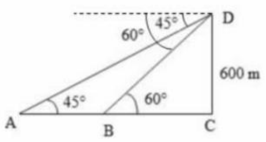
G.S.C.E
Chapter Covered HEIGHT & DISTANCE
(25 Answers and Explanations)

1B



Distance between t

= AB = (AC - BC)

$= 600 - \frac{600}{\sqrt{3}}$

$= 600\left(1 - \frac{1}{\sqrt{3}}\right)$

$= 600\left(\frac{\sqrt{3}-1}{\sqrt{3}}\right)$

$= 600\left(\frac{\sqrt{3}-1}{\sqrt{3}}\right)$

$= \frac{600\sqrt{3}(\sqrt{3}-1}{3}$

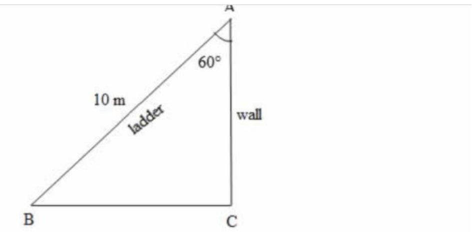
$= 200\sqrt{3}(\sqrt{3}-1)$

$= 200(3-\sqrt{3})$

$= 200(3-1.73)$

$= 254$ m

2C



Let BA be the ladder and AC be the wall as shown above.
Then the distance of the foot of the ladder from the wall = BC

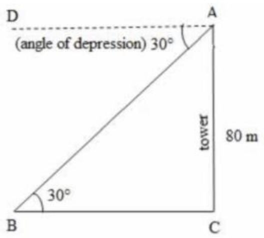
Given that BA = 10 m , ∠BAC = 60°

$\sin 60^\circ = \frac{BC}{BA}$

$\frac{\sqrt{3}}{2} = \frac{BC}{10}$

$BC = 10 \times \frac{\sqrt{3}}{2} = 5 \times 1.73 = 8.65$ m

3C



$\tan 30^\circ = \frac{AC}{BC}$

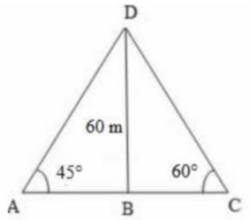
$=> \tan 30^\circ = \frac{80}{BC}$

$=> BC = \frac{80}{\tan 30^\circ} = \frac{80}{\left(\frac{1}{\sqrt{3}}\right)}$

$= 80 \times 1.73 = 138.4 \text{ m}$

i.e., Distance of the bus from the foot of the tower = 138.4 m

4B



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

$\Rightarrow 1 = \frac{60}{BA}$

$\Rightarrow BA = 60 \text{ m} \qquad \cdots(1)$

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

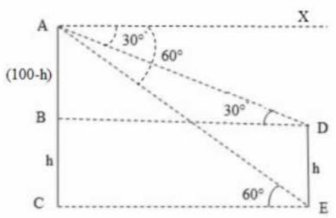
$\Rightarrow \sqrt{3} = \frac{60}{BC}$

$\Rightarrow BC = \frac{60}{\sqrt{3}} = \frac{60 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}} = \frac{60\sqrt{3}}{3}$

$= 20\sqrt{3} = 20 \times 1.73 = 34.6 \text{ m} \qquad \cdots(2)$

Distance between the two points A and C
= AC = BA + BC
= 60 + 34.6 [∵ Substituted value of BA and BC from (1) and (2)]
= 94.6 m

5B



$\tan 60^\circ = \frac{AC}{CE}$

$=> \sqrt{3} = \frac{100}{CE}$

$=> CE = \frac{100}{\sqrt{3}} \qquad \cdots (1)$

$\tan 30^\circ = \frac{AB}{BD}$

$=> \frac{1}{\sqrt{3}} = \frac{100 - h}{BD}$

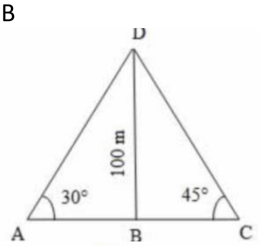
$=> \frac{1}{\sqrt{3}} = \frac{100 - h}{\left(\frac{100}{\sqrt{3}}\right)}$ ($\because$ BD = CE

$=> (100 - h) = \frac{1}{\sqrt{3}} \times \frac{100}{\sqrt{3}}$

$= \frac{100}{3} = 33.33$

$=> h = 100 - 33.33 = 66.67$ m

6B



$\tan 30^\circ = \frac{BD}{BA}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{100}{BA}$

$\Rightarrow BA = 100\sqrt{3}$

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

$\Rightarrow 1 = \frac{100}{BC}$

$\Rightarrow BC = 100$

Distance between the two ships

= AC = BA + BC

$= 100\sqrt{3} + 100$

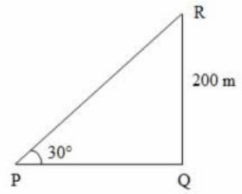
$= 100(\sqrt{3} + 1)$

= 100(1.73+1) = 100 × 2.73 = 273 m

7B

we can not find the required value

8A

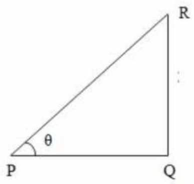


$$\tan 30^\circ = \frac{RQ}{PQ}$$

$$\frac{1}{\sqrt{3}} = \frac{200}{PQ}$$

$$PQ = 200\sqrt{3} = 200 \times 1.73 = 346 \text{ m}$$

9A



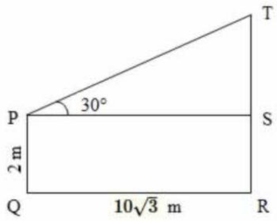
Consider the diagram shown above where QR represents the tree and PQ represents its shadow

We have, QR = PQ
Let ∠QPR = θ

$$\tan\theta = \frac{QR}{PQ} = 1 \quad (\textit{since } QR = PQ)$$

=> θ = 45°

10B



SR = PQ = 2 m
PS = QR = $10\sqrt{3}$ m

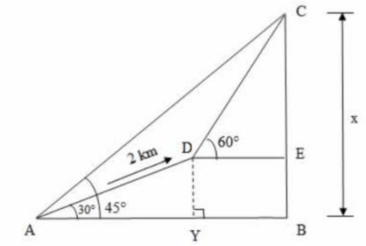
$$\tan 30^\circ = \frac{TS}{PS}$$

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

$$TS = \frac{10\sqrt{3}}{\sqrt{3}} = 10 \text{ m}$$

TR = TS + SR = 10 + 2 = 12 m

11B



From the right △ CED,

$\tan 60^\circ = \frac{CE}{DE}$

$\Rightarrow \tan 60^\circ = \frac{(CB - EB)}{YB}$

$\Rightarrow \tan 60^\circ = \frac{(CB - DY)}{(AB - AY)}$

$\Rightarrow \tan 60^\circ = \frac{(x - 1)}{(x - \sqrt{3})}$

$\Rightarrow \sqrt{3} = \frac{(x - 1)}{(x - \sqrt{3})}$

$\Rightarrow x\sqrt{3} - 3 = x - 1$

$\Rightarrow x(\sqrt{3} - 1) = 2$

$\Rightarrow 0.73x = 2$

$\Rightarrow x = \frac{2}{0.73} = 2.7$

12D

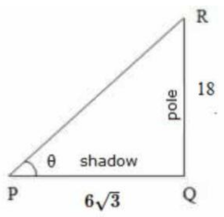
i.e., the distance travelled by the car in 10 seconds $= \frac{200\sqrt{3}}{3}$ m

Speed of the car $= \frac{\text{Distance}}{\text{Time}}$

$= \frac{\left(\frac{200\sqrt{3}}{3}\right)}{10} = \frac{20\sqrt{3}}{3}$ meter/second

$= \frac{20\sqrt{3}}{3} \times \frac{18}{5}$ km/hr $= 24\sqrt{3}$ km/hr

13B



Let RQ be the pole and PQ be the shadow

Given that RQ = 18 m and PQ $= 6\sqrt{3}$ m

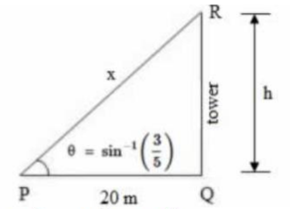
Let the angle of elevation, ∠RPQ = θ

From the right △ PQR,

$\tan\theta = \frac{RQ}{PQ} = \frac{18}{6\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

$\Rightarrow \theta = \tan^{-1}(\sqrt{3}) = 60^\circ$

14A



$PQ^2 + QR^2 = PR^2$

$20^2 + h^2 = x^2$

$20^2 + h^2 = \left(\frac{5h}{3}\right)^2$

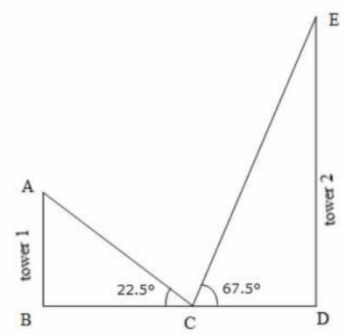
$20^2 + h^2 = \frac{25h^2}{9}$

$\frac{16h^2}{9} = 20^2$

$\frac{4h}{3} = 20$

$h = \frac{3 \times 20}{4} = 15 \text{ m}$

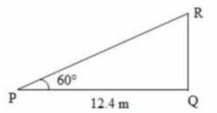
15D



Required ratio = ED : AB

$= (3 + 2\sqrt{2}) : 1$

16D



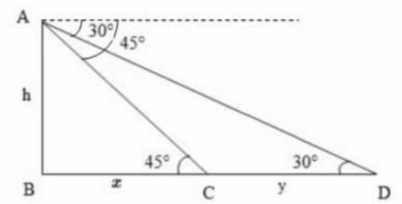
Consider the diagram shown above where PR represents the ladder and RQ represents the wall.

$\cos 60^\circ = \frac{PQ}{PR}$

$\frac{1}{2} = \frac{12.4}{PR}$

$PR = 2 \times 12.4 = 24.8 \text{ m}$

17C



$h(\sqrt{3}-1) \propto 8 \quad \cdots (A)$

$h \propto t \quad \cdots (B)$

$\frac{(A)}{(B)} => \frac{h(\sqrt{3}-1)}{h} = \frac{8}{t}$

$=> (\sqrt{3}-1) = \frac{8}{t}$

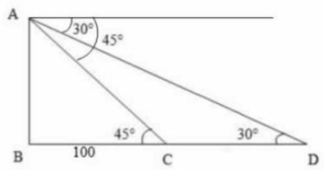
$=> t = \frac{8}{(\sqrt{3}-1)} = \frac{8}{(1.73-1)}$

$= \frac{8}{.73} = \frac{800}{73}$ minutes

$= 10\frac{70}{73}$ minutes

$\approx$ 10 minutes 57 seconds

18B



Required speed

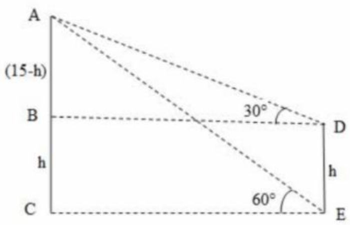
$= \frac{\text{Distance}}{\text{Time}}$

$= \frac{100(\sqrt{3}-1)}{10} = 10(1.73-1)$

= 7.3 meter/seconds

$= 7.3 \times \frac{18}{5}$ km/hr = 26.28 km/hr

19D



$\tan 60^\circ = \frac{AC}{CE}$

$=> \sqrt{3} = \frac{15}{CE}$

$=> CE = \frac{15}{\sqrt{3}} \quad \cdots (1)$

$\tan 30^\circ = \frac{AB}{BD}$

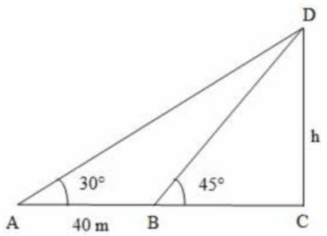
$=> \frac{1}{\sqrt{3}} = \frac{15-h}{BD}$

$=> \frac{1}{\sqrt{3}} = \frac{15-h}{\left(\frac{15}{\sqrt{3}}\right)} \quad (\because$

$=> (15-h) = \frac{1}{\sqrt{3}} \times \frac{15}{\sqrt{3}}$

$=> h = 15 - 5 = 10$ m

20D



We know that, AB = (AC - BC)

=> 40 = (AC - BC)

$=> 40 = (h\sqrt{3} - h)$

$=> 40 = h(\sqrt{3} - 1)$

$=> h = \dfrac{40}{(\sqrt{3} - 1)}$

$= \dfrac{40}{(\sqrt{3} - 1)} \times \dfrac{(\sqrt{3} + 1)}{(\sqrt{3} + 1)}$

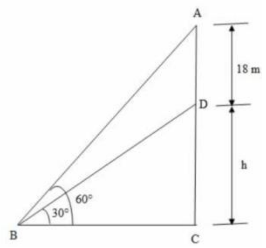
$= \dfrac{40(\sqrt{3} + 1)}{(3 - 1)}$

$= \dfrac{40(\sqrt{3} + 1)}{2}$

$= 20(\sqrt{3} + 1)$

$= 20(1.73 + 1) = 20 \times 2.73 = 54.6$ m

21C



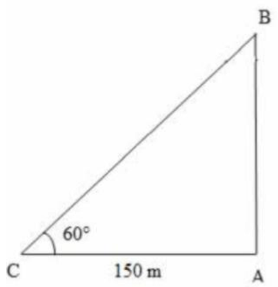
$\dfrac{(1)}{(2)} => \dfrac{h}{18 + h} = \dfrac{\left(\dfrac{BC}{\sqrt{3}}\right)}{\left(BC \times \sqrt{3}\right)} = \dfrac{1}{3}$

$=> 3h = 18 + h$

$=> 2h = 18$

$=> h = 9$ m

22A



i.e, the distance travelled by the balloon $= 150\sqrt{3}$ m

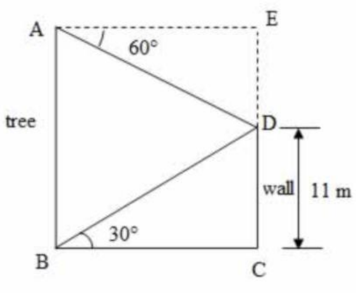
time taken = 2 min = 2 × 60 = 120 seconds

$\text{Speed} = \dfrac{\text{Distance}}{\text{Time}}$

$= \dfrac{150\sqrt{3}}{120} = 1.25\sqrt{3}$

$= 1.25 \times 1.73 = 2.16$ meter/second

23D



$$\tan 30^\circ = \frac{DC}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{11}{BC}$$

$$BC = 11\sqrt{3}\text{ m}$$

$$AE = BC = 11\sqrt{3}\text{ m} \quad \cdots(1)$$

$$\tan 60^\circ = \frac{ED}{AE}$$

$$\sqrt{3} = \frac{ED}{11\sqrt{3}}$$

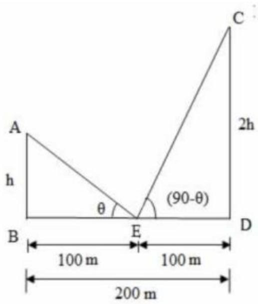
$$ED = 11\sqrt{3} \times \sqrt{3} = 11 \times 3 = 33$$

Height of the tree

= AB = EC = (ED + DC)

= (33 + 11) = 44 m

24D



$$h = 100\tan\theta \qquad \cdots(1)$$

From the right △ EDC,

$$\tan(90-\theta) = \frac{CD}{ED}$$

$$\cot\theta = \frac{2h}{100} \quad [\because \tan(90-\theta) = \cot\theta]$$

$$2h = 100\cot\theta \qquad \cdots(2)$$

$$(1)\times(2) => 2h^2 = 100^2 \quad [\because \tan\theta \times \cot\theta = \tan\theta \times \frac{1}{\tan\theta} = 1]$$

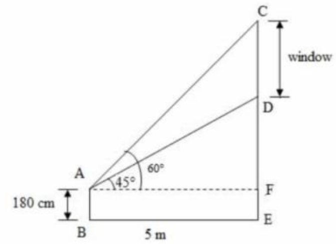
$$=> \sqrt{2}h = 100$$

$$=> h = \frac{100}{\sqrt{2}} = \frac{100\times\sqrt{2}}{\sqrt{2}\times\sqrt{2}}$$

$$= 50\sqrt{2} = 50 \times 1.41 = 70.5$$

$$=> 2h = 2 \times 70.5 = 141$$

25



From the right △ AFD,

$\tan 45^\circ = \frac{DF}{AF}$

$1 = \frac{DF}{5}$

$DF = 5 \qquad \cdots (1)$

From the right △ AFC,

$\tan 60^\circ = \frac{CF}{AF}$

$\sqrt{3} = \frac{CF}{5}$

$CF = 5\sqrt{3} \qquad \cdots (2)$

Length of the window

= CD = (CF - DF)

$= 5\sqrt{3} - 5$

$= 5\left(\sqrt{3} - 1\right) = 5(1.73 - 1)$

$= 5 \times 0.73 = 3.65 \text{ m}$