

LC 2017: PAPER 2

QUESTION 9 (50 MARKS)

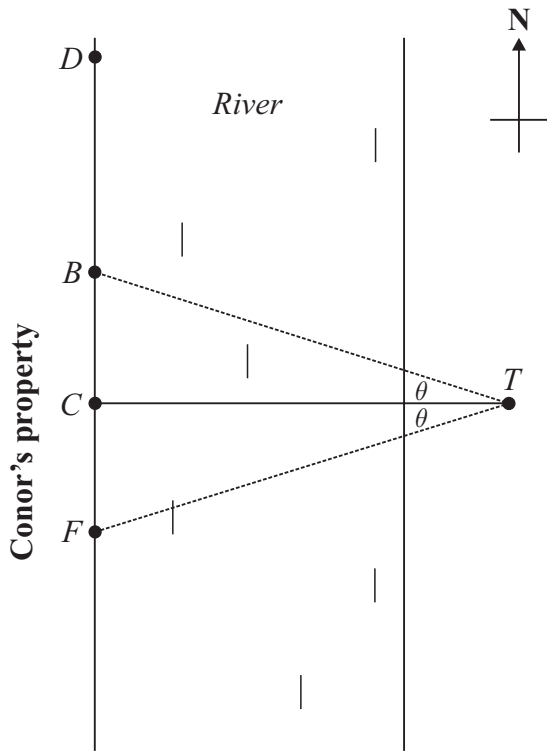


Figure 1

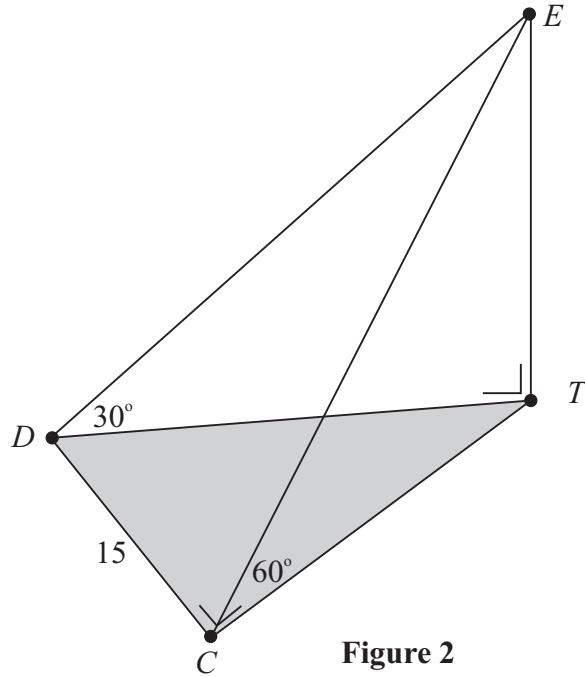


Figure 2

Question 9 (a)

Consider $\triangle CTE$:

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

Question 9 (b)

Consider $\triangle DTE$:

$$\tan 30^\circ = \frac{|TE|}{|DT|} \Rightarrow \frac{1}{\sqrt{3}} = \frac{|TE|}{|DT|} \Rightarrow |DT| = \sqrt{3}|TE|$$

Consider the right-angled $\triangle DCT$:

$$15^2 + |CT|^2 = |DT|^2$$

$$225 + |CT|^2 = (\sqrt{3}|TE|)^2$$

$$225 + |CT|^2 = 3|TE|^2$$

$$|TE|^2 = \frac{225 + |CT|^2}{3} \Rightarrow |TE| = \sqrt{\frac{225 + |CT|^2}{3}} \text{ m}$$

Question 9 (c)

$$|TE| = \frac{\sqrt{225 + |CT|^2}}{3} = \sqrt{3}|CT|$$

$$\frac{225 + |CT|^2}{3} = 3|CT|^2$$

$$225 + |CT|^2 = 9|CT|^2 \Rightarrow 225 = 8|CT|^2$$

$$|CT| = \sqrt{\frac{225}{8}} = 5.3 \text{ m}$$

Question 9 (d)

$$|TE| = \sqrt{3}|CT| = \sqrt{3} \times 5.3 = 9.2 \text{ m}$$

Question 9 (e)

$$\cos \angle FTC = \cos \theta = \frac{|CT|}{|TF|} = \frac{5.3}{9.2}$$

$$\theta = \cos^{-1}\left(\frac{5.3}{9.2}\right) = 54.8^\circ$$

Question 9 (f)

$$P(\text{Tree lands on bank}) = \frac{2 \times 54.8^\circ}{360^\circ} \times 100\% = 30.4\%$$