Ex 1.7

Q1 (i) Black $\Rightarrow$ 26 cards $\quad P(\text{Spade}) = 1/2$

(ii) Red $\Rightarrow$ 26 cards $\quad P(Q) = 2/26 = 1/13$

(iii) Picture $\Rightarrow$ 12 cards $\quad P(H) = 4/12 = 1/3$

Q2 Total $= 90$.

(i) $P(\text{drive}) = 70/90 = 7/9$

(ii) Man $\Rightarrow$ 40 total $\quad P(\text{drive}) = \frac{32}{40} = 4/5$

(iii) Female $\Rightarrow$ 50 total $\quad P(\text{drive}) = 38/40 = 19/25$.

Q3 a 2 is thrown on one die

(i) $P(\text{Product is } 6) \Rightarrow$ a 2 and 3, but 2 is definite
$\Rightarrow 1 \times 1/6 = 1/6$

(ii) $P(6 \text{ or More}) \Rightarrow$ a 2 and (3 or 4 or 5 or 6)
$= 1 \times 4/6 = 4/6 = 2/3$

Q4 (i) $P(\text{ord}) = \frac{45}{120} = \frac{3}{8}$

(ii) Girl $\Rightarrow$ 55 total $P(\text{Hyder}) = \frac{35}{55} = \frac{7}{11}$

(iii) ord $\Rightarrow$ 45 total $P(\text{Boy}) = \frac{25}{45} = \frac{5}{9}$

Q5 5 Red, 3 Blue Total = 8 Not replaced

(i) $P(R) = \frac{5}{8}$

(ii) $P(R \text{ and } R) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$

(iii) $P(B \text{ and } B) = \frac{3}{8} \times \frac{2}{7} = \frac{6}{56} = \frac{3}{28}$

(iv) $P(\text{same}) \Rightarrow P(R \text{ and } R \text{ or } B \text{ and } B)$
$= \frac{5}{14} + \frac{3}{28} = \frac{13}{28}$

Q6 5 red and 6 Black Total = 11 Not replaced

(i) $P(R \text{ and } R) = \frac{5}{11} \times \frac{4}{10} = \frac{20}{110} = \frac{2}{11}$

(ii) $P(R \text{ and } B) = \frac{5}{11} \times \frac{6}{10} = \frac{30}{110} = \frac{3}{11}$

(iii) $P(B \text{ and } B) = \frac{6}{11} \times \frac{5}{10} = \frac{30}{110} = \frac{3}{11}$

(iv) $P(\text{same}) \Rightarrow P(R \text{ and } R \text{ or } B \text{ and } B) = \frac{2}{11} + \frac{3}{11} = \frac{5}{11}$

(v) $P(2^{\text{nd}} \text{ Red}) \Rightarrow P(R \text{ and } R \text{ or } B \text{ and } R)$
$\frac{2}{11} + \frac{6}{11} \times \frac{5}{10}$
$\frac{2}{11} + \frac{3}{11} = \frac{5}{11}$

Q7 (i) $P(T, N) = \frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$

(ii) $P(E, V) = \frac{2}{5} \times \frac{1}{4} = \frac{2}{20} = \frac{1}{10}$

(iii) $P(\text{Second is } E) \Rightarrow P(E,E) \text{ or } P(V,E) \text{ or } P(N,E) \text{ or } P(T,E)$

$\Rightarrow \frac{2}{5} \times \frac{1}{4} + \frac{1}{5} \times \frac{2}{4} + \frac{1}{5} \times \frac{2}{4} \times \frac{1}{5} \times \frac{2}{4}$

$\frac{2}{20} + \frac{2}{20} + \frac{2}{20} + \frac{2}{20} = \frac{8}{20} = \frac{2}{5}$

Q8 $P(\text{Same}) = P[(I \text{ and } I) \text{ or } (M \text{ and } m)]$

$\frac{2}{8} \times \frac{1}{7} + \frac{2}{8} \times \frac{1}{7}$

$= \frac{2}{56} + \frac{2}{56} = \frac{4}{56} = \frac{1}{14}$

Q9 Total = 33.

(i) $P(\text{Girl}) = \frac{20}{33}$

(ii) Boy $\Rightarrow$ 13 Total $P(\text{left}) = 4/13$

(iii) Boy $\Rightarrow$ 13 Total Girl $\Rightarrow$ 20 Total

$P(\text{Both left}) = 4/13 \times 5/20 = \frac{20}{260} = \frac{1}{13}$

(iv) right $\rightarrow$ 24 Total $P(\text{Boy}) = 9/24 = 3/8$

Q10 $P(\text{Succ both}) = 0.8 \times 0.6 = 0.48$

$P(\text{fails one}) = 1 - P(\text{Succ Both})$

$= 1 - .48 = 0.52$

Q11 $P(\text{odd and even}) \Rightarrow P(\text{odd, even or even, odd})$

$\Rightarrow \frac{3}{5} \times \frac{2}{4} + \frac{2}{5} \times \frac{3}{4}$

$= \frac{6}{20} + \frac{6}{20} = \frac{12}{20} = \frac{3}{5}$.

Q12 (i) $P(A) = 0.4 + 0.2 = 0.6$

(ii) $P(A \cap B) = 0.2$

(iii) $P(A \cup B) = 0.4 + 0.2 + 0.3 = 0.9$

(iv) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.2}{0.5} = 0.4$

(v) $P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{0.2}{0.6} = \frac{1}{3}$

Q13 (i) $P(A) = \frac{8+4}{30} = \frac{12}{30} = \frac{2}{5}$

(ii) $P(A \cap B) = \frac{4}{30} = \frac{2}{15}$

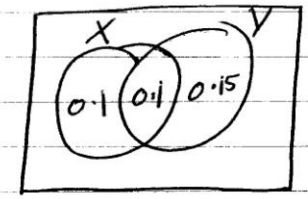
(iii) $P(A \cup B) = \frac{8+4+12}{30} = \frac{24}{30} = \frac{4}{5}$

(iv) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{2/15}{10/30} = \frac{2}{15} \times \frac{30}{16} = \frac{1}{4}$.

(v) $P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{2/15}{2/5} = \frac{2}{15} \times \frac{5}{2} = \frac{1}{3}$.

$\Rightarrow P(A|B) \neq P(B|A)$

Q14 $P(X) = 0.2$ $P(Y) = 0.25$ $P(X \cap Y) = 0.1$



(i) $P(X \cup Y) = 0.1 + 0.1 + 0.15 = 0.35$

(ii) $P(X|Y) = \frac{P(X \cap Y)}{P(Y)} = \frac{0.1}{0.25} = 0.4$

(iii) $P(Y|X) = \frac{P(Y \cap X)}{P(X)} = \frac{0.1}{0.2} = 0.5$

Q15 (i) $P(A) = 0.2 + 0.1 = 0.3$

(ii) $P(A \cup B) = 0.2 + 0.1 + 0.4 = 0.7$

(iii) $P(A') = 0.4 + 0.3 = 0.7$

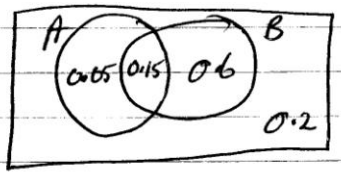
(iv) $P(A \cup B)' = 0.3$

(v) $P(A' \cap B) = 0.4$

(vi) $P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{0.1}{0.3} = 1/3$

Q16 $P(A) = 0.2$ $P(A \cap B) = 0.15$ $P(A' \cap B) = 0.6$

(i)



$1 - [0.05 + 0.15 + 0.6] = 0.2$

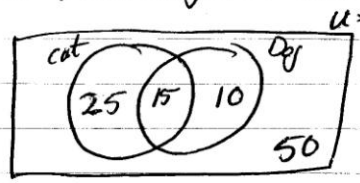
(ii) 0.2

(iii) $P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.15}{0.75} = 0.2$

(iv) $P(B|A) = \frac{P(B \cap A)}{P A} = \frac{0.15}{0.2} = 0.75$

$\Rightarrow P(A|B) \neq P(B|A)$

Q17 Cat = 40 Dog = 25 Both = 15 Total = 100



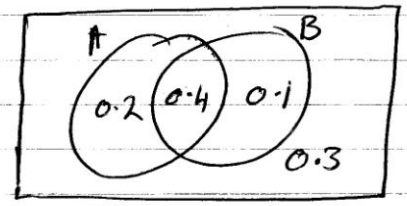
(i) $P(\text{Cat or Dog}) = \frac{25+15+10}{100} = \frac{50}{100} = \frac{1}{2}$

(ii) $P(\text{cat or Dog but not both}) = \frac{25+10}{100} = \frac{35}{100} = \frac{7}{20}$

(iii) $P(D \mid C) = \frac{P(D \cap C)}{P(C)} = \frac{15/100}{40/100} = \frac{15}{100} \times \frac{100}{40} = \frac{15}{40} = \frac{3}{8}$

(iv) $P(C' \mid D) = \frac{P(C' \cap D)}{P(C)} = \frac{10/100}{25/100} = \frac{10}{100} \times \frac{100}{25} = \frac{10}{25} = \frac{2}{5}$

Q18 $P(A) = 0.6$ $P(B) = 0.5$ $P(A \cap B) = 0.4$



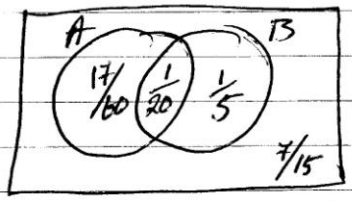
(i) $P(A \cup B) = 0.2 + 0.4 + 0.1 = 0.7$

(ii) $P(B \mid A) = \frac{P(B \cap A)}{P(A)} = \frac{0.4}{0.6} = \frac{2}{3}$

(iii) $P(A \mid B) = \frac{P(A \cap B)}{P(A)} = \frac{0.4}{0.5} = \frac{4}{5} = 0.8$

(iv) $P(B \cap A') = 0.1$

Q19 $P(A) = \frac{1}{3}$ $P(B) = \frac{1}{4}$ $P(A|B) = \frac{1}{5}$



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

$\frac{1}{5} = \frac{P(A \cap B)}{}$

$\frac{1}{5} \times \frac{1}{4} = P(A \cap B)$

$\frac{1}{20} = P(A \cap B)$

$P(A) = \frac{1}{3}$ $P(A \cap B) = \frac{1}{20}$

$\Rightarrow P(A/B) = \frac{1}{3} - \frac{1}{20}$

$= \frac{17}{60}$

$P(B/A) = \frac{1}{4} - \frac{1}{20}$

$= \frac{1}{5}$

$1 - \left(\frac{17}{60} + \frac{1}{20} + \frac{1}{5}\right) = \frac{7}{15}$

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

$= \frac{\frac{1}{20}}{\frac{1}{3}} = \frac{1}{20} \times \frac{3}{1} = \frac{3}{20}$

Q20 (i) $P(B) = 0.18 + 0.17 + 0.02 + 0.05 = 0.42$

(ii) $P(A \cap C) = 0.08 + 0.02 = 0.1$

(iii) $P(A|B) = \frac{P(A \cap B)}{P(A)} = \frac{0.2}{0.42} = \frac{10}{21}$

(iv) $P(C|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.07}{0.42} = \frac{1}{6}$

(v) $P(A \cap C') = 0.3 + 0.18 = 0.48$

(vi) $P(B \mid A \cap C) = \frac{P(B \cap (A \cap C))}{P(A \cap C)} = \frac{0.02}{0.1} = \frac{1}{5}$