Question Number	Scheme	Marks
1(a)	$\pi\int_0^1(1+\sqrt{x})^2\mathrm{d}x$	M1
	$=\pi\left[x+\frac{4}{3}x^{\frac{3}{2}}+\frac{1}{2}x^2\right]_0^1$	A1
	$=\frac{17\pi}{6}\,\mathrm{m}^3$ * including units	A1*
		(3)
(b)	$\pi\int_0^1 x(1+\sqrt{x})^2\mathrm{d}x$	M1
	$=\pi\left[\frac{1}{2}x^2+\frac{4}{5}x^{\frac{5}{2}}+\frac{1}{3}x^3\right]_0^1$	A1
	$=\frac{49\pi}{30}$	A1
	$\bar{x}=\frac{\frac{49\pi}{30}}{\frac{17\pi}{6}}$	dM1
	$=\frac{49}{85}\,\mathrm{m}$ * including units	A1 *
		(5)
		(8)

Notes	
NB: Penalise missing units maximum of once per question.	
(a)	
M1	Use of $\pi\int_0^1(1+\sqrt{x})^2\mathrm{d}x$. Limits not needed. π is required.
A1	Correct integration – limits not needed
A1*	Correct given answer correctly obtained. Must include units. Limits must be seen (sight of substitution is not required). Accept $\frac{17}{6}\pi\ \mathrm{m}^3$
(b)	
M1	Use of $\pi\int_0^1 x(1+\sqrt{x})^2\mathrm{d}x$. Limits not needed ($\pi$'s will cancel so it may not be seen)
A1	Correct integration – limits not needed
A1	Correct unsimplified with or without π (may see $\frac{1}{2}+\frac{4}{5}+\frac{1}{3}-0$)
dM1	Correct expression with their numerator (consistent π - seen in neither or both)
A1*	Correct given answer correctly obtained. Must include units.