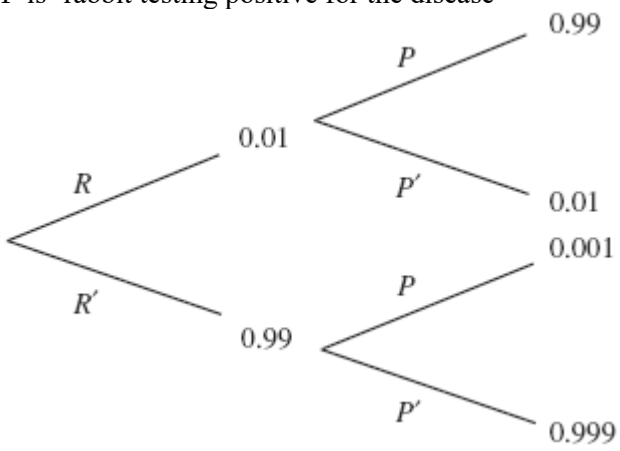
1. *R* is 'rabbit with the disease'
P is 'rabbit testing positive for the disease'



(a) $P(P) = P(R \cap P) + P(R' \cap P)$
$= 0.01 \times 0.99 + 0.99 \times 0.001$ M1
$= 0.01089 \ (= 0.0109)$ A1

Note: Award M1 for a correct tree diagram with correct probability values shown.

(b) $P(R'|P) = \dfrac{0.001 \times 0.99}{0.001 \times 0.99 + 0.01 \times 0.99} \left(= \dfrac{0.00099}{0.01089} \right)$ M1A1

$\dfrac{0.00099}{0.01089} < \dfrac{0.001}{0.01} = 10\ \%$ (or other valid argument) R1

[5]

2. (a) **METHOD 1**

P(3 defective in first 8) = $\binom{8}{3} \times \frac{4}{15} \times \frac{3}{14} \times \frac{2}{13} \times \frac{11}{12} \times \frac{10}{11} \times \frac{9}{10} \times \frac{8}{9} \times \frac{7}{8}$ M1A1A1

Note: Award M1 for multiplication of probabilities with decreasing denominators.
Award A1 for multiplication of correct eight probabilities.
Award A1 for multiplying by $\binom{8}{3}$.

$= \frac{56}{195}$ A1

METHOD 2

P(3 defective DVD players from 8) = $\frac{\binom{4}{3}\binom{11}{5}}{\binom{15}{8}}$ M1A1

Note: Award M1 for an expression of this form containing three combinations.

$= \frac{\frac{4!}{3!1!} \times \frac{11!}{5!6!}}{\frac{15!}{8!7!}}$ M1

$= \frac{56}{195}$ A1

(b) P(9^{th} selected is 4^{th} defective player $\mid$ 3 defective in first 8) = $\frac{1}{7}$ (A1)

P(9^{th} selected is 4^{th} defective player) = $\frac{56}{195} \times \frac{1}{7}$ M1

$= \frac{8}{195}$ A1

[7]

3. P (six in first throw) = $\frac{1}{6}$ (A1)

P (six in third throw) = $\frac{25}{36}\times\frac{1}{6}$ (M1)(A1)

P (six in fifth throw) = $\left(\frac{25}{36}\right)^2\times\frac{1}{6}$

P(A obtains first six) = $\frac{1}{6}+\frac{25}{36}\times\frac{1}{6}+\left(\frac{25}{36}\right)^2\times\frac{1}{6}+...$ (M1)

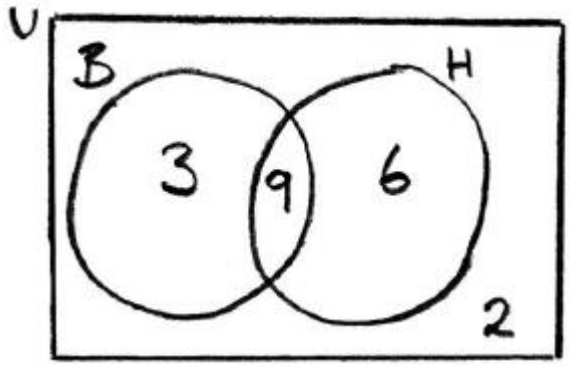
recognizing that the common ratio is $\frac{25}{36}$ (A1)

P(A obtains first six) = $\frac{\frac{1}{6}}{1-\frac{25}{36}}$ (by summing the infinite GP) M1

= $\frac{6}{11}$ A1

[7]

4. (a)



A1A1

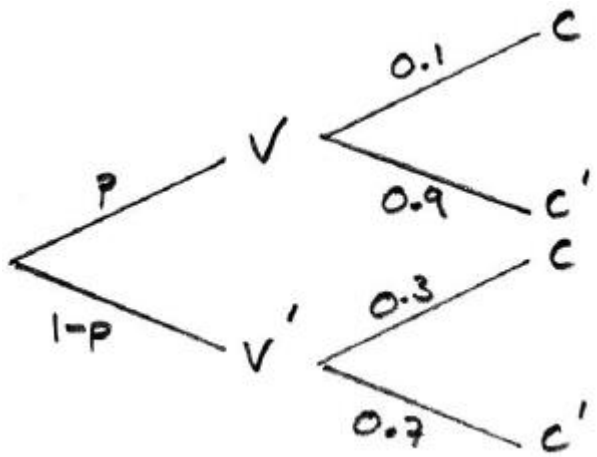
Note: Award A1 for a diagram with two intersecting regions and at least the value of the intersection.

(b) $\frac{9}{20}$ A1

(c) $\frac{9}{12}\left(=\frac{3}{4}\right)$ A1

[4]

5. (a)



using the law of total probabilities: (M1)

$0.1p + 0.3(1 - p) = 0.22$ A1

$0.1p + 0.3 - 0.3p = 0.22$

$0.2p = 0.08$

$p = \frac{0.08}{0.2} = 0.4$

$p = 40\%$ (accept 0.4) A1

(b) required probability $= \frac{0.4 \times 0.1}{0.22}$ M1

$= \frac{2}{11}$ (0.182) A1

[5]