Math 164
Fall, 2009 Name: **Solutions**
Quiz 10 - §§11.1, 11.2

For each of the following problems circle T if the given statement is always true and F if the statement is sometimes false. There is no partial credit on this part of the quiz.

1. T F For any counting numbers n and m, $(n+m)! = n! + m!$.

   This is false. Think, for instance, of $m = 3$ and $n = 2$. Then the left side is

   $$(3+2)! = 5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

   The right side is

   $$3! + 2! = 3 \cdot 2 \cdot 1 + 2 \cdot 1 = 6 + 2 = 8$$

   which is not the same as the left side.

2. T F For any counting numbers n and m, $(n \cdot m)! = n! \cdot m!$.

   This is false. Think about the case when $m = 3$ and $n = 2$. Then the left side is

   $$(3 \cdot 2)! = 6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

   The right side is

   $$3! \cdot 2! = 3 \cdot 2 \cdot 1 \cdot 2 \cdot 1$$

   which is not the same as the right side.

   Complete the following problems. Show all work and explain your reasoning.

3. Find the number of "words" that can be formed using all of the letters in NONSENSE.

   There are eight letters to rearrange, so there are 8! ways to do this. However, there are duplicate letters: 3 N's, 2 E's and 2 S's.

   Therefore the number of ways is

   $$\frac{8!}{3! \cdot 2! \cdot 2!}$$

4. There is a club with members Alan, Bill, Cathy, David and Evelyn.

   (a) Use the list method to determine how many ways there are to choose a male and a female to decorate for a party.
   Let's start listing:
   AC
   AE
   BC
   BE
   CD
   DE
   So there are 6 ways for this to happen.

(b) Find the number of ways in which you can line up all five members for a photograph.

We will use the fundamental counting principle and choose the person in the first space, then the second and so one. So there are $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5!$ ways for this to happen.