

## Quiz2 - Probability of Events SOLUTION KEY

■ calculator is allowed on all questions ■

[ total marks on quiz: 40 marks ]

1. [6 marks]

$$\text{size of sample space} = 11 + 8 + 4 + 2 = 25$$

$$(a) P(\text{basketball}) = \frac{19}{25}$$

$$(b) P(\text{not V}) = \frac{13}{25}$$

$$(c) \text{plays at least one of the 2 sports: } P(B \cup V) = \frac{23}{25}$$

$$(d) P(V | B) = \frac{8}{19}$$

2. [5 marks]

$$(a) P(4 \text{ Hs}) = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$$

$$(b) P(\text{at least one T}) = 1 - P(4 \text{ Hs}) = 1 - \frac{1}{16} = \frac{15}{16}$$

3. [6 marks]

$$(a) P(\text{all odd}) = \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{3}{7} = \frac{60}{504} = \frac{5}{42} \approx 0.119$$

$$(b) P(1 \text{ odd, 2 even}) = 3 \cdot \frac{5}{9} \cdot \frac{4}{8} \cdot \frac{3}{7} = \frac{5}{14} \approx 0.357$$

4. [6 marks]

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

since A and B are independent, then  $P(A \cap B) = P(A) \cdot P(B)$

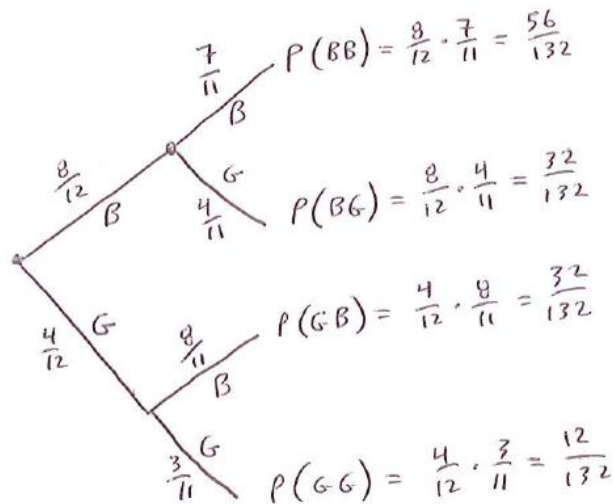
$$P(A \cup B) = P(A) + P(B) - P(A) \cdot P(B)$$

$$\text{let } P(B) = x \quad \therefore 0.73 = 0.64 + x - 0.64x \quad \Rightarrow 0.36x = 0.09$$

$$x = \frac{0.09}{0.36} = \frac{1}{4} \quad \Rightarrow P(B) = \frac{1}{4}$$

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5. [6 marks]



$$(a) P(BB) = \frac{56}{132} = \frac{14}{33} \approx 0.424$$

$$(b) P(BG) + P(GB) = \frac{32}{132} + \frac{32}{132} = \frac{64}{132} = \frac{16}{33} \approx 0.485$$

6. [5 marks]

$$P(5 \text{ wins}) = \left(\frac{2}{3}\right)^3 \left(\frac{3}{4}\right)^2 = \frac{1}{6}$$

$$P(4 \text{ wins; winning first 3 games}) = \left(\frac{2}{3}\right)^3 \left(\frac{3}{4}\right) \left(\frac{1}{4}\right) + \left(\frac{2}{3}\right)^3 \left(\frac{3}{4}\right) \left(\frac{3}{4}\right) = 2 \left(\frac{1}{18}\right) = \frac{1}{9}$$

$$\begin{aligned}
 P(4 \text{ wins; winning last 2 games}) &= \left(\frac{1}{3} \cdot \frac{2}{3} \cdot \frac{2}{3}\right) \left(\frac{3}{4}\right)^2 + \left(\frac{2}{3} \cdot \frac{1}{3} \cdot \frac{2}{3}\right) \left(\frac{3}{4}\right)^2 + \left(\frac{2}{3} \cdot \frac{2}{3} \cdot \frac{1}{3}\right) \left(\frac{3}{4}\right)^2 \\
 &= 3 \left(\frac{1}{12}\right) = \frac{1}{4}
 \end{aligned}$$

$$\text{thus, } P(4 \text{ or more wins}) = \frac{1}{6} + \frac{1}{9} + \frac{1}{4} = \frac{6}{36} + \frac{4}{36} + \frac{9}{36} = \frac{19}{36} \approx 0.528$$

7. [6 marks]

$$(a) P(X \cap Y) = P(X) \cdot P(Y) = (0.8)(0.6) = 0.48$$

$$\begin{aligned}
 (b) P(X \text{ or } Y, \text{ but not both}) &= P(X \cup Y) - P(X \cap Y) \\
 &= P(X) + P(Y) - P(X \cap Y) - P(X \cap Y) \\
 &= 0.8 + 0.6 - 0.48 - 0.48 \\
 &= 0.44
 \end{aligned}$$