

MATH 2113/CSCI 2113, Discrete Structures II

Winter 2008

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Homework Sheet 1

Due in: Wednesday 16th January, 1:30 PM

Compulsory questions

- 1 (a) In a maths exam, there are two sections A and B. There are 5 problems in Section A and 8 problems in Section B; students are required to attempt 4 problems from Section A and 5 problems from Section B. How many different sets of questions satisfy these requirements?
(b) What if the requirement is a total of 9 questions with at least 4 from Section A?
- 2 (a) How many anagrams are there of MATHEMATICS? (Count all anagrams, whether or not they are actual words.)
(b) What if we allow multiple word anagrams? (i.e. we divide the letters into different words by putting spaces between them, e.g. MAT HE M ATIC S. The order of words is important, so HE MAT ATIC S M would be a different anagram.)
- 3 (a) How many possible 7-digit numbers are there such that every digit is at least as large as its position – so the first digit is at least 1, the second digit is at least 2, etc.?
(b) How many of these are multiples of 9? Justify your answer. [Hint: recall that a number is a multiple of 9 if and only if the sum of its digits is also a multiple of 9.]
- 4 A restaurant menu has 4 choices of starters, 6 choices of main course and 3 choices for dessert.
(a) How many different 3 course meals can be chosen from this menu?
(b) How many different 2 course meals can be chosen? (The meals may consist of any two different courses, so e.g. starter + dessert is a two-course meal.)
- 5 A student has 8 identical red socks and 5 identical blue socks. How many matching pairs of socks can the student make from these?

Bonus question

- 6 Suppose we have a cube made of $n \times n \times n$ smaller cubes. A *line* through the cube is a set of n of the smaller cubes such that the centres of all the

smaller cubes are in a straight line. How many lines are there through the cube?