eClassroom

GCSE Mathematics

Tree Diagrams & Conditional Probability

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics

Section A — Foundation — Worked Solutions

[Fluency] Question 1

$(b)\ P(RR) = \frac{3}{5} \times \frac{3}{5} = \frac{9}{25}$

$(c)\ P(\geq 1R) = 1 - P(BB) = 1 - \frac{2}{5} \times \frac{2}{5} = 1 - \frac{4}{25} = \frac{21}{25}$

$\therefore$ **(b) 9/25 (c) 21/25**

[Fluency] Question 2

$(b)\ P(RR) = \frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$

$(c)\ P(\text{one each}) = \frac{3}{5} \cdot \frac{2}{4} + \frac{2}{5} \cdot \frac{3}{4} = \frac{6}{20} + \frac{6}{20} = \frac{3}{5}$

$\therefore$ **(b) 3/10 (c) 3/5**

[Fluency] Question 3

$P(A \cap B) = P(B|A) \times P(A) = 0.4 \times 0.6$

$\therefore$ **0.24**

[Fluency] Question 4

$(b)\ P(HHH) = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$

$(c)\ P(2H) = 3 \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{3}{8}$

$\therefore$ **(b) 1/8 (c) 3/8**

[Reasoning] Question 5

$P(B) = 0.7 \times 0.3 + 0.2 \times 0.7 = 0.21 + 0.14$

$\therefore$ **P(B) = 0.35**

[Reasoning] Question 6

$P(\text{diff}) = \frac{5}{8} \cdot \frac{3}{7} + \frac{3}{8} \cdot \frac{5}{7} = \frac{15}{56} + \frac{15}{56}$

$\therefore$

[Reasoning] Question 7

$(a)\ P(\text{both}) = 0.4 \times 0.7 = 0.28$

$(b)\ P(\text{Tue}) = 0.4 \times 0.7 + 0.6 \times 0.3 = 0.28 + 0.18 = 0.46$

$\therefore$ **(a) 0.28 (b) 0.46**

[Problem Solving] Question 8

$P(\text{both def}) = \frac{4}{20} \times \frac{3}{19} = \frac{12}{380}$

$\therefore$

[Problem Solving] Question 9

$P(\text{Mon}|\text{Tue}) = \frac{P(\text{Mon} \cap \text{Tue})}{P(\text{Tue})} = \frac{0.28}{0.46}$

$\therefore$

[Problem Solving] Question 10

$(a)\ P(RR) + P(BB) + P(GG) = \frac{6}{12} \cdot \frac{5}{11} + \frac{4}{12} \cdot \frac{3}{11} + \frac{2}{12} \cdot \frac{1}{11}$

$= \frac{30 + 12 + 2}{132} = \frac{44}{132} = \frac{1}{3}$

$(b)\ P(\geq 1R) = 1 - P(\text{no red}) = 1 - \frac{6}{12} \cdot \frac{5}{11} = 1 - \frac{5}{11} = \frac{6}{11}$

$\therefore$ **(a) 1/3 (b) 6/11**

Section B — Higher — Worked Solutions

[Fluency] Question 1

$P(RR) + P(BB) + P(GG) = \frac{4}{9} \cdot \frac{3}{8} + \frac{3}{9} \cdot \frac{2}{8} + \frac{2}{9} \cdot \frac{1}{8} = \frac{20}{72}$

$\therefore$

[Fluency] Question 2

$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.15}{0.40}$

$\therefore$ **0.375 = 3/8**

[Fluency] Question 3

$(a)\ P(+) = 0.01 \times 0.95 + 0.99 \times 0.05 = 0.0095 + 0.0495 = 0.059$

$(b)\ P(\text{dis}|+) = \frac{0.0095}{0.059} \approx 0.161$

$\therefore$ **(a) 0.059 (b) 0.161 (3 s.f.)**

[Reasoning] Question 4

$P(\text{red}) = \frac{1}{2} \cdot \frac{3}{5} + \frac{1}{2} \cdot \frac{1}{5} = \frac{3}{10} + \frac{1}{10}$

$\therefore$ **P(red) = 2/5**

[Reasoning] Question 5

Primes in 1–10: {2,3,5,7} = 4 primes

$P(\text{both prime}) = \frac{4}{10} \times \frac{3}{9} = \frac{12}{90}$

$\therefore$

[Reasoning] Question 6

$P(A \cap B) = P(A|B) \times P(B) = 0.6 \times 0.3$

$\therefore$ **0.18**

[Problem Solving] Question 7

$P(\geq 2G) = P(GGG) + P(2G, 1B) = \frac{1}{8} + 3 \cdot \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$

$P(\geq 1G) = 1 - P(BBB) = 1 - \frac{1}{8} = \frac{7}{8}$

$P(\geq 2G | \geq 1G) = \frac{1/2}{7/8} = \frac{4}{7}$

$\therefore$

[Problem Solving] Question 8

$P(\text{exactly 3R}) = \frac{6}{10} \cdot \frac{5}{9} \cdot \frac{4}{8} = \frac{120}{720} = \frac{1}{6}$

$P(\text{exactly 2R}) = \binom{3}{2} \cdot \frac{6}{10} \cdot \frac{5}{9} \cdot \frac{4}{8} = 3 \cdot \frac{120}{720} = \frac{1}{2}$

$P(\geq 2R) = \frac{1}{6} + \frac{1}{2} = \frac{2}{3}$

$\therefore$

[Problem Solving] Question 9

Let P(B|A')=x, then P(B|A)=2x

$P(B) = 2x \cdot 0.5 + x \cdot 0.5 = 1.5x = 0.5 \Rightarrow x = \frac{1}{3}$

$\therefore$

[Problem Solving] Question 10

$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)}$

$= \frac{0.95 \times 0.01}{0.059} = \frac{0.0095}{0.059} \approx 0.161$

Low because the disease is rare (P=0.01): most positive tests come from the healthy majority (false positives), swamping the true positives.

$\therefore$ **0.161 verified ✓. Low because base rate of disease is only 1%.**