Quiz II
Sections 5.3, 6.1
September 9, 2007

NAME: ____________________________________________

DIRECTIONS:

• Do each of the problems and show all work. **No work means no points!**
• Calculators **ARE NOT ALLOWED** on this quiz.
• Box or circle your final solution.
• Cheer for the Cubs to win the Central!

SCORES:

1. ____________
2. ____________
3. ____________
**Problem 1.** How many distinct words can be formed from the letters in: ZAMBRANO?

**Solution.** There are 2 repeated letters, the A’s. There are C(8, 2) ways to arrange the A’s. We have 6 distinct letters remaining. There are P(6, 6) ways to arrange these letters. To get the total number of words, we multiply these two numbers together to get:

\[
C(8, 2) \cdot P(6, 6) = \frac{8!}{(8-2)!2!} \cdot 6!
\]

\[
= \frac{8!}{6!2!} \cdot 6!
\]

\[
= \frac{8!}{2!}
\]

\[
= 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3
\]

\[
= 8 \cdot 7 \cdot 6 \cdot 5 \cdot 12
\]

\[
= 8 \cdot 7 \cdot 6 \cdot 60
\]

\[
= 8 \cdot 7 \cdot 360
\]

\[
= 8 \cdot 2,520
\]

\[
= 20,160
\]

So, there are 20,160 distinct words that can be formed from these letters. □
Problem 2. The Cubs are trying to select a captain. Three players are running: Lee, Ramirez and Soriano. Lee is 4 times as likely to win as Soriano, and Soriano is 2 times as likely to win as Ramirez.

(a) Define a probability function \( P \) for this problem and determine the probability that each person wins. [I would like fractions here.]

(b) Who is least likely to win?

Solution. (a) Putting the given information into math terms we have the following relations: \( P(L) = 4P(S) \), \( P(S) = 2P(R) \). From a theorem, we also have \( P(L)+P(S)+P(R) = 1 \).

So, \( P(L) = 8P(R) \). Plugging the given information into the last equation, we have:
\[
8P(R) + 2P(R) + P(R) = 1, \text{ that is } 11P(R) = 1, \text{ so } P(R) = \frac{1}{11}, \text{ from the above information, we have } P(L) = 8P(R) = 8 \cdot \frac{1}{11} = \frac{8}{11}, \text{ and } P(S) = 2P(R) = 2 \cdot \frac{1}{11} = \frac{2}{11}.
\]

(b) \( P(R) \) is the smallest fraction, so Ramirez has the least probability of winning, so he is least likely to win. \( \square \)
Problem 3. In a sample space consisting of 17 different outcomes,
a) how many events are there with 13 outcomes?
b) how many events are there with 4 outcomes?

Solution. We are just trying to get an event with 13 outcomes, that is just a 13-subset, so we have a combination.
a) We want \( C(17, 13) \) here.

\[
C(17, 13) = \frac{17!}{(17 - 13)!13!}
\]

\[
= \frac{17!}{4!13!}
\]

\[
= \frac{17 \cdot 16 \cdot 15 \cdot 14}{4 \cdot 3 \cdot 2}
\]

\[= 2380\]

b) We simply note that \( 17 - 13 = 4 \), so \( C(17, 4) = C(17, 13) = 2380 \) again.