

PH3105 Problem Set 11

Q 1) Write a program to simulate the Buffon needle problem : “A needle of length a is dropped at random on a page which has parallel lines spaced apart by b drawn on it. What is the probability that the needle will cross one of the lines?”

Solve this problem analytically as well and compare with your numerical answer.

Q 2) Write a program that used Monte Carlo methods to determine the volume of a D dimensional unit sphere and compare it with the exact answer (look it up on Google!). Use your program for $D = 3$ to $D = 20$.

Q 3) Imagine another version of our fictitious town of Markovia - but this one has three kinds of days - sunny, cloudy and rainy. If a day is sunny, the chances are 30% that it will turn cloudy on the next day, and 20% that the next day will turn rainy. If the day is cloudy, the chances of it turning sunny and rainy on the next day are 40% each. A rainy day has a 20% chance of turning sunny the next day - while the chances of its turning cloudy is 40%. Using this data predict what the probability of a given day in the new Markovia will be sunny, cloudy or rainy in the long run.

Q 4) Write a program to determine the probability that a triangle formed by three points chosen at random from a $1 \times L$ rectangle is obtuse angled as a function of L .