Math 111: Introduction to Probability
Quiz 5 — March 11th, 2008 Name: _____

This quiz covers material from section 7.5. Show your work.

**1.** (*4 points*) Suppose $P(A) = .5$, $P(B^c) = .4$, and $P(A \cap B) = .3$. Use the proper formulas to get full credit.

**a.** (*2 pts*) Determine $P(B|A)$.

**Answer:**

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{.3}{.5} = .6$$

**b.** (*2 pts*) Determine if the events $A$ and $B$ are independent.

**Answer:** Since $P(B^c) = .4$, $P(B) = 1 - .4 = .6$. Therefore,

$$P(A) \cdot P(B) = .5 \cdot .6 = .30 \qquad \text{and} \qquad P(A \cap B) = .3$$

Since these are equal, $A$ and $B$ are independent.

**2.** (*2 points*) In a two-child family, what is the probability that both children are girls given that at least one child is a girl? (Assume that the probability of a boy being born is the same as the probability of a girl being born.)

**Answer:** The probability that at least one child is a girl is $\frac{3}{4}$. The probability that both children are girls is $\frac{1}{4}$. Therefore, the conditional probability is,

$$P(A \cap B|A \cup B) = \frac{A \cap B}{A \cup B} = \frac{1/4}{3/4} = \frac{1}{3}$$

**3.** (*2 points*) Suppose the events "you eat an ice-cream sundae today" and "you hit the bullseye of a target" are independent events. If the probability that you eat an ice-cream sundae today is .1 and the probability that you both eat an ice-cream sundae today and hit the bullseye of a target is .05, then what is the probability that you hit the bullseye of a target?

**Answer:** We are given $P(sundae) = .1$ and $P(sundae \cap bullseye) = .05$. Since the events are independent,

$$.05 = P(sundae \cap bullseye) = P(sundae) \cdot P(bullseye) = .1 \cdot P(bullseye)$$

Solving gives $P(bullseye) = .5$.