UNIVERSITY OF SOUTH CAROLINA

STAT 205, SPRING 2017

Final Exam

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MAY 2, 2017

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GROUND RULES

There are 60 questions (2 points each), and you have 150 minutes.

No cheatsheet is allowed.

Calculator is allowed in this exam, but smartphone cannot be used as calculator.

No communication of any type with others is allowed. You must do it yourself.

Use number 2 pencil to fill in your scantron. Don't use a pen.

You need to fill in the I.D. number in the scantron form (**start from the left**).

Your I.D. Number can be found in the Page 3.

First Name	Last Name	I.D.	First Name	Last Name	I.D.	First Name	Last Name	I.D.
SOPHIA	Abdun	1	Claire	Hann	32	KATHERINE	Palmer	62
MATTHEW	Absher	2	CHAD	Hardin	33	Anna	Patrick	63
KATHRYN	Allgor	3	CALLIE	Hartsell	34	YURLEIDY	Piedrahita	64
JORDAN	Ard	4	KATIE	Heiken	35	CAMILLE	Pierner	65
KRISTEN	Barber	5	JOHN	Holler	36	WILLIAM	Portas	66
ASIA	Barnes	6	EMMA	Holtzclaw	37	LAUREN	Pruden	67
ALICIA	Barry	7	BRANDON	Houston	38	ERICA	Rader	68
BENJAMIN	Blanton	8	SAAD	Iftikhar	39	BRIANNA	Ray	69
BREANNA	Boone	9	ASHTON	Irvin	40	LAUREN	Reince	70
Margaret	Booth	10	DONTE	Jackson	41	MEREDITH	Riggs	71
EMILY	Boyd	11	MAEGAN	Jewson	42	JACK	Rogan	72
Morgan	Brett	12	Alexandra	Johnson	43	MEGHAN	Root	73
ELIZABETH	Broome	13	NOAH	Karch	44	MERRY	Rudinger	74
MICHELLE	Brown	14	SAVANNA	Kelly	45	VAIDA	Shelley	75
MYESHA	Butler	15	RONIT	Kulkarni	46	NICOLE	Smith	76
JAMES	Clark	16	SAMUEL	Lambert	47	REG	Taylor	77
SARAH	Colombo	17	SYDNEY	Lovelace	48	ADDISON	Testoff	78
AMANDA	Corrado	18	Adriana	Martinez Coronado	49	BRANDON	Todd	79
LOGAN	Crane	19	MATTHEW	McCrosson	50	ANDREAS	Tsakanias	80
KELSEY	Dillon	20	LAUREN	Medlin	51	RAINE	Valcich	81
JILLIAN	Faircloth	21	NATHAN	Meek	52	JOSHUA	Veloso	82
JOSHUA	Farris	22	HANNAH	Moore	53	EMMA	Wagner	83
RINESHA	Finklea	23	CASEY	Morrison	54	TAYLOR	Weidner	84
CASEY	Fissel	24	DANIEL	Nelson	55	ARIANA	Wilchenski	85
KAYLAN	Frame	25	COLIN	O'Connor	56	MACKENZIE	Williams	86
MATTHEW	Franklin	26	SIOBHAN	O'Dell	57	MATTHEW	Willis	87
KRYSTYN	Gainey	27	HALEIGH	O'Donegan	58	VICTORIA	Wills	88
AMALIA	Gelinas	28	CLAIRE	O'Loughlin	59	MICHEAL	Wood	89
MADISON	Genal	29	CASSIDY	Onley	60	EMILY	Wood	90
CALLUM	Gill	30	ALLISON	Osborne	61	CRISTINA	Young	91
BRELAND	Green	31				KATHRYN	Zabinski	92

1. In hypothesis test type II error is:

(a) Accepting H_0 when it is false. (b) Rejecting H_0 when it is false.

(c) Accepting H_0 when it is true. (d) Rejecting H_0 when it is true.

2. In hypothesis test the significance level $\boldsymbol{\alpha}$ is:

(a) Probability of type II error (b) Probability of type I error

(c) Power of the test (d) Confidence level.

Use the following information to answer questions 3 to 6.

We want to test if blood type is independent of contracting malaria or having certain blood type make an individual more susceptible to malaria. A study in malaria generated following data:

	A	B	O	AB	Total
Malaria Cases	138	199	106	33	476
Control	229	535	428	96	1300

3. The proper test to perform in this case is:

(a) t-test (b) chi-square test (c) binomial test (d) Fisher's test.

4. The proper R-code to be used in this case is:

(a)
```
malaria=matrix(c(138,229,199,535,106,428,33,96),nrow=2)
chisq.test(malaria)
```

(b)
```
malaria=matrix(c(138,229,199,535,106,428,33,96),nrow=2)
fisher.test(malaria)
```

(c)
```
malaria=matrix(c(138,229,199,535,106,428,33,96),nrow=2)
binom.test(malaria)
```

(d)
```
malaria= c(138,199,106,33)
control=c(229, 535, 428, 96)
t.test(malaria,control)
```

5. The numerical variables in this study are:

(a) Blood Group (b) Malaria (Yes or No) (c) Both (a) and (b) (d) None of (a) or (b)

6. The numerical variables in this study are:

(a) Blood Group (b) Malaria (Yes or No) (c) Both (a) and (b) (d) None of (a) or (b)

Use the following information to answer questions 7 to 8.

Mycocardial blood flow (MBF) was measured for two groups of subjects after five minutes of bicycle exercise. The normoxia ("normal oxygen") group was provided normal air to breathe whereas the hypoxia group was provided with a gas mixture with reduced oxygen to simulate high altitude. The observations (ml/min/g) were used in R with the following code:

```
>normoxia=c(3.45,3.09,3.09,2.65,2.49,2.33,2.28,2.24,2.17,1.34)
>hypoxia=c(6.37,5.69,5.58,5.57,5.11,4.88,4.68,4.50)
>t.test(normoxia, hypoxia)
```

A partial view of the output from R is given as follows:

```
     Welch Two Sample t-test

data:  normoxia and hypoxia
95 percent confidence interval:
-3.401594  -2.167406
sample estimates:
mean of x mean of y
   2.5130    5.2975
```

7. From the partial output, can you still conduct a hypothesis test to conclude if the MBF level in the two groups are significantly different or not, why or why not?

(a) We cannot conduct a test because the part showing P-value is excluded from the output.

(b) We can still conduct the test because the sample estimates of means are given and they are different.

(c) We cannot conduct a test because the degrees of freedom are not given in the output.

(d) We can still conduct the test using the confidence interval because a 95% confidence interval can be used to perform a 5% level of significance test.

8. Based on the partial output we conclude:

(a) Reduced oxygen does not significantly affect MBF level.

(b) The test is inconclusive because the entire R output was not given.

(c) Reduced oxygen does significantly affect MBF level.

(d) The probability that MBF level will decrease due to reduced oxygen is 5%.

Use the following information to answer questions 9 to 11.

A cross between white and yellow summer squash gave progeny of following colors:

Color	White	Yellow	Green
Number of progeny	158	40	10

A researcher wants to see if this data is consistent with the 12:3:1 ratio predicted by a certain genetic model.

9. Let and be proportions of white, yellow and green progeny. To verify if the data consistent with the predicted genetic model we should test the following hypothesis

a) $H_0 : p_1 = p_2 = p_3$ vs $H_A : H_0$ is false.

b) $H_0 : \theta = 1$ vs. $H_A : \theta \neq 1$

c) $H_0 : p_1 = \frac{12}{16}; p_2 = \frac{3}{16}; p_3 = \frac{1}{16}$ vs. $H_A : H_0$ is false.

d) None of the above.

10. Appropriate test to use in this case is:

a) Test for independence

b) Goodness of fit test

c) Simpson's paradox

d) Fisher's test.

11. The R-code to be used for the hypothesis test is:

(a) `color=c(158,40,10); chisq.test(color)`

(b) `color=c(158,40,10); prob=c(0.75,0.1875,0.0625); chisq.test(color, p = prob)`

(c) `color=c(158,40,10); fisher.test(color);`

(d) `color=c(158,40,10); prob=c(0.75,0.1875,0.0625); simpson.test(color);`

Use the following information to answer questions 12 to 18.

Two treatments, heparin and enoxaparin, were compared in a double blind, randomized clinical trial of patients with coronary artery disease. The subjects can be classified as having a positive or negative response to treatment; the data are given in the following table:

		Heparin	Enoxaparin
Outcome	Positive	309	266
	Negative	1255	1341
	Total	**1564**	**1607**

Below is the R-Code and output from the data

Let us assume p1 and p2 denote the chances of having positive effect while using Heparin and Enoxaparin respectively and θ denotes the odds ratio of having positive effect from Heparin to Enoxaparin.

12. An appropriate test to see if chance of a positive effect while using Heparin is any different than chance of a negative effect while using Enoxaparin will be:

(a) $H_0 : p_1 = p_2$ vs. $H_A : p_1 \neq p_2$

(b) $H_0 : p_1 - p_2 = 0$ vs. $H_A : p_1 - p_2 \neq 0$

(c) $H_0 : \theta = 1$ vs. $H_A : \theta \neq 1$

(d) All of the above.

```
> drug=matrix(c(309,1255,266,1341), nrow=2)
> prop.test(drug)

2-sample test for equality of proportions with
continuity correction

data:  drug
X-squared = 5.2688, df = 1, p-value = 0.02171
alternative hypothesis: two.sided
95 percent confidence interval:
 0.007833195 0.100077303
sample estimates:
   prop 1    prop 2
0.5373913 0.4834361
> fisher.test(drug)

     Fisher's Exact Test for Count Data

data:  drug
p-value = 0.02113
alternative hypothesis: true odds ratio is not equal
to 1
95 percent confidence interval:
 1.031443 1.494246
sample estimates:
odds ratio
  1.241168
```

13. A 95% confidence interval for $p_1 - p_2$ is given by:

(a) [1.031443, 1.494246] (b) [0.007833195, 0.100077303]

(c) [0.5373913, 0.4834361] (d) 1.241168

14. In R, the code “prop.test” actually tests the hypotheses:

(a) $H_0 : p_1 - p_2 = 0$ vs. $H_A : p_1 - p_2 \neq 0$ (b) $H_0 : \theta = 1$ vs. $H_A : \theta \neq 1$

(c) $H_0 : p_1/p_2 = 1$ vs. $H_A : p_1/p_2 \neq 1$ (d) $H_0 : \mu_1 - \mu_2 = 0$ vs. $H_A : \mu_1 - \mu_2 \neq 0$

15. In R, the code “fisher.test” actually tests the hypotheses:

(a) $H_0 : p_1 - p_2 = 0$ vs. $H_A : p_1 - p_2 \neq 0$ (b) $H_0 : \theta = 1$ vs. $H_A : \theta \neq 1$

(c) $H_0 : p_1/p_2 = 1$ vs. $H_A : p_1/p_2 \neq 1$ (d) $H_0 : \mu_1 - \mu_2 = 0$ vs. $H_A : \mu_1 - \mu_2 \neq 0$

16. From the p-values of either tests we conclude:

(a) The positive or negative outcome from the drugs under study is not associated with the choice of the drug.

(b) The positive or negative outcome from the drugs under study is associated with the choice of the drug.

(c) Chance of positive outcome is same for patients taking heparin and patients taking enoxaparin.

(d) All of the above.

17. From the confidence interval of the Fisher test we can conclude:

(a) The odds of having positive outcome from heparin is likely to be lesser than the odds of having positive outcome from enoxaparin.

(b) The odds of using heparin for patients with positive outcomes is likely to be lesser than odds of using heparin for patients with negative outcomes.

(c) The odds of having positive outcome from heparin is likely to be greater than the odds of having positive outcome from enoxaparin.

(d) The odds of using enoxaparin for patients with positive outcomes is likely to be greater than odds of using heparin for patients with negative outcomes.

18. The Fisher test output shows that estimated sample odds ratio is about 1.24. This can be interpreted as:

(a) The odds of positive outcome from heparin is 1.24 times greater than the odds of positive outcome from enoxaparin.

(b) The odds of positive outcome from enoxaparin is 1.24 times greater than the odds of positive outcome from heparin.

(c) The chance of positive outcome from heparin is 1.24 times greater than the chance of positive outcome from enoxaparin.

(d) The odds of using enoxaparin is 1.24 times greater for patients with positive outcomes than the patients with negative outcome.

Use the following information to answer questions 19 to 22.

Human beta-endorphin (HBE) is a hormone secreted by the pituitary gland under condition of stress. An exercise physiologist measured the resting (un-stresses) blood concentration of HBE in three groups of men: i) who had just entered a physical fitness program ii) who had been jogging regularly for some time and iii) sedentary people. The HBE level (pg/ml) is shown in the following table:

Entrants	38.7	41.2	39.3	37.4	38.4	36.7	41.2	43.6	37.2		
Joggers	35.7	31.2	33.4	38.9	35.2	35.1	34.3	36.2			
Sedentary	42.5	43.8	40.3	38.7	41.2	45.6	44.3	36.8	43.2	37.4	38.8

19. The appropriate null hypothesis to test if HBE level is affected by level exercise/fitness.

(a) $H_0 : p_1 = p_2 = p_3$ vs. H_A : not H_0

(b) $H_0 : \mu_1 = \mu_2 = \mu_3$ vs. H_A : not H_0

(c) $H_0 : \theta_1 = \theta_2 = \theta_3$ vs. H_A : not H_0

(d) None of the above.

Following is the Rcode and output for the analysis of the data

```
HBE=c(38.7,41.2,39.3,37.4,38.4,36.7,41.2,43.6,37.2,35.7,31.2,33.4,
38.9,35.2,35.1,34.3,36.2,42.5,43.8,40.3,38.7,41.2,45.6,44.3,36.8,
43.2,37.4,38.8)
groups=c(1,1,1,1,1,1,1,1,1,2,2,2,2,2,2,2,2,3,3,3,3,3,3,3,3,3,3,3)
groups=factor(groups)
fit=aov(HBE~groups)
summary(fit)

                Df    Sum Sq   Mean Sq    F value   Pr(>F)
groups          2    178.3      89.14       13.56     0.000103 ***
Residuals   25    164.3      6.57
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

20. The value of the F-test statistic is

(a) 89.14 (b) 0.000103 (c) 13.56 (d) 6.57

21. The p-value for the test is:

(a) 89.14 (b) 0.000103 (c) 13.56 (d) 6.57

22. At 5% level of significance we conclude that:

(a) The three groups have significantly different average HBE level.

(b) The three groups do not have significantly different average HBE level.

(c) Joggers have significantly higher HBE level than other groups.

(d) Sedentary people have significantly lower HBE level than other groups.

Use the following information to answer questions 23 to 27.

Hip dysplasia is a hip socket abnormality that affects many large breed dogs. A review of medical records of dogs seen at 27 veterinary medical teaching hospitals found the number of cases for two large breed dogs.

		Golden Retriever	Border Collie
Hip	Yes	3995	221
dysplasia?	No	42,946	5007
	Total	46941	5228

23. Calculate the odds ratio for hip dysplasia in golden retrievers vs border collies.

(a) 0.4745 (b) 1.3792 (c) 2.0133 (d) 2.1076

24. Calculate the relative risk of hip dysplasia in golden retrievers vs border collies.

(a) 0.4745 (b) 1.3792 (c) 2.0133 (d) 2.1076

25. The hypotheses that test whether hip dysplasia is more common in golden retrievers than border collies are:

a) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$ (b) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 > \mu_2$

c) $H_0 : p_1 = p_2$ vs. $H_A : p_1 \neq p_2$ (d) $H_0 : p_1 = p_2$ vs. $H_A : p_1 > p_2$

26. The most effective test to use in this case is:

(a) t-test (b) Wilcoxon-Maan-Whitney test (c) Fishers's test (d) None of the above.

27. The hypothesis testing problem in this case is called

(a) Test for independence (b) Goodness of fit test

(c) Simpson's paradox (d) Analysis of Variance

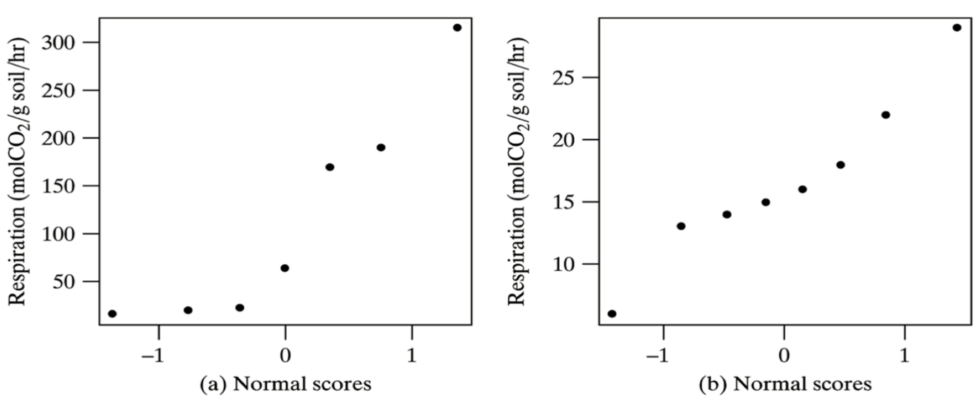
Use the following information to answer questions 28 and 29.

Soil respiration affects plant growth. Soil cores taken from two locations in forest: (1) under opening in forest canopy (gap) and (2) under heavy tree growth (growth). Amount of carbon dioxide given off by each soil core was measured (mol CO2/g soil/hr). Seven observations were taken for "gap" data and eight for "growth" data. We want to test the following hypotheses:

H_0: The soil respiration level does not differ in gap to growth areas.

H_A: The soil respiration level is different in the gap and growth area.

The QQplots for the two data set is given as follows:



28. The hypothesis that we are testing can be written in symbols as:

(a) $H_0 : \theta = 1 \ vs. H_A : \theta \neq 1$

(b) $H_0 : \mu_1 = \mu_2 \ vs. H_A : \mu_1 \neq \mu_2$

(c) $H_0 : p_1 = p_2 \ vs. H_A : p_1 \neq p_2$

(d) $H_0 : \mu_d = 0 \ vs. H_A : \mu_d \neq 0$

29. The most appropriate test to use in this case will be:

(a) Two sample t-test

(b) Paired t-test

(c) Wilcoxon-Maan-Whitney Test

(d) Cochran-Mantel-Haenszel test.

<u>Use the following to answer questions 30 to 38.</u>

A certain drug treatment cures 90% of cases of hookworm in children. Suppose that 20 children suffering from hookworm are to be treated, and that the children can be regarded as a random sample from the population.

Suppose we did not know the cure rate of the drug that treats hookworm in children. We want to test the hypothesis that the cure rate of the drug is indeed 90%. Now suppose from the sample of 20 children, we found that 17 children were cured.

30. The appropriate hypotheses to test is this case is:

(a) $H_0 : \mu = 0.90 \ vs. H_A : \mu \neq 0.90$

(b) $H_0 : \mu = 0.90 \ vs. H_A : \mu > 0.90$

(c) $H_0 : p = 0.90 \ vs. H_A : p \neq 0.90$

(d) $H_0 : p = 0.90 \ vs. H_A : p > 0.90$

For the given data on 20 children we used following R code and partial output is provided below

```
binom.test(17,20)
95 percent confidence interval for probability of success:
 0.6210732 0.9679291
```

31. On the basis of the given output we can conclude the following for the hypothesis problem:

(a) The cure rate is significantly different from 90% (or 0.90).

(b) The cure rate is not significantly different from 90% (or 0.90).

(c) The cure rate is significantly more than 96.79291% .

(d) Not enough information given to make any conclusion.

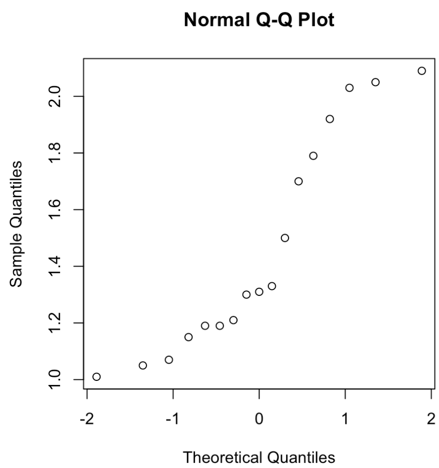
<u>Use the following to answer questions 32 to 36.</u>

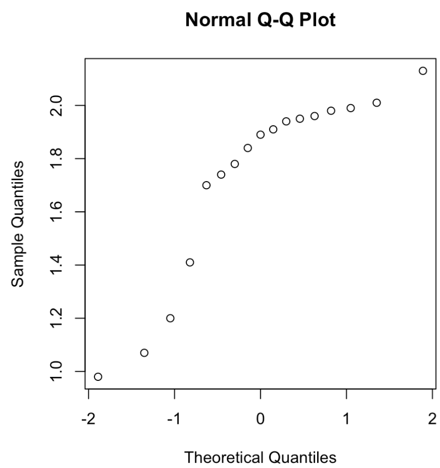
As a part of an experiment on root metabolism, a plant physiologist grew 17 birch tree seedlings with water for one day and kept 17 others as controls. He then harvested the seedlings and analyzed the roots for ATP content. The results (nmol ATP per mg tissue) were as follows:

Flooded: 1.15,1.19,1.05,1.07,1.01,1.79,1.33,1.21,1.3,1.5,1.7,1.31,1.92,1.19,2.05,2.03,2.09.
Control: 0.98,1.07,1.70,1.84,1.99,1.89,1.95,1.91,2.13,1.96,2.01,1.78,1.98,1.94,1.74,1.41,1.2

Let μ_1 and μ_2 be the average ATP content in roots of flooded trees and control trees respectively. We are interested in testing $H_0 : \mu_1 = \mu_2 \ vs. H_A : \mu_1 \neq \mu_2$

We ran codes for t-test, Wilcoxon-Maan-Whitney test and QQ-plot (left for flooded group and right for control group) in R. The outputs are as follows:






```
>t.test(Flooded, Control)

        Welch Two Sample t-test

data:  Flooded and Control
t = -2.1449, df = 31.762, p-value = 0.03971
alternative hypothesis: true difference in means is not equal
to 0
95 percent confidence interval:
 -0.52648362 -0.01351638
sample estimates:
mean of x mean of y
 1.464118  1.734118

> wilcox.test(Flooded, Control)

        Wilcoxon rank sum test with continuity correction

data:  Flooded and Control
W = 95, p-value = 0.09139
alternative hypothesis: true location shift is not equal to 0
```

32. The t-test statistics for the test is:

(a) 95 (b) 0.09139 (c) -2.1449 (d) 0.03971

33. The Wilcoxon-Maan-Whitney test statistics value for the test is:

(a) 95 (b) 0.09139 (c) -2.1449 (d) 0.03971

34. The P-value for the t-test is:

(a) 95 (b) 0.09139 (c) -2.1449 (d) 0.03971

35. The P-value for the Wilcoxon-Maan-Whitney test is:

(a) 95 (b) 0.09139 (c) -2.1449 (d) 0.03971

36. The conclusion for the hypothesis problem from the t-test (5% level of significance) is :

(a) Average ATP content in plants from flooded seedlings and control seedlings are significantly different.

(b) Average ATP content in plants from flooded seedlings and control seedlings are not significantly different.

(c) Water levels in ATP seedlings and non ATP seedlings are significantly different.

(d) Flooding significantly increases ATP content in seedlings.

37. The conclusion for the hypothesis problem from the Wilcoxon-Maan-Whitney test (5% level of significance) is:

(a) Average ATP content in plants from flooded seedlings and control seedlings are significantly different.

(b) Average ATP content in plants from flooded seedlings and control seedlings are not significantly different.

(c) Water levels in ATP seedlings and non ATP seedlings are significantly different.

(d) Flooding significantly increases ATP content in seedlings.

38. Based on the information provided for the problem which conclusion do you prefer?

(a) The t-test results because it is more powerful.

(b) The Wilcoxon-Maan-Whitney test results because the QQ plots show significant deviation from Normality.

(c) We can use either one, it does not matter because both test give us same conclusion.

(d) Neither test is conclusive because they contradict each other.

Use the following to answer problems 39 and 45

In a pharmacological study, researcher measured the concentration of brain chemical dopamine in six rats exposed to toluene and six control rats. The concentration in the striatum region of the brain were as shown in the table

Dopamine(ng/gm)	Toluene	3420	2314	1911	2464	2781	2803
	Control	1820	1843	1397	1803	2539	1990

Let μ_1 and μ_2 are the average Dopamine concentration in Toluene exposed rats and control group rats respectively.

39. If researchers want to see if the average dopamine level of toluene exposed rats is any **different** from the control rats, they should consider testing the following hypotheses:

(a) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 > \mu_2$

(b) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 < \mu_2$

(c) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$

(d) $H_0 : \mu_1 \neq \mu_2$ vs. $H_A : \mu_1 = \mu_2$

40. If the researchers wanted to prove that toluene **increases** dopamine concentration in rats, they should consider testing the following hypotheses:

(a) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 > \mu_2$

(b) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 < \mu_2$

(c) $H_0 : \mu_1 = \mu_2$ vs. $H_A : \mu_1 \neq \mu_2$

(d) $H_0 : \mu_1 \neq \mu_2$ vs. $H_A : \mu_1 = \mu_2$

We next used a Wilcoxon-Maan-Whitney test for the data. Answer the next questions using the following R-output:

```
> wilcox.test(Toluene, Control)

        Wilcoxon rank sum test

data:  Toluene and Control
W = 32, p-value = 0.02597
alternative hypothesis: true location shift is not equal to 0

> wilcox.test(Toluene, Control, alternative="greater")

        Wilcoxon rank sum test

data:  Toluene and Control
W = 32, p-value = 0.01299
alternative hypothesis: true location shift is greater than 0
```

41. The P-value for the non-directional test is:

(a) 0. 02597 (b) 0.01299 (c) 32 (d) 16

42. The P-value for the directional test is:

(a) 0. 02597 (b) 0.01299 (c) 32 (d) 16

43. The test statistic value for the non-directional test is:

(a) 0. 02597 (b) 0.01299 (c) 32 (d) 16

44. The test statistic value for the directional test is:

(a) 0. 02597 (b) 0.01299 (c) 32 (d) 16

Use the following to answer problems 46 and 52

Migraine headache patients took part in a double-blind clinical trial to assess experimental surgery. 49 patients were assigned to a real surgery and 26 were assigned to a sham surgery. Table below shows the outcome:

	Real	Sham	**Total**
Success	41	15	**56**
Failure	8	11	**19**
Total	**49**	**26**	**75**

The R code and output are given as follows.

```
> migraine=matrix(c(41,8,15,11),nrow=2)
> fisher.test(migraine)

        Fisher's Exact Test for Count Data
data:  migraine
p-value = 0.02409
alternative hypothesis: true odds ratio is not equal to 1
95 percent confidence interval:
  1.109644    12.884047

> migraine=matrix(c(41,8,15,11),nrow=2)
> chisq.test(migraine)
Pearson's Chi-squared test with Yates' continuity correction
data:  migraine
X-squared = 4.7661, df = 1, p-value = 0.02902
```

45. The estimated odds ratio for success for real to sham group is:

(a) 1.45 (b) 3.76 (c) 2.34 (d) 4.11

46. If a patient is chosen at random, the probability that the patient will have failure is:

(a) 8/49 (b) 11/26 (c) 19/75 (d) 8/75

47. If a patient is chosen at random, given the fact that he had a sham surgery, the probability that he will have failure is:

(a) 8/49 (b) 11/26 (c) 19/75 (d) 8/75

48. A 95% confidence interval for the population odds ratio θ is

(a) [1.109644, 12.884047] (b) [0.02409, 0.2902] (c) [2.7, 3.2] (d) [3.5, 5.27]

49. The **best** test to see if the surgery work is:

(a) Test for independence (b) Goodness of fit test

(c) Simpson's paradox (d) Analysis of Variance test

50. The p-value for the *chi-square test* is:

(a) 0.02409 (b) 1.109644 (c) 4.7661 (d) 0.02902

51. The p-value for the *Fisher test* is:

(a) 0.02409 (b) 1.109644 (c) 4.7661 (d) 0.02902

52. The conclusion from the fisher test is:

a) Success or failure is not associated with the fact the surgery is real or sham.

b) Success or failure is associated with the fact the surgery is real or sham.

c) Patients have better odds of having the real surgery than the sham surgery.

d) Patients have lesser odds of having the real surgery than the sham surgery.

53. The conclusion from the chi-square test is:

a) Success or failure is not associated with the fact the surgery is real or sham.

b) Success or failure is associated with the fact the surgery is real or sham.

c) Patients have better odds of having the real surgery than the sham surgery.

d) Patients have lesser odds of having the real surgery than the sham surgery.

Use the following to answer problems 53 and 60

In an experiment to compare two diets for fattening beef steers, nine *pairs* of animals were chosen from the herd; members of each pair were matched as closely as possible with respect to hereditary factors. The members of each pair were randomly allocated, one to each diet. The following table shows the weight gains (lb) of the animals over a 140-day test period on diet 1 and 2.

Diet 1	596	442	514	454	538	512	498	641	556	427	611	606
Diet 2	512	460	468	458	530	482	528	642	456	426	415	401
Difference(d)	**84**	**-18**	**46**	**-4**	**8**	**30**	**-30**	**-1**	**100**	**1**	**196**	**205**

We want to test if both diets are equally effective or not. We consider the hypotheses:

$$H_0 : \mu_1 = \mu_2 \ vs . H_A : \mu_1 \neq \mu_2$$

Following show the R code and output that conduct appropriate tests for this study.

```
> Diet1=c(596,442,514,454,538,512,498,641,556,427,611,606)
> Diet2=c(512,460,468,458,530,482,528,642,456,426,415,401)

> t.test(Diet1,Diet2,paired=TRUE)

        Paired t-test

data:  Diet1 and Diet2
t = 2.2312, df = 11, p-value = 0.04742
alternative hypothesis: true difference in means is not equal to
0
95 percent confidence interval:
   0.697348 102.135985
sample estimates:
mean of the differences
               51.41667

> binom.test(8,12)

        Exact binomial test

data:  8 and 12
number of successes = 8, number of trials = 12, p-value = 0.3877
alternative hypothesis: true probability of success is not equal
to 0.5
95 percent confidence interval:
 0.3488755 0.9007539
sample estimates:
probability of success
             0.6666667
```

54. The t-test statistic from the paired t-test is:

(a) 0.66667 (b) 2.2312 (c) 0.04742 (d) 0.3877

55. The p-value from the paired t-test is:

(a) 0.66667 (b) 2.2312 (c) 0.04742 (d) 0.3877

56. The p-value from the sign test is:

(a) 0.66667 (b) 2.2312 (c) 0.04742 (d) 0.3877

57. The 95% confidence interval for $\mu_1 - \mu_2$ is:

a) [0.3488755, 0.9007539] b) [0.697348, 102.135985] c) 51.41667 d) 0.66667

58. At 5% level of significance the conclusion from the paired t-test is:

(a) Average weight gain from Diet 1 and Diet 2 are significantly different.

(b) Average weight gain from Diet 1 and Diet 2 are not significantly different.

(c) Odds of weight gain from Diet 1 are significantly different from odds of weight gain from Diet 2.

(d) Odds of weight gain from Diet 1 are not significantly different from odds of weight gain from Diet 2.

59. At 5% level of significance the conclusion from the sign-test is:

(a) Average weight gain from Diet 1 and Diet 2 are significantly different.

(b) Average weight gain from Diet 1 and Diet 2 are not significantly different.

(c) Odds of weight gain from Diet 1 are significantly different from odds of weight gain from Diet 2.

(d) Odds of weight gain from Diet 1 are not significantly different from odds of weight gain from Diet 2.

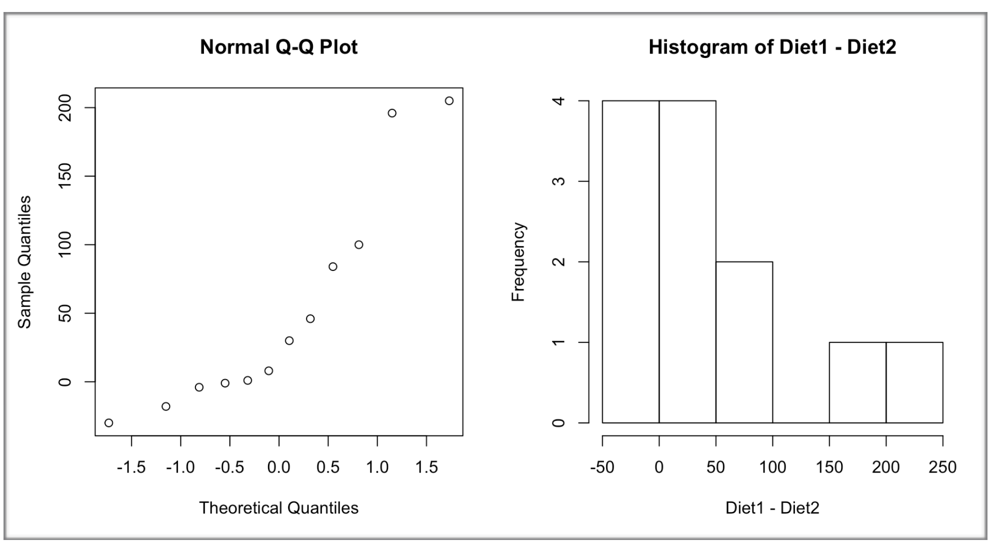
60. Based on the following plots the most appropriate conclusion for this problem is

(a) Average weight gain from Diet 1 and Diet 2 are significantly different.

(b) Average weight gain from Diet 1 and Diet 2 are not significantly different.

(c) Odds of weight gain from Diet 1 are significantly different from odds of weight gain from Diet 2.

(d) Odds of weight gain from Diet 1 are not significantly different from odds of weight gain from Diet 2.



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