Biostat HW 4

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Question #1

An experiment was conducted at the University of California–Berkeley to study the psychological environment e¤ect on the anatomy of the brain. A group of 19 rats was randomly divided into two groups. Twelve animals in the treatment group lived together in a large cage, furnished with playthings that were changed daily, while animals in the control group lived in isolation with no toys. After a month the experimental animals were killed and dissected. Table Q1 gives the cortex weights (the thinking part of the brain) in milligrams. Use the two-sample t test to compare the means of the two groups and draw appropriate conclusions. State clearly your null and alternative hypotheses and choice of test size (significant level) and p-value.

```
{'Treatment': [707, 740, 745, 652, 649, 676, 699, 696, 712, 708, 749, 690], 'Control'
: [669, 650, 651, 627, 656, 642, 698]}
```

Null and Alternative Hypotheses:

> Null hypothesis (H_0): The mean cortex weights of the treatment and control groups are equal, i.e., there is no significant difference in brain anatomy between the two groups.
>
> Alternative hypothesis (H_1): The mean cortex weights of the treatment group are different from the control group.

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T-statistic: 3.254478363839462
P-value: 0.004666592484630866
Reject the null hypothesis: There is a significant difference in cortex weights betwe
en the two groups.
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Question #2

The following data are taken from a study that compares adolescents who have bulimia to healthy adolescents with similar body compositions and levels of physical activity. Table Q2 provides measures of daily caloric intake (kcal/kg) for random samples of 23 bulimic adolescents and 15 healthy ones. Use the Wilcoxon test to compare the two populations. State clearly your null and alternative hypotheses and choice of test size (significant level) and p-value.

Null and Alternative Hypotheses:

> Null hypothesis (H_0): The daily caloric intake of bulimic adolescents

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   is equal to that of healthy adolescents.

   Alternative hypothesis (H₁): The daily caloric intake of bulimic
   adolescents is different from that of healthy adolescents.


Test Statistic: 61.5
P-value: 0.0009650590174532402
Reject the null hypothesis: There is a significant difference in daily caloric intake
between bulimic and healthy adolescents.
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Question #3

Consider the data taken from a study that attempts to determine whether the use of electronic fetal monitoring (EFM) during labor a¤ects the frequency of cesarean section deliveries. Of the 5824 infants included in the study, 2850 were monitored electronically and 2974 were not. The outcomes are shown in Table Q3. Test to compare the rates of cesarean section delivery, EFM-exposed versus nonexposed; state clearly your null and alternative hypotheses and choice of test size (significant level) and p-value.

Null and Alternative Hypotheses:

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   Null hypothesis (H₀): There is no significant association between EFM
   exposure and cesarean delivery rates.

   Alternative hypothesis (H₁): There is a significant association
   between EFM exposure and cesarean delivery rates.
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	EFM Exposure Yes	EFM Exposure No
Cesarean Delivery Yes	358	229
Cesarean Delivery No	2492	2745

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Chi-square Statistic: 37.414290910867436
Degrees of Freedom: 1
P-value: 9.55196454711465e-10
Expected Frequencies:
[[ 287.25103022  299.74896978]
 [2562.74896978 2674.25103022]]
Reject the null hypothesis: There is a significant association between EFM exposure a
nd cesarean delivery rates.
```

Question #4

In an experiment on the effect of a growth regulator on fruit setting in muskmelon the following results were obtained in Table Q4. Test whether the fruit setting in muskmelon and the application of growth regulator are independent? State clearly your null and alternative hypotheses and choice of test size (significant level) and p-value.

		Fruit set	Fruit not set	Total
0	Treated	16	9	25
1	Control	4	21	25
2	Total	20	30	50

Null and Alternative Hypotheses:

Null hypothesis (H_0): The fruit setting in muskmelon and the application of growth regulator are independent.

Alternative hypothesis (H_1): The fruit setting in muskmelon and the application of growth regulator are not independent.

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Chi-square Statistic: 10.083333333333332
Degrees of Freedom: 1
P-value: 0.0014961642897455517
Expected Frequencies:
[[10. 10.]
 [15. 15.]]
Reject the null hypothesis: The fruit setting in muskmelon and the application of gro
wth regulator are not independent.
```