Problem Set 2

Due: Monday, February 11, 2008

Note: We will refer to the text as [YG]. Starred problems are harder than the rest.

Readings: Course Notes for Lectures 3–4 and [YG] Chapter 1 (Sections 1.5–1.10).

Problem 1: [YG] Problem 1.5.2

Problem 2: [YG] Problem 1.5.6

Problem 3

You go shopping, you see that great shirt you always wanted, but you are not sure about the color. You are between blue (B), green (G), red (R), and yellow (Y). You finally decide to pick a color at random. Let E_1 denote the event that you buy either blue or green, i.e., $E_1 = \{B, G\}$. Similarly, let $E_2 = \{B, R\}$ (i.e., you either buy blue or red), and $E_3 = \{B, Y\}$ (i.e., you either buy blue or yellow).

(a) Find $\mathbf{P}[E_1 E_2]$. Are E_1 and E_2 independent ?

(b) Find $\mathbf{P}[E_1 E_3]$. Are E_1 and E_3 independent ?

(c) Find $\mathbf{P}[E_2 E_3]$. Are E_2 and E_3 independent ?

(d) Are E_1, E_2, E_3 mutually independent ?

Problem 4

A hunter has two hunting dogs. One day, on the trail of some animal, the hunter comes to a place where the road diverges into two paths. He knows that each dog, independently of the other, will choose the correct path with probability p. The hunter decides to let each dog choose a path, and if they agree, take that one, and if they disagree, to randomly pick a path. Is his strategy better than just letting one of the two dogs decide on a path?

Problem 5: [YG] Problem 1.6.7

Problem 6: [YG] Problem 1.7.8

Problem 7

A magnetic tape storing information in binary form has been corrupted. Imagine that you are to make an effort to save as much information as possible. Due to the damage on the tape, you know that there will be errors in the reading. You know that if there was a 0, the probability that you

correctly detect it is .9. The probability that you correctly detect a 1 is .85. Given that the each digit is a 1 or a 0 with equal probability, and given that you read in a 1, what is the probability that this is a correct reading?

Problem 8: [YG] Problem 1.8.4

Problem 9

A flexible manufacturing cell (FMC) consists of m machines. Each machine can be set up to produce any of p part-types.

(a) Find the total number of ways in which the m machines can be set up.

(b) Find the number of setups given that m_i machines must be set up to produce part-type i, for all $i = 1, \ldots, p$, where $m_1 + \ldots + m_p = m$.

Problem *10

(a) How many vectors of positive integers $(m_1, \ldots, m_p)$ that satisfy $m_1 + \ldots + m_p = m$ exist ?

(b) How many vectors of nonnegative integers $(m_1, \ldots, m_p)$ that satisfy $m_1 + \ldots + m_p = m$ exist ?