

To All:

I've tried to focus on the TPS Reports (and application of concepts) in this course to make your work-and-reading load as reasonable as possible. At the same time, these TPS Reports are going to continue to prove to be very challenging if you don't take more time to get through key concepts in the reading (especially Haters). I wouldn't expect the grading on TPS Reports to get any easier this semester. In quantitative research and analysis (perhaps more so than what you are used to), precision in terminology and calculations is critical. So is attention to detail.

Please review the explanations to questions in TPS Report 05 below:

#3 Write a formula in Cell A33 to calculate the skewness of the sample of doses in the experiment between Cell A2 and Cell A31. (Hint: since we're dealing with a sample, remember to use the unbiased estimate for standard deviation.)

- Write your formula in your TPS Report.

=3*(average(A2:A31)-median(A2:A31))/stdev.s(A2:A31)

The only trick here is to make sure you use stdev.s as an unbiased measure.

- In your TPS Report, indicate which column of data is the least skewed (i.e., most symmetrical) of all.

Using the skewness formula above, Test 6 (Column G) has the value closest to zero for all of the Tests (*skewness* = 0.06997), meaning that it is the least skewed or most symmetrical.

#4 Based on your measures of skewness, which Test do you think will have the strongest correlation coefficient with the Dose data?

- Write your answer and explain your reasoning in your TPS Report.

This was an open-ended question. One way to approach it is (without using Pearson or an *r*-value, since the question reads "based on your measures of skewness") to look for the data set with the most similar skewness measure as our Dose data.

The Dose data has a skewness value of -0.52055. Test 8 (Column I) has the closest skewness value of -0.47183.

However, skewness is not always (or even usually) a reliable measure for correlation. It only gives you an idea about the symmetry within a distribution.

#5 In Cell B34, write a formula to calculate the standard deviation for Test 1 scores. Copy your formula and Paste it to Cells C34 through I34.

- In your TPS Report, indicate which column of data shows test scores most tightly bunched together (i.e., which Test shows the lowest average distance between data points and the mean)?

The key concept in this question is the dispersion of data points. Standard deviation or variance could be used to assess dispersion. Either way, Test 5 (Column F) shows the least dispersion or the tightest bunching.

$\sigma = 5.66$ (standard deviation)

$\sigma^2 = 32.02$ (variance)

#6 In Cell B37, write a single formula that can be Copied and Pasted to all Cells between C37 and I37 to calculate the Pearson product-moment correlation coefficient between each column of test scores and Doses in Column A. (Hint: make sure that when you Copy and Paste your formula from B37 to other columns that you are always comparing the test data to the Dose data in Column A.)

- Write the formula from B37 in your TPS Report.

=correl(\$A2:\$A31,B2:B31)

=pearson(\$A2:\$A31,B2:B31)

Either the correl or the pearson primitive will give you the same answer. The catch here is that we want to compare each column of data back to Column A. So, we have to make sure that our column reference in our first argument is static by using the \$ before the column letter.

#7 Suppose your job is to decide which of the tests provides the best reflection of behavioral changes associated with differences in dosage of the experimental drug.

- In your TPS Report, explain which test you'd choose and explain your justification.

The statistic you'd want for this problem is the Pearson product-moment correlation coefficient (or the coefficient of determination which is just the correlation coefficient raised to the second power).

In this case, Test 4 (Column E) appears to demonstrate the strongest correlation ($r = 0.9597$ or $r^2 = 0.9211$) with the original Dose data.

#8 Now you'll focus on the Test-Retest sheet of the same Excel file. Suppose that the test scores in Column B have been selected as the most valid reflection of behavioral changes associated with differences in dosage of the experimental drug. Before we get too confident in that particular test, you'll need to determine if this very expensive test is reliable over multiple applications.

- In your TPS Report, explain what level of test-retest reliability this test provides. Make sure to cite at least one specific statistic to support your explanation.

In order to assess test-retest reliability, you should turn once again to the correlation coefficient (correl or pearson primitives) or the coefficient of determination (rsq primitive). The key is to measure the correlation between the first implementation of the test and the second implementation of the test (you do NOT compare the tests to the Dose data in this case).

The correlation coefficient for the test-retest assessment is very high ($r = 0.956$), indicating strong test-retest reliability.

#10 Our next goal is to convert numeric values on various scales from Columns A through F to z-scores so that all measurements are comparable on a single scale centered around a zero value.

- Write your formula in your TPS Report.

$= (A2 - \text{average}(A\$2:A\$51)) / \text{stdev.s}(A\$2:A\$51)$

Just be careful here with parentheses, \$, and using stdev.s for the unbiased measure.

#11 In Cells A53 and B53, calculate the median values of raw mean scores for Poll 1 and Poll 2.

- In your TPS Report, provide a detailed explanation as to which poll's median value, after 50 repeated implementations, indicates a stronger level of support for Obama's actions.

Calculating the median values of raw scores leads to measures of central tendency for the two data sets that clearly aren't comparable in scale. So we MUST convert our values to z-scores. Once we have converted all raw data from Polls 1 and 2 to z-scores, we can calculate median z-scores for each poll.

***median* _{Poll 1} = 0.038**

***median* _{Poll 2} = 0.186**

Poll 2 has a much greater median value for z-scores, indicating that overall there is stronger support for Obama's actions in Poll 2.

#12 Using the z-table, calculate the predicted percentage of raw mean scores that will fall between 0.76 and 0.82 in Poll 6.

➤ In your TPS Report, write your answer and explain how you reached that answer.

Most of you were correct in how you looked up values in the z-table, but you missed a step here. We're trying to create a prediction (future tense, as in if the poll were re-administered to the same population in the future) for raw mean scores based on an observed distribution.

However, the raw scores aren't going to relate to the z-table. So we have to convert raw values of 0.76 and 0.82 to their respective z-scores (1.216331 and 1.902232).

Then we can use the z-scores to look up corresponding percentages under the normal curve in the z-table (0.4713 and 0.3888). So the area contained under the normal curve between these two values is:

$$0.4713 - 0.3888 = 0.0825 \text{ or } 8.25\%$$

Back in the real world of polling, this means that we would only expect to see raw mean scores between 0.76 and 0.82 a little over 8% of the time if we continue to use Poll 6 on the same population.

#13 Specifically, you are asked to determine whether the new Mitsubishi Volanz or the new Ford Ninny performed better when it came to emissions scores.

➤ In your TPS Report, write your answer and explain how you reached that answer. (Hint: to assess the Volanz and Ninny on the same scale for Highway, City, and Average driving, calculate z-scores).

Your first step here is to convert all raw emissions scores from Columns B, C, and D to z-scores in Columns G, H, and I.

The key information to come out of this process is contained in the table below:

	z-Hwy	z-Cty	z-Ave
Volanz	0.938357	0.043533	0.24637
Ninny	-1.22588	0.554367	0.275155

So, if we compare on standardized highway performance, Volanz clearly wins.

If we compare on standardized city performance, Ninny wins.

Comparing on standardized average performance across highway and city, Ninny wins.