

QUESTION 5.4 *Units are required in part (c) only.*

(a) $BC^2 = 5^2 + 7^2 - 2(5)(7)\cos 112^\circ$ (MI)(AI)

Note: Award (MI) for substitution in cosine formula, (AI) for correct substitutions.

$BC = 10.0 \text{ (m)} \text{ (10.0111...)}$ (AI)(G2) [3 marks]

Note: If radians are used, award at most (MI)(AI)(A0).

(b) $\frac{\sin 40^\circ}{10.0111...} = \frac{\sin \hat{DCB}}{6}$ (MI)(AI)(ft)

Notes: Award (MI) for substitution in sine formula, (AI)(ft) for their correct substitutions. Follow through from their part (a).

$\hat{DCB} = 22.7^\circ \text{ (22.6589...)}$ (AI)(ft)

Notes: Award (A2) for 22.7° seen without working. Use of radians results in unrealistic answer. Award a maximum of (MI)(AI)(ft)(A0)(ft). Follow through from their part (a).

$\hat{DBC} = 117^\circ \text{ (117.341...)}$ (AI)(ft)(G3)

Notes: Do not penalize if use of radians was already penalized in part (a). Follow through from their answer to part (a).

OR

From use of cosine formula
 $DC = 13.8 \text{ (m)} \text{ (13.8346...)}$

(AI)(ft)

Note: Follow through from their answer to part (a).

$\frac{\sin \alpha}{13.8346...} = \frac{\sin 40^\circ}{10.0111...}$ (MI)

Note: Award (MI) for correct substitution in the correct sine formula.

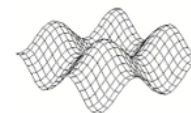
$\alpha = 62.7^\circ \text{ (62.6589...)}$ (AI)(ft)

Note: Accept 62.5° from use of 3sf.

$\hat{DBC} = 117 \text{ (117.341...)}$ (AI)(ft) [4 marks]

Note: Follow through from their part (a). Use of radians results in unrealistic answer, award a maximum of (AI)(MI)(A0)(A0).

continued...



Question 5.4 continued

(c) $\text{Area ABDC} = \frac{1}{2}(5)(7)\sin 112^\circ + \frac{1}{2}(6)(10.0111\dots)\sin 117.341\dots^\circ$ (MI)(AI)(ft)(MI)

Note: Award (MI) for substitution in both **triangle** area formulae, (AI)(ft) for their correct substitutions, (MI) for seen or implied addition of their two **triangle** areas. Follow through from their answer to part (a) and (b).

$= 42.9 \text{ m}^2$ (42.9039...) (AI)(ft)(G3) [4 marks]

Notes: Answer is 42.9 m^2 *i.e.* the units are required for the final (AI)(ft) to be awarded. Accept 43.0 m^2 from using 3sf answers to parts (a) and (b). Do not penalize if use of radians was previously penalized.

(d) $42.9039\dots \times 0.5$ (MI)(MI)

Note: Award (MI) for 0.5 seen (or equivalent), (MI) for multiplication of their answer in part (c) with their value for depth.

$= 21.5 \text{ (m}^3\text{)}$ (21.4519...) (AI)(ft)(G3) [3 marks]

Note: Follow through from their part (c) **only if working is seen**. Do not penalize if use of radians was previously penalized. Award at most (A0)(MI)(A0)(ft) for multiplying by 50.

(e) (i) $\pi(0.15)^2(0.4)$ (MI)(AI)

OR

$\pi \times 15^2 \times 40$ (28274.3...) (MI)(AI)

Notes: Award (MI) for substitution in the correct volume formula. (AI) for correct substitutions.

$= 0.0283 \text{ (m}^3\text{)}$ (0.0282743..., 0.09π)

(ii) $\frac{21.4519\dots}{0.0282743\dots}$ (MI)

Note: Award (MI) for correct division of their volumes.

$= 759$ (AI)(ft)(G2) [5 marks]

Notes: Follow through from their parts (d) and (e)(i). Accept 760 from use of 3sf answers.
 Answer must be a positive integer for the final (AI)(ft) mark to be awarded.

Total [19 marks]