Question Number	Scheme	Notes	Marks
2.	$\mathbf{M}=\begin{pmatrix} k-12 & 3 \\ 4 & k \end{pmatrix}$, where k is a real constant		
	$\left\{\det(\mathbf{M})=(k-12)k-4(3) \text{ and area ratio}=\dfrac{320}{20}=16\right\}$		
	$20(k(k-12)-4(3))=320$ or $20(k(k-12)-4(3))=-320$	20(applied $\det(\mathbf{M})$) $=\pm 320$, o.e. **Note:** Allow 320(applied $\det(\mathbf{M})$) $=\pm 20$, o.e.	M1
	or $k(k-12)-4(3)=\dfrac{320}{20}$ or $k(k-12)-4(3)=-\dfrac{320}{20}$	At least one correct equation in k that can be simplified or un-simplified	A1
	$k^2-12k-28=0$, $k^2-12k+4=0$ $\{20k^2-240k-560=0,\ 20k^2-240k+80=0\}$		
	$(k-14)(k+2)=0$ **or** $(k-6)^2-36+4=0$ to give $k=...$	**dependent on the previous M mark** At least one correct method (e.g. factorising, applying the quadratic formula, completing the square or calculator) of solving a 3TQ to give $k=...$	dM1
	$k=14,\ -2,\ 6+4\sqrt{2},\ 6-4\sqrt{2}$	At least two of either $k=14$, $k=-2$, $k=6+4\sqrt{2}$ or $k=6-4\sqrt{2}$	A1
		All four correct values of k	A1
			(5)
			5

	Question 2 Notes	
2.	**Note**	Allow 1st M1 for any of • $320(k(k-12)-4(3))=20$ • $k(k-12)-4(3)=\dfrac{20}{320}$ • $320(k(k-12)-4(3))=-20$ • $k(k-12)-4(3)=-\dfrac{20}{320}$ which can be simplified or un-simplified.
	Note	Allow 1st M1 for any of • $20(k(k-12)+4(3))=320$ • $20(k(k-12)+4(3))=-320$ • $320(k(k-12)+4(3))=20$ • $320(k(k-12)+4(3))=20$ or equivalent, which can be simplified or un-simplified.
	Note	Give 1st M0 for any of • $(k(k-12)-4(3))=(20)(320)$ • $(k(k-12)+4(3))=(20)(320)$
	Note	Give dM1 for using a calculator to write down at least one correct root for their 3TQ
	Note	For the 1st A1 mark • condone truncated 11.6 or awrt 11.7 in place of $k=6+4\sqrt{2}$ • condone awrt 0.34 in place of $k=6-4\sqrt{2}$
	Note	Allow $k=6+\sqrt{32}$ instead of $k=6+4\sqrt{2}$ and/or $k=6-\sqrt{32}$ instead of $k=6-4\sqrt{2}$ for any of the final two accuracy marks.
	Note	Allow final A1 (isw) for $k=14,\ -2,\ 6+4\sqrt{2}$, awrt 11.6, $6-4\sqrt{2}$, awrt 0.34
	Note	Give 2nd A0 (i.e. the penultimate mark) for finding only one correct value for k as a result of rejecting (or ignoring) correct values for k
	Note	Give final A0 if any of $k=14,\ -2,\ 6+4\sqrt{2},\ 6-4\sqrt{2}$ are rejected
	Note	Give final A0 for extra solutions in addition to $k=14,\ -2,\ 6+4\sqrt{2},\ 6-4\sqrt{2}$

	Question 2 Notes Continued	
2.	**Note**	$320(k(k-12)-4(3))=20$ leads to $16k^2-192k-193=0$ and $k=12.9327..., -0.9327...$ $320(k(k-12)-4(3))=-20$ leads to $16k^2-192k-191=0$ and $k=12.9236..., -0.9236...$
	Note	$20(k(k-12)+4(3))=320$ leads to $k^2-12k-4=0$ and $k=12.3245..., -0.3245...$ $20(k(k-12)+4(3))=-320$ leads to $k^2-12k+28=0$ and $k=8.8284..., 3.1715...$
	Note	$320(k(k-12)+4(3))=20$ leads to $16k^2-192k+191=0$ and $k=10.9053..., 1.0946...$ $320(k(k-12)+4(3))=-20$ leads to $16k^2-192k+193=0$ and $k=10.8925..., 1.1074...$