**Pre-assignment**

**Solution for task a**

Random walker position after t steps can be rewritten as:



Where  is the first point. Assume one dimensional random walker with steps to the left and right with probability of q and p which p+q=1. Therefore, walker will be in the position of  after t steps which can be calculated as relation 1 (it was assume that is positive after t step).



Where Rt and Lt are step times to the right and left, respectively, while t is the total steps which random walker passes. Since positive  was assumed, therefore:



Therefore, probability that walker is at the point  is:



This is the general probability distribution function for random walker starting from point a and being at point Xt after t steps.

Since the task has asked for the probability of walker coming to the starting point, it can be concluded:



As it is clear if t is odd the probability would be zero.

**Solution for task b**

By using Stirling’s approximation (), probability distribution function can be transformed to :



Therefore .

**Solution for task c**

Bu assuming , form of pdf is as:



**Solution for task d**

