Quiz 1

**Instruction:** No calculators. Show all work clearly and in order. If your answer uses the Counting (multiplication) Principle then you need to explain what each term in the product represents.

1. (4pts) You roll a die ten times. What is the chance of seeing exactly three 6’s?

   *Step 1:* There are \( \binom{10}{3} \) choices for the location of three sixes.
   
   *Step 2:* \( 5^7 \) (non-6) choices for the dice.
   
   \[
P(\text{exactly three 6's}) = \frac{\binom{10}{3} \cdot 5^7}{6^{10}}
   \]

2. (4pts) There are five groups of 3 people. How many ways can you assign these 15 people to a row of 15 chairs, so that all five groups sit together?

   \[5! \text{ ways to order the 5 groups.}\]
   
   \[3! \text{ ways to order each group of three people.}\]
   
   Thus \( 5! \cdot (3!)^5 \) total orderings.

3. (bonus +2 points) In the context of the previous problem, how many ways can you assign the 15 people so that at least four groups sit together?

   #ways for only 2 groups 1,3,3,9 to sit together: \( 7! \cdot (3!)^5 \)
   
   #ways for only 2 groups 1,3,3,9 to sit together 7! \cdot (3!) = 5! \cdot (3!)^5
   
   5 ways to choose the group to be split.
   
   So \( [7! \cdot (3!)^5 - 5! \cdot (3!)^5] \cdot \frac{1}{5} + 5! \cdot (3!)^5 = (3!)^4 \cdot [5 \cdot 7! - 4 \cdot 5!] \).