b. area of region $= -\int_{-1}^{2} \frac{1}{3}(x-2)(x+1)^2 dx$

$$= -\frac{1}{3}\int_{-1}^{2} (x^3 - 3x - 2)dx$$

$$= -\frac{1}{3}\left[\frac{x^4}{4} - \frac{3x^2}{2} - 2x\right]_{-1}^{2} \quad \text{M1}$$

$$= -\frac{1}{3}\left[\left(\frac{16}{4} - \frac{12}{2} - 4\right) - \left(\frac{1}{4} - \frac{3}{2} + 2\right)\right]$$

$$= -\frac{1}{3}\left[(-6) - \left(\frac{3}{4}\right)\right]$$

$$= -\frac{1}{3} \times -\frac{27}{4}$$

$$= \frac{9}{4} \text{ units}^2 \quad \text{A1}$$

Question 9 (6 marks)

a. No, Jenny is not right. The sample is biased to the birds who prefer the type of seed Jenny offers and those types that are not naturally shy of human habitats. A1

b. $p = \frac{4}{10}$

$= 0.4$ A1

c. 0, 1, 2 or 3 king parrots can come out of 3 birds.

Therefore, $\hat{p}$ can take values: 0, $\frac{1}{3}$, $\frac{2}{3}$ or 1. A1

d.

No. of king parrots	0	1	2	3
Proportion of king parrots ($\hat{p}$)	0	$\frac{1}{3}$	$\frac{2}{3}$	1
$\Pr(\hat{P} = \hat{p})$	$\frac{1}{6}$	$\frac{\binom{4}{1}\binom{6}{2}}{\binom{10}{3}} = \frac{1}{2}$	$\frac{\binom{4}{2}\binom{6}{1}}{\binom{10}{3}} = \frac{3}{10}$	$\frac{1}{30}$

The second of these values can be obtained by subtracting the first from 1.

correct third column of table A1
correct fourth column of table A1