Revision Paper 11 Solutions

Q1 (a) Labeling a point G along length FC and that FG is perpendicular to GA,
In ΔAFG,

$$\cos 60° = \frac{FG}{FA}$$
$$FG = FA \cos 60°$$
$$= 16\ (0.5)$$
$$= 8$$
$$\therefore FC = 7 + 8 = 15 \text{ cm}$$

(a) $\angle FCE = 60°$

$$\sin 60° = \frac{FE}{FC}$$
$$FE = FC \sin 60°$$
$$= 15 \sin 60°$$
$$= 15\ (0.866)$$
$$= 12.99 \text{ cm}$$
$$= 13.0 \text{ cm}$$

(b) $\cos 60° = \frac{EC}{FC}$

$$EC = FC \cos 60°$$
$$= 15\ (\ 0.5\ )$$
$$= 7.5 \text{ cm}$$
$$\therefore 7.5^2 = ED^2 + x^2$$
$$ED^2 = 7.5^2 - x^2$$
$$=(7.5 - x)(7.5 + x)$$

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

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

(ii) $\cos x° = \frac{AB}{AD}$

$$AB = 75 \cos x$$
$$AC - AB = 30$$
$$75 - 75 \cos x = 30$$
$$45 = 75 \cos x$$
$$\cos x = \frac{45}{75}$$
$$x = 53.1°$$

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

$$\tan 30^0 = \frac{100}{y}$$
$$y = \frac{100}{\tan 30^0}$$

y = 173.2050808m
≈ 173 m (to 3 s.f.)

(ii) $\tan 60^0 = \frac{100 + x}{y}$

Using y as $\frac{100}{\tan 30^0}$ (exact value),

$\tan 60^0 (\frac{100}{\tan 30^0}) = 100 + x$

$300 = 100 + x$

$200 = x$

Q4 (a) H = 5 cm (Isosceles Triangle)

(*b*) *Let* $AB = x$ *metres*

$\frac{x+5}{5} = \tan 60^0$ *or* $\frac{5}{x+5} = \tan 30^0$

$x = \left(5 \tan 60^0 - 5\right)$ *or* 3.66 *metres*

Q5 Let Jack's distance = g

$\tan 42° = \frac{50}{g}$

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

= 55.5… m

Let John's distance = i

$\tan 65° = \frac{50}{i}$

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

= 23.3… m

Distance apart = 55.5… – 23.3…

= 32.2 m

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

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

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

$x(\tan 76° - \tan 47°) = 7.2 \tan 47°$

$x = \frac{7.2 \tan 47°}{\tan 76° - \tan 47°} = 2.6276$ m

height of the tree = 10.5 m

distance AC = 9.83 m

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

(b) $\sin 35^\circ = \dfrac{1200 - 300}{BC}$

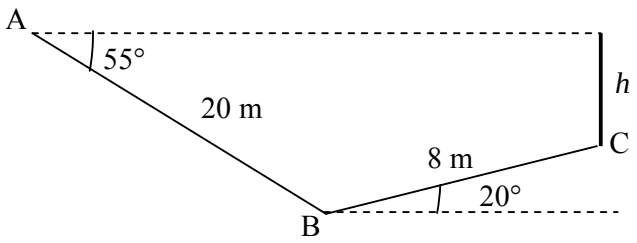
$BC = 1570$ m

(c) Let θ be the angle of depression.

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

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

Q8



Let height of first slope be x

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

$x = 20 \sin 55^\circ$

Let height of second slope be y

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

$y = 8 \sin 20^\circ$

$h = 20 \sin 55^\circ - 8 \sin 20^\circ$

$= 13.6468\ldots$

≈ 13.6 m

Q9 (a)

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

$d = 60 \tan 32^\circ$

$= 37.492...$

$\approx 37.5m$

(b) Height of airplane above lighthouse = 105 – 60 = 45 m

Let the angle of elevation of the airplane from the lighthouse be x.

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

$x^\circ = 25.110...$

$\approx 25.1^\circ$

Q10 (a)

$$\tan 35^\circ = \frac{PQ}{30}$$
$$PQ = 30\tan 35^\circ$$
$$= 21.006...$$
$$\approx 21.0m$$

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

$$\tan 18^\circ = \frac{h}{30\tan 35^\circ}$$
$$h^\circ = 6.825...$$
$$\approx 6.83m$$

Q11(a)

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

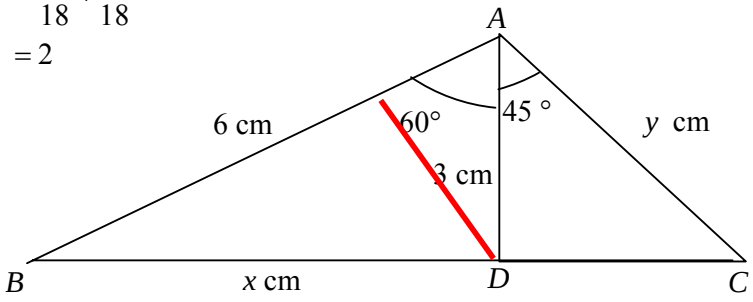
(b)

$$\frac{x^2}{18} = \frac{\sqrt{3}}{2} \div \frac{1}{\sqrt{3}} \qquad \frac{9}{y^2} = \left(\frac{1}{\sqrt{2}}\right)^2$$
$$\frac{x^2}{18} = \frac{3}{2} \qquad \frac{9}{y^2} = \frac{1}{2}$$
$$x^2 = 27 \qquad y^2 = 18$$
$$x = \sqrt{27} \qquad y = \sqrt{18}$$

(c)

$$\frac{x^2}{18} + \frac{9}{y^2}$$
$$= \frac{27}{18} + \frac{9}{18}$$
$$= 2$$

(d)



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

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

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

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

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

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

Q12(i)

$$\cos \angle BAC = \frac{7.1}{16.8} \rightarrow \angle BAC = \cos^{-1}\left(\frac{7.1}{16.8}\right)$$

$$\cos \angle BAD = \frac{7.1}{40.9} \rightarrow \angle BAD = \cos^{-1}\left(\frac{7.1}{40.9}\right)$$

$$x = \cos^{-1}\left(\frac{7.1}{40.9}\right) - \cos^{-1}\left(\frac{7.1}{16.8}\right)$$

$$= 15.0031...$$

$$\approx 15.0^\circ$$

(ii)

$$z = BD - BC$$

$$= \sqrt{40.9^2 - 7.1^2} - \sqrt{16.8^2 - 7.1^2}$$

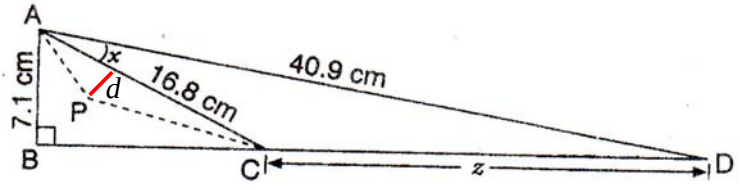
$$= 25.0530...$$

$$\approx 25.1 \text{ cm}$$

(iii) Let d be the perpendicular distance from P to AC.

$$\frac{1}{2} \times 16.8 \times d = 30$$

$$d = \frac{25}{7} cm$$



$$\sin \angle PAC = \frac{d}{5}$$
$$\angle PAC = 45.5846...$$
$$\approx 45.6^\circ$$

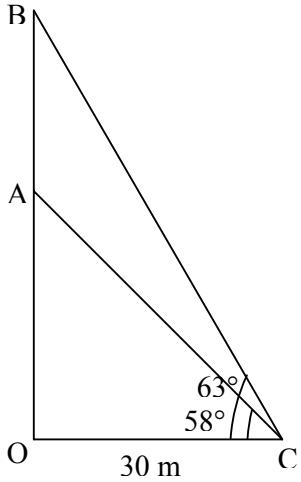
Q13(i) Let h be the height of the cliff.

$$\tan 35^\circ = \frac{h}{80}$$
$$h = 56.01660...$$
$$\approx 56.0\ m$$

(ii)

$$\tan 55^\circ = \frac{h}{CD}$$
$$CD = 39.22324...$$
$$\approx 39.2\ m$$
$$BD = 80 - CD$$
$$= 40.7767...$$
$$\approx 40.8\ m$$

Q14



$$\tan 58^\circ = \frac{OA}{30}$$
$$OA = 30 \tan 58^\circ$$
$$\tan 63^\circ = \frac{OB}{30}$$
$$OB = 30 \tan 63^\circ$$
$$AB = OB - OA$$
$$= 30 \tan 63^\circ - 30 \tan 58^\circ$$
$$= 10.86827...$$
$$\approx 10.9\ m$$