Independent or Dependent Events Homework

1. Make a tree diagram for this experiment: Toss a four-sided die and then a coin. List the outcomes and their probabilities. Are these independent events?

   1. The outcome of the die roll does not impact the probability of the coin flip. Therefore, the events are independent.

   2. Refer to the eight buttons below for the following three parts.

   Part A. Find the probability for each event if the button is replaced.
   a. white button twice \( \left( \frac{2}{8} \right) \left( \frac{3}{8} \right) = \frac{6}{64} \)
   b. gray button then a white button \( \left( \frac{5}{8} \right) \left( \frac{3}{8} \right) = \frac{15}{64} \)
   c. gray button twice \( \left( \frac{5}{8} \right) \left( \frac{5}{8} \right) = \frac{25}{64} \)

   Part B. Find the probability for each event if the button is not replaced.
   a. white button twice \( \left( \frac{2}{7} \right) \left( \frac{3}{6} \right) = \frac{6}{56} \)
   b. gray button then a white button \( \left( \frac{5}{8} \right) \left( \frac{3}{7} \right) = \frac{15}{56} \)
   c. gray button twice \( \left( \frac{5}{8} \right) \left( \frac{4}{7} \right) = \frac{20}{56} \)

   Part C. Comparing parts A and B, what happens to the probabilities when the buttons are not replaced. Explain what this means.

   The second button draw would then depend on the first draw since we will be removing one of the possible outcomes. This changes the probability of second draw.
3. In a bag, there are 4 red marbles, 5 white marbles, and 6 blue marbles. Once a marble is selected it is not replaced in the bag. Find the probability of each.

a. red marble then a white marble \( \left( \frac{4}{15} \right) \left( \frac{5}{14} \right) \)

b. a blue marble then a red marble \( \left( \frac{6}{15} \right) \left( \frac{4}{14} \right) \)

c. two red marbles in a row \( \left( \frac{4}{15} \right) \left( \frac{3}{14} \right) \)

d. blue marble three times in a row \( \left( \frac{5}{15} \right) \left( \frac{4}{14} \right) \left( \frac{6}{13} \right) \)

e. a red, white, then a blue marble \( \left( \frac{4}{15} \right) \left( \frac{5}{14} \right) \left( \frac{6}{13} \right) \)

4. A skilled archer on the US Olympic team is shooting at a target. Her chances of hitting the bulls-eye is 98% each time she shoots.

a. Make a tree diagram of her first two shots.

\[
\begin{array}{c}
(\text{18)}B \quad (\text{12)}M \\
(\text{2}M \quad (\text{18})B \\
\end{array}
\]

b. What is the probability that the archer will hit the bulls-eye both times? \( \left( \frac{18}{100} \right) \left( \frac{18}{100} \right) \)

c. What is the probability that the archer will hit the bulls-eye at least once? \( 1 - \left( \frac{4}{10000} \right) \)

d. What is the probability that the archer will miss the bulls-eye both times? \( \left( \frac{2}{100} \right) \left( \frac{2}{100} \right) = \frac{4}{10000} \)

5. State if the following events are independent or dependent.

a. tossing a penny then a nickel \( \text{INDEPENDENT} \)

b. your hand when playing a game of poker with three friends \( \text{DEPENDENT} \)

c. getting a raise and buying a new car \( \text{DEPENDENT} \)

d. having a large shoe size and having a high IQ \( \text{INDEPENDENT} \)

6. Suppose the weather man tell you that \( P(\text{sunny}) = 0.70 \) and \( P(\text{good surfing}) = 0.40 \).

a. Find \( P(\text{sunny and good surfing}) \) \( P(\text{sunny}) \cdot P(\text{surfing}) = (0.7) \cdot (0.4) = 0.28 \)

b. Find \( P(\text{sunny or good surfing}) = 0.7 + 0.4 - 0.28 = 0.82 \)

c. Discuss the differences in the two results.

The probability in (a) is looking for the overlapping probability that the events happen.
The probability in (b) is looking for the total probability that one of the events happens or both happens.