Question	Scheme	Marks	AOs
7(a)	$1=\dfrac{a}{0.5+b},\ 0.5=\dfrac{a}{2.5+b} \Rightarrow a=\ldots,\ b=\ldots$	M1	3.3
	$a = 2,\ b = 1.5$	A1	1.1b
		(2)	
(b)	$V_1=\pi\displaystyle\int x^2\mathrm{d}y=\pi\int\left(\frac{"2"}{y+"1.5"}\right)^2\mathrm{d}y$	B1ft	3.4
	$\pi\displaystyle\int_{0.5}^{2.5}\left(\frac{"2"}{y+"1.5"}\right)^2\mathrm{d}y$	M1	1.1a
	$=\{4\pi\}\left[-(y+1.5)^{-1}\right]_{0.5}^{2.5}(=\pi)$	M1	1.1b
	$x^2+(y-3)^2=0.5$	B1	2.2a
	$V_2=\pi\displaystyle\int x^2\mathrm{d}y=\pi\int\left(0.5-(y-3)^2\right)\mathrm{d}y$ or $\pi\displaystyle\int\left(-y^2+6y-8.5\right)\mathrm{d}y$	M1	1.1b
	$=\pi\displaystyle\int_{2.5}^{3+\frac{1}{\sqrt{2}}}\left(0.5-(y-3)^2\right)\mathrm{d}y$ or $=\pi\displaystyle\int_{2.5}^{3+\frac{1}{\sqrt{2}}}\left(-y^2+6y-8.5\right)\mathrm{d}y$	M1	3.3
	$=\{\pi\}\left[0.5y-\frac{1}{3}(y-3)^3\right]_{2.5}^{3+\frac{1}{\sqrt{2}}}$ or $=\{\pi\}\left[-\frac{1}{3}y^3+3y^2-8.5y\right]_{2.5}^{3+\frac{1}{\sqrt{2}}}$	A1	1.1b
	$V_1+V_2+\text{cylinder}=\pi+\pi\left(\frac{5}{24}+\frac{\sqrt{2}}{6}\right)+\frac{1}{2}\pi$	dM1	3.4
	$=\pi\left(\frac{41}{24}+\frac{\sqrt{2}}{6}\right)\approx 6.11\text{cm}^3$	A1	2.2b
		(9)	
		(11 marks)	

Notes

(a)
M1: Uses the given coordinates correctly in the equation modelling the curve to obtain at least one correct equation and attempts to find the values of a and b
A1: Correct values
(b)
B1ft: Uses the model to obtain $\pi\displaystyle\int\left(\frac{\text{their } a}{y+\text{their } b}\right)^2\mathrm{d}y$. Note the p can be recovered if appears later.
M1: Chooses limits appropriate to the model i.e. 0.5 and 2.5
M1: Integrates to obtain an expression of the form $k(y + \text{“}1.5\text{”})^{-1}$
B1: Deduces the correct equation for the circle
M1: Uses their circle equation and $\pi\displaystyle\int x^2\,\mathrm{d}y$ to attempt the top volume. Note the p can be recovered if appears later.

M1: Identifies limits appropriate to the model i.e. 2.5 and 3 + their radius
A1: Correct integration
dM1: Uses the model to find the volume of the chess piece including the cylindrical base (dependent on all previous method marks)
A1: Correct volume