

2025.9.17 HW1

A4 (1) $ABUACUBC$

(2) $\overline{ABUACUBC}$

(3) $\overline{ABC} \cup \overline{A\overline{B}C} \cup \overline{AB\overline{C}}$

(4) $\overline{A} \cup \overline{B} \cup \overline{C}$ 或 \overline{ABC}

A10 (1) $P_1 = \frac{5}{6}$

(2) $P_2 = \frac{4}{6 \times 6} = \frac{1}{9}$

(3) $P_3 = \frac{4}{6 \times 5} = \frac{2}{15}$

A12 (1) 有: $\frac{8 \times 8}{10 \times 10} = \frac{16}{25}$

无: $\frac{8 \times 7}{10 \times 9} = \frac{28}{45}$

(2) 有: $\frac{2 \times 8 \times 2}{10 \times 10} = \frac{8}{25}$

无: $\frac{2 \times 8 \times 2}{10 \times 9} = \frac{16}{45}$

(3) 有: $\frac{4}{5}$

无: $\frac{9 \times 8}{10 \times 9} = \frac{4}{5}$

A14 (1) $P_1 = \frac{2 \times 3 \times 2}{C_3^3} = \frac{12}{35}$

(2) $P_2 = \frac{C_3^3}{C_3^3} = \frac{1}{35}$

(3) $P_3 = \frac{2 \times 3 \times 2}{7 \times 6 \times 5} = \frac{2}{35}$

A15. (1) $P_1 = \frac{1}{9}$

(2) $P_2 = \frac{1 \times 7}{9 \times 8} = \frac{7}{72}$

B1 (1) $A \subset C, B \cap C = \emptyset$.

$P_1 = P(C) - P(A) = 0.1$

(2) $P_2 = P(A \cup B) = P(A) + P(B) = 0.6$

(3) $P_3 = 1 - P(A \cup B \cup C) = 1 - P(B) - P(C) = 0.3$

B2. $P = \frac{1}{C_{50}^2} = \frac{1}{1225}$

2025.9.24 HW2

A20. (1) A_i : 取甲 ($i=1$) / 乙 ($i=2$) 盒

B : 1红1白

$P(B) = P(B|A_1)P(A_1) + P(B|A_2)P(A_2)$

$= \frac{6}{10} \times \frac{1}{2} + \frac{8}{15} \times \frac{1}{2} = \frac{17}{30}$

(1) A_1 : 取出红球, A_2 : 取出白球.

B : 乙中取出红球

$P(B) = P(B|A_1)P(A_1) + P(B|A_2)P(A_2)$

$= \frac{3}{7} \times \frac{3}{5} + \frac{2}{7} \times \frac{2}{5} = \frac{13}{35}$

(3) C: 乙中取出1红1白.

$$P(C) = P(C|A_1)P(A_1) + P(C|A_2)P(A_2) \\ = \frac{12}{21} \times \frac{3}{5} + \frac{10}{21} \times \frac{2}{5} = \frac{56}{105} = \frac{8}{15}$$

A22. A_i : 产品来自 i 工厂

B : 产品为优质品

$$\text{则 } P(A_1|B) = \frac{P(A_1)P(B|A_1)}{\sum P(A_i)P(B|A_i)} = \frac{6 \times 85\%}{6 \times 85\% + 5 \times 90\% + 4 \times 80\%} = \frac{51}{128}$$

$$P(A_2|B) = \frac{45}{128}$$

$$P(A_3|B) = \frac{32}{128} = \frac{1}{4}$$

最有可能来自甲工厂

B6. (1) A_i : 取了第 i 组

B : 第一次取到的是优质品.

$$P(B) = P(B|A_1)P(A_1) + P(B|A_2)P(A_2) \\ = \frac{1}{3} \times \frac{1}{2} + \frac{3}{4} \times \frac{1}{2} = \frac{13}{24}$$

(2) C : 第2次取到的不是优质品.

$$P(C|B) = \frac{P(B|A_1)P(A_1) + P(B|A_2)P(A_2)}{P(B)} \\ = \frac{\frac{1}{3} \times \frac{20}{29} \times \frac{1}{2} + \frac{3}{4} \times \frac{5}{19} \times \frac{1}{2}}{\frac{13}{24}} = \frac{2825}{7163}$$

B7. (1) A: 系统正常工作.

$$\alpha = P(A) = P_1 P_2 P_3 P_4 + P_1 P_2 P_3 (1 - P_4) + P_1 P_2 P_4 (1 - P_3) + P_1 P_3 P_4 (1 - P_2) + P_2 P_3 P_4 (1 - P_1).$$

$$(2) \beta = \frac{P_1 P_2 P_3 P_4}{\alpha}$$

(3) B: 恰有2次正常工作.

$$\text{则 } \gamma = P(B) = C_3^2 (1 - \alpha) \alpha^2 = 3(1 - \alpha) \alpha^2.$$

B8. 设 A_1 : 出现雾霾, B : 居民戴口罩.

$$\begin{aligned} (1) P(B) &= P(B|A_1)P(A_1) + P(B|\bar{A}_1)P(\bar{A}_1) \\ &= 0.2 \times 0.4 + 0.01 \times 0.6 \\ &= 0.086 \end{aligned}$$

(2) C: 至少有1位居民戴口罩.

$$\begin{aligned} P(C) &= P(C|A_1)P(A_1) + P(C|\bar{A}_1)P(\bar{A}_1) \\ &= (1 - 0.8^3) \times 0.4 + (1 - 0.99^3) \times 0.6 \\ &= 0.1952 + 0.5999994 \times 0.078206 \\ &= 0.7951994 \approx 0.2130206 \end{aligned}$$

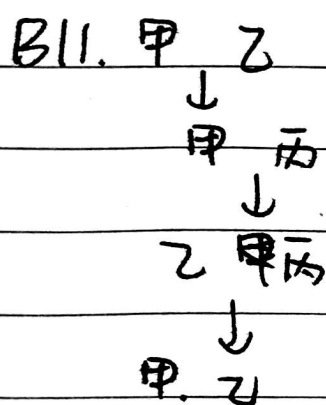
B10. 记 A_i : 飞机坠落在 i 区域 ($i=1:A; 2:B; 3:C$).

B : 有残骸被发现

C : 搜索了 A, B 均无残骸发现

$$P(A_3|C) = \frac{P(A_3)P(C|A_3)}{P(C|A_1)P(A_1) + P(C|A_2)P(A_2) + P(C|A_3)P(A_3)}$$

$$= \frac{0.1}{0.7 \times 0.7 + 0.6 \times 0.2 + 1 \times 0.1} = \frac{10}{71}$$



A : 甲胜利

B : 乙胜利

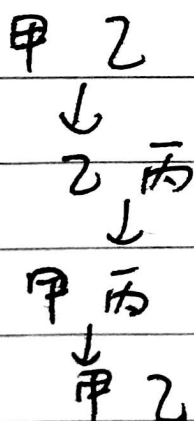
C : 丙胜利

$$P(A) = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^5 + \dots$$

$$+ \left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^7 + \dots$$

$$= \frac{\frac{1}{4}}{1 - \frac{1}{8}} + \frac{\frac{1}{16}}{1 - \frac{1}{8}}$$

$$= \frac{\frac{5}{16}}{\frac{7}{8}} = \frac{5}{14}$$



$$P(B) = \frac{6}{14}$$

$$P(C) = 2 \times \left(\left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^6 + \dots\right)$$

$$= 2 \times \frac{1}{8} \times \frac{1}{1 - \frac{1}{8}}$$

$$= \frac{2}{7}$$