



3. (a) 12 (A2) (C2)
- (b)  $\frac{3}{12} = \frac{1}{4}$  or 25% (A2) (C2)
- (c)  $\frac{2}{12} = \frac{1}{6}$  or 16.7% (3 s.f.) (A2) (C2)
- (d)  $\frac{4}{12} = \frac{1}{3}$  or 33.3% (3 s.f.) (A2) (C2)

[8]

4. (a)  $\frac{108}{250} \left( \frac{54}{125}, 0.432, 43.2\% \right)$  (A1)(A1) (C2)

*Note: Award (A1) for numerator, (A1) for denominator.*

- (b)  $\frac{25}{106}$  (0.236, 23.6%) (A1)(A1) (C2)

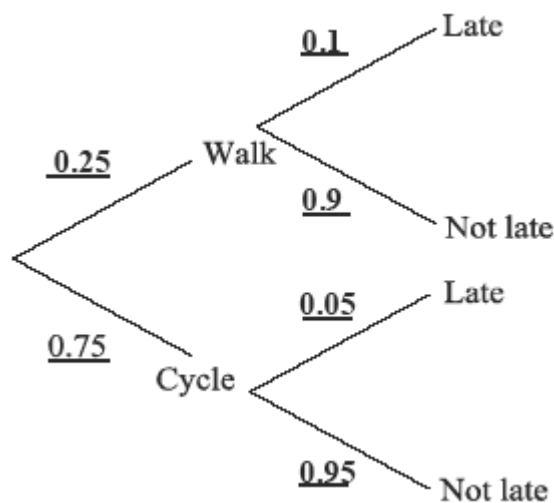
*Note: Award (A1) for numerator, (A1) for denominator.*

- (c)  $\frac{71}{170}$  (0.418, 41.8%) (A1)(A1) (C2)

*Note: Award (A1) for numerator, (A1) for denominator.*

[6]

5. (a)



(A1)(A1)(A1) (C3)

*Note: Award (A1) for 0.25, (A1) for 0.1 and 0.9, (A1) for 0.05 and 0.95.*

(b)  $P(\text{late}) = 0.25 \times 0.1 + 0.75 \times 0.05$  (A1)(ft)(M1)

*Note: Award (A1)(ft) for two correct products from their diagram and award (M1) for addition of their two products.*

$= 0.0625 \left( \frac{1}{16}, 6.25\% \right)$  (A1)(ft) (C3)

[6]

6. (a)  $= \frac{91}{150} (0.607, 60.6\%, 60.7\%)$  (A1)(A1) (C2)

*Note: Award (A1) for numerator, (A1) for denominator.*

(b)  $= \frac{111}{150} \left( \frac{37}{50}, 0.74, 74\% \right)$  (A1)(ft)(A1) (C2)

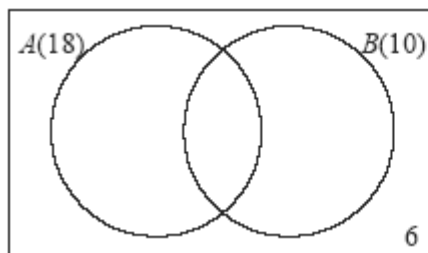
*Note: Award (A1)(ft) for their numerator in (a) +20 provided the final answer is not greater than 1. (A1) for denominator.*

(c)  $\frac{16}{91} (0.176, 17.6\%)$  (A1)(A1)(ft) (C2)

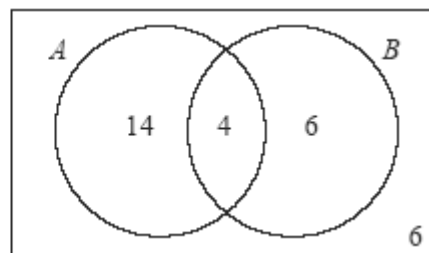
*Note: Award (A1) for numerator and (A1)(ft) for denominator. Follow through from their numerator in (a) provided answer is not greater than 1.*

[6]

7. (a)



OR



(A2) (C2)

*Note: Award (A2) for 3 correctly placed values, and no extras (4 need not be seen), (A1) for 2 correctly placed values, (A0) for 1 or no correctly placed values.*

(b)  $18 + 10 + 6 - 30$  (M1)  
 $= 4$  (A1) (C2)

(c)  $P(A | B) = \frac{4}{10} \left( \frac{2}{5}, 0.4, 40\% \right)$  (A1)(ft)(A1) (C2)

*Note: Award (A1)(ft) for their numerator from part (b), (A1) for*

denominator.

[6]

8. (a) (i)  $p(\text{green}) = \frac{5}{10}$  (A1)

(ii)  $p(\text{not green}) = \frac{5}{10}$  (A1)

*Note: Accept  $\frac{1}{2}$ , 0.5 or 50% for either answer*

(b) (i)  $p(G|G) = \frac{4}{9}$  or 0.444 (3 s.f.) (A1)

(ii)  $p(\text{not green then not green})$   
 $= \frac{5}{10} \times \frac{4}{9}$  (M1)

$= \frac{20}{90}$  or  $\frac{2}{9}$  or 0.222 (3 s.f.) (A1)

(iii)  $p(\text{one green and one not green})$   
 $= \frac{5}{10} \times \frac{5}{9} + \frac{5}{10} \times \frac{5}{9}$  (M2)

*Note: Award (M1) for  $\frac{5}{10} \times \frac{5}{9}$ , (M1) for  $(\times 2)$*

$= \frac{50}{90}$  or  $\frac{5}{9}$  or 0.556 (3 s.f.) (A1)

(c) (i)  $p(3 \text{ green}) = \frac{5}{10} \times \frac{4}{9} \times \frac{3}{8}$  (M1)

$= \frac{60}{720}$  or  $\frac{1}{12}$  or 0.0833 (3 s.f.) (A1)

$$(ii) \quad p(\text{only one green}) = 3 \times \frac{5}{10} \times \frac{5}{9} \times \frac{4}{8} \quad (\text{M2})$$

*Note: Award (M1) for  $\frac{5}{10} \times \frac{5}{9} \times \frac{4}{8}$ , (M1) for  $(\times 3)$*

$$= \frac{300}{720} \text{ or } 0.417 \text{ (3 s.f.) or } \frac{10}{24} \text{ or } \frac{5}{12} \quad (\text{A1})$$

$$(iii) \quad p(\text{at least one green}) = 1 - p(\text{no green})$$

$$= 1 - \frac{5}{10} \times \frac{4}{9} \times \frac{3}{8} \quad (\text{M1})$$

$$= 1 - \frac{60}{720}$$

$$= \frac{660}{720} \text{ or } \frac{11}{12} \text{ or } 0.917 \text{ (3 s.f.)} \quad (\text{A1})$$

[15]

9. (a)  $0.8 = 0.5 + 0.6 - P(A \cap B)$  (M1)  
 $P(A \cap B) = 0.3$  (A1) (C2)

*Note: Award (M1) for correct substitution, (A1) for correct answer.*

(b)  $P(A | B) = \frac{0.3}{0.6}$  (M1)  
 $= 0.5$  (A1)(ft) (C2)

*Note: Award (M1) for correct substitution in conditional probability formula. Follow through from their answer to part (a), provided probability is not greater than one.*

(c)  $P(A \cap B) = P(A) \times P(B)$  or  $0.3 = 0.5 \times 0.6$  (R1)

**OR**

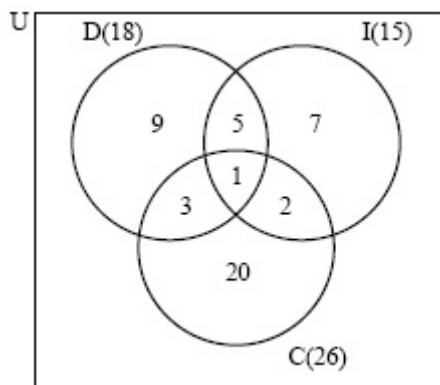
$P(A | B) = P(A)$  (R1)

they are independent. (Yes) (A1)(ft) (C2)

*Note: Follow through from their answers to parts (a) or (b). Do not award (R0)(A1).*

[6]

10. (a)



(A1)  
 (A1)  
 (A1)  
 (A1)(ft)

*Note: (A1) for rectangle with 3 intersecting circles, (A1) for 1, (A1) for 5, 3, 2, (A1)(ft) for 9, 7, 20 if subtraction is carried out, or 18, 15, 26 seen by the letters D, I and C*

(b)  $50 - 47$

(M1)

*Note: (M1) for subtracting their value from 50.*

$= 3$

(A1)(ft)(G2)

(c)  $\frac{9}{50}$

(A1)(ft)

(d)  $\frac{20}{50} \times \frac{19}{49}$

(A1)(ft)(M1)

$= \frac{38}{245} \left( \frac{380}{2450}, 0.155, 15.5\% \right)$

(A1)(ft)(G2)

*Notes: (A1)(ft) for correct fractions from their Venn diagram*

*(M1) for multiplying their fractions*

*(A1)(ft) for correct answer.*

(e)  $\frac{6}{15} \left( \frac{2}{5}, 0.4, 40\% \right)$

(A1)(ft)(A1)(ft)

*Note: (A1)(ft) for numerator, (A1)(ft) denominator*

[12]

11. (a) (i)  $a = 0 \left( \frac{0}{4} \right)$

(A1)

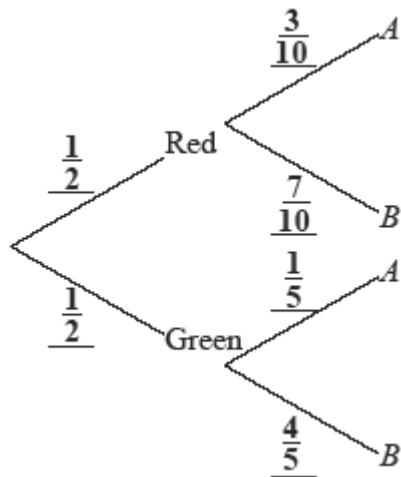
(ii)  $b = \frac{3}{4}$  (0.75, 75%) (A2)(G2)

(iii)  $\frac{4}{5} \times \frac{3}{4}$  (M1)(A1)

$\frac{12}{20} \left( \frac{3}{5}, 0.6, 60\% \right)$  (A1)(ft)(G2)

**Note:** Award (M1) for multiplying two probabilities, (A1) for using their probabilities, (A1) for answer.

(b)



(A1)(A1)(A1)

**Note:** Award (A1) for each pair.

(c) (i)  $\frac{1}{2} \times \frac{3}{10} + \frac{1}{2} \times \frac{1}{5}$  (M1)(M1)

$= \frac{5}{20} \left( \frac{1}{4}, 0.25, 25\% \right)$  (A1)(ft)(G2)

**Note:** Award (M1) for two products seen with numbers from the problem, (M1) for adding two products. Follow through from their tree diagram.

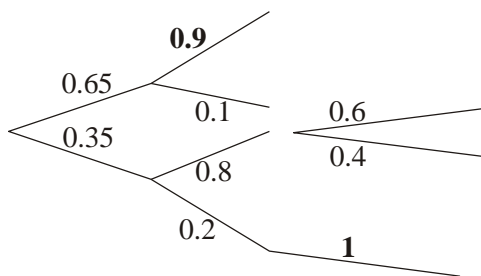
$$(ii) \quad \frac{\frac{1}{2} \times \frac{3}{10}}{\frac{1}{4}} \quad (M1)(A1)$$

$$= \frac{3}{5} \quad (0.6, 60\%) \quad (A1)(ft)(G2)$$

*Note: Award (M1) for substituted conditional probability formula, (A1) for correct substitution. Follow through from their part (b) and part (c) (i).*

[15]

12. (a)



(A1)(A1) (C2)

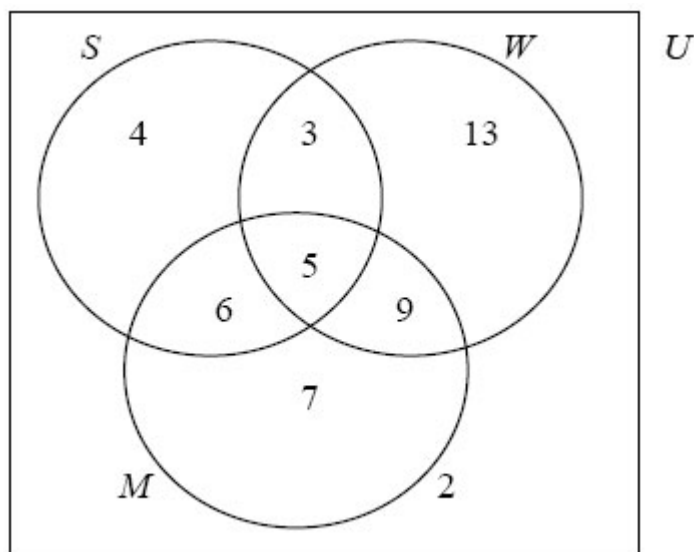
(b)  $0.65 \times 0.1 (= 0.065)$  (A1)  
 $0.35 \times 0.8 \times 0.4 (= 0.112)$  (A1)  
 $0.35 \times 0.2 \times 1$  the 1 can be implied (= 0.07) (A1)(ft)  
 0.247 (A1)(ft) (C4)

*Note: No (ft) for any probabilities greater than 1.*

[6]



13. (a)



(A1)(A1)  
(A1)(ft)  
(A1)(ft)

**Note:** Award (A1) for 2 (must be in a box), (A1) for 7, (A1)(ft) for 6 and 4, (A1)(ft) for 9 and 13. Observe the assignment of (ft) marks strictly here. Example A common error is likely to be 11 instead of 6 (A0). In this case follow through to 4 and 18 (A1)(ft) for the final pair. Here the 4 follows from the total of 27 for  $n(M)$ .

4

- (b) (i)  $n(M \cap W) = 14$  (A1)(ft)  
 (ii)  $n(M' \cup S) = 22 + 11$  **OR**  $15 + 18$  (A1)(ft)  
 $= 33$  (A1)(ft)

**Note:** Award (A2) if answer 33 is seen. Award (A1) for any of 22, 11, 15 or 18 seen but 33 absent.

3

- (c)  $P(\text{both mice short-tailed}) = \frac{18}{49} \times \frac{17}{48} = \frac{306}{2352} (=0.130)$ . (M1)(A1)(ft)  
 (G1)

**Note:** Allow alternatives such as  $153/1176$  or  $51/392$ .

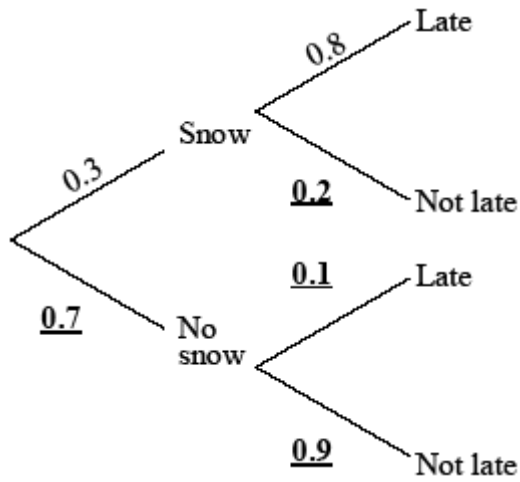
Award (M1) for any of

$\frac{18}{49}$  and  $\frac{17}{48}$  or  $\frac{18}{49} \times \frac{17}{49}$  or  $\frac{18}{49} + \frac{17}{48}$  seen.

2

[9]

14. (a)



(A1)(A1)(A1) (C3)

*Note: Award (A1) for each correct pair.*

(b)  $0.7 \times 0.1$   
 $= 0.07 \left( \frac{7}{100}, 7\% \right)$

(A1)(ft) (C1)

(c)  $0.3 \times 0.8 + 0.07$   
 $= 0.31 \left( \frac{31}{100}, 31\% \right)$

(M1)

(A1)(ft) (C2)

*Note: In (b) and (c) follow through from sensible answers only  
i.e. not a probability greater than one.*

[6]