Question Number	Scheme	Marks
2.	X follows a continuous unform distribution over $[\alpha - 3,\ 2\alpha + 3]$	
(a)	$\left\{\mathrm{E}(\bar{X}) = \mu =\right\}\ \dfrac{2\alpha + 3 + \alpha - 3}{2}$	M1
	$= \dfrac{3\alpha}{2}$. [So $\bar{X}$ is a] biased [estimator.]	A1
	bias $\left\{= \dfrac{3\alpha}{2} - \alpha\right\} = \pm\dfrac{\alpha}{2}$ bias $= \pm\dfrac{\alpha}{2}$	B1
		[3]
(b)	$k = \dfrac{2}{3}$ $\dfrac{2}{3}$	B1
		[1]
(c)	$\dfrac{3\alpha}{2} = \bar{X} \rightarrow \alpha = \dfrac{2}{3}\bar{X} = \dfrac{2}{3}(8)$ "their k" × their $\bar{x}$	M1
	Max value $= 2\left("\dfrac{16}{3}"\right) + 3$ $2 \times$ "their α" $+ 3$ See notes	M1
	$= \dfrac{41}{3}$ $\dfrac{41}{3}$ or $13\dfrac{2}{3}$ or awrt 13.7	A1
		[3]
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Notes

(a)

M1 Using the formula $\left(\dfrac{a+b}{2}\right)$ or getting $\dfrac{3\alpha}{2}$

A1 $\dfrac{3\alpha}{2}$ and concluding. Allow A1 for $\dfrac{3\alpha}{2} \neq \alpha$.

Note Also allow A1 for bias $= \pm\dfrac{\alpha}{2} \neq 0$

B1 $\pm\dfrac{\alpha}{2}$

(b)

B1 o.e.

(c)

1st M1 An attempt to use the sample data given to find $\bar{x}$ and multiply by their k.
Allow full expression for $\bar{x}$ or $\dfrac{\sum x}{n}$.

Note 1st M1 can be implied by a correct method leading to $\alpha = \dfrac{16}{3}$

2nd M1 $2 \times$ "their α" $+ 3$ where their α is a function of the sample mean – which is found by applying $\dfrac{\sum x}{n}$ from the data values given in the question.

Note $2(13) + 3 = 39$ is M0M0A0