

## Tutorial Sheet 19

### (Sum Rule, Product Rule, Inclusion-Exclusion Principle)

1. Suppose every student in a school has a three-letter initial.
  - (a) How many different three-letter initials can the students have?
  - (b) Find the number of three-letter initial with none of the letters repeated.
  - (c) Find the number of three-letter initial which do not have two consecutive repeated letters.
  
2. Every student in a university has a student number with eight characters. The first three characters are letters and the following five characters are digits.
  - (a) Find the number of possible student numbers in the university?
  - (b) How many student numbers which begin with ENG or end with 0?
  - (c) How many student numbers which begin with BUS or end with 1?
  
3. Find the number of integers from 1 to 1000 inclusive that are
  - (a) divisible by 5
  - (b) divisible by 8
  - (c) divisible by 5 and 8
  - (d) divisible by 5 or 8
  - (e) divisible by 5 but not 8
  - (f) not divisible by 4
  - (g) not divisible by 6
  - (h) divisible by neither 4 nor 6
  
- \*4. Find the number of strings of five English letters that
  - (a) contain no vowels (i) if letters can be repeated, (ii) if letters cannot be repeated
  - (b) start with a vowel (i) if letters can be repeated, (ii) if letters cannot be repeated
  - (c) at least one vowel (i) if letters can be repeated, (ii) if letters cannot be repeated
  - (d) exactly one vowel (i) if letters can be repeated, (ii) if letters cannot be repeated
  - (e) begin with B or end with H (i) if letters can be repeated, (ii) if letters cannot be repeated
  - (f) have C and E at the ends in either orders (i) if letters can be repeated, (ii) if letters cannot be repeated
  - (g) start with C and contain at least one vowel (i) if letters can be repeated, (ii) if letters cannot be repeated

\*Optional