Name: Key Date: _____ Bell: _____

AP Stats

Probability Review IC

Answer each question.

1. Suppose that 26% of freshmen at a university took AP Calculus in high school, 17% took AP Statistics, and 6% took both AP Calculus and AP Statistics. Choose a freshman from this university at random.
   a. If you know the student took AP Calculus, what is the probability that the student also took AP Statistics?
   $.06/.26 = 0.231 = \boxed{23.1\%}$
   b. If you know the student took AP Statistics, what is the probability that the student also took AP Calculus?
   $.06/.17 = .353 = \boxed{35.3\%}$
   c. Are taking AP Calculus and taking AP Statistics independent events?
   $P(\text{Calc}) = 26\%$ $P(\text{Calc}|\text{Stats}) = 35.3\%$ $\boxed{\text{No}}$
   d. Are taking AP Calculus and taking AP Statistics disjoint events?
   No; 6% took both
2. Suppose A and B are independent events such that $P(A) = 0.4$ and $P(B^C) = 0.3$. What is $P(A \cup B)$?
   $P(A) = .4$ $P(B) = .7$ $P(A \cap B) = (.4)(.7) = .28$ $P(A \cup B) = .4 + .7 - .28 = \boxed{0.82}$
3. In women's tennis, the first player to win two sets wins the match. (If the same player wins the first set and the second set, then the match ends. Otherwise, the players play a third set, and the winner of the third set wins the match.) Suppose that when Serena plays Venus, Serena wins any given set with probability 0.6, and the outcomes of different sets are independent of one another.
   a. What is the probability that Serena wins the match?
   ① $(0.6)(0.6) = 0.36$
   ② $(0.6)(0.4)(0.6) = 0.144$
   ③ $(0.4)(0.6)(0.6) = 0.144$
   $0.36 + 0.144 + 0.144 = \boxed{0.648}$
   b. If Serena wins the first set, what is the probability that she wins the match?
   $\boxed{0.84}$
   0.6
   $(0.4)(0.6) = 0.24$ $0.6 + 0.24$
   c. If Serena wins the match, what is the probability that she won the first set?
   $\frac{0.36 + 0.144}{0.648} = \frac{0.504}{0.648} = \boxed{0.778}$
4. Consider a die with three sides painted red, two sides painted blue, and one side painted yellow. Suppose you roll the die 7 times.
   a. What is the probability that you get red on the first roll and blue on the second roll?
   $(\frac{3}{6})(\frac{2}{6}) = \frac{6}{36} = \boxed{\frac{1}{6}}$
   b. What is the probability that you get the same color on the first and second rolls?
   Red: $(\frac{3}{6})(\frac{3}{6}) = \frac{1}{4}$ Blue: $(\frac{2}{6})(\frac{2}{6}) = \frac{1}{9}$ Yellow: $(\frac{1}{6})(\frac{1}{6}) = \frac{1}{36}$
   $\frac{1}{4} + \frac{1}{9} + \frac{1}{36} = \boxed{\frac{7}{18}}$
   Don't worry about these!
   c. What is the probability that you get blue exactly three times in the seven rolls?
   $(\frac{2}{6})^3(\frac{4}{6})^4 = 0.0073 * (\frac{7 \cdot 6 \cdot 5}{3!}) = \boxed{0.256}$
   d. What is the probability that you get red three times, blue twice, and yellow twice in the seven rolls?
   $(\frac{3}{6})^3(\frac{2}{6})^2 \cdot (\frac{1}{6})^2 = (3.858 \times 10^{-4}) * 210 = \boxed{0.081}$
5. Suppose that in a town, 54% of the people are male, 16% of the people are over 6 feet tall, and 24% of the males are over 6 feet tall.
   a. What is the probability that a randomly chosen person from the town is both a male and over 6 feet tall?
   $(.54)(.24) = 0.1296 = \boxed{12.96\%}$
   b. What is the probability that a randomly chosen person from the town is either a male or is over 6 feet tall?
   $.54 + .24 - .1296 = 0.6504$ $\boxed{65.04\%}$
   c. What is the probability that a randomly chosen person from the town is a male who is not over 6 feet tall?
   $(.54)(.76) = 0.4104$ $\boxed{41.04\%}$