

Root Basic 2 (continued from Basic 1, you should have your macro ready in hand):

1) Simplify the pathname and filename section of your macro; add an argument variable (such as "filename", meaning the name of your file containing all the lottery numbers) to the macro and call it from the command line (Bash shell), like this

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root -l -b -q yourmacro.C\\(\"filename\\")
```

Try to understand what's the advantage to run your macro in this way (compared to the way in Basic 1)? What do these switches mean (-l, -b, -q), also why these "\" characters are needed?

2) Instead of filling 1D histograms, try to create a Ntuple, then fill the Ntuple, plot the sum of all 6 numbers, and then fit it to a Gaussian distribution (to get mean and sigma), compare to the previous results given by 1D histograms, any difference?

3) Understand the difference between histogram and ntuple. Within ROOT, type this: TBrowser x (this will open a browser with the name 'x', you can give it any name). Then use the browser to open your newly created root file (double click) and see if you can find both the histogram and Ntuple inside, click into them and see the structure and distributions. (Hint: what's the difference between 'discrete' and 'binned' distribution?)

4) Use Ntuple method to plot the difference between the smallest and the largest number for each lottery set, what do you think the distribution will look like? Does your 'prediction' agree with the result?

5) For each lottery set, the numbers may be 'ordered' or 'not ordered', i.e. they might and might not be ordered from the smallest or the largest. Use Ntuple to draw two correlation plots in both cases ('ordered' and 'not ordered'): a) the first number vs. the last number, b) the first number vs. the sum, do you understand why the plots look in such way? Any explanations why the case of 'ordered' and 'not ordered' might look different? (If all lottery numbers are already ordered, then you need to manually undo the ordering by randomizing)

Hint: ntuple->Draw("x:y") will give you the correlation plot between variable x and y.

6) Redo 2) - 5) by replacing Ntuple by Tree, i.e. create a TTree object (with branches and/or leaves if necessary) and fill it, and then remake all the plots from the TTree object. Any difference compared to Ntuple object?