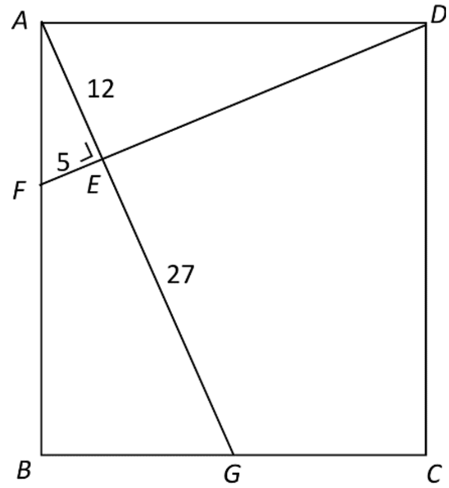
Question 5

ABCD is a rectangle.

$F \in [AB]$, $G \in [BC]$, $[FD] \cap [AG] = \{E\}$, and $FD \perp AG$.

$|AE| = 12$ cm, $|EG| = 27$ cm, and $|FE| = 5$ cm.



(a) Prove that ΔAFE and ΔDAE are similar (equiangular).

(b) Find $|AD|$.

(c) ΔAFE and ΔAGB are similar. Show that $|AB| = 36$ cm.

(d) Find the area of the quadrilateral *GCDE*.

Q5	Model Solution – 25 Marks	Marking Notes
(a)	Proof: $\|< AEF\| = \|< AED\| \ldots right\ \ angles$ $\|< FAE\| + \|< EAD\| = 90^o$ $\|< EAD\| + \|< ADE\| = 90^o$ $remaining\ angles\ in\ \Delta AED$ $\therefore \|< FAE\| = \|< ADE\|$ $\boldsymbol{or}$ $\therefore \|< AFE\| = \|< DAE\|$ $\therefore \Delta AFE\ and\ \Delta DAE\ equiangular$ $\therefore similar$	**Scale 10C (0, 4, 5, 10)** *Low Partial Credit:* • Identifies one angle of same size in each triangle *High Partial Credit:* • Identifies second angle of same size in each triangle • Implies triangles are similar without justifying $\|< FAE\| = \|< ADE\|$
(b)	$\frac{\|AD\|}{13} = \frac{12}{5}$ $\|AD\| = 31{\cdot}2$ cm	**Scale 5C (0, 2, 4, 5)** *Low Partial Credit:* • $\|AF\| = 13$ • One set of corresponding sides identified, e.g . $\frac{\|AD\|}{13}$ **or** $\frac{12}{5}$ *High Partial Credit:* • $\frac{\|AD\|}{13} = \frac{12}{5}$ or equivalent
(c)	$\frac{39}{13} = \frac{\|AB\|}{12}$ $\|AB\| = 3 \times 12 = 36$ cm	**Scale 5C (0, 2, 4, 5)** *Low Partial Credit:* • $\|AG\| = 39$ • One set of corresponding sides identified *High Partial Credit:* • $\boldsymbol{\frac{39}{13} = \frac{\|AB\|}{12}}$ or equivalent

(d)	Area = Area$ABCD-$ AreaΔAFD $-\Delta$Area$ABG+$ AreaΔAFE $= (31{\cdot}2)(36) - \frac{1}{2}(31{\cdot}2)(13)$ $- \frac{1}{2}(36)(15) + \frac{1}{2}(5)(12)$ $= 680{\cdot}4$ cm^2 **or** (method 2) Area = Area$ABCD-$ Area$\Delta ABG-$ AreaΔAED $= (31{\cdot}2)(36) - \frac{1}{2}(36)(15)$ $- \frac{1}{2}(12)\sqrt{31{\cdot}2^2 - 12^2}$ $= 1123{\cdot}2 - 270 - 172{\cdot}8$ $= 680{\cdot}4$ cm^2 **or** (method 3) Area = Area$\Delta DCG+$ AreaΔGED $= \frac{1}{2}(36)(16{\cdot}2) + \frac{1}{2}(27)\sqrt{31{\cdot}2^2 - 12^2}$ $= 291{\cdot}6 + 388{\cdot}8$ $= 680{\cdot}4$ cm^2	**Scale 5C (0, 2, 4, 5)** *Low Partial Credit:* • One relevant area formulated • Relevant equation for area *GCDE* *High Partial Credit:* • Relevant individual areas found but fails to finish • Area calculated but with one relevant area omitted (except method 3)