

Physics 326a-2011
Assignment 4

Due: Friday 9-30-11 at 4 pm

Part 1:

Go to www.KhanAcademy.org, scroll down to the lectures on Statistics, and watch the following lectures (each averages about 12 minutes long):

Statistics: Sample Variance

Statistics: Standard Deviation (watch from 4:45 to 7:30 only)

Introduction to Random Variables

Probability Density Functions

Introduction to the Normal Distribution (watch 0:00 to 21:20 only)

Central Limit Theorem

Standard Error of the Mean (watch 0:00 to 10:15 only)

If you're not already familiar with Khan's lectures: The pace is occasionally slow, and he does make occasional typos, but by the time he's done you will truly understand the concept.

Part 2:

Problem 4.1 (group problem): (Taken from "Practical Physics, 4th Ed., by G. L. Squires) The thermal conductivity of Copper at 0° C is $k = 385.0 \text{ W m}^{-1} \text{ K}^{-1}$. A large number of measurements of k , free from systematic error, form a Gaussian distribution with standard deviation $\sigma = 15.0 \text{ W m}^{-1} \text{ K}^{-1}$. What is the probability that a single measurement lies in each of the following ranges (all in units of $\text{W m}^{-1} \text{ K}^{-1}$): a) 385.0 to 385.1 b) 400.0 to 400.1 c) 415.0 to 415.1 d) 370.0 to 400.0 e) 355.0 to 415.0 f) 340.0 to 430.0 ? *Hint: You will probably want to use the CDF function that Khan discusses. This is available in both Excel and Mathematica, though the syntax is different.*

Part 3:

Devise a problem relating to the material covered in the Khan lectures. You should note which lecture it is related to. This can be a conceptual problem (similar to the conceptests we do in class) or a more quantitative problem. Also, write up a complete solution for your problem, in a form that can be understood by your fellow students; this means that you must explain your reasoning especially clearly. (I will probably use some of these problems in future years.) You may consult with other students, but each of you must submit your own problem and solution.