PRINTABLE VERSION

Quiz 13

Rule: P-value > α → Fail to Reject H_0

P-value < α → Reject H_0

You scored 100 out of 100

Question 1

*if α is not given α = 0.05

Your answer is CORRECT.

In a hypothesis test, if the computed P-value is less than 0.001, there is very strong evidence to

.05 > .001

α > p-value

Reject H_0

a) fail to reject the null hypothesis.

b) reject the null hypothesis.

c) retest with a different sample.

Question 2

```
> question2=c(6,2,7,-3,5)
> mean(question2)
[1] 3.4
> sd(question2)
[1] 4.037326
```

Your answer is CORRECT.

In a experiment on relaxation techniques, subject's brain signals were measured before and after the relaxation exercises with the following results:

$H_0: \mu_0 = 0$ $\bar{x} = 3.4$

$H_a: \mu > 0$ $s = 4.04$

Slower brain waves

Before - After > 0

Fail to Reject H_0

P-value

$P(t > 2.06) =$

```
1-pt(2.06,4)
[1] 0.05422627
```

> α

Person	1	2	3	4	5
Before	32	38	66	49	29
After	26	36	59	52	24
	6	2	7	-3	5


```
qt(1-0.05,4)
[1] 2.131847
```

Assuming the population is normally distributed, is there sufficient evidence to suggest that the relaxation exercise slowed the brain waves? (Use α=0.05)

$t = \dfrac{3.4 - 0}{4.04/\sqrt{6}} =$

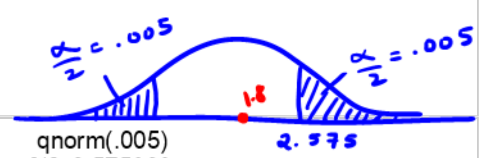
```
(3.4)/(4.04/(sqrt(6)))
[1] 2.061452
```

Fail to Reject H_0

a) Reject the null hypothesis which states there is no change in brain waves in favor of the alternate which states the brain waves slowed after relaxation.

b) Fail to reject the null hypothesis which states there is no change in brain waves.

c) There is not enough information to make a conclusion.



$H_0: p = .5$

$H_a: p \neq .5$

Question 3

α = .01

```
qnorm(.005)
[1] -2.575829
```

Your answer is CORRECT.

$n = 100$

$\hat{p} = 59/100 = .59$

Fail to Reject H_0

An experimenter flips a coin 100 times and gets 59 heads. Test the claim that the coin is fair against the two-sided claim that it is not fair at the level α=.01.

$z = \dfrac{.59 - .5}{\sqrt{\frac{(.5)(.5)}{100}}} = 1.8$ ← (+) statistic

$2 * P(z > 1.8) =$

```
2*(1-pnorm(1.8))
[1] 0.07186064
```

a) H_0: $p = .5$, H_a: $p > .5$; $z = 1.80$; Reject H_0 at the 1% significance level.

P-value α

.07186 > .01

Fail to Reject H_0

b) H_o: $p = .5$, H_a: $p \neq .5$; $z = 1.83$; Fail to reject H_o at the 1% significance level.

c) H_o: $p = .5$, H_a: $p \neq .5$; $z = 1.80$; Reject H_o at the 1% significance level.

d) H_o: $p = .5$, H_a: $p \neq .5$; $z = 1.80$; Fail to reject H_o at the 1% significance level.

e) H_o: $p = .5$, H_a: $p > .5$; $z = 1.83$; Fail to reject H_o at the 1% significance level.

Question 4

Your answer is CORRECT.

Identify the most appropriate test to use for the following situation: sample st. dev
Quart cartons of milk should contain at least 32 ounces. A sample of 22 cartons was taken and amount of milk in ounces was recorded. We would like to determine if there is sufficient evidence exist to conclude the mean amount of milk in cartons is less than 32 ounces?

$n = 22$

$H_0: \mu_0 = 32$

$H_a: \mu < 32$

when pop st. dev is not given use $\rightarrow t^*$

a) Two sample t test

b) One sample t test

c) Matched pairs

d) Two sample z test

Question 5

Your answer is CORRECT.

To use the two sample t procedure to perform a significance test on the difference of two means, we assume:

Assumptions for a two-sample t – test (these are used when the population standard deviations (or variance) are unknown) are:

1. We have two independent SRSs, from two distinct populations and we measure the same variable for both samples.
2. Both populations are normally distributed with unknown means and standard deviations.

Or if each given sample size it's at least 30. Or we'll assume normality.

a) The populations' standard deviation are known.

b) The samples from each population are independent.

c) The distributions are exactly normal in each population.

d) The sample sizes are large.

Question 6

Your answer is CORRECT.

Solid fats are more likely to raise blood cholesterol levels than liquid fats. Suppose a nutritionist analyzed the percentage of saturated fat for a sample of 6 brands of stick margarine (solid fat) and for a sample of 6 brands of liquid margarine and obtained the following results:

$\bar{x}_1 = 25.983$ $\bar{x}_2 = 17$

$$Stick = [26.3, 25.3, 26.1, 25.6, 26.7, 25.9]$$

$s_1 = 0.49967$ $s_2 = 0.39497$

$H_o: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

$$Liquid = [16.9, 16.6, 16.5, 17.4, 17.4, 17.2]$$

We want to determine if there a significant difference in the average amount of saturated fat in solid and liquid fats. What is the test statistic? (assume the population data is normally distributed)

```
> stick=c(26.3,25.3,26.1,25.6,26.7,25.9)
> liquid=c(16.9,16.6,16.5,17.4,17.4,17.2)
> mean(stick)
[1] 25.98333
> sd(stick)
[1] 0.4996666
> mean(liquid)
[1] 17
> sd(liquid)
[1] 0.3949684
```

$$t = \frac{25.983 - 17}{\sqrt{\frac{0.49967^2}{6} + \frac{0.39497^2}{6}}} = 34.548$$

a) $t = 23.264$

b) $t = 34.548$

c) $z = 34.548$

d) $z = 34.048$

e) $t = 34.048$

Question 7

Your answer is CORRECT.

It has been observed that some persons who suffer renal failure, again suffer renal failure within one year of the first episode. This is due, in part, to damage from the first episode. The performance of a new drug designed to prevent a second episode is to be tested for its effectiveness in preventing a second episode. In order to do this two groups of people suffering a first episode are selected. There are 75 people in the first group and this group will be administered the new drug. There are 45 people in the second group and this group will be administered a placebo. After one year, 11% of the first group has a second episode and 9% of the second group has a second episode. Conduct a hypothesis test to determine, at the significance level 0.05, whether there is reason to believe that the true percentage of those in the first group who suffer a second episode is less than the true percentage of those in the second group who suffer a second episode? Select the [Alternative Hypothesis, Value of the Test Statistic].

$n_1 = 75$ $\quad n_2 = 45$ $\quad \alpha = 0.05$

$\hat{p}_1 = 0.11$ $\quad \hat{p}_2 = .09$ $\quad H_o: p_1 = p_2$

$H_a: p_1 < p_2$

$$z = \frac{(0.11 - .09) - 0}{\sqrt{\frac{(.11)(.89)}{75} + \frac{(.09)(.91)}{45}}} = 0.3497$$

a) $[p_1 < p_2, 0.3497]$

b) $[p_1 \neq p_2, 0.3497]$

c) $[p_1 > p_2, 0.3497]$

d) $[p_1 = p_2, 0.3497]$

e) $[p_1 \neq p_2, 0.4497]$

f) None of the above

Question 8

Your answer is CORRECT.

It has been observed that some persons who suffer colitis, again suffer colitis within one year of the first episode. This is due, in part, to damage from the first episode. The performance of a new drug designed to prevent a second episode is to be tested for its effectiveness in preventing a second episode. In order to do this two groups of people suffering a first episode are selected. There are 55 people in the first group and this group will be administered the new drug. There are 75 people in the second group and this group will be administered a placebo. After one year, 10% of the first group has a second episode and 9% of the second group has a second episode. Conduct a hypothesis test to determine, at the significance level 0.01, whether there is reason to believe that the true percentage of those in the first group who suffer a second episode is different from the true percentage of those in the second group who suffer a second episode? Select the [Rejection Region, Decision to Reject (RH_0) or Failure to Reject (FRH_0)].

$H_0: p_1 = p_2$ $\hat{p}_1 = .10$ $\hat{p}_2 = .09$ $\alpha = .01$

$H_a: p_1 \neq p_2$ $n_1 = 55$ $n_2 = 75$

qnorm(.005)
[1] -2.575829

FRH₀ → Fail to Reject H₀

a) [z > -2.58 and z < 2.58, RH0]

b) [z > 2.58, FRH0]

c) [z < -2.58 or z > 2.58, FRH0]

d) [z < -2.58, RH0]

e) [z < -2.58 and z > 2.58, FRH0]

f) None of the above

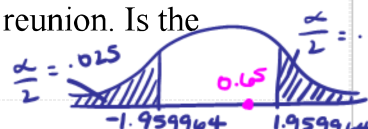
$$z = \frac{(.10 - .09) - 0}{\sqrt{\frac{(.10)(.90)}{55} + \frac{(.09)(.91)}{75}}} = 0.1914$$

Question 9

Your answer is CORRECT.

$\hat{p}_1 = \frac{647}{1048}$ $\hat{p}_2 = \frac{797}{1319}$ $H_0: p_1 = p_2$ $H_a: p_1 \neq p_2$

A private and a public university are located in the same city. For the private university, 1048 alumni were surveyed and 647 said that they attended at least one class reunion. For the public university, 797 out of 1319 sampled alumni claimed they have attended at least one class reunion. Is the difference in the sample proportions statistically significant? (Use α=0.05)



qnorm(.025)
[1] -1.959964

a) Reject the null hypothesis which states there is no difference in the proportion of alumni that attended at least one class reunion in favor of the alternate which states there is a difference in the proportions.

Fail to Reject H_0

$$z = \left(\frac{647}{1048} - \frac{797}{1319}\right) \Big/ \sqrt{\frac{\left(\frac{647}{1048}\right)\left(1 - \frac{647}{1048}\right)}{1048} + \frac{\left(\frac{797}{1319}\right)\left(1 - \frac{797}{1319}\right)}{1319}}$$

b) Fail to reject the null hypothesis. There is not enough evidence to conclude that there is a difference in the proportions. $z = 0.65$

c) There is not enough information to make a conclusion.

Question 10

Your answer is CORRECT.

Mars Inc. claims that they produce M&Ms with the following distributions:

33.6 22.4 22.4

Brown	30%	Red	20%	Yellow	20%
Orange	10%	Green	10%	Blue	10%

Expected

11.2 11.2 11.2

A bag of M&Ms was randomly selected from the grocery store shelf, and the color counts were:

Total = 112

Brown	25	Red	22	Yellow	21
Orange	14	Green	17	Blue	13

observed

Using the χ^2 goodness of fit test to determine if the proportion of M&Ms is what is claimed, what is the test statistic?

$$\chi^2 = \sum \frac{(\text{observed} - \text{Expected})^2}{\text{Expected}} = \frac{(25-33.6)^2}{33.6} + \frac{(22-22.4)^2}{22.4} + \frac{(21-22.4)^2}{22.4} + \frac{(14-11.2)^2}{11.2} + \frac{(17-11.2)^2}{11.2} + \frac{(13-11.2)^2}{11.2}$$

$$= 6.289$$

a) $\chi^2 = 4.489$

b) $\chi^2 = 6.289$

c) $\chi^2 = 12.577$

d) $\chi^2 = 9.889$

e) $\chi^2 = 1.960$

f) None of the above

Question 11

Your answer is CORRECT.

Mars Inc. claims that they produce M&Ms with the following distributions:

Expected

Brown	30% (32.1)	Red	20% (21.4)	Yellow	20% (21.4)
Orange	10% (10.7)	Green	10% (10.7)	Blue	10% (10.7)

A bag of M&Ms was randomly selected from the grocery store shelf, and the color counts were:

Observed

Total = 107

Brown	23	Red	22	Yellow	21
Orange	12	Green	16	Blue	13

Using the χ^2 goodness of fit test ($\alpha = 0.10$) to determine if the proportion of M&Ms is what is claimed. Select the [p-value, Decision to Reject (RH_0) or Failure to Reject (FRH_0)].

$$\chi^2 = \sum \frac{(\text{observed} - \text{Expected})^2}{\text{Expected}} = \underbrace{\frac{(23-32.1)^2}{32.1}}_{2.5798} + \underbrace{\frac{(22-21.4)^2}{21.4}}_{0.0168} + \underbrace{\frac{(21-21.4)^2}{21.4}}_{0.0075} + \underbrace{\frac{(12-10.7)^2}{10.7}}_{0.1579} + \underbrace{\frac{(16-10.7)^2}{10.7}}_{2.6252} + \underbrace{\frac{(13-10.7)^2}{10.7}}_{0.4944} = 5.8816$$

a) [p-value = 0.318, RH0]

b) [p-value = 0.682, RH0]

c) [p-value = 0.318, FRH0]

d) [p-value = 0.159, RH0]

e) [p-value = 0.682, FRH0]

f) None of the above

p-value : $P(X^2 > 5.8816)$

1-pchisq(5.8816,5)
[1] 0.3179108 $> \alpha$

Fail to Reject H_0