Postgraduate Program: «Data Science and Information Technologies»
Course: Biostatistics

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1st SET OF EXERCISES

1. A survey shows the following selection of snacks purchased according to the gender:

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Snack	Male	Female
Hotdog	8	12
Toasts	13	9
Peanuts	9	6
Popcorn	8	10

find something else bc the observations need to be over 20
chi square test

Test the claim that snack choices are related to the gender of the consumer.

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2. Scientists investigated the level of caffeine in cups of a specific coffee served by a single specialty coffee shop. Cups were purchased on eight consecutive days and the amount of caffeine in each of the eight cups (measured in milligrams) is provided in the following table:

317	305	465	498	517	353	357	410

Determine whether the median amount of caffeine in the cups of the specific coffee differs from 400 milligrams.   Ho: = 400 etc

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3. Scientists investigated the way wild monkeys learn to retrieve a coconut from the opposite side of a river. More specifically, 24 wild monkeys were assigned to one of three experimental conditions:
   a. Observation of another monkey: Monkeys watched another monkey retrieving the coconut by building a bridge across the river stream.
   b. Observation of a human: Monkeys watched a human retrieving the coconut.
   c. Banana reward: Monkeys were allowed to do what they wanted but each time they managed to retrieve the coconut they were rewarded with a banana.

After learning, the monkeys were required to perform the task of retrieving a coconut from the opposite side of a river. The time taken to retrieve the coconut (in inutes) was measured and recorded to the following table:

Observation of monkey	Observation of human	Banana reward
7	15	6
13	13	9
3	7	3
8	8	9
9	6	5
2	13	1
8	7	3
7	9	10

Given that the time taken to retrieve the coconut follows a normal distribution, carry out an appropriate analysis to test the hypothesis that the time is equal for all learning conditions. If the hypothesis doesn't hold, which condition leads to the fastest learning?

1) we want to test that m1 = m2 = m3
2) determination of lowest m

one-way anova

but you need to check for equality of variances

4. Assuming that the sodium level in human blood follows a normal distribution with a mean value of 160 and a standard deviation of 20, what is the probability that the sodium level in a person's blood is: *easy, make a normal distribution and*
   a. less than 140,
   b. between 125 and 140 *a. x<140*
   c. greater than 180. *b. 125<x<140*
    c. x>180

Note: You may use the disttool graphical interface.

27/10, pg 10 **5.** A microbiologist wished to determine whether there is any difference in the time it takes to make a product from two different starters: lactobacillus acidophilus (A) and bulgarius (B). Seven batches of the product were made with each of the starters. The table below shows the time taken, in hours, to make each batch:

normal distribution

the equality of variances should be checked

Starter A	Starter B
7.3	6.4
6.9	6.1
8.2	6.7
6.1	6.9
6.3	6.3
7.4	5.7
6.8	5.5

then we can use:
hypothesis tests for the mean value

Assuming that both sets of times may be considered to be random samples from normal populations, test the hypothesis that the mean time taken to make the product is the same for both starters. Present all steps of the hypothesis testing.

Remarks:

1. Where no specific significance level is stated, you should consider it equal to 0,05.

2. Your responses must include, among others, the null and the alternative hypothesis as well as the type of the hypothesis tests you have used (two-sided or one-sided).

3. Your replies must also present in detail the necessary conditions for applying the method you have selected and the testing of their validity (in case the validity does not arise from the exercise).

4. In addition, the codes (eg MATLAB) and the charts that have been used must be included.