Name: _____ July 11, 2017

FINITE MATH: QUIZ 6

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- The Honor Code is in effect for this quiz. All work must be your own.
- Please turn off all cellphones or any other electronic devices.
- Calculators are NOT allowed.
- There are 11 points available to try for. It is NOT possible to get more than 10 points on this quiz.
- The quiz lasts 12 minutes.

Useful Formulas

- IE: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- IE for mutually exclusive events: $P(A \cup B) = P(A) + P(B)$
- CP: $P(E) = 1 - P(E')$
- $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$ and $P(A \cap B) = P(B)P(A|B) = P(A)P(B|A)$
- Independence: $P(A \cap B) = P(A)P(B)$
- DeMorgan Laws: $(A \cup B)' = A' \cap B' \quad$ and $\quad (A \cap B)' = A' \cup B'$
- $n! = n \cdot (n-1) \cdot (n-2) \cdots 3 \cdot 2 \cdot 1$
- $P(n,k) = \underbrace{n \cdot (n-1) \cdot (n-2) \cdots (n-k+1)}_{k \text{ factors multiplied}} = \dfrac{n!}{(n-k)!}$
- Rearrangements with multiplicities: $\dfrac{n!}{r_1! \cdot r_2! \cdots r_k!}$
- $C(n,k) = \binom{n}{k} = \dfrac{n!}{k!(n-k)!} = \dfrac{P(n,k)}{k!}$

Problem 1. Suppose you have **four bags** with marbles, and bag each contains exactly 5 red (R), 3 white (W), and 8 yellow (Y). You select **one marble from each bag**.

a) (2pt) What is the probability that you will draw R, W, Y, R, **in that order**?

b) (2pt) How does your answer change if you only select the 4 marbles **from a single bag with replacement**, one at a time, and you want to draw R, W, Y, R, in that order?

c) (2pt) How does your answer change if you only select the 4 marbles **from a single bag without replacement**, one at a time, and you want to draw R, W, Y, R, in that order?

Problem 2. (1pt) Two bags contain red (R) and white (W) marbles:

$$\underbrace{\boxed{3R \quad 5W}}_{Bag\ 1} \qquad \underbrace{\boxed{7R \quad 4W}}_{Bag\ 2}$$

You pick one of the two bags at random (each bag is equally likely to be picked), and select a marble. What is the probability that the marble is Red?

Problem 3. (2pt) Pick two numbers at random from among $\{1, 2, 3, 4\}$, and add them up. Given that at least one of the numbers is a 2, what is the probability that their sum is a 5?

Problem 4. (2pt) A sample space S contains 100 equally likely outcomes. Consider the events E and F satisfying

$$n(E \setminus F) = 20 \qquad n(F \setminus E) = 30 \qquad n(E \cap F) = 30$$

Determine if the events are independent or not.