MS121 Discrete Mathematics, Tutorial 9

1. A restaurant menu has 4 starters, 5 mains and 3 desserts. A value meal consists of a main course together with either a starter or a dessert. How many different value meals are possible?

2. Suppose there are three roads from city A to city B and five roads from city B to city C.
(a) How many ways is it possible to travel from city A to city C via city B?
(b) How many different round-trip routes are there from city A to B to C to B and back to A?
(c) How many different routes are there from city A to B to C to B and back to A in which no road is traversed twice?

3. If a telephone number consists of 6 digits, how many such telephone numbers have at least one repeated digit?

4. A committee of four must be chosen from eight men and ten women. In how many ways can this be done? In how many ways can the committee be chosen if we require that exactly two are men? In how many ways can the committee be chosen if we require that at least two are men? In how many ways can the committee be chosen if we require that at least one man and one woman are on the committee?

5. Show that

$$\binom{n}{0} - \binom{n}{1} + \binom{n}{2} + \ldots + (-1)^n \binom{n}{n} = 0.$$

6. Use binomial coefficients to compute the coefficient of x^4 in the expansion of $(x-2)(x+1)^6$.