Math 2366, Quiz #8, Summer 2014          Name _____KEY_____

**Instructions:** Show all work. Justify answers as completely as possible. If you are asked to prove something, mere computation is not enough. You must explain your reasoning. Be sure to state your conclusion clearly. Incomplete work or justification will not receive full credit. Use exact answers unless specifically asked to round.

1. A bagel shop has onion, everything, egg, raisin, plain, poppy seed, salted, rye and cranberry bagels. How many ways are there to choose a dozen bagels?

   9 types    12 each

   $$\binom{9+12-1}{12} = \binom{20}{12} = 125,970$$

2. A book publisher has 3000 copies of a science fiction novel spread between three warehouses. How many ways are there to store these books among those warehouses?

   $$\binom{3002}{3} = 4,504,501,000$$

3. How many strings can be made from the letters in the word INTERSTATE?

   I – 1
   N – 1
   T – 3
   E – 2
   R – 1
   S – 1
   A – 1

   $$\frac{10!}{3! \, 2! \, (1!)^5} = 302,400$$

4. Find the next five elements in lexicographic order for the permutation 23587416.

   23587461          23614578
   23587614          23614587
   23587641