

MATH-57091 Probability and Statistics for High-School Teachers.

Home Work 13 due on December 5

Each problem is 13 points Instructor: Prof. Artem Zvavitch

**Problem 1.** The following are the values of independent sample from two different populations:

Sample 1: 122, 114, 130, 165, 144, 133, 139, 142, 150

Sample 2: 108, 125, 122, 140, 132, 120, 137, 128, 138

let  $\mu_1$  and  $\mu_2$  be the respective means of the two populations. Find the  $p$  value of the test of the null hypothesis

$$H_0: \mu_1 \leq \mu_2 \text{ against the alternative } H_1: \mu_1 > \mu_2,$$

when the population SD are  $\sigma_1 = 10$  and

- $\sigma_2 = 5$
- $\sigma_2 = 10$
- $\sigma_2 = 20$

**Problem 2.** The value received at a certain message-receiving station is equal to the value sent plus a random error that is normal, with mean 0 and SD 2. Two messages, each consisting of a single value, are to be sent. Because of the random error, each message will be sent 9 times. before reception, the receiver is fairly certain that the first message value will be less than or equal to the second. Should this hypothesis be rejected if the average of the value relating to message 1 is 5.6 whereas the average of those relating to message 2 is 4.1? Use the 1 percent level of significance.

**Problem 3.** Find by a hand computation, the estimated regression line for the following data

| $x$ | $y$ |
|-----|-----|
| 1   | 4   |
| 2   | 7   |
| 3   | 8   |
| 5   | 12  |

- (1) Plot the scattered diagram, and draw the estimated regression line.
- (2) Double **ALL** the data values and repeat (1). Explain your result.

**Problem 4.** The amounts (in million of pounds) of poultry products consumed in the US for the years 2008 through 2015 are as follows

25.9, 26.8, 27.3, 27.8, 29.6, 30.5, 30.8, 32.6

- Letting the year be the independent variable and consumption the dependent variable, plot a scatter diagram.
- Find the estimated regression line. (**Hint:** to simplify the algebra, you can take the  $x$  value to be the year minus 1995, or even more useful number! Please, explain, this trick).
- Predict the 2007 consumption figure.
- Predict the 2016 consumption figure.