

Practice Exam 1

Name: _____

1: Two events E and F are independent with $\Pr(E) = .5$ and $\Pr(F) = .7$.

a) Draw a venn diagram depicting these sets in a sample space of all possibly outcomes.

b) Find $\Pr(E \cup F)$. c) Find $\Pr(E \cup F^c)$. d) Find $\Pr(E|F)$.

2: Two events E and F are disjoint with $\Pr(E) = .2$ and $\Pr(F) = .3$.

a) Draw a venn diagram depicting these sets in a sample space of all possibly outcomes.

b) Find $\Pr(E \cup F)$. c) Find $\Pr(E \cup F^c)$. d) Find $\Pr(E|F)$.

3: A random variable X has the following distribution:

x	0	1	2	3
$\Pr(X = x)$.5	.2	.2	.1

a) Find EX and $\text{Var}(X)$.

b) Let $g(X) = 2X - 1$. Find $Eg(X)$ and $\text{Var}(g(X))$.

4: Let X have a geometric distribution with probability of success $p = 1/3$. That is, X has probability mass function $f(k) = \frac{1}{3} \left(\frac{2}{3}\right)^{k-1}$ for $k = 1, 2, 3, \dots$. Show analytically that the mean of X is 3. Show all your work for credit.

5: Suppose that the prevalence of prostate cancer in a certain male population is 30% and that high levels of prostate specific antigen (PSA) in the blood is used as a screen for prostate cancer. Approximately 20% of men with prostate cancer have normal PSA levels and approximately two thirds of men with high PSA levels do not have cancer. For this test, find the

a) Sensitivity b) Specificity c) Predictive value positive d) Predictive value negative

6: Find the probability of getting at least one 6 on three rolls of a fair 6-sided die.

7: Consider a bridge hand with 13 cards drawn at random from a standard deck. What is the probability that the hand contains 7 hearts.

8: List at least three sources of error for a poll that are not included in the standard error given by the Binomial probability model.