CAT Trigonometry
Practice Question Bank

20 Quantitative Aptitude Questions with Answers and Detailed Solutions

Difficulty	Questions	Focus
Easy	Q1 - Q6	Standard angle values and basic identities
Medium	Q7 - Q13	Heights & distances, compound angles, identities
Tough	Q14 - Q20	Max/min problems, equations, multi-step heights & distances

Instructions: Attempt each question on your own first. Options are labelled A-D. The correct answer and a full step-by-step solution follow every question. Standard values (e.g. sin30° = 1/2, tan45° = 1) may be used freely unless a question asks you to derive them.

EASY LEVEL

Q1. [EASY]

What is the value of sin30° + cos60°?

(A) 0.5

(B) 1

(C) 1.5

(D) 2

Correct Answer: (B) 1

Solution:

sin30° = 1/2 and cos60° = 1/2. Adding these: 1/2 + 1/2 = 1.

Q2. [EASY]

In a right triangle, θ is an acute angle such that sinθ = 3/5.

What is the value of cosθ?

(A) 3/4

(B) 4/5

(C) 5/4

(D) 5/3

Correct Answer: (B) 4/5

Solution:

Since $\sin\theta = 3/5$, consider a right triangle with opposite side 3 and hypotenuse 5. By the Pythagorean theorem, the adjacent side = $\sqrt{(5^2 - 3^2)} = \sqrt{(25 - 9)} = \sqrt{16} = 4$. Therefore $\cos\theta$ = adjacent/hypotenuse = 4/5.

Q3. [EASY]

What is the value of $\tan45° \times \cos60°$?

(A) 0.25

(B) 0.5

(C) 1

(D) 2

Correct Answer: (B) 0.5

Solution:

$\tan45° = 1$ and $\cos60° = 1/2$. Multiplying: $1 \times 1/2 = 1/2 = 0.5$.

Q4. [EASY]

For any angle θ, consider the expression $\sin^2\theta + \cos^2\theta$.

What is the value of $\sin^2\theta + \cos^2\theta$?

(A) 0

(B) 1

(C) 2

(D) $\tan\theta$

Correct Answer: (B) 1

Solution:

This is the fundamental trigonometric (Pythagorean) identity, which holds true for every angle θ: $\sin^2\theta + \cos^2\theta = 1$.

Q5. [EASY]

A 10 m long ladder is leaned against a vertical wall such that it makes an angle of 60° with the ground.

What height on the wall does the ladder reach?

(A) 5 m

(B) $5\sqrt{3}$ m

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

(D) $10/\sqrt{3}$ m

Correct Answer: (B) $5\sqrt{3}$ m

Solution:

Let the height reached on the wall be h. Since the ladder makes 60° with the ground, sin60° = h / 10 (opposite over hypotenuse). So h = 10 × sin60° = 10 × (√3/2) = 5√3 m.

Q6. [EASY]

What is the value of cosec30°?

(A) 1

(B) 2

(C) √2

(D) √3

Correct Answer: (B) 2

Solution:

cosec30° = 1/sin30° = 1/(1/2) = 2.

MEDIUM LEVEL

Q7. [MEDIUM]

θ is an angle such that 0° < θ < 90° and tanθ = 1/√3.

What is the value of θ?

(A) 30°

(B) 45°

(C) 60°

(D) 90°

Correct Answer: (A) 30°

Solution:

We know that tan30° = 1/√3. Since 0° < θ < 90°, the tangent function is one-to-one in this range, so θ = 30°.

Q8. [MEDIUM]

Simplify the expression (1 - cos²θ) / sin²θ.

(A) 1

(B) sinθ

(C) cosθ

(D) tanθ

Correct Answer: (A) 1

Solution:

Using the identity $\sin^2\theta + \cos^2\theta = 1$, we get $1 - \cos^2\theta = \sin^2\theta$. Substituting: $\sin^2\theta / \sin^2\theta = 1$.

Q9. [MEDIUM]

From a point on the ground 20 m away from the base of a tower, the angle of elevation of the top of the tower is 30°.

What is the height of the tower?

(A) $20\sqrt{3}$ m

(B) $20/\sqrt{3}$ m

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

(D) 20 m

Correct Answer: (B) $20/\sqrt{3}$ m

Solution:

Let the height of the tower be h. $\tan30° = h/20$ (opposite over adjacent). Since $\tan30° = 1/\sqrt{3}$, we get $h = 20 \times (1/\sqrt{3}) = 20/\sqrt{3}$ m.

Q10. [MEDIUM]

What is the value of sin75°? (Hint: 75° = 45° + 30°)

(A) $(\sqrt{6} + \sqrt{2})/4$

(B) $(\sqrt{6} - \sqrt{2})/4$

(C) $(\sqrt{3} + 1)/2$

(D) $(\sqrt{3} - 1)/2$

Correct Answer: (A) $(\sqrt{6} + \sqrt{2})/4$

Solution:

Using the angle sum formula: $\sin75° = \sin(45° + 30°) = \sin45°\cos30° + \cos45°\sin30°$ $= (\sqrt{2}/2)(\sqrt{3}/2) + (\sqrt{2}/2)(1/2) = \sqrt{6}/4 + \sqrt{2}/4 = (\sqrt{6} + \sqrt{2})/4$.

Q11. [MEDIUM]

The shadow of a tower is 30 m long when the sun's angle of elevation is 30°. At a later time, the sun's angle of elevation becomes 60°, and the shadow length becomes x m. The height of the tower does not change.

What is the value of x?

(A) 10 m

(B) 15 m

(C) 20 m

(D) $30/\sqrt{3}$ m

Correct Answer: (A) 10 m

Solution:

First find the tower's height using the 30° case: tan30° = height/30, so height = 30 × (1/√3) = 10√3 m. Now using the 60° case: tan60° = height/x, so x = height/tan60° = 10√3/√3 = 10 m.

Q12. [MEDIUM]

Simplify: secθ(1 - sinθ)(secθ + tanθ).

(A) 1

(B) sinθ

(C) cosθ

(D) 0

Correct Answer: (A) 1

Solution:

Write secθ = 1/cosθ and tanθ = sinθ/cosθ, so secθ + tanθ = (1 + sinθ)/cosθ. The expression becomes: (1/cosθ)(1 - sinθ) × (1 + sinθ)/cosθ = (1 - sin²θ)/cos²θ. Since 1 - sin²θ = cos²θ, this equals cos²θ/cos²θ = 1.

Q13. [MEDIUM]

θ is an acute angle such that cosθ = 7/25.

What is the value of tanθ?

(A) 24/7

(B) 7/24

(C) 25/7

(D) 7/25

Correct Answer: (A) 24/7

Solution:

Since cosθ = 7/25, consider a right triangle with adjacent side 7 and hypotenuse 25. By the Pythagorean theorem, the opposite side = √(25² - 7²) = √(625 - 49) = √576 = 24. Therefore tanθ = opposite/adjacent = 24/7.

TOUGH LEVEL

Q14. [TOUGH]

What is the maximum possible value of the expression $3\sin\theta + 4\cos\theta$ as θ varies over all real values?

(A) 5

(B) 7

(C) $\sqrt{7}$

(D) 25

Correct Answer: (A) 5

Solution:

For any expression of the form $a\cdot\sin\theta + b\cdot\cos\theta$, the maximum possible value is $\sqrt{(a^2 + b^2)}$ (achieved when $\theta = \tan^{-1}(a/b)$ for suitable a, b, since the expression can be rewritten as $R\cdot\sin(\theta + \phi)$ with $R = \sqrt{(a^2+b^2)}$). Here a = 3, b = 4, so the maximum value is $\sqrt{(9+16)} = \sqrt{25} = 5$.

Q15. [TOUGH]

Consider the equation $2\sin^2\theta - \sin\theta - 1 = 0$, where θ lies in the interval $[0°, 360°)$.

How many values of θ in this interval satisfy the equation?

(A) 2

(B) 3

(C) 4

(D) 1

Correct Answer: (B) 3

Solution:

Let $s = \sin\theta$. The equation becomes $2s^2 - s - 1 = 0$, which factors as $(2s + 1)(s - 1) = 0$. So $s = 1$ or $s = -1/2$. For $s = \sin\theta = 1$: only $\theta = 90°$ works in $[0°, 360°)$ — 1 solution. For $s = \sin\theta = -1/2$: $\theta = 210°$ and $\theta = 330°$ both work (sine is negative in the third and fourth quadrants) — 2 solutions. In total, there are 1 + 2 = 3 solutions.

Q16. [TOUGH]

Two vertical poles of heights 30 m and 18 m stand on level ground. The line joining the top of the shorter pole to the top of the taller pole makes an angle of 30° with the horizontal ground.

What is the horizontal distance between the two poles?

(A) $12\sqrt{3}$ m

(B) $12/\sqrt{3}$ m

(C) $6\sqrt{3}$ m

(D) $18\sqrt{3}$ m

Correct Answer: (A) $12\sqrt{3}$ m

Solution:

The vertical difference in height between the two poles is 30 - 18 = 12 m. If d is the horizontal distance between the poles, then, viewing the line joining the tops as the hypotenuse of a right triangle with the 12 m height difference as the opposite side: $\tan 30° = 12/d$. Since $\tan 30° = 1/\sqrt{3}$, we get $d = 12\sqrt{3}$ m.

Q17. [TOUGH]

For an angle A, it is given that $\tan A + \cot A = 2$.

What is the value of $\tan^2 A + \cot^2 A$?

(A) 2

(B) 4

(C) 0

(D) 1

Correct Answer: (A) 2

Solution:

Recall that $\tan A \times \cot A = 1$ for any angle A (they are reciprocals). Squaring the given relation: $(\tan A + \cot A)^2 = \tan^2 A + 2(\tan A)(\cot A) + \cot^2 A = \tan^2 A + 2 + \cot^2 A$. Since $\tan A + \cot A = 2$, the left side is $2^2 = 4$. So $\tan^2 A + 2 + \cot^2 A = 4$, which gives $\tan^2 A + \cot^2 A = 2$.

Q18. [TOUGH]

A man standing on top of a 100 m tall tower observes a car approaching the base of the tower along a straight, level road. The angle of depression of the car changes from 30° to 60° over a period of 10 minutes, and the car travels at constant speed throughout.

How much additional time will the car take to reach the base of the tower from the point where the angle of depression was last measured (60°)?

(A) 5 minutes

(B) 10 minutes

(C) 15 minutes

(D) 20 minutes

Correct Answer: (A) 5 minutes

Solution:

At a 30° angle of depression, the horizontal distance of the car from the tower's base is $d1 = 100/\tan 30° = 100\sqrt{3}$ m. At a 60° angle of depression, the distance is $d2 = 100/\tan 60° = 100/\sqrt{3}$ m. The distance covered in the given 10 minutes is $d1 - d2 = 100\sqrt{3} - 100/\sqrt{3} = 100(3 - 1)/\sqrt{3} = 200/\sqrt{3}$ m, giving a speed of $(200/\sqrt{3})/10 = 20/\sqrt{3}$ m per minute. The remaining distance to the tower's base is $d2 = 100/\sqrt{3}$ m, so the remaining time = d2 ÷ speed = $(100/\sqrt{3}) \div (20/\sqrt{3}) = 100/20 = 5$ minutes.

Q19. [TOUGH]

Simplify: $(\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$.

(A) 1

(B) 2

(C) $2\sin\theta\cos\theta$

(D) 0

Correct Answer: (B) 2

Solution:

Expand both squares: $(\sin\theta + \cos\theta)^2 = \sin^2\theta + 2\sin\theta\cos\theta + \cos^2\theta$, and $(\sin\theta - \cos\theta)^2 = \sin^2\theta - 2\sin\theta\cos\theta + \cos^2\theta$. Adding these, the middle terms cancel out, leaving $2\sin^2\theta + 2\cos^2\theta = 2(\sin^2\theta + \cos^2\theta) = 2 \times 1 = 2$.

Q20. [TOUGH]

θ is an angle such that $0° \leq \theta \leq 90°$ and $\sin\theta + \cos\theta = \sqrt{2}$.

What is the value of θ?

(A) 30°

(B) 45°

(C) 60°

(D) 90°

Correct Answer: (B) 45°

Solution:

The expression $\sin\theta + \cos\theta$ can be written as $\sqrt{2} \cdot \sin(\theta + 45°)$, whose maximum possible value is $\sqrt{2}$, attained only when $\sin(\theta + 45°) = 1$, i.e. $\theta + 45° = 90°$, so $\theta = 45°$. Checking directly: at $\theta = 45°$, $\sin45° + \cos45° = \sqrt{2}/2 + \sqrt{2}/2 = \sqrt{2}$, which confirms the answer.