MATH221 Mathematics for Computer Science

Outline Solutions to Tutorial Sheet Week 9

Autumn 2017

1. Using notation from the lectures. There are $3^{\underline{5}}$ permutations of 3 things taken 5 at a time. But $3^{\underline{5}} = 0$ since $k > n$.

There are $5^{\underline{3}}$ permutations of 5 things taken 3 as a time, and $5^{\underline{3}} = \frac{5!}{(5-2)!} = 10$.

2. There are $2^5 = 32$ binary words of length 5. There is 1 word that does not contain a 1 (00000) and 1 word that does not contain a 0 (11111). So there are $32 - 2 = 30$ words that contain at least one 0 and at least one 1.

3. This amounts to counting the number of perutations of 5 things taken 3 at a time. Now see above.

4. For the first part there are $n_1 = 26 = n_2 = n_3$ choices for the letters and $n_4 = 10 = n_5 = n_6$ choices for the letters. Giving a total of $(26)^3(10)^3$ possible number plates. With the restriction we have $n_1 = 26$, $n_2 = 25$, $n_3 = 24$, $n_4 = 10$ (0 is allowed to be the first digit), $n_5 = 9$ and $n_6 = 8$ giving $26 \times 25 \times 24 \times 10 \times 9 \times 8$ possible number plates.

For the second part without restriction there are $(26)^4(10)^2$ possible number plates and with restriction there are $26 \times 25 \times 24 \times 23 \times 22 \times 10 \times 9$ possible number plates.