Post-class

29 October 2009

1.4 5 a. P(one player is successful) =

$$P(A_1 \cap A_2' \cap A_3') + P(A_1' \cap A_2 \cap A_3') + P(A_1' \cap A_2' \cap A_3)$$

probability A_1 is successful, A_2 and A_3 are not

Because they are independence:

$$0.5 \cdot 0.3 \cdot 0.4 + 0.5 \cdot 0.7 \cdot 0.4 + 0.5 \cdot 0.3 \cdot 0.6$$

$$= \boxed{0.29}$$

b. P(two players are successful)

$$P(A_1 \cap A_2 \cap A_3') + P(A_1 \cap A_2' \cap A_3) + P(A_1' \cap A_2 \cap A_3)$$

$$= 0.5 \cdot 0.7 \cdot 0.4 + 0.5 \cdot 0.3 \cdot 0.6 + 0.5 \cdot 0.7 \cdot 0.6$$

$$= \boxed{0.44}$$

7. a. $P(A \cap B \cap C) = 0.5 \cdot 0.8 \cdot 0.9 = \boxed{0.36}$

b $P(A \cap B \cap C') + P(A \cap B' \cap C) + P(A' \cap B \cap C)$

$= 0.5 \cdot 0.8 \cdot 0.1 + 0.5 \cdot 0.2 \cdot 0.9 + 0.5 \cdot 0.8 \cdot 0.9 = \boxed{0.49}$

c $P(A' \cap B' \cap C') = 0.5 \cdot 0.2 \cdot 0.1 = \boxed{0.01}$

11. We want to find the probability that we choose 3 white balls in the first five (event A) ~~multip~~ AND the probability the 6^{th} ball is white (event B)

a. $P(A) = {}_5C_3 \cdot 0.5^5 = 0.3125$

$P(B) = 0.5$

$P(A \cap B) = 10 \cdot 0.5^6 = 0.15625$

A and B are independent

b. $P(A) = {}_5C_3 \cdot \dfrac{10 \cdot 9 \cdot 8 \cdot 10 \cdot 9}{20 \cdot 19 \cdot 18 \cdot 17 \cdot 16}$

white ball choices

red ball choices

${}_5C_3$ ways this can happen

# of balls that can be chosen w/o replacement

$P(B) = \dfrac{7}{15}$ ← 7 white ← 15 total

$$\boxed{P(A \cap B) = 10 \cdot \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 10 \cdot 9}{20 \cdot 19 \cdot 18 \cdot 17 \cdot 16 \cdot 15}}$$

1.5

5. $P(\text{death} \mid \text{critical}) = \dfrac{P(\text{death}) \cap P(\text{critical})}{P(\text{death})}$

$= \dfrac{0.2 \cdot 0.3}{0.2 \cdot 0.3 + 0.3 \cdot 0.1 + 0.5 \cdot 0.01}$

$= \dfrac{0.06}{0.095} = \dfrac{60}{95} = \boxed{0.632}$

7. $P(\text{smoker} \mid \text{death}) = \dfrac{P(\text{smoker}) \cap P(\text{death})}{P(\text{death})}$

$= \dfrac{0.1 \cdot 0.05}{0.1 \cdot 0.05 + 0.9 \cdot 0.005} =$

$= \dfrac{0.005}{0.0095} = \dfrac{50}{95} = \boxed{0.526}$

9 a. $P(\text{disease} \mid \text{test positive}) = \dfrac{P(\text{disease}) \cap P(\text{test positive})}{P(\text{test positive})}$

$= \dfrac{0.0005 \cdot 0.99 \cancel{+ 0.9995 \cdot 0}}{0.0005 \cdot .99 + 0.03 \cdot 0.9995}$

$= \boxed{0.016}$

b. $P(\overset{\text{no}}{\text{disease}} \mid \text{test positive}) = 1 - P(\text{disease} \mid \text{test positive})$

$= \boxed{0.984}$