Test 3

1. How many six digit numbers do not have 3 consecutive digits the same? You may consider numbers which start with one or more zeroes, so 003354 and 076458 should be counted, but 000045 and 000000 should not.

2. A survey is done of students eating at a university dining hall. Of the students who ate at least one meal there, 250 ate breakfast, 175 ate lunch and 325 ate dinner. Of these students, 75 ate both breakfast and lunch at the dining hall, 125 ate both breakfast and dinner, and 100 ate both lunch and dinner at the dining hall. Of these, 50 ate all three meals at the dining hall.

   (a) How many students were surveyed in total?

   (b) How many students ate only breakfast at the dining hall?

   (c) How many students ate breakfast and lunch, but not dinner at the dining hall?

   (d) How many students ate just one meal at the dining hall?

   (e) How many students ate exactly 2 meals at the dining hall?

3. A packing plant packs random assortments of chocolates into boxes. If each box conatains 20 chocolates chosen from 10 different types, how many different combinations of chocolates could you get in a box?

   It the packers always put at least one of each flavour in the box, how many different combinations of chocolates are possible now?

4. How many bijections are there from the set $\{1, 2, \ldots, n\}$ to itself?

5. How many bijections of the set $\{1, 2, \ldots, n\}$ to itself do not have $f(k) = k$ for any k.

6. How many ways can a list of length three with no repetition be built from the set $\{1, 2, 3, 4\}$ such that k is never in the kth position of the list?