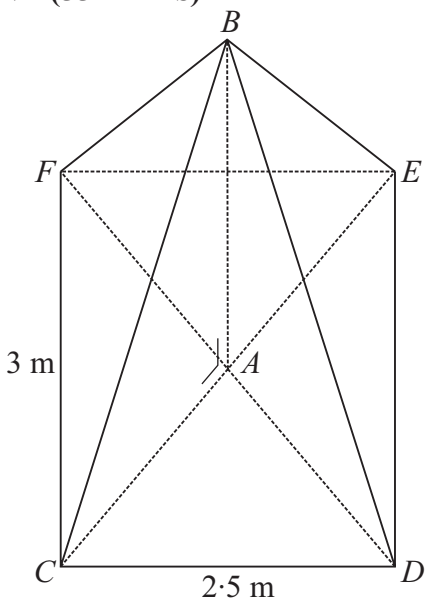
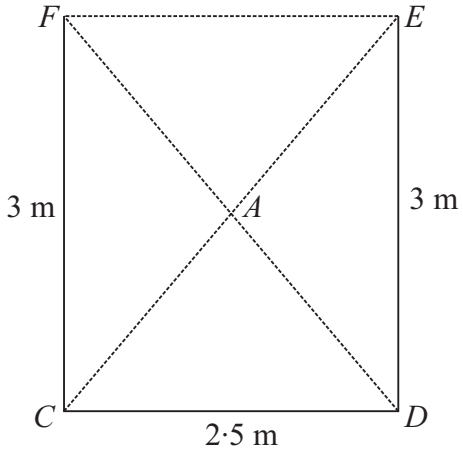
LC 2016 (Set A): Paper 2

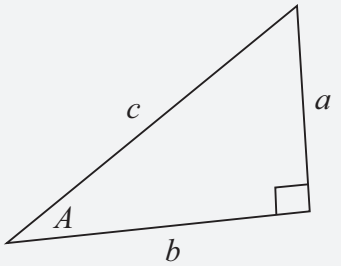
Question 7 (55 marks)



Question 7 (a) (i)



Formulae and Tables Book
Trigonometry (page 16)
Pythagoras' theorem



$c^2 = a^2 + b^2$

$|EC|^2 = |CD|^2 + |ED|^2$

$|EC| = \sqrt{2 \cdot 5^2 + 3^2}$

$|AC| = \frac{1}{2}|EC| = \frac{1}{2}\sqrt{2 \cdot 5^2 + 3^2} = 1 \cdot 95 \text{ m}$

Question 7 (a) (ii)

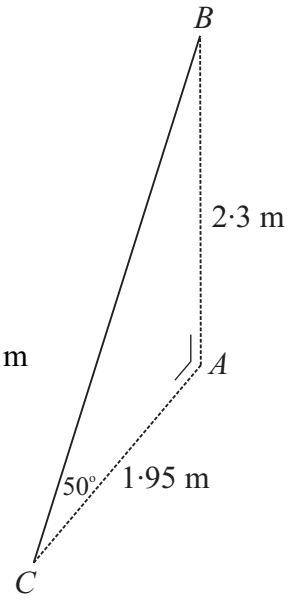
$$\tan 50^\circ = \frac{|AB|}{1 \cdot 95}$$

$$|AB| = 1 \cdot 95 \times \tan 50^\circ$$

$$= 2 \cdot 3 \text{ m}$$

Question 7 (a) (iii)

$|BC| = \sqrt{2 \cdot 3^2 + 1 \cdot 95^2} \approx 3 \text{ m}$



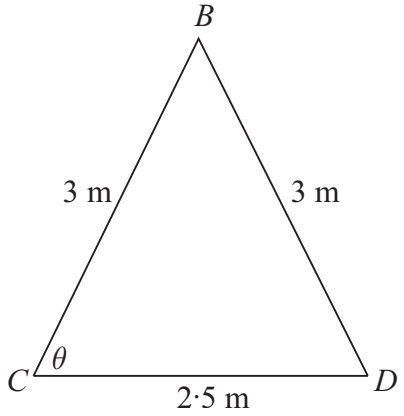
Marking Scheme Notes

Question 7 (a) (i) [Scale 10C (0, 3, 7, 10)]
3: • Pythagoras with relevant substitution
7: • $|EC|$ correct
• $|AC| = \frac{1}{2}\sqrt{15 \cdot 25}$

Question 7 (a) (ii) [Scale 10B (0, 5, 10)]
5: • tan formulated correctly

Question 7 (a) (iii) [Scale 10C (0, 3, 7, 10)]
3: • Pythagoras with relevant substitution
7: • Pythagoras fully substituted
• $|BC| = \frac{1 \cdot 95}{\sin 40^\circ}$ (i.e. $|BC|$isolated)

Question 7 (a) (iv)



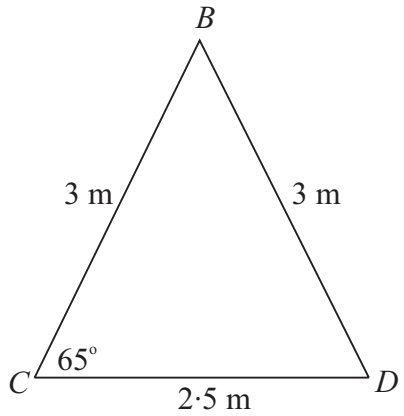
Formulae and Tables Book
Trigonometry of the triangle:
Cosine rule [page 16]
$a^2 = b^2 + c^2 - 2bc\cos A$

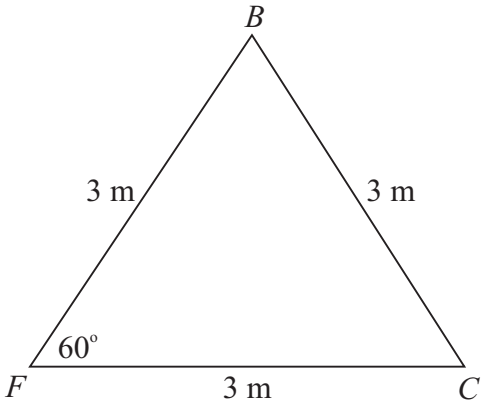
$3^2 = 3^2 + 2\cdot 5^2 - 2(3)(2\cdot 5)\cos\theta$

$\cos\theta = \dfrac{3^2 + 2\cdot 5^2 - 3^2}{2(3)(2\cdot 5)} = \dfrac{5}{12}$

$\theta = \cos^{-1}(\frac{5}{12}) \approx 65^\circ$

Question 7 (a) (v)





Total area of 4 triangular faces
= 2 faces of area of triangle *BCD* + 2 faces of area of triangle *BFC*

Area $= \frac{1}{2}ab\sin C$

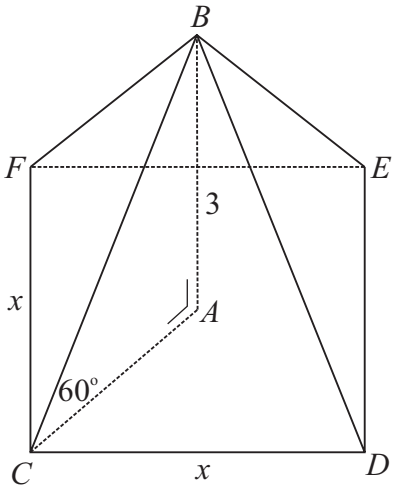
$= 2\times\frac{1}{2}\times 2\cdot 5\times 3\times\sin 65^\circ + 2\times\frac{1}{2}\times 3\times 3\times\sin 60^\circ$

$\approx 15\ \text{m}^2$

Marking Scheme Notes
Question 7 (a) (iv) [Scale 10C (0, 3, 7, 10)]
3: • cosine rule with some relevant substitution
• cosine ratio with some relevant substitutions
• identifies three sides of triangle *BCD*
7: • cosine rule with full relevant substitutions
• cosine ratio with full relevant substitutions

Question 7 (a) (v) [Scale 10D (0, 3, 5, 8, 10)]
3: • recognises area of 4 triangles
5: • Area of 1 triangle correct
8: • area of isosceles triangle and equilateral triangle
Note: Area = 4 isosceles or 4 equilateral triangles merit *HPC* at most

Question 7 (b)



$$\tan 60^\circ = \frac{3}{|AC|} \Rightarrow |AC| = \frac{3}{\tan 60^\circ} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

$$\tan 60^\circ = \frac{3}{|AC|} \Rightarrow |AC| = \frac{3}{\tan 60^\circ} = \frac{3}{\sqrt{3}} = \sqrt{3}$$

$$\therefore |EC| = 2\sqrt{3}$$

$$x^2 + x^2 = (2\sqrt{3})^2$$

$$2x^2 = 12$$

$$x^2 = 6 \Rightarrow x = \sqrt{6} \text{ m}$$

Marking Scheme Notes

Question 7 (b) [Scale 5C (0, 2, 4, 5)]

2: • effort at Pythagoras but without $|CA|$ (or $|CE|$)
• $|CA|$ found

4: • $|CE| = 2\sqrt{3}$