

Maths 190 Assignment 1

March 8, 2010

Due: 4pm, Wednesday March 17th, 2010

- Your completed assignment should be handed in to the appropriate box on the ground floor 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 working, 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. (3 marks) A dealer bought an item for \$7, sold it for \$8, bought it back for \$9 and sold it again for \$10. How much profit did she make? Explain your answer carefully.
 2. (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 grains of rice which would fit inside lecture theatre MLT3.
 - The number of tennis balls you could fit inside the Earth (if it were hollow).
 - The total distance (in meters) that you will walk (or run) in your lifetime.
 3. (6 marks)
 - (a) Express each of the following numbers as a product of prime numbers:
 - i. 210
 - ii. 3211
 - iii. 4133
 - (b) For each of the above, how many calculations did you have to do to reach your answer? Could you have used fewer calculations? Explain your answer.
 4. (6 marks)
 - (a) Write down the first 15 Fibonacci numbers, where $F_1 = 1$, $F_2 = 1$, $F_3 = F_1 + F_2 = 1 + 1 = 2$ etc.
 - (b) The Lucas numbers are defined in the same way as the Fibonacci numbers, but with $L_1 = 1$ and $L_2 = 3$ (and $L_{n+1} = L_n + L_{n-1}$). Compute the first 15 Lucas numbers.
 - (c) By computing the sum $L_n + F_n$ for $n = 1, \dots, 15$, and looking for a pattern, find a simple expression for the Lucas numbers in terms of the Fibonacci numbers.

5. (6 marks) A certain mathematics course has 104 students enrolled. For each of the following statements, state whether they are necessarily true or false. For the true statements, explain carefully why this is so, and for the false statements, give a counterexample - that is, describe a situation for which the statement does not apply.
- (a) There must be at least nine students who have their birthdays in the same month.
 - (b) There must be at least ten students who have their birthdays in the same month.
 - (c) There must be at least nine students who have their birthdays in February.
 - (d) There must be two students who have their birthday on the same day.

Tutorial write up: Remember to hand in with your assignment your written solutions to question 4 on tutorial 1 (5 marks) and question 3 on tutorial 2 (5 marks).