

Question		Working	Answer	Mark	Notes	
21	(a)	$[AG^2 = ]12^2 + 4^2 (=160)$ or $[AC^2 = ]12^2 + 3^2 (=153)$ or $[AE^2 = ]4^2 + 3^2 (=25)$		3	M1 A correct method to find $AG^2$ , $AC^2$ , $AE^2$ , $AG$ , $AC$ or $AE$ . Allow use of trig but must be fully correct method eg $[\angle GAB = ]\tan^{-1}\left(\frac{4}{12}\right)[=18.434....]$ <b>and</b> $[AG = ]\frac{12}{\cos"18.434..."}$ Ignore incorrect labels labels	M2 for $[AF^2 = ]3^2 + 12^2 + 4^2$
		$[AF^2 = ]3^2 + "160"$ or $3^2 + ("4\sqrt{10}")^2$ $[AF^2 = ]4^2 + "153"$ or $4^2 + ("3\sqrt{17}")^2$ $[AF^2 = ]12^2 + "25"$ or $[AF^2 = ]169$			M1 full method to find $AF^2$ For this mark allow values correct to 3sf. but condone truncation eg $4^2 + (\text{awrt } 12.3)^2$ or $3^2 + (\text{awrt } 12.64)^2$ Ignore incorrect labels <b>NB</b> $\sqrt{160} = 12.649...$ $\sqrt{153} = 12.369...$	
		<i>Working required</i>	13		A1 dependedent on both method marks awarded. For a full method to find $AF$ with no incorrect working seen and 13 stated Must see 169 or a correct expression for $AF^2$ with exact values used.	
		(b)	$\sin GAF = \frac{3}{"13"}$ or $\tan GAF = \frac{3}{"\sqrt{160}"}$  or $\cos GAF = \frac{"\sqrt{160}"}{"13"}$ oe		2	M1 A correct method to find $\angle GAF$ or trig ratio of $\angle GAF$ May ft values from part (a) including their $AF$ if it is not 13 if it is clearly labelled or comes from a correct calculation  Allow ( $\tan AFG = \frac{\sqrt{160}}{3}$ <b>or</b> $\sin AFG = \frac{\sqrt{160}}{13}$ <b>or</b> $\cos AFG = \frac{3}{13}$ ) <b>and</b>  $90 - \angle AFG$  Allow use of cosine or sine rule eg $3^2 = 160 + 13^2 - 2 \times \sqrt{160} \times 13 \cos GAF$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>		13.3	A1 awrt 13.3 Allow awrt 13.4		
						<b>Total 5 marks</b>