W02 Homework A

01

Conditional probability - algebra games

Assume that A_1, A_2, and A_3 partition the sample space, and assume this data:

$P[A_1]$	$P[A_2]$	$P[A_3]$	$P[B \mid A_1]$	$P[B \mid A_2]$	$P[B \mid A_3]$
30%	40%	30%	50%	50%	60%

Find these values:

$P[B]$ $P[A_1 \mid B]$ $P[A_2 \mid B]$ $P[A_3 \mid B]$

02

Bayes' Theorem - Stolen computer

Someone in a coffee shop "promises" to watch your computer while you're in the bathroom.

- If she does watch it, the probability that it gets stolen is 10%.
- If she doesn't watch it, the probability that it gets stolen is 70%.
- You think there's a 90% chance she is honest enough to watch it, having promised.

When you come back from the bathroom, the computer is gone.

What is the probability that she witnessed the theft?

03

Independence algebra

Assume A_1, A_2, and A_3 are mutually independent. Compute $P[A_1 A_2 \cup A_3]$ in terms of $P[A_1]$, $P[A_2]$, and $P[A_3]$.

04

Bin of marbles

A bin contains 5 red marbles, 7 blue marbles, and 3 white marbles.

We draw a random marble. If it's red, we put it back, if it's not red, we keep it. We do this three times.

(a) What is the probability of getting red then white then blue?

(b) Suppose the last draw was blue. What is the probability that the first was red?

05

Counting license plates

A license plate must consist of 3 letters followed by 4 digits. Assuming we choose from 26 letters, A-Z, and 10 digits, 0-9, how many different license plates could be created if:

(a) Letters and numbers cannot be repeated.

(b) Letters and numbers can be repeated except that there must be exactly two 9's.

06

Counting outcomes - permutations and combinations

In a lottery, five distinct numbers are picked at random from $1, 2, 3, \ldots, 40$. How many possible outcomes are there:

(a) If we care about the order of numbers.

(b) If the order does not matter.