Math 10 2017 midterm NAME: Score:

Problem 1: Please do not do the arithmetic, just leave the formula for the answer with numbers put in.

a) Every week you buy a ticket in a lottery that offers one chance in a million of winning. What is the chance that you never win, even if you keep this up for ten years?

b) You find a lottery with better odds. The rules: you buy a ticket, choose 3 different numbers from 1 to 100, and write them on a ticket. The lottery has a box with 100 balls numbered from 1 to 100. Three balls are drawn without replacement. If the numbers on these balls are the same as the numbers on your ticket, you win. Order does not matter. If you decide to play, what is your chance of winning?

c) In the novel Bomber, Len Deighton argues that a WWII pilot had a 2% chance of being shot down on each mission. So in 50 missions he is "mathematically certain" to be shot down because 50*2% = 100%. Is this a good argument? If so, why? If not, what is the correct chance of being shot down in 50 missions?

Problem 2

A utility company serves 50,000 households. As part of a survey of customer attitudes they take a simple random sample of 750 households. The average number of television sets in the sample households turns out to be 1.86 and the sample standard deviation is .80.

a) Should the statistician plan on using a z or t test to compute the 95% confidence interval? Why?

b) Does it matter whether the statistician uses the formula for population SD or sample standard deviation in this calculation? Why or why not?

c) What is the box model that describes the construction of this confidence interval?

d) What is the 95% confidence interval for the estimate of 1.86 televisions per household?

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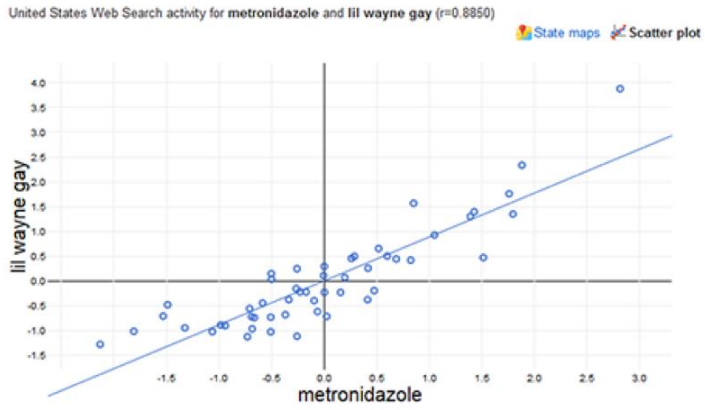
Problem 3 The following picture shows a scatterplot of data. Each point represents the number of internet searches on two topics on a given day. The search terms label the x and y axis.



a) Do you think that Pearson's correlation coefficient for this bivariate data is greater than .5? Why or why not?

b) How can you have negative numbers of searches? What units is this really in?

c) If the scales were changed so that searches on "lil wayne gay" were measured in thousands and searches on "metronidazole" were measured in hundreds, would this change Pearson's correlation coefficient? Why or why not?

d) All statistics texts declare: Correlation does not mean causation. How is this data an example of this statement?

Problem 4

White and Hispanic males rated on a 7-point scale whether they though Donald Trump's intention to build a wall along the United States – Mexico border was wrong.

Table 1. Means and Variances in Current Events Study.

Condition	n	Mean	Variance
White males	27	3.00	2.00
Hispanic males	27	6.00	1.00

a) State one assumption about the populations that you must make to construct a confidence interval.

b) Compute the SE for each population.

c) Compute the standard error of the difference between the means.

d) Construct the 95% confidence interval.

e) What is the null hypothesis for this study?

f) In this context, what does the confidence interval actually mean?