AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES

CPPSP : Concepts in Physics and Problem Solving in Physics

CPPSP 2018 Tutorial 01

1205 - 1300 Monday 22 October 2018

Do as many problems as you can in the tutorial session. You are not expected to complete all of them. Discuss the problem with other students, and ask the tutors for help. Hand in your solution, even if incomplete, to your tutor by dinner time. These tutorials will not be marked,but the tutors need to get an idea of your progress. The aim of this tutorial is
- to look at a problem in different ways
- to become familiar with Python, and to use Python to solve fairly simple problems,
- to discuss the problem with other students,
- to present your understanding (whether partial or complete) verbally to others.

1) Get an idea of the formula for the sum of all the odd integers between 1 and n by

- writing a Python program with a simple(?) loop and run it for these values of n : 3, 5, 11, 99. Check this by hand. Can you see the pattern? Can you guess the formula? We might expect that the sum should be roughly but not exactly, $(n(n+1)/2)/2$, which is the sum of all the integers, both even and odd, between 1 and n.

- getting a candidate formula by a geometric approach to representing the sum.

- then proving the formula is correct for all n by mathematical induction.

2) Write a Python program that calculates the sum S of 100 numbers. Each number is a random number between between 0 and 1.00. Python has a random number generator that you can use.
Run this program 10 times. What fraction of these sums S lie between 48 and 52? Comment on whether or not you find this result surprising.

3) [Do this ONLY if you have time] Start thinking about how to write a Python program to simulate the coin flipping problem discussed in the lecture, where Alice and Bob have to flip coins until they achieve the terminating pattern of HT for Alice, and HH for BoB.

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