STAT 400 / MATH 463 Fall 2011

Homework #1

(due Friday, September 2, by 3:00 p.m.)

No credit will be given without supporting work.

1. Suppose that $P(A) = 0.60$, $P(B) = 0.40$, $P(A \cap B) = 0.30$.
What is the probability that …

a) either A occurs or B occurs (or both);

b) B does not occur;

c) B occurs and A does not occur;

d) neither A nor B occurs.

2. Suppose $P(A) = 0.6$, $P(B) = 0.5$, $P(C) = 0.4$,
$P(A \cap B) = 0.3$, $P(A \cap C) = 0.2$, $P(B \cap C) = 0.2$,
$P(A \cap B \cap C) = 0.1$. Find …

a) $P(A \cup B)$;

b) $P(B \cup C)$;

c) $P((A \cup B) \cap C')$;

d) $P(A \cup (B \cap C))$.

3. Suppose a baseball player steps to the plate with the intention of trying to "coax" a base on balls by never swinging at a pitch. The umpire, of course, will necessarily call each pitch either a ball (B) or a strike (S). What outcomes make up the event A, that a batter walks on the sixth pitch? Note: A batter "walks" if the fourth ball is called before the third strike.

4. Consider a "thick" coin with three possible outcomes of a toss (Heads, Tails, and Edge) for which Heads and Tails are equally likely, but Edge is seven times less likely than Heads. What is the probability of Heads ?

5. Suppose $S = \{ 0, 1, 2, 3, \ldots \}$ and

$$P(0) = p, \qquad P(k) = \frac{1}{5^k}, \quad k = 1, 2, 3, \ldots .$$

a) Find the value of p that would make this a valid probability model.

b) Find $P(\text{odd}) = P(1, 3, 5, 7, \ldots)$.

6. Suppose $S = \{1, 2, 3, \ldots\}$ and $P(k) = \dfrac{(\ln 2)^k}{k!}$, $k = 1, 2, 3, \ldots$.

Is this is a valid probability model? *Justify your answer.*

7. A bank classifies borrowers as "high risk" or "low risk," and 16% of its loans are made to those in the "high risk" category. Of all the bank's loans, 5% are in default. It is also known that 40% of the loans in default are to high-risk borrowers.

a) What is the probability that a randomly selected loan is in default and issued to a high-risk borrower?

b) What is the probability that a loan will default, given that it is issued to a high-risk borrower?

c) What is the probability that a randomly selected loan is either in default or issued to a high-risk borrower, or both?

d) A loan is being issued to a borrower who is not high-risk. What is the probability that this loan will default?

8. A family that owns two automobiles is selected at random. Suppose that the probability that the older car is American is 0.70, the probability that the newer car is American is 0.50, and the probability that both the older and the newer cars are American is 0.40.

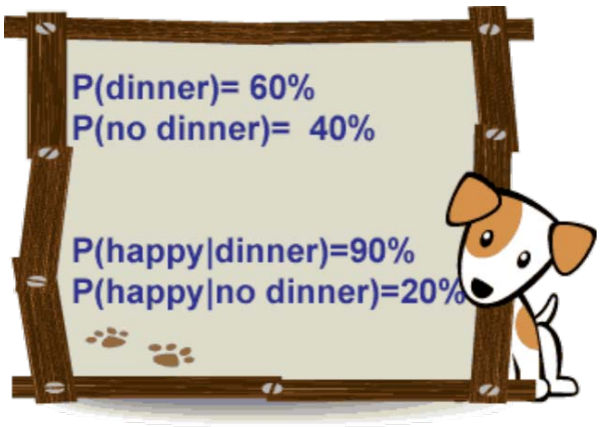
a) Find the probability that at least one car is American (i.e. that either the older car or the newer car, or both cars are American).

b) Find the probability that neither car is American.

c) Suppose that the older car is American. What is the probability that the newer car is also American?

d) What is the probability that the older car is American, given that the newer car is American?

9.



Find …

a) $P(\text{dinner} \mid \text{happy})$.

b) $P(\text{no dinner} \mid \text{not happy})$.

From the textbook: **8th edition** (7th edition)

1.2-4 (1.2-2) **1.2-14** (1.2-12) **1.2-16** (1.2-14)

1.4-4 **1.4-18** **1.6-2**

(same for the 8th and the 7th editions)