1. The sample space of a fair coin flip is \{H,T\}.
   
   The sample space of a sequence of three fair coin flips is all \(2^3\) possible sequences of outcomes: \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}.
   
   The sample space of a sequence of five fair coin flips in which at least four flips are heads is \{HHHHH, HHHHT, HHHTH, HHTHH, HTHHH, THHHH\}.
   
   The probability of heads doesn’t matter (unless it’s 0 or 1).

2. \(P(\text{sum is 8}) = P(2,6) + P(6,2) + P(3,5) + P(5,3) + P(4,4) = \frac{5}{36}\)
   
   \(P(\text{sum is 8}| \text{first is 3}) = P(5) = \frac{1}{6}\)

3. \(P(\text{disease}|\text{positive}) = \frac{P(\text{positive}|\text{disease})P(\text{disease})}{P(\text{positive})} = \frac{P(\text{positive}|\text{disease})P(\text{disease})}{P(\text{positive}|\text{disease})P(\text{disease}) + P(\text{positive}|\text{no disease})P(\text{no disease})}\)
   
   \(= \frac{0.95 \times 0.001}{(0.95 \times 0.001) + (0.05 \times 0.999)} \approx 0.0187\)

4. \(P(\neg T, \neg C) = 1 - (0.05 + 0.05 + 0.1) = 0.8\)
   
   \(P(T) = 0.05 + 0.05 = 0.1\)
   
   \(P(C) = 0.05 + 0.1 = 0.15\)
   
   They are not independent.
   
   \(P(T|C) = \frac{0.05}{0.05 + 0.1} = \frac{1}{3} \neq 0.1 = P(T)\).

5. \(P(A \cap B) = P(\text{first roll is 3}) = \frac{1}{6}\)
   
   \(P(A \cap C) = P(\text{first roll is 3 and second roll is a 6}) = \frac{1}{36}\)
   
   \(P(B \cap C) = P(\text{rolls are (3,6), (4,5), or (5,4)}) = \frac{3}{36} = \frac{1}{12}\)
   
   \(P(A \cap B \cap C) = P(\text{first roll is 3 and second roll is a 6}) = \frac{1}{36}\)

6. \(P(\text{biased}|\text{all 10 heads}) = \frac{P(\text{all 10 heads}|\text{biased})P(\text{biased})}{P(\text{all 10 heads})} = \frac{P(\text{all 10 heads}|\text{biased})P(\text{biased})}{P(\text{all 10 heads})P(\text{biased})} = \frac{1 \times 0.001}{(1 \times 0.001) + (0.5^{10} \times 0.999)} \approx 0.506\)