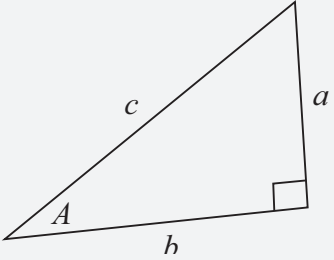


**LC 2015 (SET B): PAPER 2**

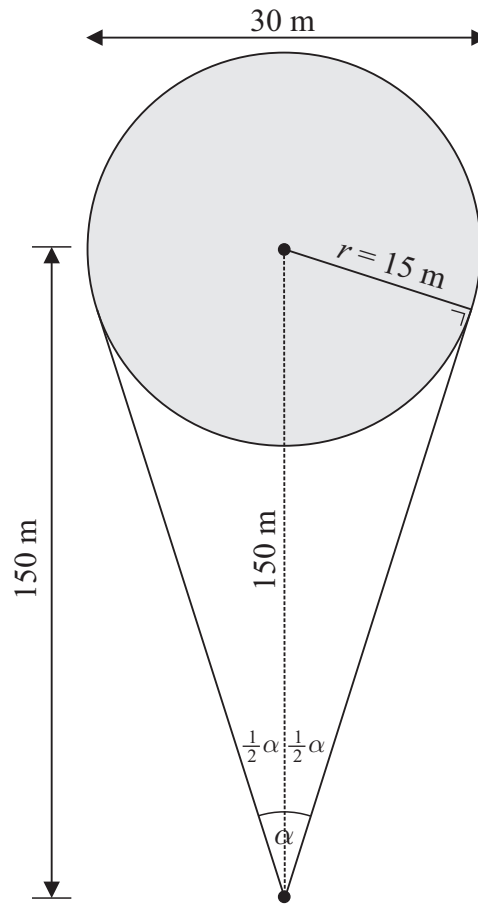
**QUESTION 9 (45 MARKS)**

**Question 9 (a)**

**FORMULAE AND TABLES BOOK**  
**Trigonometry: Right-angled triangle [page 16]**



$\sin A = \frac{a}{c}, \cos A = \frac{b}{c}, \tan A = \frac{a}{b}$



$$\sin\left(\frac{\alpha}{2}\right) = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{15}{150}$$

$$\left(\frac{\alpha}{2}\right) = \sin^{-1}\left(\frac{1}{10}\right) = 5.74^\circ$$

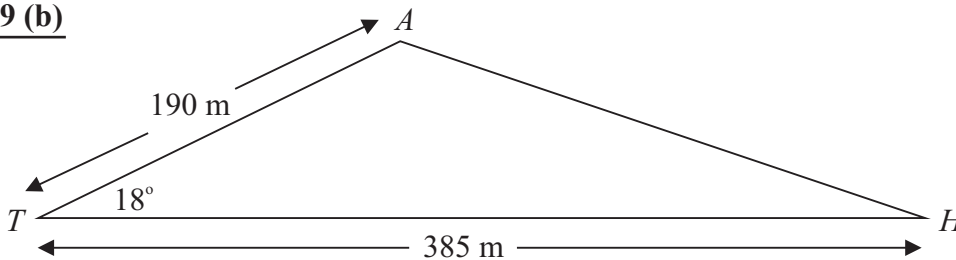
$$\therefore \alpha = 2 \times 5.74^\circ = 11.5^\circ$$

**MARKING SCHEME NOTES**

**Question 9 (a) [Scale 10C (0, 4, 8, 10)]**

- 4:**
- Effort at expressing sine function in terms of 15 and 150
  - Finds third side of triangle and makes effort to find an angle
- 8:**
- Half angle found

**Question 9 (b)**



$$|AH|^2 = 190^2 + 385^2 - 2(190)(385)\cos 18^\circ$$

$$\therefore |AH| = \sqrt{190^2 + 385^2 - 2(190)(385)\cos 18^\circ} \approx 213 \text{ m}$$

**FORMULAE AND TABLES BOOK**  
**Trigonometry of the triangle:**  
**Cosine rule [page 16]**  
 $a^2 = b^2 + c^2 - 2bc \cos A$

**MARKING SCHEME NOTES**

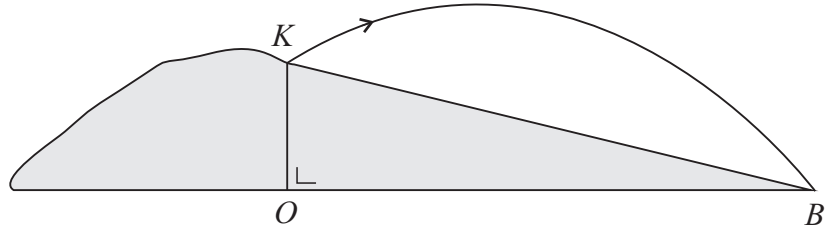
**Question 9 (b) [Scale 10C (0, 4, 8, 10)]**

- 4: • Cosine Rule with some correct substitution  
 • Effort at calculating  $|AX|$  or  $|TX|$
- 8: • Cosine Rule substituted correctly  
 • Finds  $|AX|$  and formulates for  $|TX|$  (or vice versa)

**Question 9 (c) (i)**

$$h = -6t^2 + 22t + 8$$

$$t = 0: h = 8 \text{ m}$$

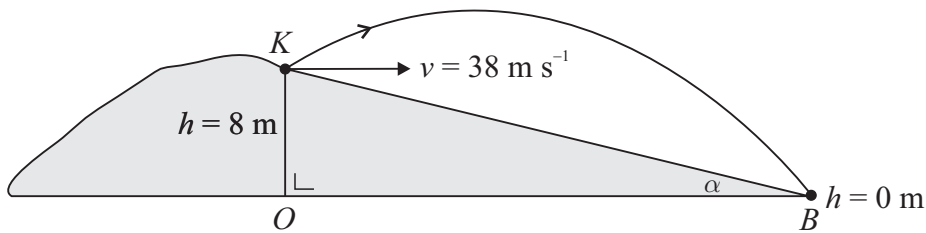


**MARKING SCHEME NOTES**

**Question 9 (c) (i) [Scale 5B (0, 2, 5)]**

- 2: •  $t = 0$  indicated  
 Note: Accept  $h = 8 \text{ m}$  without work

**Question 9 (c) (ii)**



Find the time for the ball to land by putting  $h = 0 \text{ m}$ :

$$h = 0: h = -6t^2 + 22t + 8$$

$$\therefore -6t^2 + 22t + 8 = 0$$

$$3t^2 - 11t - 4 = 0$$

$$(3t + 1)(t - 4) = 0$$

$$\therefore t = 4 \text{ s}$$

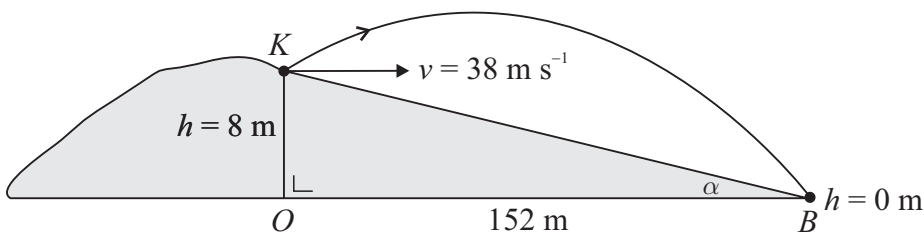
**FORMULAE AND TABLES BOOK**

**Speed:**

$$\text{Velocity} = \frac{\text{Distance}}{\text{Time}}$$

$$v = \frac{s}{t}$$

Horizontal distance  $|OB| = v \times t = 38 \times 4 = 152 \text{ m}$



$$\tan \alpha = \frac{8}{152} \Rightarrow \alpha = \tan^{-1} \left( \frac{8}{152} \right) \approx 3^\circ$$

**MARKING SCHEME NOTES**

**Question 9 (c) (ii) [Scale 10C (0, 4, 8, 10)]**

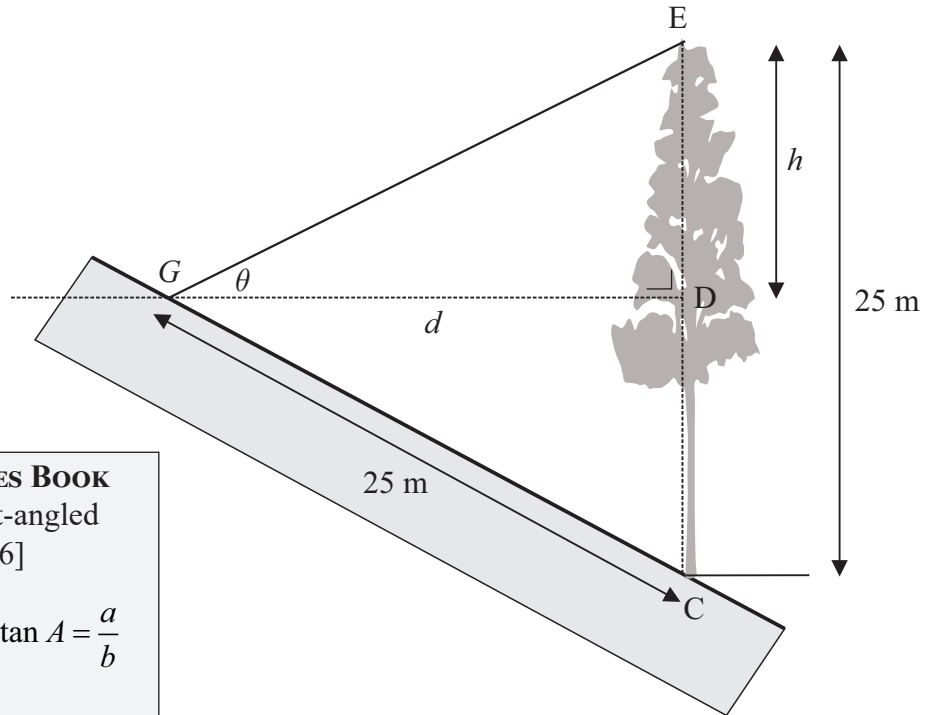
4: •  $h = 0$  indicated

8: •  $|OB|$  found for positive value for  $t$

**Question 9 (d) (i)**

$$\tan \theta = \frac{1}{2} = \frac{h}{d} \Rightarrow d = 2h$$

$$|CD| = 25 - h$$



**FORMULAE AND TABLES BOOK**  
**Trigonometry: Right-angled triangle** [page 16]

$$\sin A = \frac{a}{c}, \cos A = \frac{b}{c}, \tan A = \frac{a}{b}$$

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

**MARKING SCHEME NOTES**

**Question 9 (d) (i) [Scale 5B (0, 2, 5)]**

2: •  $\frac{h}{d} = \frac{1}{2}$

•  $|CD| = 25 - h$

**Question 9 (d) (ii)**

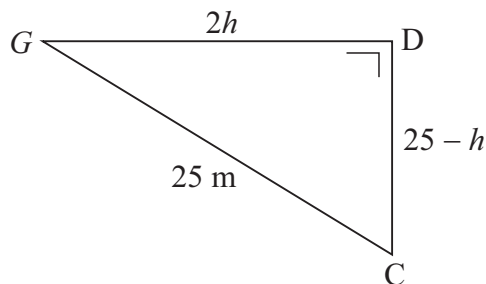
$$25^2 = (2h)^2 + (25 - h)^2$$

$$625 = 4h^2 + 625 - 50h + h^2$$

$$5h^2 + 50h = 0$$

$$5h(h - 10) = 0$$

$$\therefore h = 10 \text{ m}$$



**MARKING SCHEME NOTES**

**Question 9 (d) (ii) [Scale 5D (0, 2, 3, 4, 5)]**

2: • Pythagoras with some correct substitution

3: • Pythagoras correctly substituted

4: • Quadratic equation expanded correctly