

**XJCO1511: Introduction to Discrete Mathematics**

**2023/24**

**Coursework 2**

**Released: Monday, March 25, 2024, at 8 a.m.**

**Due: Friday, April 5, by 5 p.m.**

1. There are 30 books that are all identical copies of the same title, that need to be arranged on a bookshelf with 5 shelves (say shelf 1, shelf 2, shelf 3, shelf 4 and shelf 5). In how many ways can this be done subject to the following conditions.

(a) [4 marks] There is no empty shelf and shelf 5 gets exactly 10 books.

(b) [4 marks] For  $i \in \{1, \dots, 5\}$ , shelf  $i$  gets at least  $i$  books.

2. [4 marks] In a sweet shop there is a large jar with three types of candy (aniseed drops, butter mints and cherry drops) all mixed up. A child sticks his hand into the jar and grabs a bunch of candies. What is the least number of candies that he must grab in order to ensure that he will get at least 7 candies of the same type.

3. [4 marks] What is the coefficient of term  $a^2b^8$  when the expression  $(2a + b + 5)^{12}$  is expanded.