COMP9020 20T1   # Week 8 Problem Set
                                        Counting   Foundations of Computer
                                                                                 Science

[Show with no answers]   [Show with all answers]

1. (Inclusion-Exclusion)

   Let $S = \{a, b, c, d\}$ and $T = \{e, f, g\}$.

   a. How many different relations on $S \times S$ are there?

   b. How many different **antireflexive** relations on $S \times S$ are there?

   c. How many different functions $f : S \longrightarrow T$ are there?

   d. How many different **onto** functions $f : S \longrightarrow T$ are there?

   [show answer]

2. (Combinations)

   A management panel at a hospital needs to include at least one member from each of the
   following three professions: a doctor, a lawyer and an accountant. How many different panels can
   be formed in each of the following situations?

   a. Each profession offers 5 possible candidates. The panel size is 3.

   b. Each profession offers 4 possible candidates, but A. Brent (doctor) refuses to serve with C.
      David (lawyer). The panel size is 3.

   c. Each profession offers 5 possible candidates. The panel size is 5.

   d. Each profession offers 4 possible candidates, but A. Brent (doctor) refuses to serve with C.
      David (lawyer). The panel size is 5.

   [show answer]

3. (Sequences)

   How many sequences of 10 coin flips have at most 3 heads?

   [show answer]

4. (Advanced Counting)

   How many 5-letter words over the alphabet Σ = {*a, c, e, n, s*}

   a. include the substring *ace*?

   b. include all letters from Σ with *a* before *e* (for example, *canes*)?

   c. have all their letters in alphabetical order (for example, *aceen*)?

   [show answer]

5. **Challenge Exercise**

   In a movie theatre, 4 couples are sitting in one row with men and women alternating. If no couple
   is sitting together, how many arrangements are possible?

   [show answer]

Assessment

After you have solved the exercises, go to COMP9020 20T1 Quiz Week 8 to answer 4 quiz questions on this week's problem set (Exercises 1-4 only) and lecture.

The quiz is worth 2.5 marks.

There is no time limit on the quiz once you have started it, but the deadline for submitting your quiz answers is **Thursday, 16 April 10:00:00am**.

Please continue to respect the **quiz rules**:

Do …

- use your own best judgement to understand & solve a question
- discuss quizzes on the forum only **after** the deadline on Thursday

Do not …

- post specific questions about the quiz **before** the Thursday deadline
- agonise too much about a question that you find too difficult