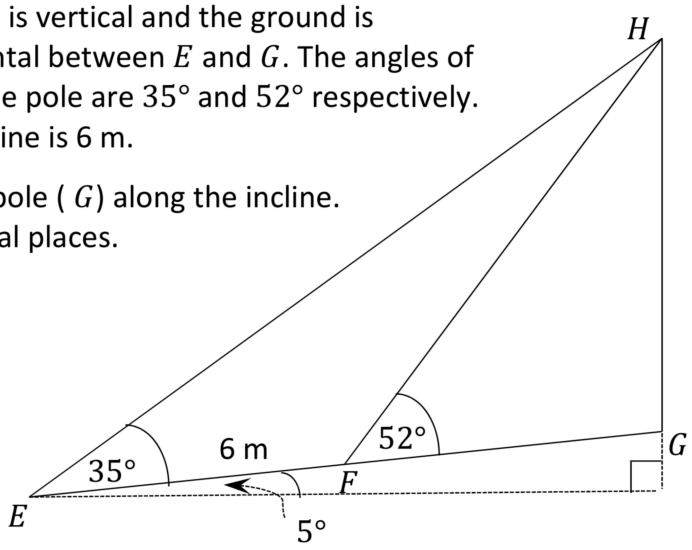
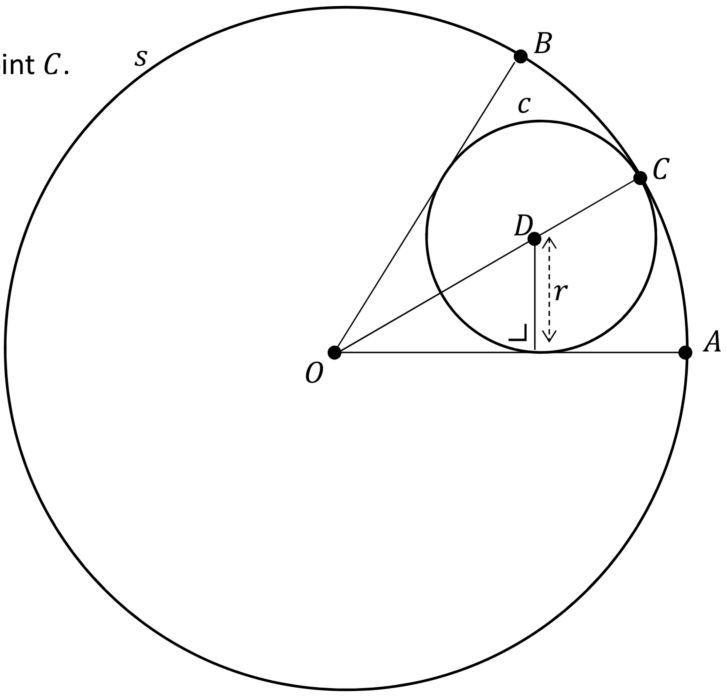
Question 3 **(25 marks)**

(a) A flagpole $[GH]$, shown in the diagram, is vertical and the ground is inclined at an angle of $5°$ to the horizontal between E and G. The angles of elevation from E and F to the top of the pole are $35°$ and $52°$ respectively. The distance from E to F along the incline is 6 m.

Find how far F is from the base of the pole (G) along the incline.
Give your answer correct to two decimal places.



(b) In the diagram the large circle s has centre O and the small circle c has centre D.
The circle c touches the circle s at the point C.
OA and OB are tangents to c as shown.
The radius of c is r.
$|\angle BOA| = 60°$.
The ratio of the area of s to the area of c is $k : 1$.
Find the value of k.



Q3	Model Solution – 25 Marks	Marking Notes
(a)	$$\frac{6}{\sin 17°} = \frac{\lvert HF\rvert}{\sin 35°}$$ $$\lvert HF\rvert = \frac{6\sin 35°}{\sin 17°} = 11{\cdot}77$$ $$\frac{11{\cdot}77}{\sin 95°} = \frac{x}{\sin 33°}$$ $$x = \frac{11{\cdot}77(\sin 33°)}{\sin 95°}$$ $$x = 6{\cdot}43 \text{ m}$$	**Scale 15C (0, 5, 10, 15)** *Low Partial Credit:* $\lvert\angle FHE\rvert = 17°$ $\lvert\angle GHF\rvert = 33°$ Some relevant substitution into relevant formula *High Partial Credit:* $\lvert HF\rvert$ found and stops $\lvert HE\rvert = 16{\cdot}17$ found and stops Incorrect value of $\lvert HF\rvert$ (or $\lvert HE\rvert$) used correctly to find x
(b)	$\lvert\angle BOA\rvert = 60° \Rightarrow \lvert\angle COA\rvert = 30°$ $\sin\angle COA = \frac{r}{DO} = \frac{1}{2}$ $\Longrightarrow \lvert DO\rvert = 2r$ $\Longrightarrow \lvert OC\rvert = 3r$ Area $c = \pi r^2$ Area $s = \pi(3r)^2 = 9\pi r^2$ Area s : Area $c = 9:1 \Longrightarrow k = 9$	**Scale 10D (0, 3, 5, 8, 10)** *Low Partial Credit:* 30° Area $c = \pi r^2$ *Mid Partial Credit:* $\lvert DO\rvert = 2r$ *High Partial Credit:* $\lvert OC\rvert = 3r$