Godalming College

Statistics 9 – Conditional Probability: Solutions

Section 1 – Review of previous topics.

1. $s = 4,\ u = 0,\ v = ?,\ a = g,\ t = ?$

   (a) $s = ut + \frac{1}{2}at^2$ so $t = \sqrt{\frac{8}{9.8}} = 0.90s$ (2s.f.)

   (b) $v = u + at$ so $v = g \times 0.90 = 8.9\text{ms}^{-1}$ (2s.f.)

2. $s = -,\ u = 0,\ v = ?,\ a = 2,\ t = ?$

   (a) $t = 3;\quad v = u + at = 6\text{ms}^{-1}$

   (b) When $t = 2 \quad s = 0 \times 2 + \frac{1}{2} \times 2 \times 2^2 = 4\text{m}$

   When $t = 3 \quad s = 0 \times 3 + \frac{1}{2} \times 2 \times 3^2 = 9\text{m}$ so it travels 9 – 4 = 5m during this second

3. $s = ?,\ u = 30,\ v = 0,\ a = -4.8,\ t = -$

   $v^2 = u^2 + 2as \quad \Rightarrow 0 = 30^2 - 9.6s \qquad \Rightarrow s = \frac{900}{9.6} = 93.75m = 94m \quad (2\ \text{s.f.})$

   So the car stops 6.3 metres (2 s.f.) before the next lamppost.

   The answer may be inaccurate as road surface may vary, resistance varies with speed etc.

4. Stone 1: $s = -8,\ u = 10,\ v = -,\ a = -g,\ t = ?$

   Stone 2: $s = -8,\ u = -5,\ v = -,\ a = -g,\ t = ?$

   Using $s = ut + \frac{1}{2}at^2$ for both and also using $t > 0,\ t_1 = 2.656, t_2 = 0.8656$ and so time between = 1.79 seconds (2 d.p.)

5. AB journey $s = 50,\ u = U,\ v = -,\ a = A,\ t = 5$

   AC journey $s = 210,\ u = U,\ v = -,\ a = A,\ t = 15$

   Using $s = ut + \frac{1}{2}at^2$ for both gives $50 = 5U + 125A$ and $210 = 15U + 112.5A$

   Solve to give $U = 8$ and $A = 0.8$ so speed at point A = 8ms^{-1} and at point C = 8 + 15 x 0.8 = 20ms^{-1}

Section 2 – Consolidation of this week's topic. Please complete all questions.

1.

	Football	Rugby	Cricket	Golf	Total
Female	21	11	10	8	50
Male	24	6	13	7	50
Total	45	17	23	15	100

(a) $\frac{15}{100}$ ✓✓ (b) $\frac{50}{100}$ ✓✓ (c) $\frac{21}{50}$ ✓✓ (d) $\frac{13}{23}$ ✓✓

(8 marks)

2.

	Car	Train	Walk	Total
Year 12	25	15	30	70
Year 13	35	5	10	50
Total	60	20	40	120

(a) $\frac{20}{120}$ (b) $\frac{25}{60}$ (c) $\frac{25}{70}$ (d) $\frac{35+10}{60+40} = \frac{45}{100}$

(11 marks)

3. (a) $P(A \cup B) = P(A) + P(B) - P(A) \times P(B)$ as A and B are independent

$\frac{2}{3} = \frac{1}{2} + P(B) - \frac{1}{2} \times P(B) \Rightarrow \frac{1}{6} = \frac{1}{2} \times P(B) \Rightarrow P(B) = \frac{1}{3}$

(b) $P(A|B) = P(A)$ as A and B are independent = $\frac{1}{2}$

(c) $P(B'|A) = P(B')$ as A and B are independent = $1 - \frac{1}{3} = \frac{2}{3}$

(8 marks)

4.

(a) $\frac{4+14+31+17}{1+4+14+31+17+5+5+3} = \frac{66}{80}$ (b) $\frac{31+5}{80} = \frac{36}{80}$ (c) $\frac{14+31}{4+14+31+17} = \frac{45}{66}$

(d) $\frac{5+3}{31+17+5+3} = \frac{8}{56}$ (e) $\frac{3+1}{4+1+17+3} = \frac{4}{25}$

(10 marks)

5. (a) 0.23 (b) $0.34 + 0.16 = 0.5$ (c) $\frac{0.16}{0.16+0.27} = \frac{16}{43} = 0.372$ (3 d.p.)

(d) $\frac{0.27}{1-0.16} = \frac{9}{28} = 0.321$ (3 d.p.)

(8 marks)

6. (a) $\frac{8+8}{8+5+6+9+4+9+8+8} = \frac{16}{57}$ (b) $\frac{8+5+9+4+9+8}{57} = \frac{43}{57}$ (c) $\frac{8+9}{8+9+9+4} = \frac{17}{30}$

(d) $\frac{6+9+8}{5+6+4+9+9+8} = \frac{23}{41}$ (e) $\frac{9+8+9}{8+9+8+8+9+6} = \frac{26}{48}$

(10 marks)

Total 55 marks

Section 3

a) A & B are independent — B1 (1)

b) A & B are mutually exclusive — B1 (1)

c) $P(A \cap B') = P(A) - P(A \cap B)$ — M1

$\therefore \frac{1}{6} = \frac{1}{4} - P(A \cap B) \Rightarrow P(A \cap B) = 0$ — A1

$\therefore$ A & B are mutually exclusive — B1 (3)

d) $P(A|B) = \frac{P(A \cap B)}{P(B)} = 0$ — M1 (dep on prev M1) A1 (2)

e) $P(A' \cap B') = 1 - P(A) - P(B) + P(A \cap B)$ — M1

$= 1 - \frac{1}{4} - \frac{1}{3} + 0$ — A1

$= \frac{5}{12}$ — A1 (3)