MAT 8452-2 6/11/2020

HW #2

2) $\binom{6}{3} = 20$

XYYYXX YXYYXX XXYYXY
XYXYYX YXXYYX XYYXXY
XYYXYX YXYXYX YXYXXY
XXYYYX XYXYXY YXXYXY

$P = \frac{12}{20} = \frac{3}{5}$

3)

Rank1	Rank2	Rank3	Rank4	T^+
+	−	+	+	8
+	−	+	−	4
+	−	−	+	5
+	−	−	−	1
+	+	+	+	10
+	+	+	−	6
+	+	−	+	7
+	+	−	−	3
−	−	+	+	7
−	−	+	−	3
−	−	−	+	4
−	−	−	−	0
−	+	+	+	9
−	+	+	−	5
−	+	−	+	6
−	+	−	−	2

T_+	prob
0	1/16
1	1/16
2	1/16
3	2/16 = 1/8
4	2/16 = 1/8
5	2/16 = 1/8
6	2/16 = 1/8
7	2/16 = 1/8
8	1/16
9	1/16
10	1/16

It's not possible to do a level 0.05 upper tailed test b/c $P(T^+ \geq 10) = \frac{1}{16} > 0.05$ we can't find such T_+ to do a level 0.05 test.

Pair			Diff
1	35	51	-16
2	20	32	-12
3	24	28	4
4	28	48	20

$2^4 = 16$

4)

4	12	16	20	$\bar{x}$	4	12	16	20	$\bar{x}$
+	+	−	−	-5	−	+	−	−	-7
+	+	−	+	5	−	+	−	+	3
+	+	+	−	3	−	+	+	−	1
+	+	+	+	13	−	+	+	+	11
+	−	−	−	-11	−	−	−	−	-13
+	−	−	+	-1	−	−	−	+	-3
+	−	+	−	-3	−	−	+	−	-5
+	−	+	+	7	−	−	+	+	5

$\bar{x}$	prob
-13	$\frac{1}{16}$
-11	$\frac{1}{16}$
-7	$\frac{1}{16}$
-5	$\frac{2}{16}$
-3	$\frac{2}{16}$
1	$\frac{1}{16}$
3	$\frac{2}{16}$
5	$\frac{2}{16}$
7	$\frac{1}{16}$
11	$\frac{1}{16}$
13	$\frac{1}{16}$
-1	$\frac{1}{16}$

5) a)

Dog i	X_i	Y_i	Diff	R_i	ψ_i	$R_i\psi_i$
1	350	480	130	5	1	5
2	200	130	-70	4	0	0
3	240	250	10	1	1	1
4	290	310	20	2	1	2
5	90	280	190	6	1	6
6	370	1450	1080	7	1	7
7	240	280	40	3	1	3

$T^+ = 24$

$H_0: \theta = 0$ $H_a: \theta < 0$

Then apply wilcox.test (X_i, Y_i), Pair = True, alterative = "less") to obtain $T^+ = 24$ with a p value of 0.055

Therefore, we fail to reject H_0 and cannot conclude H_a, that is, we do not have enough evidence to conclude that stimulation of the vagus nerve increase the blood level of immunoreactive insulin

						2
2	400	533	133	4	1	4
3	520	362	-158	6	0	0
4	490	628	138	5	1	5
5	574	463	-111	3	0	0
~~6~~	~~427~~	~~427~~	~~0~~			
7	435	449	14	1	1	1

$T^+ = 12$ $\quad n = 7-1 = 6$

b) $H_0: \theta = 0$ $\quad H_a: \theta > 0$

Using R psignrank(12, 6, lower.tail=F) we estimated $\alpha = 0.34$ and p value 0.42. Therefore, we fail to reject H_0, and cannot conclude H_a. that is, we do not have enough evidence to conclude that growth hormone therapy increase heat-insoluble hydroxyproline in the skin.

6) $\binom{7}{2} = 21$ possibilities, each equally likely

possibility (1 2 3 4 5 6 7)	W
XYYXXXX	6+7=13
XYXXXXY	2+7=9
XXYXXXY	3+7=10
XXXYXXY	4+7=11
XXXXYXY	5+7=12
XYYXXXX	2+3=5.
XXYYXXX	3+4=7
XXXYYXX	4+5=9
XXXXYYX	5+6=11
YYXXXXX	1+2=3
YXYXXXX	1+3=4
YXXYXXX	1+4=5
YXXXYXX	1+5=6
YXXXXYX	1+6=7
YXXXXXY	1+7=8
XYXYXXX	2+4=6
XYXXYXX	2+5=7
XYXXXYX	2+6=8
XXXYXYX	4+6=10
XXYXXYX	3+6=9
XXYXXYX	3+5=8

W	null pmb
3	1/21
4	1/21
5	2/21
6	2/21
7	3/21 = 1/7
8	3/21 = 1/7
9	3/21 = 1/7
10	2/21
11	2/21
12	1/21
13	1/21
	1

Since it is upper tailed test $\Delta > 0$ and $\alpha = 0.2$ then $P(W \geq 11) < 0.2$

Thus, $W \geq 11$ is the rejection reg.

The exact α level is $(2+1+1)/21 \approx 0.19$