Due: April 18th, 2024,10pm
Problems Due: 1,2,3

1. We are given the readings from a particular blood test

$$0.22, 1.05, -0.24, 0.18, 0.16, -0.67, 2.49, -0.07, -0.13, -0.03$$

   (a) Perform the sign test (by hand) for the null hypothesis that the median is 0 versus the fact the median is greater than 0.

   (b) Perform the Wilcox signed rank test (by hand) for the null hypothesis that the median is 0 versus the fact the median is greater than 0.

   (c) Using the inbuilt `R`- test `wilcox.test` and verify your result.

2. We are given the readings from a particular blood test

$$\text{Post-Treatment} - 0.22, 1.05, -0.24, 0.18, 0.16, -0.67, 2.49, -0.07, -0.13, -0.03$$

$$\text{Placebo} - 0.19, 3.00, 1.34, 1.35, 1.95, 1.63, 0.68, 0.51, 1.65, 0.92$$

   (a) Perform the Mann Whitney U test (by hand) for the null hypothesis that the median is 0 versus the fact the median is greater than 0.
   Use the tables at https://mason.gmu.edu/ alaemmer/bio214/mwu-table2.pdf.

   (b) Using the inbuilt `R`- test `wilcox.test` and verify your result.

3. Perform the following Bootstrap calculation in `R`.

   (a) First generate 25 samples from Poisson (5).

   (b) Using `sample` generate 200 bootstrap samples and compute means $\lambda_i^\star$ for each bootstrap sample $i = 1, \ldots 200$.

   (c) Plot the histogram for $\lambda_i^\star$, draw a vertical line at 5 and one at the bootstrap mean $\frac{1}{200}\sum_{i=1}^{200}\lambda_i^\star$.

   (d) Compute the bias, standard error and a 95% confidence interval.

   (e) *Extra-credit:* Can you justify numerically that that the interval in the previous part is a 95% interval ?

Wilcoxon Signed Sum Rank test := **Table of Critical Values of W:**

The critical value of W can be found in the table below:

Two-Sided Test α	**0.1**	**0.05**	**0.02**	**0.01**
One-Sided Test α	**0.05**	**0.025**	**,01**	**0.005**
n				
5	1			
6	2	1		
7	4	2	0	
8	6	4	2	0
9	8	6	3	2
10	11	8	5	3
11	14	11	7	5
12	17	14	10	7
13	21	17	13	10
14	26	21	16	13
15	30	25	20	16
16	36	30	24	19
17	41	35	28	23
18	47	40	33	28
19	54	46	38	32
20	60	52	43	37
21	68	59	49	43
22	75	66	56	49
23	83	73	62	55
24	92	81	69	61
25	101	90	77	68
26	110	98	85	76
27	120	107	93	84
28	130	117	102	92
29	141	127	111	100
30	152	137	120	109

For E.g.: the appropriate one-sided critical value for say sample size ($n = 8$) at one-sided level of significance ($\alpha = 0.05$) the critical value of W is 6. So the rule is to reject H_0 if $W < 6$.