DEPARTMENT OF MATHEMATICS

MATHS 190 Tutorial 1

Tutorials in Maths 190 are **collaborative tutorials**. You should work in groups of 3 or 4 students, discussing the situations and puzzles listed below, or issues arising from lectures. Part of your final mark depends on your participation in tutorials.

1. Suppose that John and Phil each have the same amount of money in their pockets. How much must John give to Phil so that Phil would have $10 more than John?

2. There are two boxes: one marked A and one marked B. Each box could contain either $1 million, or a deadly snake that will kill you instantly. You must open one box. On box A there is a sign that reads:

   > At least one of these boxes contains $1 million.

   On box B there is a sign that reads:

   > A deadly snake that will kill you instantly is in box A.

   You are told that either both signs are true or both are false. Which box do you open? Be careful, the wrong answer is fatal!

3. A drawer full of unpaired socks contains 18 black socks, 12 white socks, and 6 red socks. The socks all feel the same when I get socks out of the drawer in the dark.

   How many socks should I take out of the drawer to be **certain** I have:

   (a) a matching pair?

   (b) four socks of the same colour?

   (c) a pair of red socks?

   (d) two matching pairs, of different colours?

4. **Write up your answer to this question and hand it in with your answers to Assignment 1 (due 17th March).** See below for instructions on writing tutorial reports. Don't forget to write down the names of the people in your tutorial group, so that you can acknowledge your collaborators in your report.

   The Easter Bunny hides 31 eggs in 5 rooms for 3 children to find. All the eggs are found by the children. Find the **largest** number that can be written in each box.

   (a) We can be sure that one of the rooms has at least $\square$ eggs in it.

   (b) One of the children will find at least $\square$ eggs.

   (c) Each child will find at least $\square$ eggs.

   (d) There is a room in which one of the children will find at least $\square$ eggs.

5. Suppose I have 17 sweets of 3 flavours which I divide between 2 children. Complete the following statements so they are true regardless of how the sweets are divided, using the largest possible number in place of the '?'.

   (a) There are at least ? sweets of the same flavour.

   (b) One of the children will get ? sweets.

   (c) One of the children will get ? sweets of the same flavour.

   For each of (a), (b) and (c), replace the '?' with the number one greater than your original answer. Now give a single example of a distribution of sweets for which all three new sentences are *false*.

6. Three strangers, Claire, Steven and James, meet at a taxi stand at the airport and decided to share a cab to save money. Each has a different destination, but all the destinations are on the motorway leading from the airport, so no circuitous driving is required. Claire's destination is 10km away, Steven's is 20km away, and James' is 30km away. The taxi costs $1.50 per km, regardless of the number of passengers. How much should each person pay? (Caution: there is more than one way of looking at this situation. A good place to start would be to discuss what would be a fair way to divide the costs).

7. **Harder: only attempt if you have finished all the other puzzles**. Stacy and Sam Smyth were known for throwing a heck of a good party. At one of their wild gatherings, five couples were present (this included the Smyth's, of course). The attendees were cordial, and some even shook hands with other guests. Although we have no idea who shook hands with whom, we do know that no one shook hands with themselves and no one shook hands with his or her spouse. Given these facts, a guest might not shake anyone's hand or might shake as many as eight other people's hands. At midnight, Sam Smyth gathered the crowd and asked the nine other people how many hands each of them had shaken. Much to Sam's amazement, each person gave a different answer. That is, someone didn't shake any hands, someone else shook one hand, someone else shook two hands, someone else shook three hands, and so forth, down to the last person, who shook eight hands. Given this outcome, determine the exact number of hands that Stacy Smyth shook.

Writing up tutorial questions

A written solution for question 4 should be handed in for marking with Assignment 1 (due 17th March). Instructions on how to hand in your assignment are on the Assignment 1 question sheet.

In your solution, you should include:

- the names of the people you discussed this with in your tutorial group;
- a clear statement of your solution to the puzzle;
- a clear explanation (in one or two paragraphs) or how you arrived at this solution; and,
- a statement of any assumptions you had to make in obtaining your answer.