

Name: _____

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July 16, 1998

ISyE 3027B
Test 1

[30]

1. Suppose $P(A) = .3$, $P(B) = .5$, and $P(A | B) = .6$. Compute

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

[30]

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

[30]

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 4 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 3 of one rank and 1 card from another rank?
- (b) What is the probability of 2 pairs, i.e. 2 of one rank and 2 of another rank?

5. There are 3 sources for a particular component. We purchase 70% from Source A, 20% 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?