Height and Distance Questions for CGL Tier 2, CGL Tier 1 and SSC 10+2 Exams

HEIGHT & DISTANCE QUIZ 4

Directions: Study the following questions carefully and choose the right answer:

1. The angle of elevation of the top of a tower from the point P and Q at distance of 'a' and 'b' respectively from the base of the tower and in the same straight line with it are complementary. The height of the tower is

A. $\sqrt{ab}$ B. $\frac{a}{b}$ C. ab D. a^2b^2

2. The angle of elevation of a tower from a distance 100 m from its foot is 30°. Height of the tower is :

A. $\frac{100}{\sqrt{3}}$ m B. $\frac{150}{\sqrt{3}}$ m C. $\frac{200}{\sqrt{3}}$ m D. $100\sqrt{3}$ m

3. A tower standing on a horizontal plane subtends a certain angle at a point 160 m apart from the foot of the tower. On advancing 100 m towards it, the tower is found to subtend an angle twice as before. The height of the tower is

A. 80 m B. 100 m C. 160 m D. 200 m

4. The angle of elevation of a tower from a distance 50 m from its foot is 30°. The height of the tower is

A. $50\sqrt{3}$ m B. $\frac{50}{\sqrt{3}}$ m C. $75\sqrt{3}$ m D. $\frac{75}{\sqrt{3}}$ m

6. The length of the shadow of a vertical tower on level ground increases by 10 metres when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

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

6. The elevation of the top of a tower from a point on the ground is 45°. On traelling 60 m from the point towards the tower, the elevation of the top becomes 60°. The height of the tower (in metres) is

A. 30 B. $30(3-\sqrt{3})$ C. $30(3+\sqrt{3})$ D. $30\sqrt{3}$

7. From two points on the ground lying on a straight line through the foot of a pillar, the two angles of elevation of the top of the pillar are complementary to each other. If the distance of the two points from the foot of the pillar are 9 metres and 16 metres and the two points lie on the same side of the pillar, then the height of the pillar is

A. 5 m B. 10 m C. 7 m D. 12 m

8. The angle of elevation of the top of a vertical tower situated perpendicularly on a plane is observed as 60° from a point P on the same plane. From another point Q, 10 m vertically above the point P, the angle of depression of the foot of the tower is 30°. The height of the tower is

A. 15 m B. 30 m C. 20 m D. 25 m

9. From a point 20 m away from the foot of a tower, the angle of elevation of the top of the tower is 30°. The height of the tower is

$A. 10\sqrt{3}m$ $B. 20\sqrt{3}m$ $C. \frac{10}{\sqrt{3}}m$ $D. 20\sqrt{3}m$

10. The angle of elevation of a ladder leaning against a house is 60° and the foot of the ladder is 6.5 metres from the house. The length of the ladder is

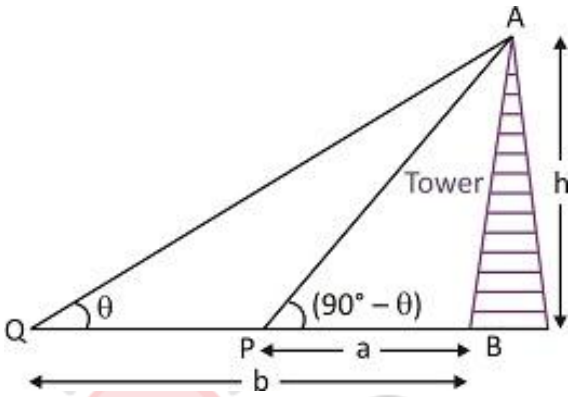
A. $\frac{13}{\sqrt{3}}$ m B. 13 m C. 15 m D. 3.25 m

Correct answers:

1	2	3	4	5	6	7	8	9	10
A	A	A	B	A	C	D	B	D	B

Explanations:

1.



Let, the height of the tower = h metre

Given, BP = a metre and BQ = b metre

And, ∠APB and ∠AQB are complementary.

∴ ∠AQB = Θ and ∠APB = (90° – Θ)

In ΔABQ,

$\tan \Theta = \frac{AB}{BQ}$

$\tan \Theta = \frac{h}{b}$ ...(i)

Now, in ΔABP,

$\tan (90° - \Theta) = \frac{AB}{BP}$

$\cot \Theta = \frac{h}{a}$ ...(ii)

[∵ tan (90° – Θ) = cot Θ]

By multiplying both equations (i) and (ii)

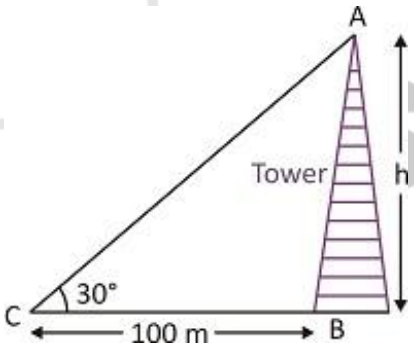
$\tan \Theta \cot \Theta = \frac{h}{b} \times \frac{h}{a}$

$1 = \frac{h^2}{ab}$ [∵ tan Θ cot Θ = 1]

$h = \sqrt{ab}$

Hence, option A is correct.

2.



Given, distance BC = 100 m

Let, the height of the tower = h metre

In ΔABC,

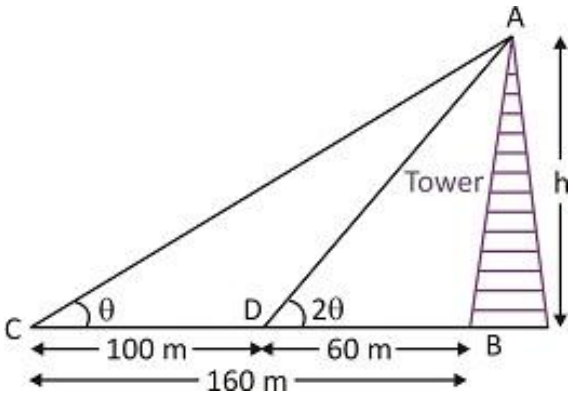
$\tan 30° = \frac{AB}{BC}$

$\frac{1}{\sqrt{3}} = \frac{h}{100}$

$h = \frac{100}{\sqrt{3}} m$

Hence, option A is correct.

3.



Given, BC = 160 m and CD = 100 m

∴ BD = BC – CD = 160 – 100 = 60 m

Let, the height of the tower, AB = h metre

And, ∠ACB = Θ and ∠ADB = 2Θ

In ΔABC,

$\tan \Theta = \frac{AB}{BC} = \frac{h}{100}$ ...(i)

Now, in ΔABD,

$\tan 2\Theta = \frac{AB}{BD}$

$\frac{2\tan\Theta}{1 - \tan^2 \Theta} = \frac{h}{60}$

$[\because \tan 2\Theta = \frac{2\tan\Theta}{1 - \tan^2 \Theta}]$

$120 \tan \Theta = h(1 - \tan^2 \Theta)$

$120 \times \frac{h}{160} = h[1 - (\frac{h}{160})^2]$

[From eq. (i)]

$\frac{3}{4} = 1 - (\frac{h}{160})^2$

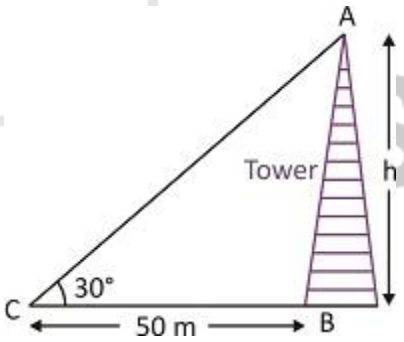
$(\frac{h}{160})^2 = 1 - \frac{3}{4} = \frac{1}{4}$

$\frac{h}{160} = \frac{1}{4} = \frac{1}{2}$

h = 80 m

Hence, option A is correct.

4.



Given, distance BC = 50 m

Let, the height of the tower AB = h metre

In ΔABC,

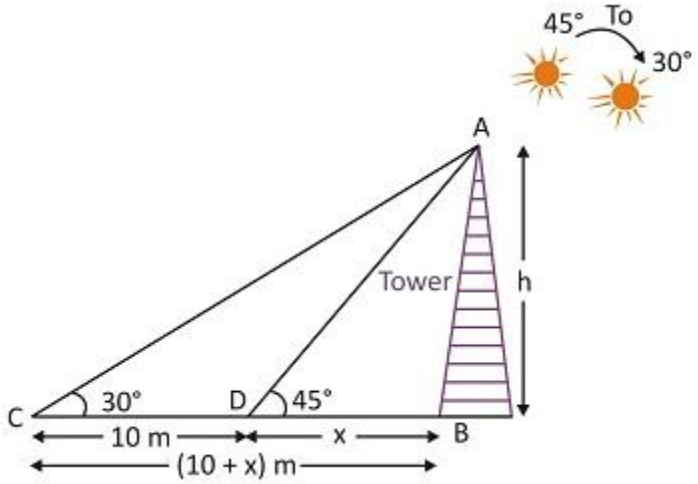
$\tan 30° = \frac{AB}{BC}$

$\frac{1}{\sqrt{3}} = \frac{h}{50}$

$h = \frac{50}{\sqrt{3}} m$

Hence, option B is correct.

5.



Let, the height of the pillar, AB = h metre.

When the sun's angle of elevation was 45°, then the length of shadow of the pillar is BD = x (let).

And, when the sun's angle of elevation is 30°, then the length of shadow of the pillar is BC.

When the sun changes from 45° to 30°, then the length of shadow of the pillar increases CD = 10 (given)

∴ BC = CD + BD = (10 + x) m

In ΔABD,

$\tan 45° = \frac{AB}{BD} \Rightarrow 1 = \frac{h}{x}$

$\Rightarrow$ h = x ...(i)

Now, in ΔABC,

$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{3}$

$= \frac{h}{x + 10}$

$\Rightarrow$ h 3 – x = 10

$\Rightarrow$ h 3 – h = 10 [From eq. (i)]

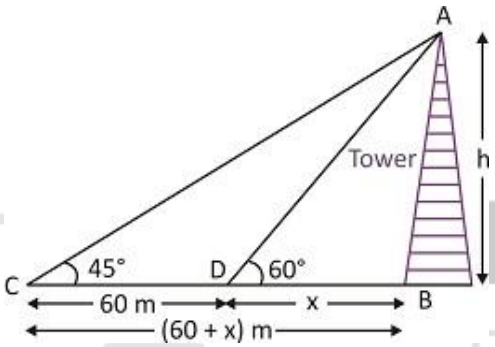
$\Rightarrow$ h(3 – 1) = 10

$\Rightarrow$ h = $\frac{10}{\sqrt{3}-1} \times \frac{3+1}{\sqrt{3}+1}$

$= 5\left(\sqrt{3}+1\right)m$

Hence, option A is correct.

6.



Let, the height of the tower, AB = h metre

And, BD = x metre

Given, CD = 60 m

$\therefore$ BC = CD + BD = (60 + x) m

In ΔABC,

$\tan 45° = \frac{AB}{BC} \Rightarrow 1 = \frac{h}{60+x}$

$\Rightarrow$ x = h – 60 ...(i)

Now, in ΔABD,

$\tan 60° = \frac{AB}{BD} \Rightarrow \sqrt{3} = \frac{h}{x}$

$\Rightarrow$ h = x $\sqrt{3}$

$\Rightarrow$ h = (h – 60) 3 [From eq. (i)]

$\Rightarrow$ h = h $\sqrt{3}$ – 60 $\sqrt{3}$

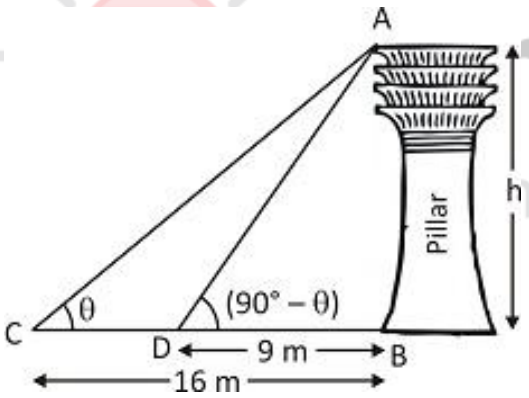
$\Rightarrow h(\sqrt{3}-1) = 60\sqrt{3}$

$\Rightarrow$ h = $\frac{60\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= 30\sqrt{3}(\sqrt{3}+1) = 30(3+\sqrt{3})m$

Hence, option C is correct.

7.



Given, distance BD = 9 m and BC = 16 m

Let, the height of the pillar = h metre

∠ACB and ∠ADB are complementary.

∴ ∠ACB = Θ and ∠ADB = (90° – Θ)

In ΔABC,

tan Θ = $\frac{AB}{BC}$

tan Θ = $\frac{h}{\quad}$ ...(i)

Now, in ΔABD,

$\tan (90° - \Theta) = \frac{AB}{BD}$

$\cot \Theta = \frac{h}{9}$ ...(ii) [$\because \tan (90° - \Theta) = \cot \Theta$]

By multiplying both equations (i) and (ii),

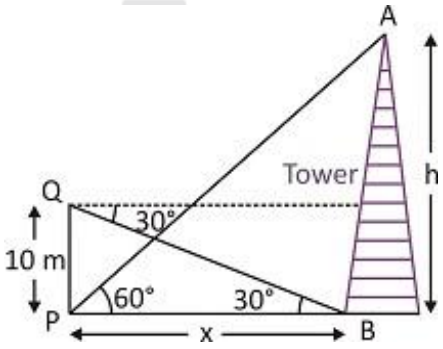
$\tan \Theta \cot \Theta = \frac{h^2}{144}$

$1 = \frac{h^2}{144}$ [$\because \tan \Theta \cot \Theta = 1$]

$h = \sqrt{144} = 12\, m$

Hence, option D is correct.

8.



Given, PQ = 10 m

Let, the height of the tower AB = h metre

And, BP = x metre

In ΔPBQ,

$\tan 30° = \frac{PQ}{PB}$

$\frac{1}{\sqrt{3}} = \frac{10}{x}$

$x = 10\sqrt{3}$ m

Now, in ΔABP,

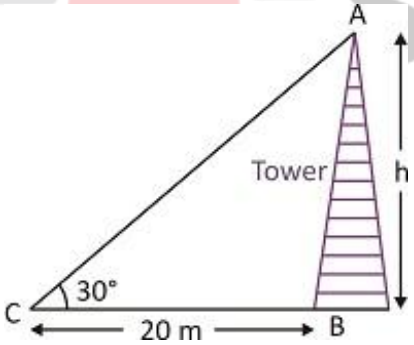
$\tan 60° = \frac{AB}{PB}$

$\sqrt{3} = \frac{h}{x}$

$h = x\sqrt{3} = 10\sqrt{3} \times \sqrt{3} = 30\ m$

Hence, option B is correct.

9.



Given, distance BC = 20 m

Let, the height of the tower AB = h metre

In ΔABC,

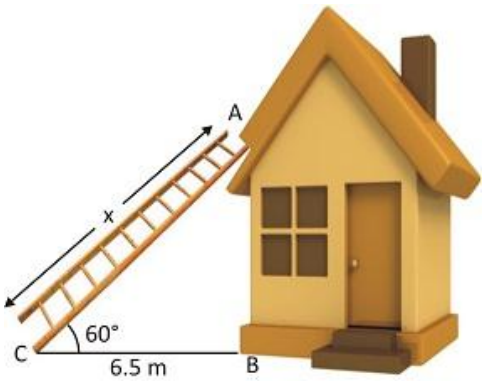
$\tan 30° = \frac{AB}{BC}$

$\frac{1}{\sqrt{3}} = \frac{h}{20}$

$h = \frac{20}{\sqrt{3}}$ m

Hence, option D is correct.

10.



Given, distance between of the ladder and the house BC = 6.5 m

Let, the length of the ladder = x metre

In the right-angled ΔABC,

$\cos 60° = \frac{6.5}{x}$

$\frac{1}{2} = \frac{6.5}{x}$

x = 13 metres

Hence, option B is correct.