

Revision Paper 11 Solutions

- Q1 (a) Labeling a point G along length FC and that FG is perpendicular to GA,
In $\triangle AFG$,

$$\begin{aligned}\cos 60^\circ &= \frac{FG}{FA} \\ FG &= FA \cos 60^\circ \\ &= 16 (0.5) \\ &= 8 \\ \therefore FC &= 7 + 8 = 15 \text{ cm}\end{aligned}$$

(a) $\angle FCE = 60^\circ$

$$\begin{aligned}\sin 60^\circ &= \frac{FE}{FC} \\ FE &= FC \sin 60^\circ \\ &= 15 \sin 60^\circ \\ &= 15 (0.866) \\ &= 12.99 \text{ cm} \\ &= 13.0 \text{ cm}\end{aligned}$$

(b) $\cos 60^\circ = \frac{EC}{FC}$

$$\begin{aligned}EC &= FC \cos 60^\circ \\ &= 15 (0.5) \\ &= 7.5 \text{ cm} \\ \therefore 7.5^2 &= ED^2 + x^2 \\ ED^2 &= 7.5^2 - x^2 \\ &= (7.5 - x)(7.5 + x)\end{aligned}$$

Q2 (i) $AD^2 = AB^2 + BD^2$

$$\begin{aligned}75^2 &= 45^2 + BD^2 \\ BD &= \sqrt{75^2 - 45^2} \\ &= 60 \text{ m}\end{aligned}$$

(ii) $\cos x^\circ = \frac{AB}{AD}$

$$\begin{aligned}AB &= 75 \cos x \\ AC - AB &= 30 \\ 75 - 75 \cos x &= 30 \\ 45 &= 75 \cos x \\ \cos x &= \frac{45}{75} \\ x &= 53.1^\circ\end{aligned}$$

- Q3 (i) Let the distance of the boat from the foot of the hill be y metres.

$$\begin{aligned}\tan 30^\circ &= \frac{100}{y} \\ y &= \frac{100}{\tan 30^\circ}\end{aligned}$$

$$y = 173.2050808\text{m}$$

$$\approx 173 \text{ m (to 3 s.f.)}$$

$$(ii) \tan 60^\circ = \frac{100 + x}{y}$$

$$\text{Using } y \text{ as } \frac{100}{\tan 30^\circ} \text{ (exact value),}$$

$$\tan 60^\circ \left(\frac{100}{\tan 30^\circ} \right) = 100 + x$$

$$300 = 100 + x$$

$$200 = x$$

Q4 (a) $H = 5 \text{ cm}$ (Isosceles Triangle)

(b) Let $AB = x \text{ metres}$

$$\frac{x+5}{5} = \tan 60^\circ \text{ or } \frac{5}{x+5} = \tan 30^\circ$$

$$x = (5 \tan 60^\circ - 5) \text{ or } 3.66 \text{ metres}$$

Q5 Let Jack's distance = g

$$\tan 42^\circ = \frac{50}{g}$$

$$g = \frac{50}{\tan 42^\circ}$$

$$= 55.5 \dots \text{ m}$$

Let John's distance = i

$$\tan 65^\circ = \frac{50}{i}$$

$$i = \frac{50}{\tan 65^\circ}$$

$$= 23.3 \dots \text{ m}$$

$$\text{Distance apart} = 55.5 \dots - 23.3 \dots$$

$$= 32.2 \text{ m}$$

$$Q6(a) \tan 76^\circ = \frac{h}{x} \text{ (or } \tan 14^\circ = \frac{x}{h} \text{)}$$

$$\tan 47^\circ = \frac{h}{x+7.2} \text{ (or } \tan 43^\circ = \frac{x+7.2}{h} \text{)}$$

$$(b) x \tan 76^\circ = 7.2 \tan 47^\circ + x \tan 47^\circ$$

$$x(\tan 76^\circ - \tan 47^\circ) = 7.2 \tan 47^\circ$$

$$x = \frac{7.2 \tan 47^\circ}{\tan 76^\circ - \tan 47^\circ} = 2.6276 \text{ m}$$

height of the tree = 10.5 m

distance $AC = 9.83 \text{ m}$

Q7(a) $\sqrt{4000^2 + 300^2} = 4010 \text{ m}$

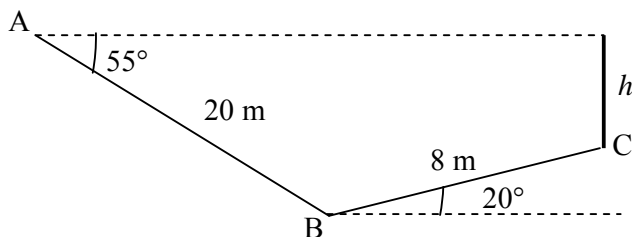
(b) $\sin 35^\circ = \frac{1200 - 300}{BC}$
 $BC = 1570 \text{ m}$

(c) Let θ be the angle of depression.

$$\tan 35^\circ = \frac{1200 - 300}{BY} \Rightarrow BY = 1285 \text{ m}$$

$$\tan \theta = \frac{1200}{4000 + 1285} \Rightarrow \theta = 12.8^\circ$$

Q8



Let height of first slope be x

$$\sin 55^\circ = \frac{x}{20}$$

$$x = 20 \sin 55^\circ$$

Let height of second slope be y

$$\sin 20^\circ = \frac{y}{8}$$

$$y = 8 \sin 20^\circ$$

$$\begin{aligned} h &= 20 \sin 55^\circ - 8 \sin 20^\circ \\ &= 13.6468\dots \\ &\approx 13.6 \text{ m} \end{aligned}$$

$$\tan 32^\circ = \frac{d}{60}$$

Q9 (a) $d = 60 \tan 32^\circ$
 $= 37.492\dots$
 $\approx 37.5 \text{ m}$

(b) Height of airplane above lighthouse = $105 - 60 = 45 \text{ m}$
 Let the angle of elevation of the airplane from the lighthouse be x .

$$\tan x^\circ = \frac{45}{60 \tan 32^\circ}$$

$$\begin{aligned} x^\circ &= 25.110\dots \\ &\approx 25.1^\circ \end{aligned}$$

Q10 (a)

$$\begin{aligned}\tan 35^\circ &= \frac{PQ}{30} \\ PQ &= 30 \tan 35^\circ \\ &= 21.006\dots \\ &\approx 21.0m\end{aligned}$$

(b) Let the height of the tree be h .

$$\begin{aligned}\tan 18^\circ &= \frac{h}{30 \tan 35^\circ} \\ h &= 6.825\dots \\ &\approx 6.83m\end{aligned}$$

Q11(a)

$$\begin{aligned}\frac{\sin 60^\circ}{\tan 30^\circ} + (\cos 45^\circ)^2 &= \left(\frac{x}{6}\right) \div \left(\frac{3}{x}\right) + \left(\frac{3}{y}\right)^2 \\ &= \frac{x^2}{18} + \frac{9}{y^2}\end{aligned}$$

$$\frac{x^2}{18} = \frac{\sqrt{3}}{2} \div \frac{1}{\sqrt{3}} \qquad \frac{9}{y^2} = \left(\frac{1}{\sqrt{2}}\right)^2$$

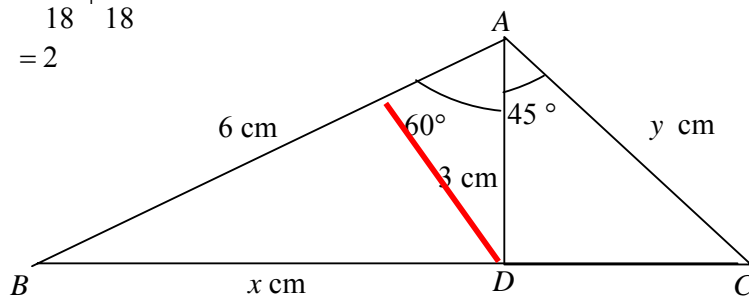
(b) $\frac{x^2}{18} = \frac{3}{2}$ $\frac{9}{y^2} = \frac{1}{2}$

$$\begin{aligned}x^2 &= 27 & y^2 &= 18 \\ x &= \sqrt{27} & y &= \sqrt{18}\end{aligned}$$

(c) $\frac{x^2}{18} + \frac{9}{y^2}$

$$\begin{aligned}&= \frac{27}{18} + \frac{9}{18} \\ &= 2\end{aligned}$$

(d)



Let the perpendicular distance (red line) from D to AB be d .

$$\sin 60^\circ = \frac{d}{3}$$

$$d = 3 \sin 60^\circ$$

$$= 3 \left(\frac{\sqrt{3}}{2} \right)$$

$$= \frac{3\sqrt{3}}{2} \text{ or } 2.598076\dots$$

$$\approx 2.60 \text{ cm}$$