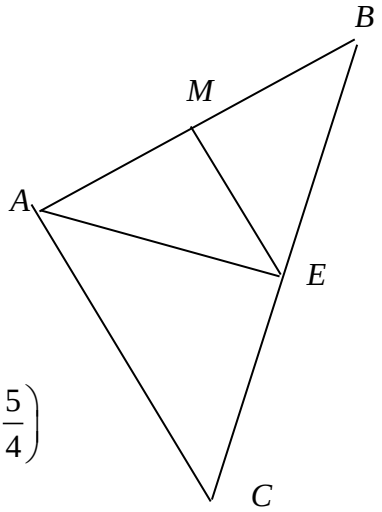
Question Number	Scheme	Marks
9	Grad $AB = \dfrac{6-4}{1-(-4)} = \dfrac{2}{5}$	M1
	Grad $AC = \dfrac{-1-4}{-2-(-4)} = -\dfrac{5}{2}$	A1
	$\dfrac{2}{5}\times\left(-\dfrac{5}{2}\right) = -1 \therefore AB$ is perpendicular to AC.	M1A1cso (4)
	See notes for 2 alt methods	
(b)	$\dfrac{y+1}{6+1} = \dfrac{x+2}{1+2}$	M1A1
	$7x - 3y + 11 = 0$	A1 (3)
(c)	Grad $l = -\dfrac{5}{2}$ (= grad AC)	
	Midpoint $AB = \left(-\dfrac{3}{2}, 5\right)$	B1B1
	Eqn. l: $y - 5 = -\dfrac{5}{2}\left(x + \dfrac{3}{2}\right)$ $\left(y = \dfrac{-5}{2}x + \dfrac{5}{4}\right)$	M1A1 (4)
(d)	(E is midpoint of BC) E is $\left(-\dfrac{1}{2}, \dfrac{5}{2}\right)$ or decimal equivalents	B1, B1 (2)
(e)	AE perp to BC	M1
	$EC = \sqrt{\left(1.5^2 + 3.5^2\right)} = \sqrt{14.5}$	M1
	$AE = \sqrt{\left(3.5^2 + 1.5^2\right)} = \sqrt{14.5}$	A1
	Area $\Delta AEC = \dfrac{1}{2}AE \times EC = \dfrac{1}{2}\times 14.5 = 7.25$ oe	A1 (4)
		[17]
ALT 1	Area $\Delta AEC = \dfrac{1}{2}$ Area ΔABC	M1
	$AB = \sqrt{\left(5^2 + 2^2\right)} = \sqrt{29}$	M1
	$AC = \sqrt{2^2 + 5^2} = \sqrt{29}$	A1
	Area $\Delta AEC = \dfrac{1}{2}\times\dfrac{1}{2}\times AB \times AC = \dfrac{29}{4}$ oe $\left(7\dfrac{1}{4}\right.$ or $\left.7.25\right)$	A1



Question Number	Scheme	Marks
ALT 2:	Use "determinant" method with coordinates of *A, E, C*	
	$\text{"Area } \Delta AEC\text{"} = \frac{1}{2}\begin{vmatrix} -4 & -\frac{1}{2} & -2 & -4 \\ 4 & \frac{5}{2} & -1 & 4 \end{vmatrix}$	M1A1 (first M first A)
M1	$= \frac{1}{2}\left(-4\times\frac{5}{2} + -\frac{1}{2}\times -1 + -2\times 4 - \left(-4\times -1 + -2\times\frac{5}{2} + -\frac{1}{2}\times 4\right)\right)$	
	$= -\frac{29}{4}$	M1 (second M)
A1	$\text{Area } \Delta AEC = \frac{29}{4}$	A1
(a)		
M1	Attempt gradient of either line. May find equation of either line and extract gradient from it.	
A1	Correct gradient of both lines	
M1	Attempt product of their gradients or state "negative reciprocals", provided the gradients are negative reciprocals, even if they are not correct. (no need for product)	
A1cso	Product $= -1$ or "negative reciprocals" and a conclusion (eg $\therefore$ perpendicular, shown, # or similar)	
ALT 1	Find lengths of *AB*, *AC* and *BC* and use Pythagoras	
M1	Attempt lengths of 2 of these lines	
A1	Correct lengths of all 3 lines ($\sqrt{29}, \sqrt{29}, \sqrt{58}$)	
M1	Use Pythagoras (sum of squares of the two shorter sides = square of longest)	
A1cso	Everything correct and a conclusion given (as above)	
ALT 2	Find an equation of the perpendicular to *AB* through *C*. Find the intersection of this line with *AB* and show it is *A*.	
M1	Attempt the gradient of *AB*	
A1	Correct equation of the perpendicular through *C* $\left(y+1 = -\frac{5}{2}(x+2) \text{ oe} \right)$	
M1	Attempt an equation for *AB* **and** solve with their previous line	
A1	Correct intersection (- 4, 4) **and** a conclusion.	
(b)		
M1	Use any *complete* method for the equation of *BC*. (Use of $y = mx + c$ requires an attempt to find a numerical value for *c*.)	
A1	Correct numbers in their choice of method	
A1	Correct equation in the required form. All terms to be on one side of the = sign with 0 on the other. Can be an integer multiple of the one shown.	

Question Number	Scheme	Marks
(c)		
B1	Either coordinate of the midpoint of *AB*	
B1	Second coordinate of midpoint	
M1	Any *complete* method for the equation of the perpendicular bisector. Must include the gradient as the negative reciprocal of their gradient of *AB* or their gradient of *AC*. If (a) done by Pythagoras an appropriate gradient must be found for this M mark.	
A1	Correct equation of the perpendicular bisector, any equivalent form. Must have $y = ...$	
(d)		
B1	Either coordinate of *E*; fraction or decimal	
B1	Second coordinate of *E*; fraction or decimal	
(e)		
M1	For the statement shown. Give by implication if the following work implies use of this. No explanation needed.	
M1	Attempting the length of *EC* or *AE*	
A1	Both lengths correct.	
A1	Obtain the correct area of the triangle. (7.3 scores A0)	
ALT 1:		
M1	For the statement shown. Give by implication if the following work implies use of this. No explanation needed.	
M1	Attempting the length of *AB* or *AC*	
A1	Both lengths correct. Award marks if work seen in (a) and used here.	
A1	Obtain the correct area of the triangle. (7.3 scores A0)	
ALT 2:	By "determinant" method.	
M1	Area $\Delta AEC = \left(\frac{1}{2}\right)\begin{vmatrix} -4 & -\frac{1}{2} & -2 & -4 \\ 4 & \frac{5}{2} & -1 & 4 \end{vmatrix}$.	$\frac{1}{2}$ not needed for this mark. Coords of *A*, *C* and their coords of *E* needed with first pair repeated at the end. Points in any order.
A1	Correct numbers in the "determinant" (with or without the $\frac{1}{2}$ present)	
M1	Include the $\frac{1}{2}$ and attempt to multiply out their determinant.	
A1	Correct area, must be positive.	
NB	Enter marks in e-PEN order (M1M1A1A1) not in marking order (M1A1M1A1)	