Question 1

**DATA** Buyers; INPUT Time @@;

diff=Time-**25**;

DATALINES;

28 25 27 31 10 26 30 15 55 12 24 32 28 42 38

;

**PROC** **UNIVARIATE** DATA = Buyers Normal;

VAR diff;

**RUN**;

**PROC** **TTEST** DATA = Buyers SIDES = U;

VAR diff;

**RUN**;

The UNIVARIATE Procedure

Variable: diff

| **Tests for Normality** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.941665 | **Pr < W** | 0.4038 |

The TTEST Procedure

Variable: diff

| **DF** | **t Value** | **Pr > t** |
| --- | --- | --- |
| 14 | 1.08 | 0.1485 |

The p value for shapiro test is 0.4038 greater than 0.05, we cannot reject null hypothesis, we can assume that the data follow normal distribution.

The p value for t test is 0.1485 greater than 0.05, we cannot reject the null hypothesis, do NOT have enough evidence to conclude that the mean time for a warehouse to fill a buyer’s order is more than 25 minutes.

Question 2

**data** mice;

INPUT group bp;

datalines;

1 152

1 157

1 179

1 182

1 176

1 149

2 384

2 369

2 354

2 375

2 366

2 423

;

**PROC** **UNIVARIATE** data = mice normal;

class group;

var bp;

title 'check for normality';

**run**;

**PROC** **TTEST** data = mice sides = lower;

class group;

var bp;

**run**;

The UNIVARIATE Procedure

Variable: bp

group = 1

| **Tests for Normality** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.85134 | **Pr < W** | 0.1614 |

The UNIVARIATE Procedure

Variable: bp

group = 2

| **Tests for Normality** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.869398 | **Pr < W** | 0.2238 |

The TTEST Procedure

Variable: bp

| **Equality of Variances** | | | | |
| --- | --- | --- | --- | --- |
| **Method** | **Num DF** | **Den DF** | **F Value** | **Pr > F** |
| **Folded F** | 5 | 5 | 2.63 | 0.3121 |

| **Method** | **Variances** | **DF** | **t Value** | **Pr < t** |
| --- | --- | --- | --- | --- |
| **Pooled** | Equal | 10 | -18.51 | <.0001 |
| **Satterthwaite** | Unequal | 8.3215 | -18.51 | <.0001 |

The p value for shapiro test is 0.1614 and 0.2238, both are greater than 0.05, we cannot reject the null hypothesis, we can assume that both samples follow a normal distribution.

The p value for F test is 0.3121 greater than 0.05, we cannot reject the null hypothesis, we can assume they have the same variance.

The p value for pooled variance t test is less than 0.0001 which is less than 0.05, we reject the null

hypothesis, there are enough evidence that rats have higher blood pressure at 5°C than 26°C.

Question 3

**DATA** corn;

input farm varietyA varietyB;

diff=varietyA-varietyB;

datalines;

1 48.2 41.5

2 44.6 40.1

3 49.7 44.0

4 40.5 41.2

5 54.6 49.8

6 47.1 41.7

7 51.4 46.8

;

**run**;

**PROC** **UNIVARIATE** data = corn normal;

var diff;

**RUN**;

| **Tests for Normality** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.756933 | **Pr < W** | 0.0150 |

| **Tests for Location: Mu0=0** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Student's t** | **t** | 4.908079 | **Pr > |t|** | 0.0027 |
| **Sign** | **M** | 2.5 | **Pr >= |M|** | 0.1250 |
| **Signed Rank** | **S** | 13 | **Pr >= |S|** | 0.0313 |

The p value for shapiro test is 0.0150 less than 0.05, we reject the null hypothesis, we cannot assume

the difference follow a normal distribution.

According to the signed Rank test, the p value is 0.0313 less than 0.05, we reject the null hypothesis,

There are significant difference between these two varieties of corn

Question 4

**DATA** Sales;

INPUT Before After;

Diff = After - Before;

DATALINES;

12 18

18 24

25 24

9 14

14 19

16 20

;

**PROC** **UNIVARIATE** DATA = Sales NORMAL;

VAR Diff;

**RUN**;

The UNIVARIATE Procedure

Variable: Diff

| **Tests for Normality** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.735678 | **Pr < W** | 0.0144 |

The p value for shapiro test is 0.0144 less than 0.05, we reject the null hypothesis, we cannot assume that the difference follows a normal distribution.

| **Tests for Location: Mu0=0** | | | | |
| --- | --- | --- | --- | --- |
| **Test** | **Statistic** | | **p Value** | |
| **Student's t** | **t** | 3.866801 | **Pr > |t|** | 0.0118 |
| **Sign** | **M** | 2 | **Pr >= |M|** | 0.2188 |
| **Signed Rank** | **S** | 9.5 | **Pr >= |S|** | 0.0625 |

The p value of one sided signed Rank test is half of the two sided, which is 0.0625/2 = 0.03125, which is greater than 0.01, we cannot reject the null hypothesis, we cannot conclude means sales increase after the course.