

## Homework-7 Solutions

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**NOTE:** The program was written in R. So, statistic for Wilcoxon test would

### Problem-a:

1. *Two sample z test*

Values of Standard deviation for patients BEFORE treatment is: **0.6317977**

Values of Standard deviation for patients AFTER treatment is: **0.6847394**

2. *Two sample T-Test: Degrees of freedom is  $9+9-2 = 16$*

4. **Paired Z test**

Values of Standard deviation for Paired Data is: **0.7390628**

5. **Paired t-test**

Degrees of freedom is  $9-1 = 8$

### Problem-b:(Result got through R code)

"-- Two Sample Z Test - P Value & Statistic--"

id	1020	1021	1022	1023	1024
p	0.54875244	0.02506588	0.56242897	0.75233848	0.42871182
stat	0.5996306	-2.2403860	0.5792374	0.3155574	0.7913979

"-- Two Sample T Test - P Value & Statistic--"

id	1020	1021	1022	1023	1024
p	0.28065100	0.02427776	0.32642738	0.61735554	0.59330880
stat	1.1166067	-2.4874792	1.0123687	0.5095019	0.5449419

"-- Mann-Whitney Test - P Value & Statistic--"

id	1020	1021	1022	1023	1024
p	0.29732620	0.01875771	0.43628137	0.54570136	0.73044015
stat	53	14	50	48	45

"-- Paired Z Test - P Value & Statistic --"

id	1020	1021	1022	1023	1024
p	0.449701802	0.004738438	0.465265481	0.690776819	0.318444325
stat	0.7559123	-2.8242975	0.7302040	0.3978011	0.9976599

"-- Paired T Test - P Value & Statistic --"

id	1020	1021	1022	1023	1024
p	0.02978104	0.02236363	0.36647044	0.55724994	0.23747847
stat	2.6385335	-2.8237714	0.9572514	0.6124395	1.2768180

"-- Wilcoxon Signed Test - P Value & Statistic --"

id	1020	1021	1022	1023	1024
p	0.8	0.6	1.0	1.0	0.8
stat	6	2	5	5	6

**Problem-c:**

" Top 12 significant P-values "

"-- Two Sample Z Test --"

	id	p
[1,]	9107	2.007654e-08
[2,]	5245	1.165323e-06
[3,]	7935	1.750952e-06
[4,]	5158	8.544083e-06
[5,]	5834	1.318682e-05
[6,]	7625	1.979591e-05
[7,]	7147	2.008350e-05
[8,]	2053	2.424204e-05
[9,]	7410	4.035003e-05
[10,]	5852	5.410882e-05
[11,]	1979	7.454814e-05
[12,]	3026	7.692948e-05

"-- Two Sample T Test --"

	id	p
[1,]	4623	0.0003310629
[2,]	6610	0.0005374456
[3,]	7064	0.0007135529
[4,]	9107	0.0010305466
[5,]	318	0.0010407191
[6,]	6634	0.0011604619

[7,]	7994	0.0013495225
[8,]	2996	0.0013610668
[9,]	6820	0.0018284944
[10,]	787	0.0021405373
[11,]	8207	0.0021848992
[12,]	7935	0.0022046654

-- Mann-Whitney Test --

	id	p
[1,]	6634	8.227067e-05
[2,]	6610	4.936240e-04
[3,]	7064	4.936240e-04
[4,]	318	1.234060e-03
[5,]	9107	1.234060e-03
[6,]	4623	1.470114e-03
[7,]	787	1.851090e-03
[8,]	7994	1.851090e-03
[9,]	6495	2.756067e-03
[10,]	7568	2.756067e-03
[11,]	8207	2.756067e-03
[12,]	3058	3.990128e-03

-- Paired Z Test --

	id	p
[1,]	9107	1.507222e-12
[2,]	5245	8.872148e-10
[3,]	7935	1.679632e-09
[4,]	5158	2.009746e-08
[5,]	5834	3.961905e-08
[6,]	7625	7.476146e-08
[7,]	7147	7.646553e-08
[8,]	2053	1.026014e-07
[9,]	7410	2.273340e-07
[10,]	5852	3.593344e-07
[11,]	1979	5.922984e-07
[12,]	3026	6.220580e-07

-- Paired T Test --

	id	p
[1,]	7994	4.669435e-05
[2,]	6448	9.712434e-05
[3,]	1043	1.121254e-04
[4,]	2167	3.043333e-04
[5,]	1202	3.532373e-04
[6,]	7420	3.868327e-04

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[7,] 5483 4.522793e-04
[8,] 301 4.771858e-04
[9,] 2629 4.996791e-04
[10,] 7644 9.090941e-04
[11,] 7414 9.169960e-04
[12,] 2539 9.832040e-04
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*-- Wilcoxon Signed Test --*

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      id      p
[1,]  22 0.00390625
[2,] 261 0.00390625
[3,] 301 0.00390625
[4,] 719 0.00390625
[5,] 775 0.00390625
[6,] 1016 0.00390625
[7,] 1043 0.00390625
[8,] 1202 0.00390625
[9,] 1299 0.00390625
[10,] 1452 0.00390625
[11,] 1873 0.00390625
[12,] 1979 0.00390625
```

#### **Problem-d**

" # of genes at different significance levels"

*-- Two Sample Z Test --*

0.01 - 114

0.05 - 269

0.10 - 435

*-- Two Sample T Test --*

0.01 - 45

0.05 - 201

0.10 - 446

*-- Mann-Whitney Test --*

0.01 - 34

0.05 - 188

0.10 - 433

*-- Paired Z Test --*

0.01 - 240

0.05 - 500

0.10 - 756

*-- Paired T Test --*

0.01 - 113  
0.05 - 473  
0.1 - 875

"-- *Wilcoxon Signed Test* --"

0.01 - 113  
0.05 - 409  
0.10 - 891

" # of genes at different significance levels with **Bonferroni Correction**"

-- *Two Sample Z Test* --"

2  
4  
5

"-- *Two Sample T Test* --"

0  
0  
0

"-- *Mann-Whitney Test* --"

0  
0  
0

"-- *Paired Z Test* --"

14  
18  
28

"-- *Paired T Test* --"

0  
0  
0

"-- *Wilcoxon Signed Test* --"

0  
0  
0

" # of genes at different significance levels with **Sidak Correction**"

-- *Two Sample Z Test* --"

2  
4  
5

*-- Two Sample T Test --*

0

0

0

*-- Mann-Whitney Test --*

0

0

0

*-- Paired Z Test --*

15

18

28

*-- Paired T Test --*

0

0

0

*-- Wilcoxon Signed Test --*

0

0

0

### **Problem-e**

*-- Two Sample Z Test: FDR--*

0.2205714

*-- Two Sample T Test: FDR --*

0.07885714

*-- Mann-Whitney Test: FDR --*

0.1211429

*-- Paired Z Test: FDR --*

0.4388571

*-- Paired T Test: FDR --*

0

*-- Wilcoxon Signed Test: FDR --*

0.1348571







