

**Maths 190          Assignment 1**

July 28, 2009

Due: 4pm, Wednesday August 5th, 2009

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- Your completed assignment should be handed in to the appropriate box in the basement of the Mathematics/Physics Building **before** 4pm on the date due.
  - Your assignment **must** be accompanied by a blue Mathematics Department coversheet. Copies of the coversheet are available in the basement.
  - Late assignments or assignments placed in the wrong box **will not be accepted**.
  - You must show all your workings, and write careful, clear explanations of your solutions, stating all your assumptions.
  - You may discuss your attempts to answer the questions with other members of the class. However, **you should write up your answers yourself (do not copy from another person or allow another person to copy from you)**. If you worked with someone on your answers, state who you worked with.
1. (4 marks) What is the smallest number that has three distinct prime factors in its prime factorisation? What is the smallest number that has four distinct prime factors in its prime factorisation?
  2. (3 marks) **Tribonacci**. Start with the numbers 0,0,1, and generate future numbers in this new sequence but adding up the previous **three** numbers. Write out the first 15 terms in this sequence (starting with the first 1), and calculate the quotients of consecutive terms. What do you notice?
  3. (6 marks) Put the following numbers in order from smallest to largest (show all your working, and state all assumptions you make):
    - The number of golf balls which would fit inside lecture theatre MLT3.
    - The number of seconds you will spend studying for Maths 190 this semester (including attending lectures and tutorials).
    - The number of mobile phones in New Zealand.
  4. (6 marks) Next semester there will be 38,500 students enrolled at Auckland University and 2500 courses to choose from. Assume that each student will take 4 courses, and there are no limits to the number of students that can enrol in each course, or any restrictions on which courses students can take.
    - (a) What is the largest number  $n$  such that you can be sure the statement ‘There is at least one course with at least  $n$  students’ is true?
    - (b) What is the largest number  $m$  such that you can be sure the statement ‘There are at least  $m$  courses with more than 1 student’ is true?
    - (c) Can you be sure that there are two students who will have the same schedule next semester? Explain your answer carefully.

5. (6 marks) (Mindscape 7, Chapter 1) The infamous band Slippery Even When Dry ended their concert and checked into the Fuzzy Fig Motel. The guys in the band (Spike, Slip and Milly) decided to share a room. They were told by Chip, the night clerk, that the room was \$25 for the night.

Milly, who took care of the band's finances, collected \$10 from each band member and gave Chip \$30. Chip handed back Milly the change, \$5 in dollar coins. Milly, knowing how bad Slip and Spike were at arithmetic, pocketed two of the dollars, turned to the others, and said "Well guys, we got \$3 change, so we each get one back." She then gave each of the other two members a dollar and pocketed the last one for herself.

Once the band had left the office, Chip, who witnessed the little piece of deception, suddenly realised that something strange had happened. Each of the three band members first put in \$10 so there was a total of \$30 at the start. Then Milly gave each guy and herself \$1 back. That means each person only put in \$9, which is a total of \$27. Milly had skimmed off \$2, so that gives a total of \$29. But there were \$30 to start with. Chip wondered what happened to that extra dollar and who had it.

Can you please resolve and explain the issue? Give as much detail as you can.

**Tutorial write up:** Remember to hand in with your assignment your written solutions to question 3 on tutorial 1 (5 marks) and question 5 on tutorial 2 (5 marks).