

MAT 2379 3X (Spring 2012)
Assignment 2
Deadline: Thursday, May 30, 2013 (in class)
There are a total of 5 questions.

1. A test is being developed to detect a particular disease. To evaluate the diagnostic test, we obtained the following data:

	$D = \text{"disease"}$	$D^c = \text{"no disease"}$
positive result	170	25
negative result	5	150
total	175	175

- (a) Determine the false positive rate and the false negative rate for this test.
- (b) Determine the specificity and the sensitivity for this test.
- (c) What is the prevalence of the disease among these subjects?
- (d) Assume that we apply the test on a patient who is a member of a population where the prevalence for this disease is 1%. The test result is positive. What is the probability that this patient has the disease?
2. A frizzled fowl has genotype FF , a normal fowl has genotype ff , and a fowl with genotype Ff is slightly frizzled. This is an example of codominant alleles. Use a Punnett square or a tree diagram to compute the probability that an offspring would be frizzled, in the following cases.
- (a) Both parents are slightly frizzled.
- (b) Only one parent is slightly frizzled and the other is normal.
- (c) Only one parent is slightly frizzled and the other is frizzled.
3. Let A and B be independent events such that $P(A) = 0.35$ and $P(B) = 0.75$. Compute $P(A \cup B)$ and $P(A \cap B)$.

4. Let X be a discrete random variable with the following probability mass function:

x		0	1	2	3
$P(X = x)$		p	$2p$	$3p$	p

- (a) Determine the value of p . *Hint:* Consider the total probability.
 - (b) Compute $P(X > 1)$.
 - (c) Compute the mean of X .
 - (d) Compute the standard deviation of X .
5. Consider a new medication for a particular type of short term pain. The medication was given to 20 patients and 17 reported a significant reduction in their pain. Such pain does subside for about 50% of all patients even without medication. Assuming that the medication has no effect in terms of reducing the pain, compute the probability that at least 17 of 20 patients would report a significant reduction in their pain.