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

HEIGHT & DISTANCE QUIZ 3

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

1. The angle of elevation of the top of a building and the top of the chimney on the roof of the building from a point on the ground are x° and 45° respectively. The height of building is h metre. Then the height of the chimney (in metre) is :

A. h cot x + h B. h cot x – h C. h tan x – h D. h tan x + h

2. Two posts are x metres apart and the height of one is double that of the other. If from the mid-point of the line joining their feet, an observer finds the angular elevations of their tops to be complementary, then the height (in metres) of the shorter post is

A. x/2√2 B. x/4 C. x√2 D. x/√2

3. An aeroplane when flying at a height of 5000 m from the ground passes vertically above another aeroplane at an instant, when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. The vertical distance between the aeroplanes at that instant is

A. $5000(\sqrt{3} - 1)m$ B. $5000(3 - \sqrt{3})m$ C. $5000\left(1 - \frac{1}{\sqrt{3}}\right)m$ D. 4500 m

4. A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30°. The man walks some distance towards the tower and then his angle of elevation of the top of the tower is 60°. If the height of the tower is 30 m, then the distance he moves is

A. 22 m B. 22√3 m C. 20 m D. 20√3 m

5. The distance between two vertical poles is 60 m. The height of one of the poles is double the height of the other. The angle of elevation of the top of the poles from the middle point of the line segment joining their feet are complementary to each other. The height of the poles are :

A. 10 m and 20 m B. 20 m and 40 m

C. 20.9 m and 41.8 m D. 15√2 m and 30√2 m

6. An aeroplane when flying at a height of 3125 m from the ground passes vertically below another plane at an instant when the angle of elevation of the two planes from the same point on the ground are 30° and 60° respectively. The distance between the two planes at that instant is

A. 6520 m B. 6000 m C. 5000 m D. 6250 m

7. The shadow of the tower becomes 60 metres longer when the altitude of the sun changes from 45° to 30°. Then the height of the tower is

A. $20(\sqrt{3}+ 1)m$ B. $24(\sqrt{3}+ 1)m$ C. $30(\sqrt{3}+ 1)m$ D. $30(\sqrt{3}- 1)m$

8. A vertical post 15 ft high is broken at a certain height and its upper part, not completely separated, meets the ground at an angle of 30°. Find the height at which the post is broken.

A. 10 ft B. 5 ft C. 15√3(2 – √3) ft D. 5√3 ft

9. The shadow of a tower is √3 times its height. Then the angle of elevation of the top of the tower is

A. 45° B. 30° C. 60° D. 90°

10. The angle of elevation of an aeroplane from a point on the ground is 60°. After 15 seconds flight, the elevation changes to 30°. If the aeroplane is flying at a height of 1500√3 m, find the speed of the plane.

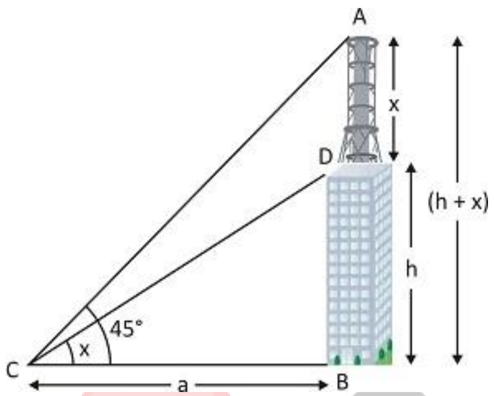
A. 300 m/sec B. 200 m/sec C. 100 m/sec D. 150 m/sec

Correct answers:

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

Explanations:

1.



Given, the height of the building, BD = h metre

Let, the height of the chimney, AD = x metre

and, BC = a metre

∴ AB = BD + AD = (h + x) m

In ΔABC,

$\tan 45° = \frac{AB}{BC}$

$1 = \frac{x + h}{a}$

$a = x + h$ ...(i)

Now, in ΔBCD,

$\tan x = \frac{BD}{BC}$

$\tan x = \frac{h}{a}$

$a = h \cot x$ ...(ii)

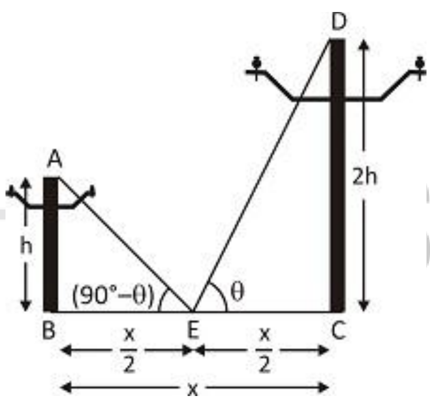
From eq. (i) and (ii),

$x + h = h \cot x$

$x = h \cot x - h$

Hence, option B is correct.

2.



Given, BC = x metre,

Let E is the mid-point of BC

∴ BE = EC = x/2 metre

Let, the height of the pole AB = h metre

∴ The height of the pole CD = 2h metre

And, ∠AEB and ∠DEC are complementary.

∴ ∠AEB = (90° – Θ) and ∠DEC = Θ

In ΔABE,

$\tan (90° - \Theta) = \frac{AB}{BE}$

$$\cot \Theta = \frac{h}{x/2} = \frac{2h}{x} \quad ...(i)$$

[$\because \tan (90° - \Theta) = \cot \Theta$]

Now, in ΔCDE,

$$\tan \Theta = \frac{CD}{CE}$$

$$\tan \Theta = \frac{2h}{x/2} = \frac{4h}{x} \quad ...(ii)$$

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

$$\cot \Theta \tan \Theta = \frac{2h}{x} \times \frac{4h}{x}$$

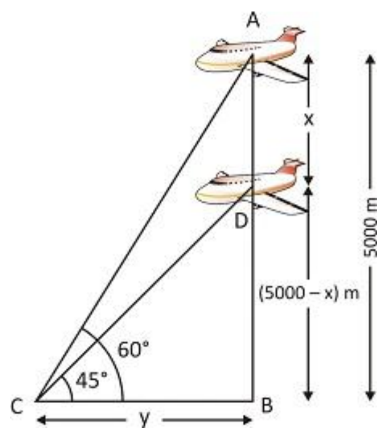
$$1 = \frac{8h^2}{x^2} \quad [\because \cot \Theta \tan \Theta = 1]$$

$$h^2 = \frac{x^2}{8}$$

$$h = \frac{x}{2\sqrt{2}}$$

Hence, option A is correct.

3.



Given, the height of an aeroplane from the ground, AB = 5000 m,

Let, the distance between the aeroplanes, AD = x metre

And, BC = y metre

∴ BD = AB – AD = (5000 – x) m

In ΔABC,

$\tan 60^\circ = \frac{AB}{BC}$

$\sqrt{3} = \frac{5000}{y}$

$y = \frac{5000}{\sqrt{3}} m$

Now, in ΔBCD,

$\tan 45^\circ = \frac{BD}{BC}$

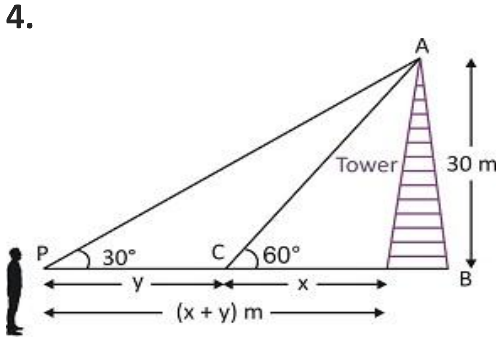
$1 = \frac{5000 - x}{y}$

x = 5000 – y

$x = 5000\left(1 - \frac{1}{\sqrt{3}}\right)$

Hence, option C is correct.

4.



Given, the height of the tower, AB = 30 m

Let, the man moves the distance, CP = y metre

And, BC = x metre

∴ BP = BC + CP = (x + y) m

In ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\sqrt{3} = \frac{30}{x}$

$x = \frac{30}{\sqrt{3}} = 10\sqrt{3}m$

Now, in ΔABP,

$\tan 30° = \frac{AB}{BP}$

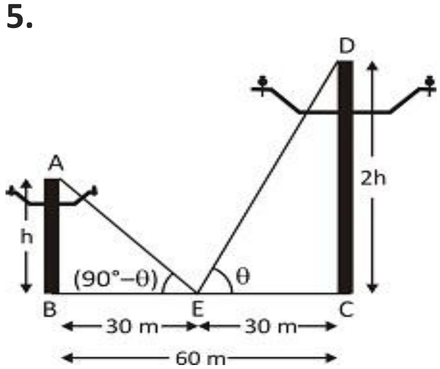
$\frac{1}{\sqrt{3}} = \frac{30}{x + y}$

$y = 30\sqrt{3} - x$

$y = 30\sqrt{3} - 10\sqrt{3} = 20\sqrt{3}m$

Hence, option A is correct.

5.



Given, BC = 60 metre,

Let E is the mid-point of BC

∴ BE = EC = 30 metre

Let, the height of the pole AB = h metre

∴ The height of the pole CD = 2h metre

And, ∠AEB and ∠DEC are complementary.

∴ ∠AEB = (90° – Θ) and ∠DEC = Θ

In ΔABE,

$\tan (90° - \Theta) = \frac{AB}{BE}$

$\cot \Theta = \frac{h}{30}$ ...(i)

Now, in ΔCDE,

$\tan \Theta = \frac{CD}{CE}$

$\tan \Theta = \frac{2h}{30} = \frac{h}{15}$ ...(ii)

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

$\cot \Theta \tan \Theta = \frac{h}{30} \times \frac{h}{15}$

$1 = \frac{h^2}{450}$ [∵ $\cot \Theta \tan \Theta = 1$]

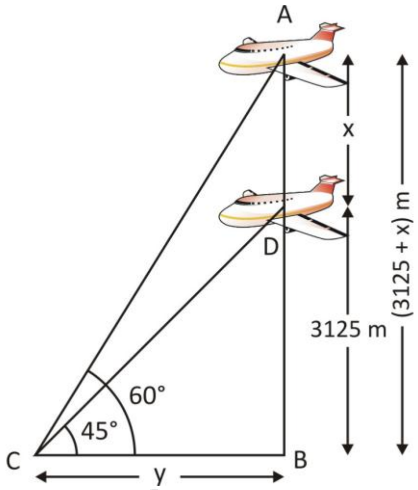
$h = \sqrt{450} = 15\sqrt{2}$

∴ The height of the pole AB = h = $15\sqrt{2}$

And, the height of the pole CD = 2h = $2 \times 15\sqrt{2} = 30\sqrt{2}$

Hence, option D is correct.

6.



Given, the height of an aeroplane from the ground, BD = 3125 m

Let, the distance between the aeroplanes, AD = x metre

And, BC = y metre

∴ AB = AD + BD = (3125 + x) m

In ΔBCD,

$\tan 30° = \frac{BD}{BC}$

$\frac{1}{\sqrt{3}} = \frac{3125}{y}$

$y = 3125\sqrt{3}m$

In ΔABC,

$\tan 60° = \frac{AB}{BC}$

$\sqrt{3} = \frac{x + 3125}{y}$

$y\sqrt{3} = \ x \ + \ 3125$

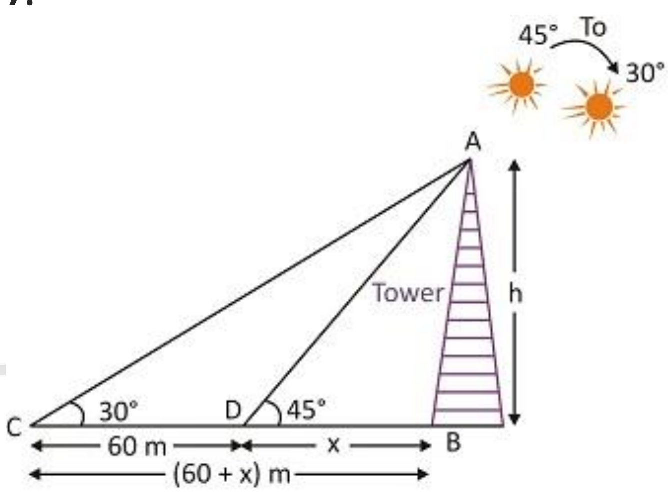
$3125\sqrt{3} \times \sqrt{3} = x + 3125$

x = 9375 – 3125 = 6250 m

∴ The distance between the aeroplanes is 6250 metres.

Hence, option D is correct.

7.



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

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

When the sun changes from 45° to 30°, then the length of shadow of the tower increases CD = 60 m (given)

And, when the sun's angle of elevation is 30°, then the length of shadow of the tower is BC = CD + BD = (60 + x) metre.

In ΔABD,

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

h = x

Now, in ΔABC,

$\tan 30° = \frac{AB}{BC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x + 60}$

$h\sqrt{3} - x = 60$

$h\sqrt{3} - h = 60 \quad [\because\ h = x]$

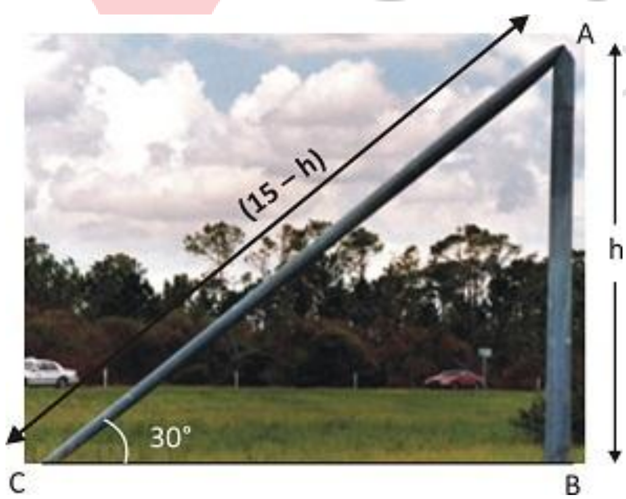
$h(\sqrt{3} - 1) = 60$

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

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

Hence, option C is correct.

8.



Total height of post = AB + AC = 15 ft

Let, the post is broken at point A, ∴ AB = h

And, AC = 15 – AB = (15 – h) ft

In ΔABC,

$\sin 30° = \frac{AB}{AC}$

$\frac{1}{2} = \frac{h}{15 - h}$

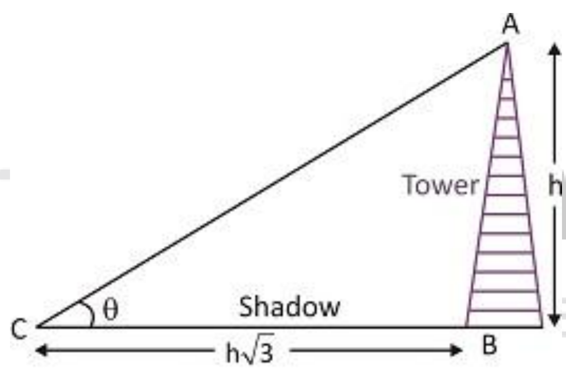
$15 - h = 2h$

$3h = 15$

$h = 5$ ft

Hence, option B is correct.

9.



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

And, the angle of elevation = Θ

then, the shadow of the tower, BC = $h\sqrt{3}$ metre

In ΔABC,

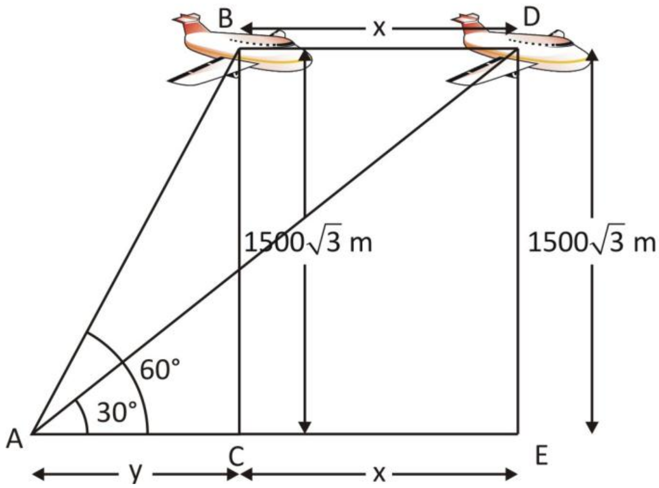
$\tan \Theta = \frac{AB}{BC}$

$\tan \Theta = \frac{h}{h\sqrt{3}} = \frac{1}{\sqrt{3}} = \tan 30°$

$\Theta = 30°$

Hence, option B is correct.

10.



Given, the height of the aeroplane, BC = 1500 √3 meter

Let, an aeroplane travelled distance BD = x metre in 15 seconds.

And, AC = y metre

∴ AE = CE + AC = (x + y) m

In ΔABC,

$$\tan 60° = \frac{BC}{AC}$$

$$\sqrt{3} = \frac{1500\sqrt{3}}{y}$$

y = 1500 m

Now, in ΔADE,

$$\tan 30° = \frac{DE}{AE}$$

$$\frac{1}{3} = \frac{1500\ \ 3}{x + y}$$

x + y = 4500

$x + 1500 = 4500$

$x = 3000$ m

∴ The aeroplane travelled 3000 m distance in 15 seconds.

∴ Speed = $\frac{3000}{15}$ = 200 m/sec

Hence, option A is correct.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