1. SUMMARY
   a. Hopefully we’ve learnt some amount of programming: the process of designing, writing, testing, debugging, and maintaining the source code of computer programs.
   b. You should know how to use some of the most fundamental tools of programming: variables, types, operators, branching, loops. You should know how to create your own functions.
   c. You also know a few practical ways of solving problems, including exhaustive enumeration (brute force search), and recursion.
   d. You can now even begin to create your own classes.
   e. Hopefully we’ve increased our problem solving skills: The ability to formulate problems, think creatively about solutions, and express the solution clearly and accurately.
   f. Hopefully you’ve developed a good programming style, adding comments, descriptions, naming variables, functions, methods, and class usefully.
   g. Perhaps a little bit of what is going on inside computers has been demystified. If not program, you can now more confidently know what everything that you are doing on your computers all day. There’s a probability that someone that you will be working with will be doing programming.
   h. More and more, hopefully you can see that programming can be used to help you to do your very own thought experiments. How do I write a program that will help me think about a specific phenomena and understand it better.

2. TRANSFER
   a. Even though most of this course was taught in Python, the course is not about Python itself. It is about learning to design recipes. So these tools should transfer to other languages.
   b. Compare and contrast a factorial function in:
      i. MATLAB
      ii. C / C++

3. THOUGHT EXPERIMENTS

   “A man starts from a point 0 and walks $d$ yards in a straight line; he then turns through any angle whatever and walks another $d$ yards in a second straight line. He repeats this process $n$ times. What is the probability that after these $n$ stretches he is at a distance $r$ from his starting point, 0?”


   a. That is related to the question: how far is the person after $n$ steps? This is a hard question to figure out in your head. And even a little hard to figure out using pen and paper and a calculator. But a simulation allows us to study it easily. Carry out the implications of the thought.
   b. Once we’ve figured that out. We can then ask, is this distance affected by the range of the turning angle? Are there some range of angles that minimize the distance and some that maximize the distance covered? How about the area covered, instead - are there some angle ranges that maximize the area covered?
   c. What if there are multiple people starting? What are the chances of two of them running into each other again?
   d. What if the people are interacting? They could be interacting in different ways. One group could be asked to change orientation in the direction of it’s closest neighbor. Another group could be asked to change orientation in the direction of the center of mass of the group. This two different rules of interaction will create different patterns, dynamics, clusters, behaviors. If we then look out the window, and see one of the two clusters, in one condition, but the other type of cluster in the other condition. Then we could propose a mechanism for what individuals are doing in each of those two conditions.