Computer Science 1820

Solutions for Recommended Exercises

Section 6.3

---

2. $P(E\,|\,F) \;=\; \dfrac{P(E\cap F)}{P(F)} \;=\; \dfrac{P(E)\cdot P(F\,|\,E)}{P(F)} \;=\; \dfrac{(2/3)\cdot(5/8)}{3/4} \;=\; \dfrac{10/24}{3/4} \;=\; \dfrac{5}{12}\cdot\dfrac{4}{3} \;=\; \boxed{5/9.}$

4. Let F be the event that Ann picks the *first* box, S be the event that she picks the *second* box, and O be the event that she selects an *orange* ball. Then, by Bayes' Theorem,

$$P(S\,|\,O) \;=\; \frac{P(S)\cdot P(O\,|\,S)}{P(S)\cdot P(O\,|\,S)\,+\,P(\overline{S})\cdot P(O\,|\,\overline{S})} \;=\; \frac{P(S)\cdot P(O\,|\,S)}{P(S)\cdot P(O\,|\,S)\,+\,P(F)\cdot P(O\,|\,F)}$$

$$=\; \frac{(1/2)\cdot P(O\,|\,S)}{(1/2)\cdot P(O\,|\,S)\,+\,(1/2)\cdot P(O\,|\,F)} \;=\; \frac{(1/2)\cdot P(O\,|\,S)}{(1/2)\cdot P(O\,|\,S)\,+\,(1/2)\cdot(3/7)}$$

$$=\; \frac{(1/2)\cdot(5/11)}{(1/2)\cdot(5/11)\,+\,(1/2)\cdot(3/7)} \;=\; \frac{(1/2)\cdot(5/11)}{(1/2)\cdot(5/11)\,+\,(1/2)\cdot(3/7)}\cdot\frac{2}{2}$$

$$=\; \frac{5/11}{(5/11)+(3/7)} \;=\; \frac{5/11}{(35/77)+(33/77)} \;=\; \frac{5/11}{68/77} \;=\; \frac{5}{11}\cdot\frac{77}{68} \;=\; \boxed{35/68.}$$

6. Let T be the event that a player *tests* positive for steroids and U be the event that the player *uses* steroids. Then, by Bayes' Theorem,

$$P(U\,|\,T) \;=\; \frac{P(U)\cdot P(T\,|\,U)}{P(U)\cdot P(T\,|\,U)\,+\,P(\overline{U})\cdot P(T\,|\,\overline{U})} \;=\; \frac{P(U)\cdot P(T\,|\,U)}{P(U)\cdot P(T\,|\,U)\,+\,(1-P(U))\cdot P(T\,|\,\overline{U})}$$

$$=\; \frac{0.05\cdot P(T\,|\,U)}{0.05\cdot P(T\,|\,U)\,+\,(1-0.05)\cdot P(T\,|\,\overline{U})} \;=\; \frac{0.05\cdot P(T\,|\,U)}{0.05\cdot P(T\,|\,U)\,+\,0.95\cdot P(T\,|\,\overline{U})}$$

$$=\; \frac{0.05\cdot 0.98}{0.05\cdot 0.98\,+\,0.95\cdot P(T\,|\,\overline{U})} \;=\; \frac{0.05\cdot 0.98}{0.05\cdot 0.98\,+\,0.95\cdot 0.12} \;=\; \frac{0.049}{0.049+0.114} \;=\; \frac{0.049}{0.163}$$

$$=\; \boxed{49/163.}$$