Key.

**Quiz 4**
**Statistics for Business (22S:008, Bognar)** **September 20, 2006**

1. *(8 pts)* During 2005, the Minnesota Department of Health approximated that the prevalence of Chlamydia in the state is approximately 248 cases per 100,000 residents (i.e. $P(C) = 0.00248$). If 2 Minnesotans are randomly selected, approximate the probability that the first person has Chlamydia *or* the second person has Chlamydia (i.e. find $P(C_1 \text{ or } C_2)$). *Assume independence. Show all of your work using good notation.*

$$P(C_1 \text{ or } C_2) = P(C_1) + P(C_2) - P(C_1 \text{ and } C_2) \quad \because \text{not m.e.}$$
$$= P(C_1) + P(C_2) - P(C_1)P(C_2) \quad \because \text{indep}$$
$$= 0.00248 + 0.00248 - (0.00248)^2$$
$$= 0.0049538496$$

2. *(12 pts)* Suppose a bowl has 5 chips; 1 chip is colored black, and the remaining 4 chips are colored red. Suppose *two* chips are selected at random *without* replacement.

   (a) *(6 pts)* Find the probability that the first chip is black *and* the second chip is red (i.e. find $P(B_1 \text{ and } R_2)$). *Show all of your work using good notation.*

$$P(B_1 \text{ and } R_2) = P(B_1)P(R_2|B_1) \quad \because \text{not indep}$$
$$= \frac{1}{5} \cdot \frac{4}{4}$$
$$= \frac{1}{5}$$

   (b) *(6 pts)* Find the probability that the first chip is black *or* the second chip is black (i.e. find $P(B_1 \text{ or } B_2)$). *Hint: we can find the probability of obtaining a black on the second draw via the "law of total probability":* $P(B_2) = P(B_1)P(B_2|B_1) + P(R_1)P(B_2|R_1)$. *Show all of your work using good notation.*

$$P(B_1 \text{ or } B_2) = P(B_1) + P(B_2) \quad \because \text{m.e.}$$
$$= P(B_1) + P(B_1)P(B_2|B_1) + P(R_1)P(B_2|R_1)$$
$$= \frac{1}{5} + \frac{1}{5} \cdot 0 + \frac{4}{5} \cdot \frac{1}{4}$$
$$= \frac{2}{5}$$