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ISyE 3027A  
Test 1

[30]

1. Suppose  $P(A) = .4$ ,  $P(B) = .5$ , and  $P(A | B) = .6$ . Compute

- (a)  $P(A')$ ?
- (b)  $P(A \cap B)$ ?
- (c)  $P(A \cup B)$ ?
- (d)  $P(B | A)$ ?
- (e)  $P(B | A')$ ?

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2. Suppose  $S = \{a, b, c\}$ ,  $P(a) = 2/10$ ,  $P(b) = 3/10$ ,  $X(a) = 3$ ,  $X(b) = 5$ ,  $X(c) = 3$ ,  $Y(a) = 4$ ,  $Y(b) = 4$ ,  $Y(c) = 4$ . Compute

- (a)  $\Pr\{X = 3\}$ ?
- (b)  $\Pr\{X < 4\}$ ?
- (c)  $\Pr\{X = 3 | X < 4\}$ ?
- (d)  $\Pr\{Y = 4, X = 2\}$ ?
- (e) the probability mass function of  $X$ ?

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3. Some important distributions are: Bernoulli, exponential, geometric, binomial, hypergeometric, Poisson, uniform, Erlang, gamma, beta, normal, and chi-squared (some of these are “red herrings;” i.e., intended to mislead you). What would be the most reasonable guess for each of the following situations (give the simplest that seems appropriate)?

- (a) Whether or not a tornado touches down next month in Georgia.
- (b) The number of years out of the next 10 that Georgia has tornadoes touching down.
- (c) The number of years until there is a tornado causing more damage in Georgia than the damage incurred this year.
- (d) The number of years until there is a year with no tornadoes in Georgia.
- (e) Whether in the next 10 years, there are more than 5 years with tornadoes touching down in Georgia.

[30]

4. Suppose you are dealt 6 cards at random from a standard 52 card deck. In the following questions, do not simplify your answer. Leave it in terms of factorials or  $()$ .

- (a) What is the probability of 4 of one rank and two cards from another rank?
- (b) What is the probability of 2 triples, i.e. 3 of one rank and 3 of another rank?

5. There are 3 sources for a particular component. We purchase 60% from Source A, 30% from B, and 10% from C. Based on past data, we know that 1% of the items supplied by A and 2% of the items from B and C are defective.

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- (a) What is the probability of a randomly selected component being defective?
- (b) Given that a component is defective, what is the probability that it came from Source B?