

Physics Distributions Tutorial

In Excel:

- 1) Tabulate and plot a normal distribution whose mean is 8 and whose RMS is 2 for integers between plus and minus 10 sigma
- 2) By trial and error determine approximately at what sigma the FWHM (full width at half max) occurs: in the spreadsheet, show this by calculating the MAX value in one box and the Half Max calculation.
- 3) Using the normXXX functions calculate how often one would expect to measure a value from a normally distributed parent distribution that is > 6 sigma from the mean. (Put in form: Expect 1 out of N: ie find N). > 5 sigma ? >4 sigma?
- 4) Using combin() and permut(), find the number of permutations and combinations of 30 different objects taken in groups of 5 at a time. Write out what product the permutation function is calculating in this case
- 5) Using combin(), calculate the probability that a weighted coin that has probability 20% heads, 80% tails will show tails exactly 10 times when thrown 14 times.
- 6) If the probability to detect one cosmic ray event is small ie following a Poisson distribution, calculate the best estimate for the error if 100 cosmic rays were detected in a certain time period.

Part 2)

- 7) Tabulate and plot the binomial distribution for $n = 10$ and $p = 0.4$. Look up the Negative Binomial Distribution on Wikipedia and plot it for the same p , and " n " ($=r$) and compare.
- 8) Download the file from website named 'gaussian_randoms.xls'. Use the first column to make a fake sample of measurements of the number 9 with a normal error distribution whose sigma is 2. Similarly make the second column measurement of the number 6 with a sigma also of 2. Now for each row calc $f(x,y) = x/y$ where x is first col and y is second. Histogram and plot the f values. Compare to values of a Gaussian with the mean = $9/6$ and width taken from the error propagation formula. When making/plotting the histogram, choose rather wide bin sizes either 1 or 0.5.