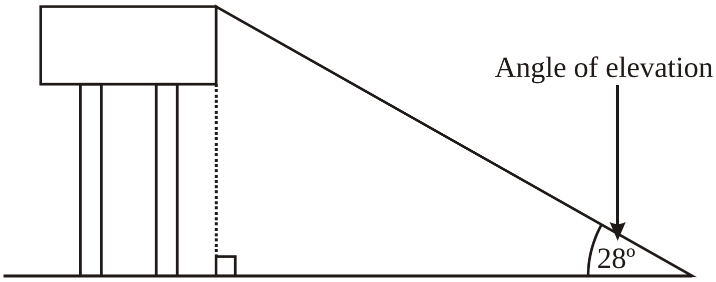
2D Trig IB -ANSWERS

1. (a)



(A1)

(b) $x = \dfrac{26.5}{\tan 28°}$ (or equivalent, allow follow-through from part (a)) (M1)

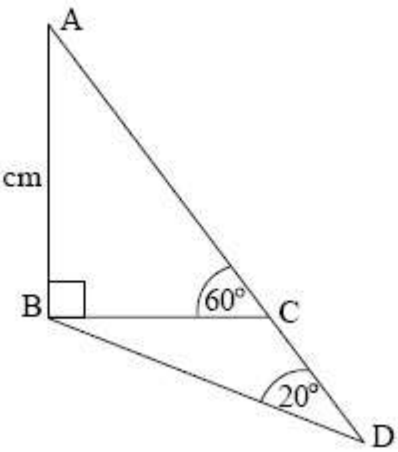
= 49.83925... (A1)

= 50 m (correct to nearest metre) (A1)

[4]

2. *Unit penalty* ***(UP)*** *is applicable where indicated.*

(a) (i)



For A, B, C, 7.3, 60°, 90°, shown in correct places (A1)

Note: *The 90° should look like 90° (allow $\pm 10°$)*

(ii) Using tan 60 or tan 30 (M1)

UP 4.21 cm (A1)(ft)

(ft) on their diagram

Or

Using sine rule with their correct values (M1)

UP 4.21 cm (A1)(ft)

Or

Using special triangle $\frac{7.3}{\sqrt{3}}$ (M1)

UP 4.21 cm (A1)(ft)

Or

Any other valid solution

Note*: If A and B are swapped then BC = 8.43 cm* (C3)

(b) (i) For ACD in a straight line and all joined up to B, for 20° shown in correct place and D labelled. D must be on AC extended. (A1)

(ii) $\text{B}\hat{\text{C}}\text{D} = 120°$ (A1)

$\text{C}\hat{\text{B}}\text{D} = 40°$ (A1) (C3)

[6]

3. (a) $C\hat{A}B = 180 - 2\times23°$ (M1)
$= 134°$ (A1) (C2)

(b) $\frac{AB}{\sin 23°} = \frac{15}{\sin 134°}$ (M1)

Note: *Follow through with candidate's answer from (a)*

$AB = \frac{15\sin 23°}{\sin 134°}$

$AB = 8.147702831...$

$= 8.15$ (3 s.f.) (A1) (C2)

[4]

4. (a) $\text{A}\hat{\text{C}}\text{D} = 120°$ (M1)

$\text{AD}^2 = 3^2 + 4^2 - 2(3)(4)\cos 120°$ ***or*** $\text{AD}^2 = 3^2 + 7^2 - 2(3)(7)\cos 60°$ (M1)

Note: *Award (M1) for correct substitution only.*

$\text{AD} = \sqrt{37}$ (A1)

$= 6.08$ cm (2 d.p.) (A1)

[4]

5. (a) Angle A = 90 – 5 = 85°. (M1)(A1) (C2)

(b) $BC^2 = 6^2 + 8^2 - 2 \times 8 \times 6 \cos(85°)$ (M1)(A1)

so BC = $\sqrt{91.6330487}$ = 9.57 (3 s.f.) (A1) (C3)

(c) $\dfrac{BC}{\sin(A)} = \dfrac{AC}{\sin(B)}$ (M1)

$\sin(B) = \dfrac{6\sin(85°)}{9.572515275} = 0.6244093654$ (A1)

Angle B = $\sin^{-1}(0.6244093654) = 38.6°$ (A1) (C3)

Note: *Allow 38.7° if obtained using 9.57.*

[8]

6. ***Note on use of radians:***

In (a) the answer will be –874. Award (A0) at the last step for either + or – 874.
In (b) follow through with either sign from (a) can receive (M1) (A1) ft, but in both cases the final answer of ± 947000 receives (A0) for unrealistic sign and/or for unrealistic magnitude.

(a) Third angle of triangle =180 – (75 + 40) (M1)

= 65° (A1)

Notes: *Award (A2) for 65 seen.*
For use of 40° or 75° in an otherwise correct sine rule award (M1)(A0)(A0)

Length of fence: $\dfrac{x}{\sin 65°} = \dfrac{410}{\sin 75°}$ (sine rule) (M1)(A1)

x = 385 m (3 s.f.) (A1)

or (G2) 5

(b) Area = $\dfrac{1}{2} ab \sin c$

area = $\dfrac{1}{2} \times 385 \times 245 \sin 24°$ (M1)(A1)

= 19 200 (m^2) (3 s.f.) (A1)

or (G2) 3

[8]

7. (a) $CA^2 = 800^2 + 500^2$ (M1)(A1)

CA = 943 (AG) 2

(b) tan $B\hat{C}A = \frac{800}{500}$ (M1)(A1)

$B\hat{C}A = 58.0°$ (Allow 58°) (AG) 2

(c) (i) $C\hat{A}B = 180 - 90 - 58 = 32°$ (M1)

$C\hat{A}O = 110 - 32 = 78°$ (A1)

(ii) $CO^2 = 1500^2 + 943^2 - 2 \times 1500 \times 943 \cos 78°$ (M1)(A1)

CO = 1597

= 1600 m (3 s.f.) (A1) 5

(d) Area of triangle OAC = $\frac{1}{2} \times 1500 \times 943 \times \sin 78°$

(or more accurate values) (M1)

= 691794.89 m^2 (692 000) (A1)

Area of triangle ABC = $\frac{1}{2} \times 800 \times 500 = 200\,000\ m^2$ (A1)

Total area = 691795 + 200 000

= 892000 m^2 (**ft** from candidate's angle $C\hat{A}O$) (A1) 4

(e) Time in seconds = $\frac{(1500+800+500+1597)}{4}$ (A1)(A1)

Note: *Award (A1) for numerator, (A1) for 4 in denominator.*

= 1099.25

Time in minutes = $\frac{1099.25}{60}$

= 18.3 (**ft** from candidate's answer to (c)(ii)) (A1) 3

[16]