Height and Distance Questions for SSC CHSL PDF

Instructions

For the following questions answer them individually

Question 1

129 meter from the foot of a cliff on level of ground, the angle of elevation of the top of a cliff is 30°. The height of this cliff is

A $50\sqrt{3}$ metre

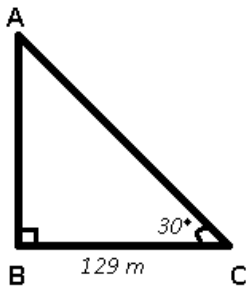
B $45\sqrt{3}$ metre

C $43\sqrt{3}$ metre

D $47\sqrt{3}$ metre

Answer: C

Explanation:



Given : BC = 129 m and $\angle$ ACB = 30°

To find : AB is the cliff = ?

Solution : In $\triangle$ ABC,

=> $tan(30^\circ) = \frac{AB}{BC}$

=> $\frac{1}{\sqrt{3}} = \frac{AB}{129}$

=> $AB = \frac{129}{\sqrt{3}}$

=> $AB = 43\sqrt{3}$ m

=> Ans - (C)

Question 2

A 1.6 m tall observer is 45 meters away from a tower. The angle of elevation from his eye to the top of the tower is 30°, then the height of the tower in meters is (Take √3 = 1.732)

A 25.98

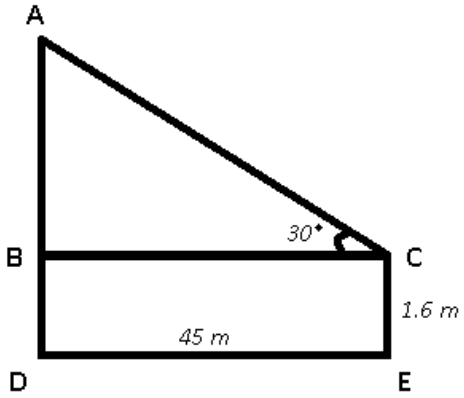
B 26.58

C 27.58

D 27.98

Answer: C

Explanation:



Given : CE is the observer of height = 1.6 m and he is at distance of DE = 45 m from tower

To find : Height of tower AD = ?

Solution : By symmetry, BC = DE = 45 m and BD = CE = 1.6 m

In △ ABC,

=> $tan(\angle ACB) = \frac{AB}{BC}$

=> $tan(30°) = \frac{AB}{45}$

=> $\frac{1}{\sqrt{3}} = \frac{AB}{45}$

=> $AB = \frac{45}{\sqrt{3}} = 15\sqrt{3}$ m

=> $AB = 15 \times 1.732 = 25.98$ m

∴ Height of tower, AD = AB + BD

= $25.98 + 1.6 = 27.58$ m

=> Ans - (C)

Question 3

A boy standing in the middle of a field, observes a flying bird in the north at an angle of elevation of 30° and after 2 minutes, he observes the same bird in the south at an angle of elevation of 60°. If the bird flies all along in a straight line at a height of 50 m, then its speed in km/h is :

A 4.5

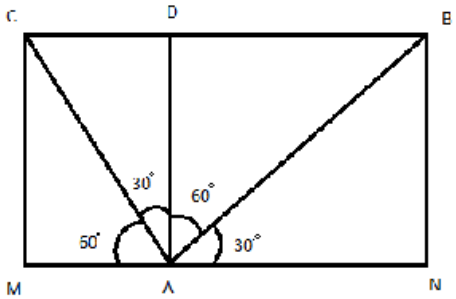
B 3

C 9

D 6

Answer: D

Explanation:



From the diagram,
Height = AD = 50√3 m
∠BAN = 30°
∠CAM = 60°
∴∠BAD = 90° - 30° = 60°
∴∠CAD = 90° - 60° = 30°
From ΔABD,
tan∠BAD = Perpendicular/ Base
tan60° = BD/AD
√3 = BD/(50√3)
BD = 50 × 3 = 150 m
From ΔACD,
tan∠CAD = Perpendicular/ Base
tan30° = CD/AD
1/√3 = CD/(50√3)
CD = 50 m
∴ Distance travelled by the bird
= BC = BD + CD = 150 m + 50 m = 200 m = 0.200 km
Time taken to cover this distance = 2 minutes = 2/60 hr = 1/30 hr
∴ Speed
= Distance travelled/ Time required
=0.200 ×30km/hr
= 0.200 × 30 km/hr
= 6 km/hr
Option D is the correct answer

Question 4

A car is travelling on a straight road leading to a tower. From a point at a distance of 500 m from the tower, as seen by the driver, the angle of elevation of the top of the tower is 30°. After driving towards the tower for 10 seconds, the angle of elevation of the top of the tower as seen by the driver is found to be 60°. Then the speed of the car is

A 135 km/hr.

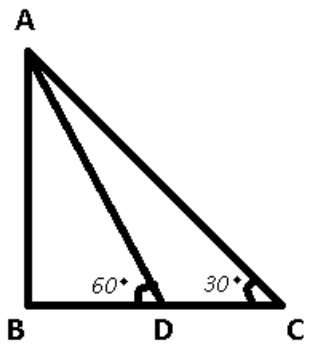
B 110 km/hr.

C 120 km/hr.

D 90 km/hr.

Answer: C

Explanation:



BC = 500 m

Let CD be x => BD = $500 - x$

From △ABC

=> $tan30 = \frac{AB}{BC}$

=> $\frac{1}{\sqrt{3}} = \frac{AB}{500}$

=> $AB = \frac{500}{\sqrt{3}}$ m

Now, from △ABD

=> $tan60 = \frac{AB}{BD}$

=> $\sqrt{3} = \frac{\frac{500}{\sqrt{3}}}{500-x}$

=> $3(500 - x) = 500$

=> $3x = 1000$

∴ $x = \frac{1000}{3}$ metre = $\frac{1}{3}$ km

Also, speed of car = $\frac{distance}{time}$

= $\frac{\frac{1}{3}}{\frac{10}{60*60}}$ km/hr

= 120 km/hr

Question 5

A kite is flying at the height of 75m from the ground. The string makes an angle θ (where cotθ = 8/15) with the level ground. Assuming that there is no slack in the string the length of the string is equal to :

A 85 metre

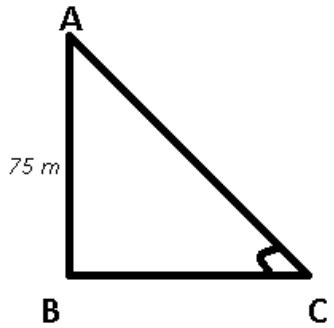
B 65 metre

C 75 metre

D 40 metre

Answer: A

Explanation:



Height of kite from ground = AB = 75 m

∠ACB = θ

We know that $cot\theta = \frac{8}{15}$

=> $\frac{BC}{AB} = \frac{8}{15}$

=> $BC = \frac{8*75}{15} = 40m$

Now, length of string AC = $\sqrt{(AB)^2 + (BC)^2}$

=> AC = $\sqrt{75^2 + 40^2}$

= $\sqrt{5625 + 1600} = \sqrt{7225}$

=> AC = 85 m

Question 6

A man is climbing a ladder which is inclined to the wall at an angle of 30°. If he ascends at a rate of 2 m/s, then he approaches the wall at the rate of

A 1.5 m/s

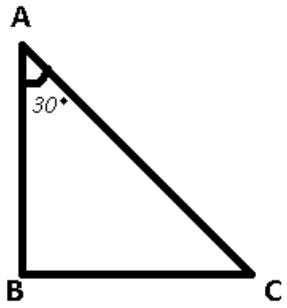
B 1 m/s

C 2 m/s

D 2.5 m/s

Answer: B

Explanation:



Let BC = x and AC = y

$\therefore sin30 = \frac{BC}{AC}$

=> $\frac{1}{2} = \frac{x}{y}$

=> $y = 2x$

After 1 second, required speed, $x = \frac{y}{2}$

= $\frac{2}{2} = 1$ m/s

Question 7

A person of height 6ft. wants to pluck a fruit which is on a 26/3 ft. high tree. If the person is standing 8/√3 ft. away from the base of the tree, then at what angle should he throw a stone so that it hits the fruit ?

A 75°

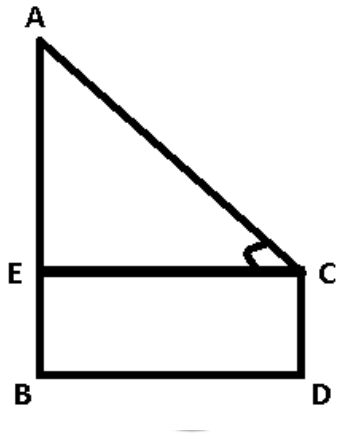
B 30°

C 45°

D 60°

Answer: B

Explanation:



Height of person = CD = 6 ft

Height of tree = AB = $\frac{26}{3}$ ft

Distance between them = BD = $\frac{8}{\sqrt{3}}$ ft

To find : $\angle ACE = \theta = ?$

Solution : AE = AB - BE = $\frac{26}{3}$ - 6

=> AE = $\frac{8}{3} ft$

and BD = CE = $\frac{8}{\sqrt{3}}$ ft

Now, in $\triangle AEC$

=> $tan\theta = \frac{AE}{CE}$

=> $tan\theta = \frac{\frac{8}{3}}{\frac{8}{\sqrt{3}}}$

=> $tan\theta = \frac{1}{\sqrt{3}}$

=> $\theta = 30°$

Question 8

A pilot in an aeroplane at an altitude of 200 m observes two points lying on either side of a river. If the angles of depression of the two points be 45° and 60°, then the width of the river is

A $(200 + \frac{200}{\sqrt{3}})$ m

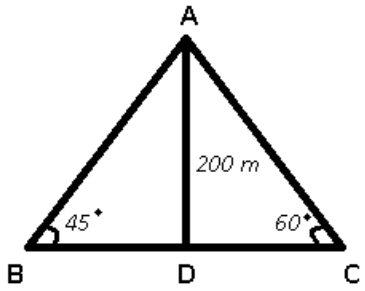
B $(200 - \frac{200}{\sqrt{3}})$ m

C $400\sqrt{3}$ m

D $(\frac{400}{\sqrt{3}})$ m

Answer: A

Explanation:



Given : A is the aeroplane and AD = 200 m

To find : Width of river = BC = ?

Solution : In $\triangle$ ADC

=> $tan(60^\circ) = \frac{AD}{DC}$

=> $\sqrt{3} = \frac{200}{DC}$

=> $DC = \frac{200}{\sqrt{3}}$ m

Similarly, in $\triangle$ ABD

=> $tan(45^\circ) = \frac{AD}{DB}$

=> $1 = \frac{200}{DB}$

=> $DB = 200$ m

$\therefore$ BC = BD + DC

= $(200 + \frac{200}{\sqrt{3}})$ m

=> Ans - (A)

Question 9

A straight tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle of 30° with the ground . The distance from the foot of the tree to the point , where the top touches the ground is 10 m. Find the total height of the tree?

A $10\sqrt{3}$ m

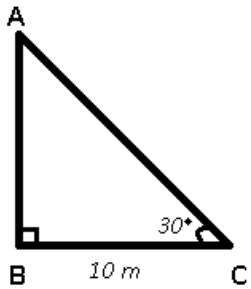
B $\frac{10\sqrt{3}}{3}$ m

C $10(\sqrt{3}+1)$ m

D $10(\sqrt{3}-1)$ m

Answer: A

Explanation:



(AB+BC) = h is the whole height of the tree, the tree breaks down from point A, BC = 10 m

In △ ABC,

=> $tan(30°) = \frac{AB}{BC}$

=> $\frac{1}{\sqrt{3}} = \frac{AB}{10}$

=> $AB = \frac{10}{\sqrt{3}}$ m --------(i)

Again, in △ ABC,

=> $cos(30°) = \frac{BC}{AC}$

=> $\frac{\sqrt{3}}{2} = \frac{10}{AC}$

=> $AC = \frac{20}{\sqrt{3}}$ m ---------(ii)

Adding equations (i) and (ii),

=> $AB + AC = \frac{10}{\sqrt{3}} + \frac{20}{\sqrt{3}}$

=> $h = \frac{30}{\sqrt{3}} = 10\sqrt{3}$ m

=> Ans - (A)

Question 10

A tower is broken at a point P above the ground. The top of the tower makes an angle 60° with the ground at Q. From another point R on the opposite side of Q angle of elevation of point P is 30°. If QR = 180 m, then what is the total height (in metres) of the tower?

A 90

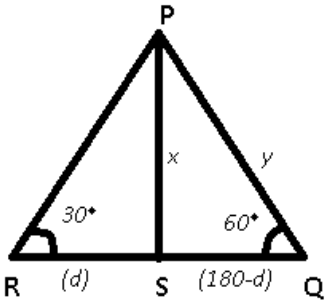
B $45\sqrt{3}$

C $45(\sqrt{3}+1)$

D $45(\sqrt{3}+2)$

Answer: D

Explanation:



In △ PRS,

=> $tan(30°) = \frac{PS}{RS}$

=> $\frac{1}{\sqrt{3}} = \frac{x}{d}$

=> $d = \sqrt{3}x$ ----------(i)

Similarly, in △ PQS,

=> $tan(60°) = \frac{PS}{SQ}$

=> $\sqrt{3} = \frac{x}{180-d}$

=> $180\sqrt{3} - 3x = x$ [Using equation (i)]

=> $x + 3x = 4x = 180\sqrt{3}$

=> $x = \frac{180\sqrt{3}}{4} = 45\sqrt{3}$ ----------(ii)

Again, in $\triangle$ PQS,

=> $sin(60°) = \frac{PS}{PQ}$

=> $\frac{\sqrt{3}}{2} = \frac{x}{y}$

=> $\sqrt{3}y = 2(45\sqrt{3})$ [Using equation (ii)]

=> $y = \frac{90\sqrt{3}}{\sqrt{3}} = 90$ ----------(iii)

Adding equations (ii) and (iii), we get :

=> $x + y = 45\sqrt{3} + 90$

=> Height of tower = $45(\sqrt{3} + 2)$ m

=> Ans - (D)

Question 11

A tower stands on the top of a building which is 40 metres high. The angle of depression of a point situated on the ground from the top and bottom of the tower are found to be 60° and 45° respectively. What is the height (in metres) of tower?

A $20\sqrt{3}$

B $30(\sqrt{3}+1)$

C $40(\sqrt{3}-1)$

D $50(\sqrt{3}-1)$

Answer: C

Question 12

A tree is broken by the wind. If the top of the tree struck the ground at an angle of 30° and at a distance of 30 m from the root, then the height of the tree is

A 25√3 m

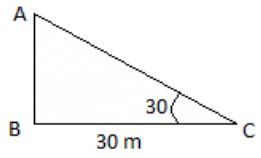
B 30√3 m

C 15√3 m

D 20√3 m

Answer: B

Explanation:



$tan30 = \frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$cos30 = \frac{BC}{AC} = \frac{sqrt3}{2}$

Height of the tree = $AB + AC$

$AB = BC \times \frac{1}{\sqrt{3}}$

$AB = 30 \times \frac{1}{\sqrt{3}} = \frac{30}{\sqrt{3}}$

$AC = \frac{2 \times BC}{\sqrt{3}} = \frac{2 \times 30}{\sqrt{3}}$

$AB + AC = \frac{30}{\sqrt{3}} + \frac{60}{\sqrt{3}} = 30\sqrt{3}$

Hence Option B is the correct answer.

Question 13

A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h. At a point on the plane, the angle of elevation of the bottom of the flag staff is α and that of the top of the flag staff is β. Then the height of the tower is

A $h \tan \alpha$

B $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$

C $\frac{h \tan \alpha}{\tan \alpha - \tan \beta}$

D None of these

Answer: B

Question 14

From a point on a bridge across the river, the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 2.5m from the banks, then the width of the river is (take √3 = 1.732)

A 5.83m

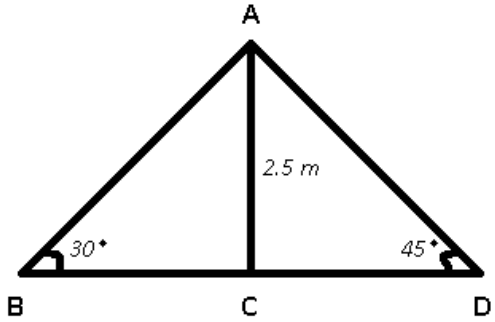
B 6.83m

C 5.76m

D 6.87m

Answer: B

Explanation:



AC is the height of the bridge = 2.5 m

Width of river = BD = ?

In △ ACD,

=> $tan(\angle ACD) = \frac{AC}{CD}$

=> $tan(45^\circ) = 1 = \frac{2.5}{CD}$

=> $CD = 2.5$ m

Similarly, in $\triangle$ ABC,

=> $tan(30^\circ) = \frac{2.5}{BC}$

=> $\frac{1}{\sqrt{3}} = \frac{2.5}{BC}$

=> $BC = 2.5 \times 1.732 = 4.33$ m

$\therefore$ BD = BC + CD

= $2.5 + 4.33 = 6.83$ m

=> Ans - (B)

Question 15

From a point P on a level ground, the angle of elevation of the top of a tower is 30°. If the tower is 270 m high. the distance of point P from the foot of the tower is:

A 476.65 m

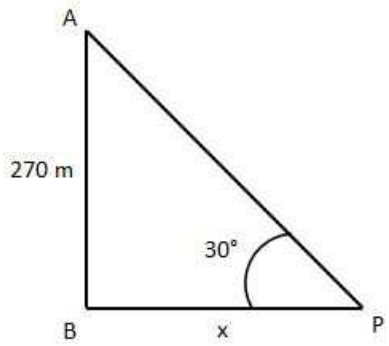
B 367.65 m

C 467.65 m

D 376.65 m

Answer: C

Explanation:
Given, Height of the tower = 270 m
Let the distance from the foot of the tower to P be x m



tan 30 = $\frac{AB}{BP}$

$\frac{1}{\sqrt{3}} = \frac{270}{x}$

$x = 270\sqrt{3} = 270 \times 1.732 = 467.65m$