Statistics Calculator Cheat Sheet

* Generating Random Numbers:
  + Math🡪PRB🡪randInt(I,R,N)
  + I = Initial Number
  + R = Range
  + N= Number of random numbers desired
  + For example: If you wanted 10 random numbers from 1 to 115, it should look like this: **randInt(1,115,10)**
* Creating a List
  + 1st Way: Start with left parenthesis: “{“ then enter your list, one number at a time, with a comma between numbers. Then type right parenthesis “}” then STO🡪2nd L1 (the #1 button)
  + 2nd Way: Stat🡪(1) Edit
  + Here you will see List1, List2, List3, etc.
  + Just enter the values in each list
* Plotting A Histogram
  + 2nd STATPLOT
  + Turn on plot 1
  + Xlist –L1
  + Freq –L2
  + Zoom 9
* Mean/Sum/Sum Squares/Sample Standard Deviation/Population Standard Deviation
  + Stat🡪Calc🡪1-Var Stats (if you don’t enter a list, it will assume List1, otherwise, comma, L2, or L3 etc.)
* Permutations
  + Math🡪PRB🡪nPr
  + N=the number to choose from
  + R = the number of permutations we want
  + For example: Find the number of ways of forming 3 digit codes in which no digit is repeated
  + We use: *nPr* = 10P3= 720 NOTE: you must enter 10 before you go to Math etc.
* Combinations
  + Math🡪PRB🡪nCr
  + N= The number to choose from
  + R= the number of combinations we want
  + For example: A 3 person committee is needed to be formed. There are 8 eligible people to choose from
  + How many different committees could be formed?
  + We use nCr = 8C3 = 56
* DIscrete Probability Distribution:
  + Enter 2 lists (L1, L2)
  + Stats 🡪1 VarStats, L1,L2
  + (remember, mean = expected value)
* Binomial Distribution:
  + 2nd🡪Vars🡪BinomialPDF(N,P,S) –this solves for 1 point on the curve –Solving for “exactly” one solution –for example, on a 10 question true false test, what is the probability of guessing exactly 4 right? (10,.5,4)
  + N = number of trials
  + P = probability of success
  + S = number of successes
  + 2nd🡪Vars🡪BinomialCDF(N,P,S) –this solves for cumulative probability
  + N= number of trials
  + P = probability of success
  + S= the number of successes you want to solve “up to”
  + If you wish to solve “greater than” problems, you solve “up to” and then subtract from one.
* Geometric Distribution:
  + 2nd🡪Vars🡪Geometpdf(p,x) –this solves for one point on the curve
  + P = probability of success
  + X = number of trials for success
  + 2nd🡪Vars🡪GeometCDF(p,x) –this solves for cumulative probability
  + P=probability of success
  + X = the number of trials you want to solve “up to”
* Poisson Distribution
  + 2nd🡪Vars🡪Poissonpdf(µ,x) –this solves for 1 point on the curve
  + µ = mean
  + x = number of occurrences
  + 2nd🡪Vars🡪PoissonCDF(µ,x) –this solves for cumulative occurrences
  + µ = mean
  + x = number of occurrences you want to add “up to”
* Cumulative Area using Z-Scores
  + 2nd🡪Vars🡪 Normalcdf(ll,rl,µ,σ) –this will calculate total area, not just one point
  + Where ll = left limit. We want it to be as close to zero as possible, so we type “-EE99” 🡪note “ee” is the 2nd comma button
  + Where rl is the right limit. This is the z-score (unless you are calculating “above” the z-score
  + Where µ is the mean –in a standard normal distribution, this is zero
  + Where σ is the standard deviation. In a standard normal distribution this is one
  + Example: Find the cumulative area for a z-score of 1.15 🡪 **Normalcdf(-EE9,1.15,0,1)**
  + **Note: If you are calculating a Standard Normal distribution, you do not need to enter the mean or the S.D. –just the left/right limits.**
  + You can also draw the area under the curve, and simultaneously calculate it:
  + 2nd🡪Vars🡪Draw🡪ShadeNorm(LL,RL, µ,σ)
  + LL = Left Limit, RL = Right Limit, mean, and standard deviation
  + You do not need to list mean and standard deviation if you are using a standard, normal distribution
  + You may have to change your window to get a good picture (i.e. x-min = -3, x-max = 3, y min = 0, y max = 1)
* Cumulative Area not using z-scores
  + You can also solve these problems using NormalCDF without converting, and you will get the same answer 🡪Again we have NormalCDF(LL,RL,µ,σ)
  + For example: NormalCDF(-EE99,-1.6,0,1) = .0547992894
  + Not converting z-scores, we would enter: NormalCDF(0,175,215,25) = .0547992894
* Converting Probability (or area) in a normal distribution to a z-score
  + 2nd🡪Vars🡪 InvNorm(a, µ, σ)
  + For example: Fine the z-score that corresponds to a cumulative area of .3632🡪InvNorm(.3632,0,1) = -.3499
  + NOTE: If you are using a standard normal distribution, you do not need to enter the mean or the standard deviation
* Converting Percentiles into Z-Scores
  + Convert the percentile into a decimal
  + 2nd🡪Vars🡪InvNorm(perc)
  + Perc = percentile as a decimal
  + For example, what is the z-score corresponding to the 5th percentile?
  + enter InvNorm(.05) = -1.6448
* Calculating Confidence Intervals
  + Stat🡪Test🡪ZInterval
  + If you made a list, choose Data
  + If you are given σ,xbar, n and a confidence level, then choose stats
  + This will calculate the left/right limit of the interval estimate
  + X-bar is the point estimate
* Calculate Maximum error of estimate (E) (normal distribution)
  + Stat🡪Test🡪ZInterval
  + Choose Stats and enter data
  + You will not enter x-bar (don’t know it)
  + You will have a left/right limit again, but one value is negative, and you are solving for maximum error, therefore your answer is the positive version of the answer
* Finding the Critical Values of T
  + 2nd🡪Vars🡪invT(***area***,D.F.)
  + Area is almost the same as the confidence level –but you have to add one tail to get (in essence) the right limit, or critical T-value.
  + For example, find the critical value of T for a 95% confidence when the sample size is 15
  + Area = .95 + one tail, or .975
  + D.F. = 14
  + InvT(.975,14) = 2.1447 🡪 which is the T-Critical value
* Calculating Confidence Intervals on the T-Distribution Curve
  + Stat🡪Test🡪TInterval
  + If you made a list, choose Data
  + If you are given σ,xbar, n and a confidence level, then choose stats
  + This will calculate the left/right limit of the interval estimate
  + X-bar is the point estimate
* Calculate Maximum error of estimate (E) (t- distribution)
  + Stat🡪Test🡪TInterval
  + Choose Stats and enter data
  + You will not enter x-bar
  + You will have a left/right limit again, but one value is negative, and you are solving for maximum error, therefore your answer is the positive version of the answer
* Calculate P-Value
  + 2nd Vars 🡪normalcdf
  + For a left tail test enter (–EE99,Zscore)
  + For a right tail test enter (Zscore, -EE99)
  + For a 2 tail test, do one or the other and multiply your answer times 2 (for 2 tails)
* Calculate P-Value using T-Tables
  + 2nd Vars 🡪tcdf
  + For a left tail test enter (–EE99,Zscore,df)
  + For a right tail test enter (Zscore, -EE99,df)
  + For a 2 tail test, do one or the other and multiply your answer times 2 (for 2 tails)
* Calculate Confidence Interval for P-Value
  + Stats 🡪Tests🡪1PropZInt
  + Enter X (the number of successes in the sample)
  + Enter n (the size of the sample)
  + Enter the confidence level
  + This will give you the confidence level, and the p-hat
  + It will not give you the Margin of Error (E) should you need that, you gotta go old school ☺
* Calculate Hypothesis Testing using P-Values
  + Stats 🡪Tests 🡪 Z-Test
  + Input Stats
  + Enter the mean, the standard deviation, the sample mean, and n
  + Here were our 2 equations:
    - H0 ***μ* ≥ 13 sec**
    - Ha ***μ* < 13 sec (Claim)**
    - Alpha is <.01
  + We will test the claim, so chose  **< *μ*0**
  + We get a p-value of .00145, which is less than .01
  + Therefore reject null hypothesis, which means the claim (in this case) is true
* Find Critical Values for T
  + 2nd Vars 🡪 InvT(area,D.F.)
  + Area = *α* = 0.05
  + *n* = 21 so D.F. = 20
  + Solve InvT(.05,20) and get -1.7247 or -1.725
  + NOTE: This is a left tailed test. For a right tailed test, use the “Positive” answer 🡪 1.725
  + NOTE: For a left tailed test, use the “negative answer” 🡪 -1.7247
  + NOTE: For a 2 tailed test, divide the area into 2 (.05/2 = .025) and use both tails
* Hypothesis Tests for Proportions
  + Choose Stats 🡪 Tests 🡪 1-PropZTest
  + P0 = .25 (null hypothesis
  + X = number of successes. They tell us success happened 21% of the time. There were 200 sampled, so x = .21 x 200 = 42
  + NOTE: You can actually type in .21 x 200 for this entry
  + n = 200
  + Prop = “not equal” remember, we are testing the Alternative Hypothesis (Binomial is ALWAYS not equal)
  + Z test score = -1.30 –we could compare this to a Z critical score if we calculated it
  + P = .19
  + This is not less than .10, so it is not in the tail(s), so we do not reject the null hypothesis
* Two-Sample *z*-Test for the Difference Between Means (Large Independent Samples)
  + Enter Sigma xbar 1, xbar 2, n1, n2
  + Decide which alternate test to calculate
  + Compare P-Value to Alpha and decide
* Two Sample *t*-Test for the Difference Between Means (Small Independent Samples)
  + Use Stats 🡪Test 🡪 2-SampTTest
  + Enter data
  + When it asks “Pooled” choose no if the population variances are not equal
    - If you choose yes, then the population variances are equal
    - Therefore you add both “n” values, and the D.F. is n+n-2 (this is calculated for you)
  + Compare the p-value to the alpha
* *t*-Test for the Difference Between Means (Dependent Samples)
  + What you are really testing is the difference between the means
  + Enter the “before” data in List 1
  + Enter the “after” data in List 2
  + Go to the header of List 3, and enter List 1 minus List 2
  + Now you have the difference between the means
  + Go to stats 🡪 test 🡪 t-test
  + Run program using data from List 3
  + Enter “0” for the population mean µ
  + Test the Alternate Hypothesis (Usually “not equal to”
* Two-Sample *z*-Test for the Difference Between Proportions
  + **First remember to check np>5 and nq>5**
  + Go to Stats 🡪Calc🡪2-PropZTest
  + To enter xbar 1, enter this:
  + You can enter .86 x 150 and .74 x 200 (xbar 2) and let it calculate for you
  + In this case, test that the proportions are not equal
* Calculate R Value (Linear Regression)
  + Enter the data in List 1 and List 2
  + To graph it 🡪2nd “y=“ 🡪plot on
  + Check the window to ensure that all values will fit into the window –adjust x or y as required –Use “zoom 9”
  + To calculate R 🡪stats 🡪calc 🡪4: LinReg(ax+b)
  + Here you will find both “R” and “R2”
  + Notice also, this is the equation of the line
  + Normally we use “y=**m**x+b” the calculator calls it “y=**a**x+b”
* Test a Population Correlation Coefficient *ρ*
  + Go to Stats 🡪Test 🡪 LinRegTTest (note: you have to have entered data in List1 and List2)
  + Notice you need to know what the Alternative Hypothesis is to test it
  + For RegEQ do this: Go to Vars 🡪Y-Vars 🡪Function 🡪Y1 enter
  + This will enter Y1 on the RegEQ line
  + This will then enter the equation for a line in the string Y1 –This is so we can graph it if we want
  + Notice that you see beta and rho. They will be “not equal to” or greater than or less than. This is the alternate hypothesis. (Remember beta is the “opposite” of the population correlation coefficient)
  + After you calculate the values, you will find the “R”
  + You will also see the t-score and more importantly the P-value
  + This time we **WANT** P-value to be less than the alpha. This means we are in the tail, which means the correlation is stronger. The **MORE** in the tail, the stronger the correlation
* Graphing a Linear Regression T Test
  + Again, choose a statplot to view the points entered in List1 or List2
  + Select “zoom 9” to see the statplot best
  + This time you will also see a line through the statplot
  + This is the line you created and stored in string Y1
  + You can now see the line that “best fits” the plotted points
  + Suppose you had 30 data points, and wanted to predict the 35th data point
  + Go to Vars 🡪Y-Vars 🡪 Function 🡪enter 🡪 (xx) enter
  + Y1will show on the screen, enter this: **Y1 (35)** and hit enter
  + This will show the predicted 35th entry based on your line
  + 35 would be the “x-value” (explanatory or independent) and your answer would be the “y-value” (dependent or response)
* Find the equation of a Regression Line
  + Stats 🡪Tests 🡪 LinRegTTest
  + Set RegEQ:Y1 by going to…
  + Vars 🡪Y-Vars 🡪Enter Enter
  + This will store the equation of the line in Y1
  + Then set Statplot to “on”
  + Choose “Zoom9” to plot equation
  + Choose “Y=“ to see the equation of the line
  + Notice the equation of the line is not in the normal “order” we are used to