 · 8 Apr · Shift 2 MCQ

The value of $36\left(4\cos^2 9^\circ - 1\right)\left(4\cos^2 27^\circ - 1\right)\left(4\cos^2 81^\circ - 1\right)\left(4\cos^2 243^\circ - 1\right)$ is

(A) 54
(B) 18
(C) 27
(D) 36

Answer: (D) 36 · Key from source paper

Q60 JEE Main 2023 · 6 Apr · Shift 1 MCQ

From the top A of a vertical wall AB of height 30 m, the angles of depression of the top P and bottom Q of a vertical tower PQ are 15° and 60° respectively, B and Q are on the same horizontal level. If C is a point on AB such that $CB = PQ$, then the area (in m^2) of the quadrilateral $BCPQ$ is equal to

(A) $300(\sqrt{3} - 1)$
(B) $300(\sqrt{3} + 1)$
(C) $600(\sqrt{3} - 1)$
(D) $200(\sqrt{3} - 1)$

Answer: (C) $600(\sqrt{3} - 1)$ · Key from source paper

Q61 JEE Main 2023 · 6 Apr · Shift 2 Numerical

The value of $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$ is _____ .

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q62 JEE Main 2023 · 1 Feb · Shift 1 MCQ

For a triangle ABC, the value of $\cos 2A + \cos 2B + \cos 2C$ is least. If its inradius is 3 and incentre is M, then which of the following is NOT correct?

(A) Perimeter of ΔABC is $18\sqrt{3}$

(B) $\sin 2A + \sin 2B + \sin 2C = \sin A + \sin B + \sin C$

(C) $\overrightarrow{MA} \cdot \overrightarrow{MB}$ = - 18

(D) area of ΔABC is $\frac{27\sqrt{3}}{2}$

Answer: (D) area of ΔABC is $\frac{27\sqrt{3}}{2}$ · Key from source paper

Q63 JEE Main 2023 · 30 Jan · Shift 1 MCQ

If $\tan 15^\circ + \frac{1}{\tan 75^\circ} + \frac{1}{\tan 105^\circ} + \tan 195^\circ = 2a$, then the value of $a + \frac{1}{a}$ is :

(A) 4

(B) $4 - 2\sqrt{3}$

(C) 2

(D) $5 - \frac{3}{2}\sqrt{3}$

Answer: (A) 4 · Key from source paper

Q64 JEE Main 2023 · 29 Jan · Shift 1 MCQ

Let $f(\theta) = 3\left(\sin^4\left(\frac{3\pi}{2} - \theta\right) + \sin^4(3\pi + \theta)\right) - 2(1 - \sin^2 2\theta)$ and $S = \left\{\theta \in [0, \pi] : f'(\theta) = -\frac{\sqrt{3}}{2}\right\}$. If $4\beta = \sum_{\theta \in S} \theta$ then $f(\beta)$ is equal to

(A) $\frac{11}{8}$

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

(C) $\frac{9}{8}$

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

Answer: (B) $\frac{5}{4}$ · Key from source paper

Q65 JEE Main 2023 · 29 Jan · Shift 2 MCQ

The set of all values of λ for which the equation $\cos^2 2x - 2\sin^4 x - 2\cos^2 x = \lambda$ has a real solution x, is

(A) $[-2, -1]$

(B) $\left[-2, -\frac{3}{2}\right]$

(C) $\left[-1, -\frac{1}{2}\right]$

(D) $\left[-\frac{3}{2}, -1\right]$

Answer: (D) $\left[-\frac{3}{2}, -1\right]$ · Key from source paper

EdLoop JEE

Q66 JEE Main 2023 · 25 Jan · Shift 2 Numerical

If m and n respectively are the numbers of positive and negative value of θ in the interval $[-\pi, \pi]$ that satisfy the equation $\cos 2\theta \cos\frac{\theta}{2} = \cos 3\theta \cos\frac{9\theta}{2}$, then mn is equal to _____ .

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q67 JEE Main 2023 · 24 Jan · Shift 2 Numerical

Let $S = \{\theta \in [0, 2\pi) : \tan(\pi\cos\theta) + \tan(\pi\sin\theta) = 0\}$, then $\sum_{\theta\in S} \sin^2\left(\theta + \frac{\pi}{4}\right)$ is equal to

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q68 JEE Main 2022 · 29 Jul · Shift 1 MCQ

The angle of elevation of the top of a tower from a point A due north of it is α and from a point B at a distance of 9 units due west of A is $\cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$. If the distance of the point B from the tower is 15 units, then $\cot\alpha$ is equal to

(A) $\frac{6}{5}$
(B) $\frac{9}{5}$
(C) $\frac{4}{3}$
(D) $\frac{7}{3}$

Answer: (A) $\frac{6}{5}$ · Key from source paper

Q69 JEE Main 2022 · 29 Jul · Shift 1 Numerical

Let $S = \{\theta \in (0, 2\pi) : 7\cos^2\theta - 3\sin^2\theta - 2\cos^2 2\theta = 2\}$. Then, the sum of roots of all the equations $x^2 - 2(\tan^2\theta + \cot^2\theta)x + 6\sin^2\theta = 0\ \theta \in S$, is _____.

Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q70 JEE Main 2022 · 29 Jul · Shift 2 MCQ

The number of elements in the set $S = x \in \mathbb{R} : 2\cos\frac{x^2+x}{6} = 4^x + 4^{-x}$ is

(A) 1
(B) 3
(C) 0
(D) infinite

Answer: (A) 1 · Key from source paper

Q71 JEE Main 2022 · 28 Jul · Shift 2 MCQ

A horizontal park is in the shape of a triangle OAB with $AB = 16$. A vertical lamp post OP is erected at the point O such that $\angle PAO = \angle PBO = 15^\circ$ and $\angle PCO = 45^\circ$, where C is the midpoint of AB. Then $(OP)^2$ is equal to

(A) $\frac{32}{\sqrt{3}}\left(\sqrt{3}-1\right)$
(B) $\frac{32}{\sqrt{3}}\left(2-\sqrt{3}\right)$
(C) $\frac{16}{\sqrt{3}}\left(\sqrt{3}-1\right)$
(D) $\frac{16}{\sqrt{3}}\left(2-\sqrt{3}\right)$

Answer: (B) $\frac{32}{\sqrt{3}}\left(2-\sqrt{3}\right)$ · Key from source paper

Q72 JEE Main 2022 · 28 Jul · Shift 2 Numerical

Let $S = \left[-\pi, \frac{\pi}{2}\right) - \left\{-\frac{\pi}{2}, -\frac{\pi}{4}, -\frac{3\pi}{4}, \frac{\pi}{4}\right\}$. Then the number of elements in the set $A = \left\{\theta \in S : \tan\theta\left(1+\sqrt{5}\tan(2\theta)\right) = \sqrt{5} - \tan(2\theta)\right\}$ is _____.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q73 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Let a vertical tower AB of height $2h$ stands on a horizontal ground. Let from a point P on the ground a man can see upto height h of the tower with an angle of elevation 2α. When from P, he moves a distance d in the direction of $\overrightarrow{AP}$, he can see the top B of the tower with an angle of elevation α. If $d = \sqrt{7}h$, then $\tan\alpha$ is equal to

(A) $\sqrt{5}-2$
(B) $\sqrt{3}-1$
(C) $\sqrt{7}-2$
(D) $\sqrt{7}-\sqrt{3}$

Answer: (C) $\sqrt{7}-2$ · Key from source paper

Q74 JEE Main 2022 · 27 Jul · Shift 2 MCQ

Let $S = \left\{\theta \in \left(0, \frac{\pi}{2}\right) : \sum_{m=1}^{9} \sec\left(\theta + (m-1)\frac{\pi}{6}\right)\sec\left(\theta + \frac{m\pi}{6}\right) = -\frac{8}{\sqrt{3}}\right\}$. Then

(A) $\mathrm{S} = \left\{\frac{\pi}{12}\right\}$
(B) $S = \left\{\frac{2\pi}{3}\right\}$
(C) $\sum_{\theta\in S}\theta = \frac{\pi}{2}$
(D) $\sum_{\theta\in S}\theta = \frac{3\pi}{4}$

Answer: (C) $\sum_{\theta\in S}\theta = \frac{\pi}{2}$ · Key from source paper

EdLoop JEE

Q75 JEE Main 2022 · 27 Jul · Shift 2 MCQ

The angle of elevation of the top P of a vertical tower PQ of height 10 from a point A on the horizontal ground is 45°. Let R be a point on AQ and from a point B, vertically above R, the angle of elevation of P is 60°. If $\angle BAQ = 30^\circ$, $AB = d$ and the area of the trapezium $PQRB$ is α, then the ordered pair (d, α) is

(A) $\left(10\left(\sqrt{3}-1\right), 25\right)$
(B) $\left(10\left(\sqrt{3}-1\right), \frac{25}{2}\right)$
(C) $\left(10\left(\sqrt{3}+1\right), 25\right)$
(D) $\left(10\left(\sqrt{3}+1\right), \frac{25}{2}\right)$

Answer: (A) $\left(10\left(\sqrt{3}-1\right), 25\right)$ · Key from source paper

Q76 JEE Main 2022 · 26 Jul · Shift 1 MCQ

Let $S = \left\{\theta \in [0, 2\pi] : 8^{2\sin^2\theta} + 8^{2\cos^2\theta} = 16\right\}$. Then $n(S) + \sum_{\theta \in S}\left(\sec\left(\frac{\pi}{4}+2\theta\right)\operatorname{cosec}\left(\frac{\pi}{4}+2\theta\right)\right)$ is equal to:

(A) 0
(B) -2
(C) -4
(D) 12

Answer: (C) -4 · Key from source paper

Q77 JEE Main 2022 · 26 Jul · Shift 2 Numerical

If the sum of solutions of the system of equations $2\sin^2\theta - \cos 2\theta = 0$ and $2\cos^2\theta + 3\sin\theta = 0$ in the interval $0, 2\pi$ is $k\pi$, then k is equal to _____ .

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q78 JEE Main 2022 · 25 Jul · Shift 1 MCQ

The number of solutions of $\cos x = \sin x$, such that $-4\pi \le x \le 4\pi$ is

(A) 4
(B) 6
(C) 8
(D) 12

Answer: (C) 8 · Key from source paper

Q79 JEE Main 2022 · 25 Jul · Shift 1 MCQ

A tower PQ stands on a horizontal ground with base Q on the ground. The point R divides the tower in two parts such that $QR = 15$m. If from a point A on the ground the angle of elevation of R is 60° and the part PR of the tower subtends an angle of 15° at A, then the height of the tower is

(A) $52\sqrt{3} + 3$m
(B) $5\sqrt{3} + 3$m
(C) $10\sqrt{3} + 1$m
(D) $102\sqrt{3} + 1$m

Answer: (A) $52\sqrt{3} + 3$m · Key from source paper

Q80 JEE Main 2022 · 25 Jul · Shift 2 MCQ

The value of $2 \sin \frac{\pi}{22} \sin \frac{3\pi}{22} \sin \frac{5\pi}{22} \sin \frac{7\pi}{22} \sin \frac{9\pi}{22}$ is equal to:

(A) $\frac{1}{16}$
(B) $\frac{5}{16}$
(C) $\frac{7}{16}$
(D) $\frac{3}{16}$

Answer: (A) $\frac{1}{16}$ · Key from source paper

Q81 JEE Main 2022 · 29 Jun · Shift 1 Numerical

The number of elements in the set $S = \theta \in [-4\pi, 4\pi] : 3\cos^2 2\theta + 6\cos 2\theta - 10\cos^2 \theta + 5 = 0$ is _____.

Numerical value type: the answer is a number.

Answer: 32. · Key from source paper

Q82 JEE Main 2022 · 29 Jun · Shift 2 MCQ

From the base of a pole of height 20 meter, the angle of elevation of the top of a tower is 60°. The pole subtends an angle 30° at the top of the tower. Then the height of the tower is:

(A) $15\sqrt{3}$
(B) $20\sqrt{3}$
(C) $20 + 10\sqrt{3}$
(D) 30

Answer: (D) 30 · Key from source paper

Q83 JEE Main 2022 · 29 Jun · Shift 2 Numerical

The number of solutions of the equation $\sin\ x = \cos^2\ x$ in the interval $(0,\ 10)$ is _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q84 JEE Main 2022 · 28 Jun · Shift 1 MCQ

Let AB and PQ be two vertical poles, 160m apart from each other. Let C be the middle point of B and Q, which are feet of these two poles. Let $\frac{\pi}{8}$ and θ be the angles of elevation from C to P and A, respectively. If the height of pole PQ is twice the height of pole AB, then $\tan^2\theta$ is equal to

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

(B) $\frac{3+\sqrt{2}}{2}$

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

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

Answer: (C) $\frac{3-2\sqrt{2}}{4}$ · Key from source paper

Q85 JEE Main 2022 · 28 Jun · Shift 2 MCQ

If $\cot\alpha = 1$ and $\sec\beta = -\frac{5}{3}$, where $\pi < \alpha < \frac{3\pi}{2}$ and $\frac{\pi}{2} < \beta < \pi$, then the value of $\tan(\alpha+\beta)$ and the quadrant in which $\alpha+\beta$ lies, respectively are

(A) $-\frac{1}{7}$ and $\mathrm{IV}^{\mathrm{th}}$ quadrant

(B) 7 and I^{st} quadrant

(C) -7 and $\mathrm{IV}^{\mathrm{th}}$ quadrant

(D) $\frac{1}{7}$ and I^{st} quadrant

Answer: (A) $-\frac{1}{7}$ **and** $\mathrm{IV}^{\mathrm{th}}$ **quadrant** · Key from source paper

Q86 JEE Main 2022 · 27 Jun · Shift 1 MCQ

The value of $\cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{6\pi}{7}\right)$ is equal to

(A) -1

(B) $-\frac{1}{2}$

(C) $-\frac{1}{3}$

(D) $-\frac{1}{4}$

Answer: (B) $-\frac{1}{2}$ · Key from source paper

Q87 JEE Main 2022 · 27 Jun · Shift 2 MCQ

$\alpha = \sin 36^\circ$ is a root of which of the following equation

(A) $16x^4 - 20x^2 + 5 = 0$
(B) $16x^4 + 20x^2 + 5 = 0$
(C) $10x^4 - 10x^2 - 5 = 0$
(D) $16x^4 - 10x^2 + 5 = 0$

Answer: (A) $16x^4 - 20x^2 + 5 = 0$ · Key from source paper

Q88 JEE Main 2022 · 26 Jun · Shift 1 Numerical

If $\sin^2(10^\circ)\sin(20^\circ)\sin(40^\circ)\sin(50^\circ)\sin(70^\circ) = \alpha - \frac{1}{16}\sin(10^\circ)$, then $16 + \alpha^{-1}$ is equal to _____ .

Numerical value type: the answer is a number.

Answer: 80. · Key from source paper

Q89 JEE Main 2022 · 26 Jun · Shift 2 MCQ

$16\sin(20^\circ)\sin(40^\circ)\sin(80^\circ)$ is equal to

(A) $\sqrt{3}$
(B) $2\sqrt{3}$
(C) 3
(D) $4\sqrt{3}$

Answer: (B) $2\sqrt{3}$ · Key from source paper

Q90 JEE Main 2022 · 25 Jun · Shift 1 MCQ

Let a, b and c be the length of sides of a triangle ABC such that $\frac{a+b}{7} = \frac{b+c}{8} = \frac{c+a}{9}$. If r and R are the radius of incircle and radius of circumcircle of the triangle ABC, respectively, then the value of $\frac{R}{r}$ is equal to

(A) 2
(B) $\frac{3}{5}$
(C) $\frac{5}{2}$
(D) 1

Answer: (C) $\frac{5}{2}$ · Key from source paper

Q91 JEE Main 2022 · 25 Jun · Shift 1 Numerical

The number of values of x in the interval $\frac{\pi}{4}, \frac{7\pi}{4}$ for which $14\,\mathrm{cosec}^2\,x - 2\sin^2 x = 21 - 4\cos^2 x$ holds, is _____ .

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

EdLoop JEE

Q92 JEE Main 2022 · 25 Jun · Shift 2 MCQ

The value of $2\sin 12^\circ - \sin 72^\circ$ is

(A) $\frac{\sqrt{5}1-\sqrt{3}}{4}$
(B) $\frac{1-\sqrt{5}}{8}$
(C) $\frac{\sqrt{3}1-\sqrt{5}}{2}$
(D) $\frac{\sqrt{3}1-\sqrt{5}}{4}$

Answer: (D) $\frac{\sqrt{3}1-\sqrt{5}}{4}$ · Key from source paper

Q93 JEE Main 2022 · 24 Jun · Shift 1 MCQ

Let $S = \{\theta \in [-\pi, \pi] - \{\pm\frac{\pi}{2}\} : \sin\theta\tan\theta + \tan\theta = \sin 2\theta\}$. If $T = \sum_{\theta\in S}\cos 2\theta$, then $T + n(S)$ is equal to

(A) $7 + \sqrt{3}$
(B) 5
(C) $8 + \sqrt{3}$
(D) 9

Answer: (D) 9 · Key from source paper

Q94 JEE Main 2022 · 24 Jun · Shift 2 MCQ

The number of solutions of the equation $\cos\left(x + \frac{\pi}{3}\right)\cos\left(\frac{\pi}{3} - x\right) = \frac{1}{4}\cos^2 2x$, $x \in [-3\pi, 3\pi]$ is:

(A) 8
(B) 5
(C) 6
(D) 7

Answer: (D) 7 · Key from source paper

Q95 JEE Main 2021 · 1 Sep · Shift 2 MCQ

If n is the number of solutions of the equation $2\cos x\, 4\sin\frac{\pi}{4} + x\sin\frac{\pi}{4} - x - 1 = 1$, $x \in 0, \pi$ and S is the sum of all these solutions, then the ordered pair n, S is :

(A) $2, \frac{8\pi}{9}$
(B) $3, \frac{13\pi}{9}$
(C) $2, \frac{2\pi}{3}$
(D) $3, \frac{5\pi}{3}$

Answer: (B) $3, \frac{13\pi}{9}$ · Key from source paper

Q96 JEE Main 2021 · 31 Aug · Shift 1 MCQ

cosec 18° is a root of the equation:

(A) $x^2 - 2x - 4 = 0$

(B) $4x^2 + 2x - 1 = 0$

(C) $x^2 + 2x - 4 = 0$

(D) $x^2 - 2x + 4 = 0$

Answer: (A) $x^2 - 2x - 4 = 0$ · Key from source paper

Q97 JEE Main 2021 · 31 Aug · Shift 1 MCQ

A vertical pole fixed to the horizontal ground is divided in the ratio $3 : 7$ by a mark on it with lower part shorter than the upper part. If the two parts subtend equal angles at a point on the ground 18 m away from the base of the pole, then the height of the pole (in meters) is :

(A) $8\sqrt{10}$

(B) $6\sqrt{10}$

(C) $12\sqrt{10}$

(D) $12\sqrt{15}$

Answer: (C) $12\sqrt{10}$ · Key from source paper

Q98 JEE Main 2021 · 31 Aug · Shift 2 MCQ

The number of solutions of the equation $32^{\tan^2 x} + 32^{\sec^2 x} = 81,\ 0 \le x \le \frac{\pi}{4}$ is :

(A) 0

(B) 2

(C) 1

(D) 3

Answer: (C) 1 · Key from source paper

Q99 JEE Main 2021 · 27 Aug · Shift 1 MCQ

Let $\frac{\sin A}{\sin B} = \frac{\sin(A-C)}{\sin(C-B)}$, where A, B, C are angles of a triangle ABC. If the lengths of the sides opposite these angles are a, b, c respectively, then

(A) b^2, c^2, a^2 are in A.P.

(B) c^2, a^2, b^2 are in A.P.

(C) $b^2 - a^2 = a^2 + c^2$

(D) a^2, b^2, c^2 are in A.P.

Answer: (A) b^2, c^2, a^2 are in A.P. · Key from source paper

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Q100 JEE Main 2021 · 27 Aug · Shift 2 MCQ

Two poles AB of length a metres and CD of length $a + b (b \ne a)$ metres are erected at the same horizontal level with bases at B and D. If $BD = x$ and $\tan \angle ACB = \frac{1}{2}$, then:

(A) $x^2 + 2(a+2b)x - b(a+b) = 0$
(B) $x^2 + 2(a+2b)x + a(a+b) = 0$
(C) $x^2 - 2ax + b(a+b) = 0$
(D) $x^2 - 2ax + a(a+b) = 0$

Answer: (C) $x^2 - 2ax + b(a+b) = 0$ · Key from source paper

Q101 JEE Main 2021 · 27 Aug · Shift 2 Numerical

Let S be the sum of all solutions (in radians) of the equation $\sin^4\theta + \cos^4\theta - \sin\theta\cos\theta = 0$ in $[0, 4\pi]$ then $\frac{8S}{\pi}$ is equal to

Numerical value type: the answer is a number.

Answer: 56. · Key from source paper

Q102 JEE Main 2021 · 26 Aug · Shift 1 MCQ

The sum of solutions of the equation $\frac{\cos x}{1+\sin x} = |\tan 2x|$, $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right) - \left\{-\frac{\pi}{4}, \frac{\pi}{4}\right\}$ is:

(A) $\frac{\pi}{10}$
(B) $-\frac{7\pi}{30}$
(C) $-\frac{\pi}{15}$
(D) $-\frac{11\pi}{30}$

Answer: (D) $-\frac{11\pi}{30}$ · Key from source paper

Q103 JEE Main 2021 · 26 Aug · Shift 2 MCQ

The value of $2\sin\left(\frac{\pi}{8}\right)\sin\left(\frac{2\pi}{8}\right)\sin\left(\frac{3\pi}{8}\right)\sin\left(\frac{5\pi}{8}\right)\sin\left(\frac{6\pi}{8}\right)\sin\left(\frac{7\pi}{8}\right)$ is :

(A) $\frac{1}{4\sqrt{2}}$
(B) $\frac{1}{8}$
(C) $\frac{1}{8\sqrt{2}}$
(D) $\frac{1}{4}$

Answer: (B) $\frac{1}{8}$ · Key from source paper

Q104 JEE Main 2021 · 27 Jul · Shift 1 MCQ

If $\sin\theta + \cos\theta = \frac{1}{2}$, then $16(\sin(2\theta) + \cos(4\theta) + \sin(6\theta))$ is equal to:

(A) 23
(B) -27
(C) -23
(D) 27

Answer: (C) -23 · Key from source paper

EdLoop JEE

Q105 JEE Main 2021 · 27 Jul · Shift 2 MCQ

Let $\alpha = \max_{x \in R}\left\{8^{2\sin 3x} \cdot 4^{4\cos 3x}\right\}$ and $\beta = \min_{x \in R}\left\{8^{2\sin 3x} \cdot 4^{4\cos 3x}\right\}$. If $8x^2 + bx + c = 0$ is a quadratic equation whose roots are $\alpha^{1/5}$ and $\beta^{1/5}$, then the value of $c - b$ is equal to :

(A) 42
(B) 47
(C) 43
(D) 50

Answer: (A) 42 · Key from source paper

Q106 JEE Main 2021 · 27 Jul · Shift 2 MCQ

If $\tan\left(\frac{\pi}{9}\right), x, \tan\left(\frac{7\pi}{18}\right)$ are in arithmetic progression and $\tan\left(\frac{\pi}{9}\right), y, \tan\left(\frac{5\pi}{18}\right)$ are also in arithmetic progression, then $|x - 2y|$ is equal to :

(A) 4
(B) 3
(C) 0
(D) 1

Answer: (C) 0 · Key from source paper

Q107 JEE Main 2021 · 27 Jul · Shift 2 MCQ

Let $f : R \to R$ be defined as $f(x+y) + f(x-y) = 2f(x)f(y)$, $f\left(\frac{1}{2}\right) = -1$. Then the value of $\sum_{k=1}^{20} \frac{1}{\sin(k)\sin(k+f(k))}$ is equal to :

(A) $\operatorname{cosec}^2(21)\cos(20)\cos(2)$
(B) $\sec^2(1)\sec(21)\cos(20)$
(C) $\operatorname{cosec}^2(1)\operatorname{cosec}(21)\sin(20)$
(D) $\sec^2(21)\sin(20)\sin(2)$

Answer: (C) $\operatorname{cosec}^2(1)\operatorname{cosec}(21)\sin(20)$ · Key from source paper

Q108 JEE Main 2021 · 25 Jul · Shift 1 MCQ

The sum of all values of x in $[0, 2\pi]$, for which $\sin x + \sin 2x + \sin 3x + \sin 4x = 0$, is equal to :

(A) 8π
(B) 11π
(C) 12π
(D) 9π

Answer: (D) 9π · Key from source paper

EdLoop JEE

Q109 JEE Main 2021 · 25 Jul · Shift 1 MCQ

A spherical gas balloon of radius 16 meter subtends an angle 60° at the eye of the observer A while the angle of elevation of its center from the eye of A is 75°. Then the height (in meter) of the top most point of the balloon from the level of the observer's eye is :

(A) $8(2+2\sqrt{3}+\sqrt{2})$
(B) $8(\sqrt{6}+\sqrt{2}+2)$
(C) $8(\sqrt{2}+2+\sqrt{3})$
(D) $8(\sqrt{6}-\sqrt{2}+2)$

Answer: (B) $8(\sqrt{6}+\sqrt{2}+2)$ · Key from source paper

Q110 JEE Main 2021 · 25 Jul · Shift 2 MCQ

The value of $\cot\frac{\pi}{24}$ is:

(A) $\sqrt{2}+\sqrt{3}+2-\sqrt{6}$
(B) $\sqrt{2}+\sqrt{3}+2+\sqrt{6}$
(C) $\sqrt{2}-\sqrt{3}-2+\sqrt{6}$
(D) $3\sqrt{2}-\sqrt{3}-\sqrt{6}$

Answer: (B) $\sqrt{2}+\sqrt{3}+2+\sqrt{6}$ · Key from source paper

Q111 JEE Main 2021 · 22 Jul · Shift 1 MCQ

The number of solutions of $\sin^7 x+\cos^7 x=1, x\in[0,4\pi]$ is equal to

(A) 11
(B) 7
(C) 5
(D) 9

Answer: (C) 5 · Key from source paper

Q112 JEE Main 2021 · 20 Jul · Shift 1 MCQ

If in a triangle ABC, $AB=5$ units, $\angle B=\cos^{-1}\left(\frac{3}{5}\right)$ and radius of circumcircle of ΔABC is 5 units, then the area (in sq. units) of ΔABC is:

(A) $10+6\sqrt{2}$
(B) $8+2\sqrt{2}$
(C) $6+8\sqrt{3}$
(D) $4+2\sqrt{3}$

Answer: (C) $6+8\sqrt{3}$ · Key from source paper

Q113 JEE Main 2021 · 20 Jul · Shift 2 MCQ

Let in a right angled triangle, the smallest angle be θ. If a triangle formed by taking the reciprocal of its sides is also a right angled triangle, then $\sin\theta$ is equal to:

(A) $\frac{\sqrt{5}+1}{4}$
(B) $\frac{\sqrt{5}-1}{2}$
(C) $\frac{\sqrt{2}-1}{2}$
(D) $\frac{\sqrt{5}-1}{4}$

Answer: (B) $\frac{\sqrt{5}-1}{2}$ · Key from source paper

Q114 JEE Main 2021 · 18 Mar · Shift 1 Numerical

The number of solutions of the equation $|\cot x| = \cot x + \frac{1}{\sin x}$ in the interval $[0, 2\pi]$ is

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q115 JEE Main 2021 · 18 Mar · Shift 2 MCQ

If $15\sin^4\alpha + 10\cos^4\alpha = 6$, for some $\alpha \in R$, then the value of $27\sec^6\alpha + 8\,\text{cosec}^6\alpha$ is equal to :

(A) 350
(B) 500
(C) 400
(D) 250

Answer: (D) 250 · Key from source paper

Q116 JEE Main 2021 · 18 Mar · Shift 2 MCQ

A pole stands vertically inside a triangular park ABC. Let the angle of elevation of the top of the pole from each corner of the park be $\frac{\pi}{3}$. If the radius of the circumcircle of ΔABC is 2, then the height of the pole is equal to :

(A) $\frac{2\sqrt{3}}{3}$
(B) $2\sqrt{3}$
(C) $\sqrt{3}$
(D) $\frac{1}{\sqrt{3}}$

Answer: (B) $2\sqrt{3}$ · Key from source paper

Q117 JEE Main 2021 · 17 Mar · Shift 2 MCQ

The number of solutions of the equation $x + 2\tan x = \frac{\pi}{2}$ in the interval $[0, 2\pi]$ is

(A) 3
(B) 4
(C) 2
(D) 5

Answer: (A) 3 · Key from source paper

Q118 JEE Main 2021 · 16 Mar · Shift 1 MCQ

The number of roots of the equation, $(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$ in the interval $[0, \pi]$ is equal to :

(A) 3
(B) 4
(C) 8
(D) 2

Answer: (B) 4 · Key from source paper

Q119 JEE Main 2021 · 16 Mar · Shift 2 Numerical

In ΔABC, the lengths of sides AC and AB are 12 cm and 5 cm, respectively. If the area of Δ ABC is 30 cm^2 and R and r are respectively the radii of circumcircle and incircle of ΔABC, then the value of $2R + r$ (in cm) is equal to _____.

Numerical value type: the answer is a number.

Answer: 15. · Key from source paper

Q120 JEE Main 2021 · 26 Feb · Shift 1 Numerical

The number of integral values of k for which the equation $3\sin x + 4\cos x = k + 1$ has a solution, $k \in R$ is _____.

Numerical value type: the answer is a number.

Answer: 11. · Key from source paper

Q121 JEE Main 2021 · 26 Feb · Shift 1 Numerical

If $\sqrt{3}(\cos^2 x) = (\sqrt{3} - 1)\cos x + 1$, then number of solutions of the given equation when $x \in \left[0, \frac{\pi}{2}\right]$ is _____.

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q122 JEE Main 2021 · 25 Feb · Shift 1 MCQ

All possible values of $\theta \in [0, 2\pi]$ for which $\sin 2\theta + \tan 2\theta > 0$ lie in :

(A) $(0, \frac{\pi}{2}) \cup (\pi, \frac{3\pi}{2})$
(B) $(0, \frac{\pi}{2}) \cup (\frac{\pi}{2}, \frac{3\pi}{4}) \cup (\pi, \frac{7\pi}{6})$
(C) $(0, \frac{\pi}{4}) \cup (\frac{\pi}{2}, \frac{3\pi}{4}) \cup (\pi, \frac{5\pi}{4}) \cup (\frac{3\pi}{2}, \frac{7\pi}{4})$
(D) $(0, \frac{\pi}{4}) \cup (\frac{\pi}{2}, \frac{3\pi}{4}) \cup (\frac{3\pi}{2}, \frac{11\pi}{6})$

Answer: (C) $(0, \frac{\pi}{4}) \cup (\frac{\pi}{2}, \frac{3\pi}{4}) \cup (\pi, \frac{5\pi}{4}) \cup (\frac{3\pi}{2}, \frac{7\pi}{4})$ · Key from source paper

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Q123 JEE Main 2021 · 25 Feb · Shift 1 MCQ

A man is observing, from the top of a tower, a boat speeding towards the tower from a certain point A, with uniform speed. At that point, angle of depression of the boat with the man's eye is 30° (Ignore man's height). After sailing for 20 seconds, towards the base of the tower (which is at the level of water), the boat has reached a point B, where the angle of depression is 45°. Then the time taken (in seconds) by the boat from B to reach the base of the tower is :

(A) 10
(B) $10\left(\sqrt{3}-1\right)$
(C) $10\sqrt{3}$
(D) $10\left(\sqrt{3}+1\right)$

Answer: (D) $10\left(\sqrt{3}+1\right)$ · Key from source paper

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Q124 JEE Main 2021 · 25 Feb · Shift 2 MCQ

If $0 < x, y < \pi$ and $\cos x + \cos y - \cos(x+y) = \frac{3}{2}$, then $\sin x + \cos y$ is equal to:

(A) $\frac{1}{2}$
(B) $\frac{\sqrt{3}}{2}$
(C) $\frac{1-\sqrt{3}}{2}$
(D) $\frac{1+\sqrt{3}}{2}$

Answer: (D) $\frac{1+\sqrt{3}}{2}$ · Key from source paper

Q125 JEE Main 2021 · 24 Feb · Shift 1 MCQ

If $e^{\cos^2 x + \cos^4 x + \cos^6 x + \ldots \infty \log_e 2}$ satisfies the equation $t^2 - 9t + 8 = 0$, then the value of $\frac{2\sin x}{\sin x + \sqrt{3}\cos x}$, where $0 < x < \frac{\pi}{2}$, is equal to

(A) $\frac{3}{2}$
(B) $\frac{1}{2}$
(C) $\sqrt{3}$
(D) $2\sqrt{3}$

Answer: (B) $\frac{1}{2}$ · Key from source paper

Q126 JEE Main 2021 · 24 Feb · Shift 1 MCQ

Two vertical poles are $150\ \text{m}$ apart and the height of one is three times that of the other. If from the middle point of the line joining their feet, an observer finds the angles of elevation of their tops to be complementary, then the height of the shorter pole (in meters) is:

(A) 25
(B) 30
(C) $20\sqrt{3}$
(D) $25\sqrt{3}$

Answer: (D) $25\sqrt{3}$ · Key from source paper

Q127 JEE Main 2021 · 24 Feb · Shift 2 MCQ

The angle of elevation of a jet plane from a point A on the ground is 60°. After a flight of 20 seconds at the speed of $432\ \text{km/hour}$, the angle of elevation changes to 30°. If the jet plane is flying at a constant height, then its height is:

(A) $1200\sqrt{3}\ \text{m}$
(B) $2400\sqrt{3}\ \text{m}$
(C) $1800\sqrt{3}\ \text{m}$
(D) $3600\sqrt{3}\ \text{m}$

Answer: (A) $1200\sqrt{3}\ \text{m}$ · Key from source paper

Q128 JEE Main 2021 · 24 Feb · Shift 2 MCQ

A possible value of $\tan\left(\frac{1}{4}\sin^{-1}\frac{\sqrt{63}}{8}\right)$ is:

(A) $2\sqrt{2}-1$
(B) $\frac{1}{2\sqrt{2}}$
(C) $\sqrt{7}-1$
(D) $\frac{1}{\sqrt{7}}$

Answer: (D) $\frac{1}{\sqrt{7}}$ · Key from source paper

Q129 JEE Main 2020 · 6 Sep · Shift 1 Numerical

The angle of elevation of the top of a hill from a point on the horizontal plane passing through the foot of the hill is found to be 45°. After walking a distance of 80 meters towards the top, up a slope inclined at angle of 30° to the horizontal plane the angle of elevation of the top of the hill becomes 75°. Then the height of the hill (in meters) is _____.

Numerical value type: the answer is a number.

Answer: 80. · Key from source paper

EdLoop JEE

Q130 JEE Main 2020 · 6 Sep · Shift 2 MCQ

The angle of elevation of the summit of a mountain from a point on the ground is 45°. After climbing up one km towards the summit at an inclination of 30° from the ground, the angle of elevation of the summit is found to be 60°. Then the height (in km) of the summit from the ground is :

(A) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$
(B) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$
(C) $\frac{1}{\sqrt{3}-1}$
(D) $\frac{1}{\sqrt{3}+1}$

Answer: (C) $\frac{1}{\sqrt{3}-1}$ · Key from source paper

Q131 JEE Main 2020 · 5 Sep · Shift 2 MCQ

If $L = \sin^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$ and $M = \cos^2\left(\frac{\pi}{16}\right) - \sin^2\left(\frac{\pi}{8}\right)$

(A) $L = -\frac{1}{2\sqrt{2}} + \frac{1}{2}\cos\frac{\pi}{8}$
(B) $L = \frac{1}{4\sqrt{2}} - \frac{1}{4}\cos\frac{\pi}{8}$
(C) $M = \frac{1}{4\sqrt{2}} + \frac{1}{4}\cos\frac{\pi}{8}$
(D) $M = \frac{1}{2\sqrt{2}} + \frac{1}{2}\cos\frac{\pi}{8}$

Answer: (D) $M = \frac{1}{2\sqrt{2}} + \frac{1}{2}\cos\frac{\pi}{8}$ · Key from source paper

Q132 JEE Main 2020 · 4 Sep · Shift 1 MCQ

Two vertical poles $AB = 15\ m$ and $CD = 10\ m$ are standing apart on a horizontal ground with points A and C on the ground. If P is the point of intersection of BC and AD, then the height of P (in m) above the line AC is :

(A) 20/3
(B) 5
(C) 10/3
(D) 6

Answer: (D) 6 · Key from source paper

Q133 JEE Main 2020 · 4 Sep · Shift 2 MCQ

The angle of elevation of a cloud C from a point P, $200\ m$ above a still take is 30°. If the angle of depression of the image of C in the lake from the point P is 60°, then PC (in m) is equal to

(A) 100
(B) $200\sqrt{3}$
(C) 400
(D) $400\sqrt{3}$

Answer: (C) 400 · Key from source paper

Q134 JEE Main 2020 · 4 Sep · Shift 2 MCQ

The minimum value of $2^{\sin x} + 2^{\cos x}$ is :

(A) $2^{-1+\frac{1}{\sqrt{2}}}$
(B) $2^{-1+\sqrt{2}}$
(C) $2^{1-\sqrt{2}}$
(D) $2^{1-\frac{1}{\sqrt{2}}}$

Answer: (D) $2^{1-\frac{1}{\sqrt{2}}}$ · Key from source paper

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Q135 JEE Main 2020 · 2 Sep · Shift 2 MCQ

If the equation $\cos^4\theta + \sin^4\theta + \lambda = 0$ has real solutions for θ then λ lies in interval

(A) $\left(-\frac{5}{4}, -1\right)$
(B) $\left[-1, -\frac{1}{2}\right]$
(C) $\left(-\frac{1}{2}, -\frac{1}{4}\right]$
(D) $\left[-\frac{3}{2}, -\frac{5}{4}\right]$

Answer: (B) $\left[-1, -\frac{1}{2}\right]$ · Key from source paper

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Q136 JEE Main 2020 · 9 Jan · Shift 1 MCQ

The value of $\cos^3\left(\frac{\pi}{8}\right).\cos\left(\frac{3\pi}{8}\right) + \sin^3\left(\frac{\pi}{8}\right).\sin\left(\frac{3\pi}{8}\right)$ is:

(A) $\frac{1}{\sqrt{2}}$
(B) $\frac{1}{2\sqrt{2}}$
(C) $\frac{1}{2}$
(D) $\frac{1}{4}$

Answer: (B) $\frac{1}{2\sqrt{2}}$ · Key from source paper

Q137 JEE Main 2020 · 9 Jan · Shift 1 Numerical

The number of distinct solutions of the equation, $\log_{\frac{1}{2}}|\sin x| = 2 - \log_{\frac{1}{2}}|\cos x|$ in the interval $[0, 2\pi]$, is _____.

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q138 JEE Main 2020 · 8 Jan · Shift 2 Numerical

If $\frac{\sqrt{2}\sin\alpha}{\sqrt{1+\cos 2\alpha}} = \frac{1}{7}$ and $\sqrt{\frac{1-\cos 2\beta}{2}} = \frac{1}{\sqrt{10}}$, $\alpha, \beta \in \left(0, \frac{\pi}{2}\right)$, then $\tan(\alpha + 2\beta)$, is equal to

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q139 JEE Main 2020 · 7 Jan · Shift 1 MCQ

Let α and β be two real roots of the equation $(k+1)\tan^2 x - \sqrt{2}\cdot\lambda\tan x = (1-k)$, where $k(\neq -1)$ and λ are real numbers. If $\tan^2(\alpha+\beta) = 50$, then a value of λ is

(A) $10\sqrt{2}$
(B) 10
(C) 5
(D) $5\sqrt{2}$

Answer: (B) 10 · Key from source paper

Q140 JEE Main 2020 · 7 Jan · Shift 2 MCQ

If θ_1 and θ_2 be respectively the smallest and the largest values of θ in $(0, 2\pi) - \{\pi\}$ which satisfy the equation, $2\cot^2\theta - \frac{5}{\sin\theta} + 4 = 0$, then $\int_{\theta_1}^{\theta_2} \cos^2 3\theta\, d\theta$ is equal to:

(A) $\frac{\pi}{3}$
(B) $\frac{2\pi}{3}$
(C) $\frac{\pi}{3} + \frac{1}{6}$
(D) $\frac{\pi}{9}$

Answer: (A) $\frac{\pi}{3}$ · Key from source paper

Q141 JEE Main 2019 · 12 Apr · Shift 1 MCQ

The equation $y = \sin x \sin x + 2 - \sin^2(x+1)$ represents a straight line lying in:

(A) first, third and fourth quadrants
(B) second and third quadrants only
(C) first, second and fourth quadrants
(D) third and fourth quadrants only

Answer: (D) third and fourth quadrants only · Key from source paper

Q142 JEE Main 2019 · 12 Apr · Shift 1 MCQ

The number of solutions of the equation $1 + \sin^4 x = \cos^2 3x,\ \ x \in -\frac{5\pi}{2}, \frac{5\pi}{2}$ is:

(A) 5
(B) 7
(C) 3
(D) 4

Answer: (A) 5 · Key from source paper

Q143 JEE Main 2019 · 12 Apr · Shift 2 MCQ

Let S be the set of all $\alpha \in R$ such that the equation, $\cos 2x + \alpha \sin x = 2\alpha - 7$ has a solution. Then S is equal to:

(A) $[3,\ 7]$
(B) $[2,\ 6]$
(C) $[1,\ 4]$
(D) R

Answer: (B) $[2,\ 6]$ · Key from source paper

Q144 JEE Main 2019 · 12 Apr · Shift 2 MCQ

The angle of the top of a vertical tower standing on a horizontal plane is observed to be 45° from a point A on the plane. Let B be the point 30 m vertically above the point A. If the angle of elevation of the top of the tower from B be 30° , then the distance (in m) of the foot of the tower from the point A is:

(A) $15\left(3+\sqrt{3}\right)$
(B) $15\left(1+\sqrt{3}\right)$
(C) $15\left(5-\sqrt{3}\right)$
(D) $15\left(3-\sqrt{3}\right)$

Answer: (A) $15\left(3+\sqrt{3}\right)$ · Key from source paper

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Q145 JEE Main 2019 · 10 Apr · Shift 1 MCQ

All the pairs $(x,\ y)$, that satisfy the inequality $2^{\sqrt{\sin^2 x - 2\sin x + 5}} \cdot \frac{1}{4^{\sin^2 y}} \leq 1$ also satisfy the equation:

(A) $2\sin x = \sin y$
(B) $\sin x = 2\sin y$
(C) $|\sin x| = |\sin y|$
(D) $2|\sin x| = 3\sin y$

Answer: (C) $|\sin x| = |\sin y|$ · Key from source paper

Q146 JEE Main 2019 · 10 Apr · Shift 1 MCQ

ABC is a triangular park with $AB = AC = 100$ metres. A vertical tower is situated at the mid-point of BC. If the angles of elevation of the top of the tower at, A and B are $\cot^{-1}\left(3\sqrt{2}\right)$ and

$\text{cosec}^{-1}\left(2\sqrt{2}\right)$ respectively, then the height of the tower (in metres) is

(A) $\frac{100}{3\sqrt{3}}$

(B) 20

(C) 25

(D) $10\sqrt{5}$

Answer: (B) 20 · Key from source paper

Q147 JEE Main 2019 · 10 Apr · Shift 2 MCQ

The angles $A,\ B\ \&\ C$ of a ΔABC are in $A.P.$ and $a : b = 1 : \sqrt{3}$. If $c = 4\ cm$, then the area (in $sq.\ cm$) of this triangle is:

(A) $2\sqrt{3}$

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

(C) $\frac{4}{\sqrt{3}}$

(D) $4\sqrt{3}$

Answer: (A) $2\sqrt{3}$ · Key from source paper

Q148 JEE Main 2019 · 9 Apr · Shift 1 MCQ

The value of $\cos^2 10^\circ - \cos 10^\circ\ \cos 50^\circ + \cos^2 50^\circ$ is

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

(B) $\frac{3}{4} + \cos 20^\circ$

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

(D) $\frac{3}{2}\left(1 + \cos 20^\circ\right)$

Answer: (A) $\frac{3}{4}$ · Key from source paper

Q149 JEE Main 2019 · 9 Apr · Shift 1 MCQ

Let $S = \{\theta \in [-2\pi, 2\pi] : 2\cos^2\theta + 3\sin\theta = 0\}$. Then the sum of the elements of S is:

(A) π

(B) $\frac{13\pi}{6}$

(C) $\frac{5\pi}{3}$

(D) 2π

Answer: (D) 2π · Key from source paper

Q150 JEE Main 2019 · 9 Apr · Shift 2 MCQ

The value of $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ$ is:

(A) $\frac{1}{36}$
(B) $\frac{1}{16}$
(C) $\frac{1}{18}$
(D) $\frac{1}{32}$

Answer: (B) $\frac{1}{16}$ · Key from source paper

Q151 JEE Main 2019 · 9 Apr · Shift 2 MCQ

Two poles standing on a horizontal ground are of heights 5 m and 10 m respectively. The line joining their tops makes an angle of 15° with the ground. Then the distance (in m) between the poles, is

(A) $10\left(\sqrt{3}-1\right)$
(B) $\frac{5}{2}\left(2+\sqrt{3}\right)$
(C) $5\left(2+\sqrt{3}\right)$
(D) $5\left(\sqrt{3}+1\right)$

Answer: (C) $5\left(2+\sqrt{3}\right)$ · Key from source paper

Q152 JEE Main 2019 · 8 Apr · Shift 1 MCQ

If $\cos\alpha+\beta=\frac{3}{5}$, $\sin(\alpha-\beta)=\frac{5}{13}$ and $0<\alpha,\beta<\frac{\pi}{4}$, then $\tan 2\alpha$ is equal to:

(A) $\frac{21}{16}$
(B) $\frac{63}{52}$
(C) $\frac{33}{52}$
(D) $\frac{63}{16}$

Answer: (D) $\frac{63}{16}$ · Key from source paper

Q153 JEE Main 2019 · 8 Apr · Shift 2 MCQ

Two vertical poles of height, 20 m and 80 m stand apart on a horizontal plane. The height (in meters) of the point of intersection of the lines joining the top of each pole to the foot of the other, from this horizontal plane is:

(A) 16
(B) 12
(C) 18
(D) 15

Answer: (A) 16 · Key from source paper

Q154 JEE Main 2019 · 8 Apr · Shift 2 MCQ

If the lengths of the sides of a triangle are in A.P and the greatest angle is double the smallest, then a ratio of lengths of the sides of this triangle is:

(A) 3: 4: 5
(B) 5: 6: 7
(C) 5: 9: 13
(D) 4: 5: 6

Answer: (D) 4: 5: 6 · Key from source paper

Q155 JEE Main 2019 · 12 Jan · Shift 1 MCQ

The maximum value of $3\cos\theta + 5\sin\left(\theta - \frac{\pi}{6}\right)$ for any real value of θ is :

(A) $\sqrt{19}$
(B) $\sqrt{31}$
(C) $\frac{\sqrt{79}}{2}$
(D) $\sqrt{34}$

Answer: (A) $\sqrt{19}$ · Key from source paper

Q156 JEE Main 2019 · 12 Jan · Shift 2 MCQ

If $\sin^4\alpha + 4\cos^4\beta + 2 = 4\sqrt{2}\sin\alpha\cos\beta$, $\alpha,\ \beta \in [0, \pi]$, then $\cos(\alpha+\beta) - \cos(\alpha-\beta)$ is equal to

(A) -1
(B) $-\sqrt{2}$
(C) $\sqrt{2}$
(D) 0

Answer: (B) $-\sqrt{2}$ · Key from source paper

Q157 JEE Main 2019 · 12 Jan · Shift 2 MCQ

If the angle of elevation of a cloud from a point P which is $25m$ above a lake be 30° and the angle of depression of reflection of the could in the lake from P be 60°, then the height of the cloud (in meters) from the surface of the lake is :

(A) 50
(B) 60
(C) 45
(D) 42

Answer: (A) 50 · Key from source paper

Q158 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Let $f_k(x) = \frac{1}{k}\left(\sin^k x + \cos^k x\right)$ for k = 1, 2, 3, ... Then for all x ∈ R, the value of $f_4(x) - f_6(x)$ is equal to :

(A) $\frac{1}{12}$
(B) $\frac{1}{4}$
(C) $\frac{-1}{12}$
(D) $\frac{5}{12}$

Answer: (A) $\frac{1}{12}$ · Key from source paper

Q159 JEE Main 2019 · 11 Jan · Shift 1 MCQ

In a triangle, the sum of lengths of two sides is x and the product of the lengths of the same two sides is y. if $x^2 - c^2 = y$, where c is the length of the third side of the triangle, then the circumradius of the triangle is

(A) $\frac{3}{2}y$
(B) $\frac{c}{\sqrt{3}}$
(C) $\frac{c}{3}$
(D) $\frac{y}{\sqrt{3}}$

Answer: (B) $\frac{c}{\sqrt{3}}$ · Key from source paper

Q160 JEE Main 2019 · 11 Jan · Shift 2 MCQ

Given $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$ for a ΔABC with usual notation. If $\frac{\cos A}{\alpha} = \frac{\cos B}{\beta} = \frac{\cos C}{\gamma}$, then the ordered triad (α, β, γ) has a value

(A) (7,19,25)
(B) (3,4,5)
(C) (5,12,13)
(D) (19,7,25)

Answer: (A) (7,19,25) · Key from source paper

Q161 JEE Main 2019 · 10 Jan · Shift 1 MCQ

The sum of all values of $\theta \in \left(0, \frac{\pi}{2}\right)$ satisfying $\sin^2 2\theta + \cos^4 2\theta = \frac{3}{4}$ is

(A) $\frac{\pi}{2}$
(B) $\frac{3\pi}{8}$
(C) $\frac{5\pi}{4}$
(D) π

Answer: (A) $\frac{\pi}{2}$ · Key from source paper

Q162 JEE Main 2019 · 10 Jan · Shift 1 MCQ

Consider a triangular plot ABC with sides $AB = 7\ m$, $BC = 5\ m$ and $CA = 6\ m$. A vertical lamp-post at the mid-point D of AC subtends an angle 30° at B. The height (in m) of the lamp-post is:

(A) $2\sqrt{21}$
(B) $\frac{2}{3}\sqrt{21}$
(C) $\frac{3}{2}\sqrt{21}$
(D) $7\sqrt{3}$

Answer: (B) $\frac{2}{3}\sqrt{21}$ · Key from source paper

Q163 JEE Main 2019 · 10 Jan · Shift 2 MCQ

The value of $\cos\frac{\pi}{2^2}\cdot\cos\frac{\pi}{2^3}\cdot\ldots\cdot\cos\frac{\pi}{2^{10}}\cdot\sin\frac{\pi}{2^{10}}$ is:

(A) $\frac{1}{1024}$
(B) $\frac{1}{512}$
(C) $\frac{1}{2}$
(D) $\frac{1}{256}$

Answer: (B) $\frac{1}{512}$ · Key from source paper

Q164 JEE Main 2019 · 10 Jan · Shift 2 MCQ

With the usual notation in ΔABC, if $\angle A + \angle B = 120^\circ$, $a = \sqrt{3}+1$ units and $b = \sqrt{3}-1$ units, then the ratio $\angle A : \angle B$ is

(A) $7:1$
(B) $9:7$
(C) $3:1$
(D) $5:3$

Answer: (A) $7:1$ · Key from source paper

Q165 JEE Main 2019 · 9 Jan · Shift 1 MCQ

For any $\theta \in \frac{\pi}{4}, \frac{\pi}{2}$, the expression $3\sin\theta - \cos\theta^4 + 6\sin\theta + \cos\theta^2 + 4\sin^6\theta$ equals:

(A) $13 - 4\cos^2\theta + 6\cos^4\theta$
(B) $13 - 4\cos^2\theta + 6\sin^2\theta\cos^2\theta$
(C) $13 - 4\cos^6\theta$
(D) $13 - 4\cos^4\theta + 2\sin^2\theta\cos^2\theta$

Answer: (C) $13 - 4\cos^6\theta$ · Key from source paper

Q166 JEE Main 2019 · 9 Jan · Shift 2 MCQ

If $0 \le x < \frac{\pi}{2}$, then the number of values of x for which $\sin x - \sin 2x + \sin 3x = 0$, is:

(A) 4
(B) 3
(C) 2
(D) 1

Answer: (C) 2 · Key from source paper

Q167 JEE Main 2018 · 16 Apr · Online MCQ

A man on the top of a vertical tower observes a car moving at a uniform speed towards the tower on a horizontal road. If it takes 18 min for the angle of depression of the car to change from 30° to 45°, then the time taken (in min) by the car to reach the foot of the tower is

(A) $\frac{9}{2}\left(\sqrt{3}-1\right)$
(B) $18\left(1+\sqrt{3}\right)$
(C) $18\left(\sqrt{3}-1\right)$
(D) $9\left(1+\sqrt{3}\right)$

Answer: (D) $9\left(1+\sqrt{3}\right)$ · Key from source paper

Q168 JEE Main 2018 · 15 Apr · Shift 1 MCQ

If $\tan A$ and $\tan B$ are the roots of the quadratic equation, $3x^2 - 10x - 25 = 0$ then the value of $3\sin^2(A+B) - 10\sin(A+B)\cdot\cos(A+B) - 25\cos^2(A+B)$ is

(A) 25
(B) -25
(C) -10
(D) 10

Answer: (B) -25 · Key from source paper

Q169 JEE Main 2018 · 15 Apr · Shift 1 MCQ

An aeroplane flying at a constant speed, parallel to the horizontal ground, $\sqrt{3}$ km above it, is observed at an elevation of 60° from a point on the ground. If, after five seconds, its elevation from

the same point, is 30°, then the speed (in km/hr) of the aeroplane is

(A) 1500
(B) 750
(C) 720
(D) 1440

Answer: (D) 1440 · Key from source paper

Q170 JEE Main 2018 · 15 Apr · Shift 2 MCQ

The number of solutions of $\sin 3x = \cos 2x$, in the interval $\left(\frac{\pi}{2}, \pi\right)$ is

(A) 3
(B) 4
(C) 2
(D) 1

Answer: (D) 1 · Key from source paper

Q171 JEE Main 2018 · 15 Apr · Shift 2 MCQ

Consider the following two statements. Statement $\boldsymbol{p}$: The value of $\sin 120^{\circ}$ can be divided by taking $\theta = 240^{\circ}$ in the equation
$2\sin\frac{\theta}{2} = \sqrt{1+\sin\theta} - \sqrt{1-\sin\theta}$.
Statement $\boldsymbol{q}$: The angles A, B, C and D of any quadrilateral $ABCD$ satisfy the equation
$\cos\left(\frac{1}{2}(A+C)\right) + \cos\left(\frac{1}{2}(B+D)\right) = 0$
Then the truth values of p and q are respectively.

(A) F, T
(B) T, T
(C) F, F
(D) T, F

Answer: (A) F, T · Key from source paper

Q172 JEE Main 2018 · 15 Apr · Shift 2 MCQ

A tower T_1 of height $60\ \mathrm{m}$ is located exactly opposite to a tower T_2 of height $80\ \mathrm{m}$ on a straight road. From the top of T_1, if the angle of depression of the foot of T_2 is twice the angle of elevation of the top of T_2, then the width (in m) of the road between the feet of the towers T_1 and T_2 is

(A) $20\sqrt{2}$
(B) $10\sqrt{2}$
(C) $10\sqrt{3}$
(D) $20\sqrt{3}$

Answer: (D) $20\sqrt{3}$ · Key from source paper

Q173 JEE Main 2018 · 8 Apr · Offline MCQ

If sum of all the solutions of the equation $8\cos x \cdot \left(\cos\left(\frac{\pi}{6}+x\right)\cdot\cos\left(\frac{\pi}{6}-x\right)-\frac{1}{2}\right)=1$ in $[0,\ \pi]$ is $k\pi$, then k is equal to:

(A) $\frac{20}{9}$
(B) $\frac{2}{3}$
(C) $\frac{13}{9}$
(D) $\frac{8}{9}$

Answer: (C) $\frac{13}{9}$ · Key from source paper

Q174 JEE Main 2018 · 8 Apr · Offline MCQ

PQR is a triangular park with $PQ = PR = 200$ m. A T.V. tower stands at the mid-point of QR. If the angles of elevation of the top of the tower at P, Q and R are respectively, $45^\circ,\ 30^\circ$ and 30°, then the height of the tower (in m) is:

(A) $50\sqrt{2}$
(B) 100
(C) 50
(D) $100\sqrt{3}$

Answer: (B) 100 · Key from source paper

Q175 JEE Main 2017 · 9 Apr · Online MCQ

The lengths of two adjacent sides of a cyclic quadrilateral are 2 units and 5 units and the angle between them is 60°. If the area of the quadrilateral is $4\sqrt{3}$ sq. units, then the perimeter of the quadrilateral is

(A) 12.5 units
(B) 13 units
(C) 13.2 units
(D) 12 units

Answer: (D) 12 units · Key from source paper

Q176 JEE Main 2017 · 2 Apr · Offline MCQ

If $5(\tan^2 x - \cos^2 x) = 2\cos 2x + 9$, then the value of $\cos 4x$ is

(A) $-\frac{3}{5}$
(B) $\frac{1}{3}$
(C) $\frac{2}{9}$
(D) $-\frac{7}{9}$

Answer: (D) $-\frac{7}{9}$ · Key from source paper

Q177 JEE Main 2017 · 2 Apr · Offline MCQ

Let a vertical tower AB have its end A on the level ground. Let C be the mid-point of AB and P be a point on the ground such that $AP = 2AB$. If $\angle BPC = \beta$, then $\tan\beta$ is equal to:

(A) $\frac{6}{7}$
(B) $\frac{1}{4}$
(C) $\frac{2}{9}$
(D) $\frac{4}{9}$

Answer: (C) $\frac{2}{9}$ · Key from source paper

Q178 JEE Main 2016 · 10 Apr · Online MCQ

If $A > 0,\ B > 0$ and $A + B = \frac{\pi}{6}$, then the minimum positive value of $(\tan A + \tan B)$ is :

(A) $\sqrt{3} - \sqrt{2}$
(B) $4 - 2\sqrt{3}$
(C) $\frac{2}{\sqrt{3}}$
(D) $2 - \sqrt{3}$

Answer: (B) $4 - 2\sqrt{3}$ · Key from source paper

Q179 JEE Main 2016 · 10 Apr · Online MCQ

Let $P = \{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\}$ and $Q = \{\theta : \sin\theta + \cos\theta = \sqrt{2}\sin\theta\}$, be two sets. Then

(A) $P \subset Q$ and $Q - P \neq \phi$
(B) $Q \not\subset P$
(C) $P = Q$
(D) $P \not\subset Q$

Answer: (C) $P = Q$ · Key from source paper

Q180 JEE Main 2016 · 10 Apr · Online MCQ

The angle of elevation of the top of a vertical tower from a point A, due east of it is 45° . The angle of elevation of the top of the same tower from a point B, due south of A is 30° . If the distance between

A and B is $54\sqrt{2}m$, then the height of the tower (in meters), is:

(A) 108
(B) $36\sqrt{3}$
(C) $54\sqrt{3}$
(D) 54

Answer: (D) 54 · Key from source paper

Q181 JEE Main 2016 · 9 Apr · Online MCQ

If m and M are the minimum and the maximum values of $4+\frac{1}{2}\sin^2 2x-2\cos^4 x,\ x\in R$, then $M-m$ is equal to:

(A) $\frac{15}{4}$
(B) $\frac{9}{4}$
(C) $\frac{7}{4}$
(D) $\frac{1}{4}$

Answer: (B) $\frac{9}{4}$ · Key from source paper

Q182 JEE Main 2016 · 9 Apr · Online MCQ

The number of $x\in[0,\ 2\pi]$ for which $\left|\sqrt{2\sin^4 x+18\cos^2 x}-\sqrt{2\cos^4 x+18\sin^2 x}\right|=1$ is:

(A) 2
(B) 6
(C) 4
(D) 8

Answer: (D) 8 · Key from source paper

Q183 JEE Main 2016 · 3 Apr · Offline MCQ

If $0\le x<2\pi$, then the number of real values of x, which satisfy the equation $\cos x+\cos 2x+\cos 3x+\cos 4x=0$, is

(A) 7
(B) 9
(C) 3
(D) 5

Answer: (A) 7 · Key from source paper

Q184 JEE Main 2016 · 3 Apr · Offline MCQ

A man is walking towards a vertical pillar in a straight path, at a uniform speed. At a certain point A on the path, he observes that the angle of elevation of the top of the pillar is 30°. After walking for 10

minutes from A in the same direction, at a point B, he observes that the angle of elevation of the top of the pillar is 60°. Then the time taken (in minutes) by him, from B to reach the pillar, is

(A) 20
(B) 5
(C) 6
(D) 10

Answer: (B) 5 · Key from source paper

Q185 JEE Main 2015 · 11 Apr · Online MCQ

If $\cos\alpha + \cos\beta = \frac{3}{2}$ and $\sin\alpha + \sin\beta = \frac{1}{2}$ and θ is the arithmetic mean of α & β, then $\sin 2\theta + \cos 2\theta$ is equal to:

(A) $\frac{3}{5}$
(B) $\frac{7}{5}$
(C) $\frac{4}{5}$
(D) $\frac{8}{5}$

Answer: (B) $\frac{7}{5}$ · Key from source paper

Q186 JEE Main 2015 · 11 Apr · Online MCQ

Let 10 vertical poles standing at equal distances on a straight line, subtend the same angle of elevation α at a point O on this line and all the poles are on the same side of O. If the height of the longest pole is h and the distance of the foot of the smallest pole from O is a; then the distance between two consecutive poles, is

(A) $\frac{h\sin\alpha + a\cos\alpha}{9\cos\alpha}$
(B) $\frac{h\cos\alpha - a\sin\alpha}{9\sin\alpha}$
(C) $\frac{h\sin\alpha + a\cos\alpha}{9\sin\alpha}$
(D) $\frac{h\cos\alpha - a\sin\alpha}{9\cos\alpha}$

Answer: (B) $\frac{h\cos\alpha - a\sin\alpha}{9\sin\alpha}$ · Key from source paper

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Q187 JEE Main 2015 · 10 Apr · Online MCQ

In a ΔABC, $\frac{a}{b} = 2 + \sqrt{3}$, and $\angle C = 60^\circ$. Then the ordered pair $(\angle A, \angle B)$ is equal to:

(A) $(105^\circ, 15^\circ)$
(B) $(15^\circ, 105^\circ)$
(C) $(45^\circ, 75^\circ)$
(D) $(75^\circ, 45^\circ)$

Answer: (A) $(105^\circ, 15^\circ)$ · Key from source paper

EdLoop JEE

Q188 JEE Main 2015 · 4 Apr · Offline MCQ

If the angles of elevation of the top of a tower from three collinear points A, B and C on a line leading to the foot of the tower are 30°, 45° and 60° respectively, then the ratio $AB : BC$, is

(A) $2 : 3$
(B) $\sqrt{3} : 1$
(C) $\sqrt{3} : \sqrt{2}$
(D) $1 : \sqrt{3}$

Answer: (B) $\sqrt{3} : 1$ · Key from source paper

Q189 JEE Main 2014 · 11 Apr · Online MCQ

If $2\cos\theta + \sin\theta = 1$ $\left(\theta \neq \frac{\pi}{2}\right)$, then $7\cos\theta + 6\sin\theta$ is equal to:

(A) $\frac{1}{2}$
(B) 2
(C) $\frac{11}{2}$
(D) $\frac{46}{5}$

Answer: (B) 2 · Checked by our team

Q190 JEE Main 2014 · 11 Apr · Online MCQ

The angle of elevation of the top of a vertical tower from a point P on the horizontal ground was observed to be α. After moving a distance 2 metres from P towards the foot of the tower, the angle of elevation changes to β. Then the height (in metres) of the tower is:

(A) $\frac{2\sin\alpha\sin\beta}{\sin(\beta-\alpha)}$
(B) $\frac{\sin\alpha\sin\beta}{\cos(\beta-\alpha)}$
(C) $\frac{2\sin(\beta-\alpha)}{\sin\alpha\sin\beta}$
(D) $\frac{\cos(\beta-\alpha)}{\sin\alpha\sin\beta}$

Answer: (A) $\frac{2\sin\alpha\sin\beta}{\sin(\beta-\alpha)}$ · Key from source paper

Q191 JEE Main 2014 · 9 Apr · Online MCQ

If cosec $\theta = \frac{p+q}{p-q}$ $(p \neq q,\ p \neq 0)$, then $\left|\cot\left(\frac{\pi}{4} + \frac{\theta}{2}\right)\right|$ is equals to:

(A) pq
(B) $\sqrt{\frac{p}{q}}$
(C) $\sqrt{\frac{q}{p}}$
(D) $\sqrt{pq}$

Answer: (C) $\sqrt{\frac{q}{p}}$ · Key from source paper

EdLoop JEE

Q192 JEE Main 2014 · 9 Apr · Online MCQ

The number of values of α in $[0,\ 2\pi]$ for which $2\sin^3\alpha - 7\sin^2\alpha + 7\sin\alpha = 2$, is :

(A) 3
(B) 1
(C) 6
(D) 4

Answer: (A) 3 · Key from source paper

Q193 JEE Main 2014 · 6 Apr · Offline MCQ

Let $f_k(x) = \frac{1}{k}\left(\sin^k x + \cos^k x\right)$ where $x \in R$ and $k \geq 1$. Then $f_4(x) - f_6(x)$ equals

(A) $\frac{1}{4}$
(B) $\frac{1}{12}$
(C) $\frac{1}{6}$
(D) $\frac{1}{3}$

Answer: (B) $\frac{1}{12}$ · Key from source paper

Q194 JEE Main 2014 · 6 Apr · Offline MCQ

A bird is sitting on the top of a vertical pole 20 m high and its elevation from a point O on the ground is 45°. It flies off horizontally straight away from the point O. After one second, the elevation of the bird from O is reduced to 30°. Then the speed (in m/s) of the bird is

(A) $20\sqrt{2}$
(B) $20\left(\sqrt{3}-1\right)$
(C) $40\left(\sqrt{2}-1\right)$
(D) $40\left(\sqrt{3}-\sqrt{2}\right)$

Answer: (B) $20\left(\sqrt{3}-1\right)$ · Key from source paper

Q195 JEE Main 2013 · 25 Apr · Online MCQ

Let A = $\{\theta : \sin(\theta) = \tan(\theta)\}$ and B = $\{\theta : \cos(\theta) = 1\}$ be two sets. Then:

(A) A = B
(B) $A \not\subset B$
(C) $B \not\subset A$
(D) $A \subset B$ and $B - A \neq \phi$

Answer: (B) $A \not\subset B$ · Key from source paper

Q196 JEE Main 2013 · 23 Apr · Online MCQ

The number of solutions of the equation $\sin 2x - 2\cos x + 4\sin x = 4$ in the interval $[0, 5\pi]$ is :

(A) 3
(B) 5
(C) 4
(D) 6

Answer: (A) 3 · Key from source paper

Q197 JEE Main 2013 · 22 Apr · Online MCQ

Statement-1: The number of common solutions of the trigonometric equations $2\sin^2\theta - \cos 2\theta = 0$ and $2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is two. Statement-2: The number of solutions of the equation, $2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, \pi]$ is two.

(A) Statement-1 is true; Statement-2 is true; Statement-2 is a correct explanation for statement-1.
(B) Statement-1 is true; Statement-2 is true; Statement-2 is not a correct explanation for statement-1.
(C) Statement-1 is false; Statement-2 is true.
(D) Statement-1 is true; Statement-2 is false.

Answer: (B) Statement-1 is true; Statement-2 is true; Statement-2 is not a correct explanation for statement-1. · Key from source paper

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Q198 JEE Main 2013 · 7 Apr · Offline MCQ

The expression $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A}$ can be written as :

(A) $\tan A + \cot A$
(B) $\sec A + \operatorname{cosec} A$
(C) $\sin A \cos A + 1$
(D) $\sec A \operatorname{cosec} A + 1$

Answer: (D) $\sec A \operatorname{cosec} A + 1$ · Key from source paper

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Q199 JEE Main 2013 · 7 Apr · Offline MCQ

$ABCD$ is a trapezium such that AB and CD are parallel and $BC \perp CD$. If $\angle ADB = \theta$, $BC = p$ and $CD = q$, then AB is equal to

(A) $\frac{p^2+q^2}{p^2\cos\theta + q^2\sin\theta}$
(B) $\frac{\left(p^2+q^2\right)\sin\theta}{(p\cos\theta + q\sin\theta)^2}$
(C) $\frac{\left(p^2+q^2\right)\sin\theta}{p\cos\theta + q\sin\theta}$
(D) $\frac{p^2+q^2\cos\theta}{p\cos\theta + q\sin\theta}$

Answer: (C) $\frac{\left(p^2+q^2\right)\sin\theta}{p\cos\theta + q\sin\theta}$ · Key from source paper

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Q200 AIEEE 2012 · 26 May · Online MCQ

The value of $\cos 255^\circ + \sin 195^\circ$ is

(A) $\frac{\sqrt{3}-1}{2\sqrt{2}}$
(B) $\frac{\sqrt{3}-1}{\sqrt{2}}$
(C) $-\frac{\sqrt{3}-1}{\sqrt{2}}$
(D) $\frac{\sqrt{3}+1}{\sqrt{2}}$

Answer: (C) $-\frac{\sqrt{3}-1}{\sqrt{2}}$ · Key from source paper

Q201 AIEEE 2012 · 19 May · Online MCQ

Suppose θ and $\phi(\neq 0)$ are such that $\sec(\theta+\phi)$, $\sec\theta$ and $\sec(\theta-\phi)$ are in A.P. If $\cos\theta = k\cos\left(\frac{\phi}{2}\right)$ for some k, then k is equal to

(A) $\pm\sqrt{2}$
(B) ± 1
(C) $\pm\frac{1}{\sqrt{2}}$
(D) ± 2

Answer: (A) $\pm\sqrt{2}$ · Key from source paper

Q202 AIEEE 2012 · 12 May · Online MCQ

If in a triangle ABC, $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$, then $\cos A$ is equal to

(A) $5/7$
(B) $1/5$
(C) $35/19$
(D) $19/35$

Answer: (B) $1/5$ · Key from source paper

Q203 AIEEE 2012 · 7 May · Online MCQ

If two vertical poles 20 m and 80 m high stand apart on a horizontal plane, then the height (in m) of the point of intersection of the lines joining the top of each pole to the foot of other is

(A) 16
(B) 18
(C) 50
(D) 15

Answer: (A) 16 · Key from source paper

Q204 AIEEE 2012 · Offline MCQ

In a ΔPQR, if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then the angle R is equal to

(A) $\frac{5\pi}{6}$
(B) $\frac{\pi}{6}$
(C) $\frac{\pi}{4}$
(D) $\frac{3\pi}{4}$

Answer: (B) $\frac{\pi}{6}$ · Key from source paper

Q205 AIEEE 2011 MCQ

If $A = \sin^2 x + \cos^4 x$, then for all real x

(A) $\frac{13}{16} \leq A \leq 1$
(B) $1 \leq A \leq 2$
(C) $\frac{3}{4} \leq A \leq \frac{13}{16}$
(D) $\frac{3}{4} \leq A \leq 1$

Answer: (D) $\frac{3}{4} \leq A \leq 1$ · Key from source paper

Q206 AIEEE 2010 MCQ

Let $\cos(\alpha+\beta) = \frac{4}{5}$ and let $\sin(\alpha-\beta) = \frac{5}{13}$, where $0 \leq \alpha, \beta \leq \frac{\pi}{4}$, then $\tan 2\alpha =$

(A) $\frac{56}{33}$
(B) $\frac{19}{12}$
(C) $\frac{20}{7}$
(D) $\frac{25}{16}$

Answer: (A) $\frac{56}{33}$ · Key from source paper

Q207 AIEEE 2010 MCQ

For a regular polygon, let r and R be the radii of the inscribed and the circumscribed circles. A false statement among the following is

(A) There is a regular polygon with $\frac{r}{R} = \frac{1}{\sqrt{2}}$
(B) There is a regular polygon with $\frac{r}{R} = \frac{2}{3}$
(C) There is a regular polygon with $\frac{r}{R} = \frac{\sqrt{3}}{2}$
(D) There is a regular polygon with $\frac{r}{R} = \frac{1}{2}$

Answer: (B) There is a regular polygon with $\frac{r}{R} = \frac{2}{3}$ · Key from source paper

Q208 AIEEE 2009 MCQ

Let A and B denote the statements A: $\cos\alpha + \cos\beta + \cos\gamma = 0$ B: $\sin\alpha + \sin\beta + \sin\gamma = 0$ If $\cos(\beta-\gamma) + \cos(\gamma-\alpha) + \cos(\alpha-\beta) = -\frac{3}{2}$, then

(A) A is true and B is false
(B) A is false and B is true
(C) both A and B are true
(D) both A and B are false

Answer: (C) both A and B are true · Key from source paper

Q209 AIEEE 2008 MCQ

AB is a vertical pole with B at the ground level and A at the top. A man finds that the angle of elevation of the point A from a certain point C on the ground is 60°. He moves away from the pole along the line BC to a point D such that $CD = 7$ m. From D the angle of elevation of the point A is 45°. Then the height of the pole is

(A) $\frac{7\sqrt{3}}{2} \cdot \frac{1}{\sqrt{3}-1}\, m$
(B) $\frac{7\sqrt{3}}{2} \cdot (\sqrt{3}+1)m$
(C) $\frac{7\sqrt{3}}{2} \cdot (\sqrt{3}-1)\mathrm{m}$
(D) $\frac{7\sqrt{3}}{2} \cdot \frac{1}{\sqrt{3}+1}$

Answer: (B) $\frac{7\sqrt{3}}{2} \cdot (\sqrt{3}+1)m$ · Key from source paper

Q210 AIEEE 2007 MCQ

A tower stands at the centre of a circular park. A and B are two points on the boundary of the park such that $AB(=a)$ subtends an angle of 60° at the foot of the tower, and the angle of elevation of the top of the tower from A or B is 30°. The height of the tower is

(A) $\frac{2a}{\sqrt{3}}$
(B) $2a\sqrt{3}$
(C) $\frac{a}{\sqrt{3}}$
(D) $a\sqrt{3}$

Answer: (C) $\frac{a}{\sqrt{3}}$ · Key from source paper

Q211 AIEEE 2006 MCQ

If the roots of the quadratic equation $x^2 + px + q = 0$ are $\tan 30^\circ$ and $\tan 15^\circ$, respectively then the value of $2 + q - p$ is

(A) 2
(B) 3
(C) 0
(D) 1

Answer: (B) 3 · Key from source paper

Q212 AIEEE 2006 MCQ

The number of values of x in the interval $[0, 3\pi]$ satisfying the equation $2\sin^2 x + 5\sin x - 3 = 0$ is

(A) 4
(B) 6
(C) 1
(D) 2

Answer: (A) 4 · Key from source paper

Q213 AIEEE 2006 MCQ

If $0 < x < \pi$ and $\cos x + \sin x = \frac{1}{2}$, then $\tan x$ is

(A) $\frac{(1-\sqrt{7})}{4}$
(B) $\frac{(4-\sqrt{7})}{3}$
(C) $-\frac{(4+\sqrt{7})}{3}$
(D) $\frac{(1+\sqrt{7})}{4}$

Answer: (C) $-\frac{(4+\sqrt{7})}{3}$ · Key from source paper

Q214 AIEEE 2005 MCQ

If in a triangle ABC, the altitudes from the vertices A, B, C on opposite sides are in H.P., then $\sin A, \sin B, \sin C$ are in

(A) G.P.
(B) A.P.
(C) Arithmetic - Geometric Progression
(D) H.P.

Answer: (B) A.P. · Key from source paper

Q215 AIEEE 2005 MCQ

In a triangle PQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2 + bx + c = 0,\ a \neq 0$ then

(A) $a = b + c$
(B) $c = a + b$
(C) $b = c$
(D) $b = a + c$

Answer: (B) $c = a + b$ · Key from source paper

Q216 AIEEE 2005 MCQ

In a triangle ABC, let $\angle C = \frac{\pi}{2}$. If r is the inradius and R is the circumradius of the the triangle ABC, then $2(r+R)$ equals

(A) $b+c$
(B) $a+b$
(C) $a+b+c$
(D) $c+a$

Answer: (B) $a+b$ · Key from source paper

Q217 AIEEE 2004 MCQ

If $u = \sqrt{a^2\cos^2\theta + b^2\sin^2\theta} + \sqrt{a^2\sin^2\theta + b^2\cos^2\theta}$, then the difference between the maximum and minimum values of u^2 is given by

(A) $2(a^2+b^2)$
(B) $2\sqrt{a^2+b^2}$
(C) $(a+b)^2$
(D) $(a-b)^2$

Answer: (D) $(a-b)^2$ · Key from source paper

Q218 AIEEE 2004 MCQ

Let α, β be such that $\pi < \alpha - \beta < 3\pi$. If $\sin\alpha + \sin\beta = -\frac{21}{65}$ and $\cos\alpha + \cos\beta = -\frac{27}{65}$, then the value of $\cos\frac{\alpha-\beta}{2}$ is

(A) $-\frac{3}{\sqrt{130}}$
(B) $\frac{3}{\sqrt{130}}$
(C) $\frac{6}{65}$
(D) $-\frac{6}{65}$

Answer: (A) $-\frac{3}{\sqrt{130}}$ · Key from source paper

Q219 AIEEE 2004 MCQ

A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite bank of the river is 60° and when he retires 40 meter away from the tree the angle of elevation becomes 30°. The breadth of the river is

(A) 20 m
(B) 30 m
(C) 40 m
(D) 60 m

Answer: (A) 20 m · Key from source paper

Q220 AIEEE 2004 MCQ

The sides of a triangle are $\sin\alpha$, $\cos\alpha$ and $\sqrt{1+\sin\alpha\cos\alpha}$ for some $0<\alpha<\frac{\pi}{2}$. Then the greatest angle of the triangle is

(A) 60°
(B) 90°
(C) 120°
(D) 150°

Answer: (C) 120° · Key from source paper

Q221 AIEEE 2004 MCQ

If $f: R \to S$, defined by $f(x)=\sin x-\sqrt{3}\cos x+1$, is onto, then the interval of S is

(A) $[0,3]$
(B) $[-1,1]$
(C) $[0,1]$
(D) $[-1,3]$

Answer: (D) $[-1,3]$ · Key from source paper

Q222 AIEEE 2003 MCQ

The upper $\frac{3}{4}$ th portion of a vertical pole subtends an angle $\tan^{-1}\frac{3}{5}$ at a point in the horizontal plane through its foot and at a distance 40 m from the foot. A possible height of the vertical pole is

(A) 80 m
(B) 20 m
(C) 40 m
(D) 60 m

Answer: (C) 40 m · Checked by our team

Q223 AIEEE 2003 MCQ

The sum of the radii of inscribed and circumscribed circles for an n sided regular polygon of side a, is

(A) $\frac{a}{4}\cot\left(\frac{\pi}{2n}\right)$
(B) $a\cot\left(\frac{\pi}{n}\right)$
(C) $\frac{a}{2}\cot\left(\frac{\pi}{2n}\right)$
(D) $a\cot\left(\frac{\pi}{2n}\right)$

Answer: (C) $\frac{a}{2}\cot\left(\frac{\pi}{2n}\right)$ · Checked by our team

Q224 AIEEE 2003 MCQ

In a triangle ABC, medians AD and BE are drawn. If AD = 4, $\angle DAB = \frac{\pi}{6}$ and $\angle ABE = \frac{\pi}{3}$, then the area of the $\triangle ABC$ is

(A) $\frac{64}{3}$
(B) $\frac{8}{3}$
(C) $\frac{16}{3}$
(D) None of these

Answer: (D) None of these · Key from source paper

Q225 AIEEE 2003 MCQ

If in a triangle ABC, $a\cos^2\left(\frac{C}{2}\right) + c\cos^2\left(\frac{A}{2}\right) = \frac{3b}{2}$, then the sides a, b and c

(A) satisfy $a + b = c$
(B) are in A.P.
(C) are in G.P.
(D) are in H.P.

Answer: (B) are in A.P. · Key from source paper

Q226 AIEEE 2002 MCQ

The number of solution of $\tan x + \sec x = 2\cos x$ in $[0, 2\pi)$ is

(A) 2
(B) 3
(C) 0
(D) 1

Answer: (A) 2 · Checked by our team

Q227 AIEEE 2002 MCQ

The sides of a triangle are 3x + 4y, 4x + 3y and 5x + 5y where x, y > 0 then the triangle is

(A) right angled
(B) obtuse angled
(C) equilateral
(D) none of these

Answer: (B) obtuse angled · Checked by our team

Q228 AIEEE 2002 MCQ

In a triangle with sides $a, b, c, r_1 > r_2 > r_3$ (which are the ex-radii) then

(A) a > b > c
(B) a < b < c
(C) a > b and b < c
(D) a < b and b > c

Answer: (A) a > b > c · Key from source paper

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