Both of the following problems relate to the following game: First, a fair coin is tossed. If the coin comes up heads, Spinner A is spun. If tails comes up, Spinner B is spun. You win the amount of money that the arrow points to.

![Spinners](image)

1. What is the expected amount of money that you will win? (5 points)

   **Solution:** The outcomes of the game are winning $0, $1, $2, and $3. To find the expected value, we need to compute the probability of each of these outcomes:

   \[
   P(\$0) = (0.5)(0.5) + (0.5)(0.25) = 0.375 \\
   P(\$1) = (0.5)(0.25) + (0.5)(0.5) = 0.375 \\
   P(\$2) = (0.5)(0.25) = 0.125 \\
   P(\$3) = (0.5)(0.25) = 0.125
   \]

   The expected amount of money you will win is \(0.375)(0)+(0.375)(1)+(0.125)(2)+(0.125)(3) = \$1\).

2. Suppose you win $1. What is the probability that the coin came up heads? (5 points)

   **Solution:** This problem is a conditional probability problem, but Bayes’s Formula is used here specifically because you know something about the probability that you win $1 if the coin comes up heads (or tails), and you want to find the reverse: The probability that the coin came up heads if you won $1. Then

   \[
   P(\text{heads} \mid \text{win } \$1) = \frac{P(\text{heads} \cap \text{win } \$1)}{P(\text{win } \$1)} = \frac{P(\text{heads}) \cdot P(\text{win } \$1 \mid \text{heads})}{P(\text{heads}) \cdot P(\text{win } \$1 \mid \text{heads}) + P(\text{tails}) \cdot P(\text{win } \$1 \mid \text{tails})} = \frac{(0.5)(0.25)}{(0.5)(0.25) + (0.5)(0.5)} = \frac{1}{3}.
   \]