UCD JUNIOR MATHEMATICAL ENRICHMENT CLASSES 2019

Dear student,

If you enjoy mathematics and wish to learn it better, I would like to invite you to participate in the Mathematical Enrichment programme at University College Dublin.

Learning mathematics can be a lot of fun, but it requires effort and time. Before you enrol in the programme, I want to give you a taste of the kind of problems that we are going to discuss, so that you can decide whether you are interested. You must attempt the problems below before you sign up.

The suggested problems are non-standard and can be challenging. It's okay if you cannot solve them at the first glance. Allocate one or two hours and give them a good try. It is enough to do two or three of them. If you can only do one, it is alright. Write your solutions carefully and include all the explanations as practice. It is not enough to write just the answer! The most important thing is to demonstrate your thought processes. Even if you do not find the full solution, a partial solution is valuable.

Good luck!

Exercise 1.

Insert brackets and signs '+', '−', '×', '', to get a correct equality:

$$\frac{1}{2} \quad \frac{1}{6} \quad \frac{1}{6009} = 2003$$

Exercise 2.

A rectangle was cut by six vertical and six horizontal lines to get 49 smaller rectangles. It turned out that the perimeter (measured in metres) of each small rectangle is an integer (i.e. a whole number). Is it necessary that the perimeter of the original rectangle (also measured in metres) was an integer?

Exercise 3.

To open a safebox you need a 7-digit number consisting only of twos and threes. The safebox opens if there are more twos than threes and the number is divisible by three and by four. Think of a code that opens the safebox.

Exercise 4.

A magic island is inhabited by knights, who always tell truth, and liars, who always lie. A tourist met three islanders and asked each of them: "How many knights are there among your companions?". The first islander answered: "None". The second islander said: "One". What did the third one say?

Exercise 5.

I wrote ten consecutive integers on the board. My friend wiped out one of them so that the sum of the rest became 2002. Which numbers were left on the board?