Each of 12 patients went on the South Beach Diet for 5 weeks. Their weights before and after the diet are listed here.

| Subject | WEIGHT BEFORE | WEIGHT AFTER | DIFFERENCE |
|---|---|---|---|
| **1** | 300 | 290 | 10 |
| **2** | 350 | 331 | 19 |
| **3** | 190 | 200 | -10 |
| **4** | 400 | 395 | 5 |
| **5** | 244 | 240 | 4 |
| **6** | 321 | 300 | 21 |
| **7** | 330 | 332 | -2 |
| **8** | 250 | 242 | 8 |
| **9** | 190 | 185 | 5 |
| **10** | 160 | 158 | 2 |
| **11** | 260 | 256 | 4 |
| **12** | 240 | 220 | 20 |

A company is considering buying the rights to the South Beach Diet, but before doing it, they would like you to do an analysis and give your opinion whether they should purchase the rights to this diet. You perform the first of several analysis using SAS. The output of the Univariate and Paired test is given below. You must give a thorough yet concise summary of your findings. Your summary should contain the following in the order given:

1. Your recommendation based on your findings.
2. Why you have given this recommendation based on the pertinent output. (You should give p-values and similar information)
3. Speak to the validity of the tests you performed in SAS. (That is, speak to the questions as to whether conditions were met to do the analytical technique(s) you used)

OUTPUT OF SAS found on the next page:

DISCRIPTIVE STATISTICS ON BEFORE AND AFTER WEIGHT FOR PEOPLE ON THE SOUTH BEACH DIET

The UNIVARIATE Procedure

# Variable: WEIGHT_BEFORE

| Basic Statistical Measures | | | |
|---|---|---|---|
| **Location** | | **Variability** | |
| **Mean** | 269.5833 | **Std Deviation** | 72.22120 |
| **Median** | 255.0000 | **Variance** | 5216 |
| **Mode** | 190.0000 | **Range** | 240.00000 |
| | | **Interquartile Range** | 110.50000 |

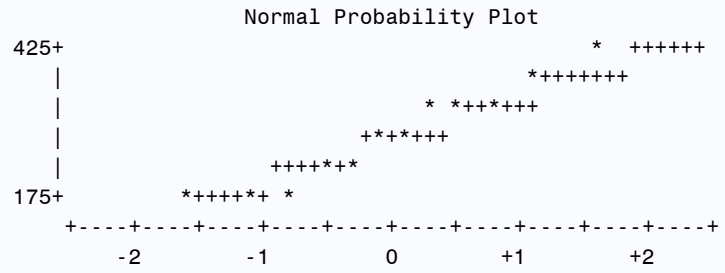
| Tests for Normality | | | | |
|---|---|---|---|---|
| **Test** | | **Statistic** | | **p Value** |
| **Shapiro-Wilk** | **W** | 0.968919 | **Pr < W** | 0.8992 |
| **Kolmogorov-Smirnov** | **D** | 0.136116 | **Pr > D** | >0.1500 |
| **Cramer-von Mises** | **W-Sq** | 0.033163 | **Pr > W-Sq** | >0.2500 |
| **Anderson-Darling** | **A-Sq** | 0.205908 | **Pr > A-Sq** | >0.2500 |

| Quantiles (Definition 5) | |
|---|---|
| **Quantile** | **Estimate** |
| **100% Max** | 400.0 |
| **99%** | 400.0 |
| **95%** | 400.0 |
| **90%** | 350.0 |
| **75% Q3** | 325.5 |
| **50% Median** | 255.0 |
| **25% Q1** | 215.0 |
| **10%** | 190.0 |
| **5%** | 160.0 |

| Quantiles (Definition 5) | |
|---|---|
| **Quantile** | **Estimate** |
| **1%** | 160.0 |
| **0% Min** | 160.0 |

| Extreme Observations | | | |
|---|---|---|---|
| **Lowest** | | **Highest** | |
| **Value** | **Obs** | **Value** | **Obs** |
| 160 | 10 | 300 | 1 |
| 190 | 9 | 321 | 6 |
| 190 | 3 | 330 | 7 |
| 240 | 12 | 350 | 2 |
| 244 | 5 | 400 | 4 |

```
  Stem Leaf                      #             Boxplot
     4 0                         1                |
     3 5                         1                |
     3 023                       3             +-----+
     2 56                        2             *--+--*
     2 44                        2             +-----+
     1 699                       3                |
       ----+----+----+----+
  Multiply Stem.Leaf by 10**+2
```



Variable: WEIGHT_AFTER

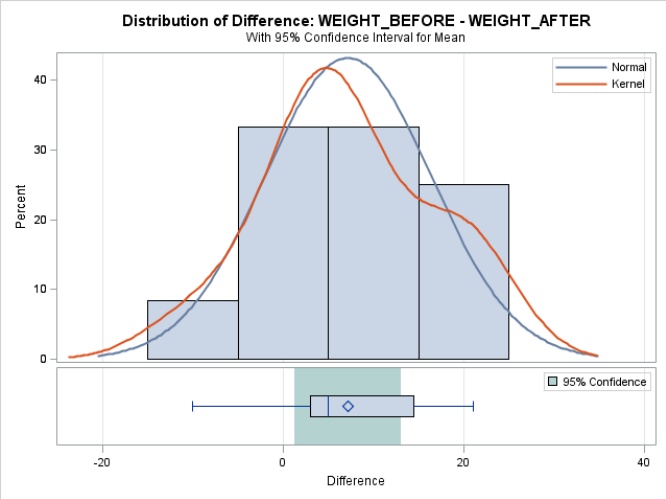
| Basic Statistical Measures | | | |
|---|---|---|---|
| **Location** | | **Variability** | |
| **Mean** | 262.4167 | **Std Deviation** | 69.31412 |
| **Median** | 249.0000 | **Variance** | 4804 |
| **Mode** | . | **Range** | 237.00000 |
| | | **Interquartile Range** | 105.50000 |

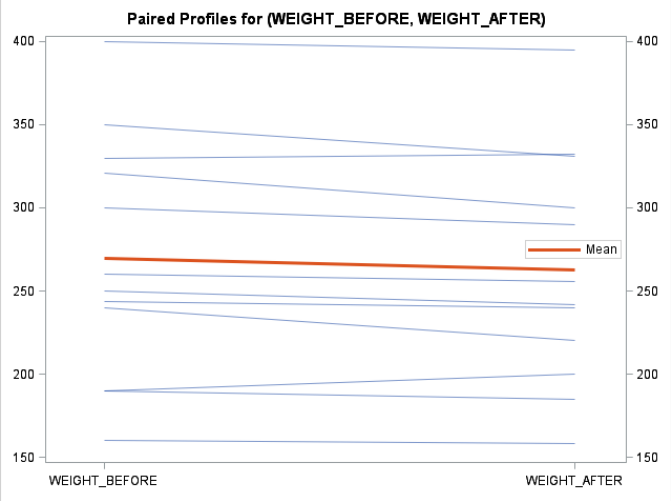
| Tests for Normality | | | | |
|---|---|---|---|---|
| **Test** | | **Statistic** | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.975972 | **Pr < W** | 0.9623 |
| **Kolmogorov-Smirnov** | **D** | 0.120212 | **Pr > D** | >0.1500 |
| **Cramer-von Mises** | **W-Sq** | 0.024675 | **Pr > W-Sq** | >0.2500 |
| **Anderson-Darling** | **A-Sq** | 0.165204 | **Pr > A-Sq** | >0.2500 |

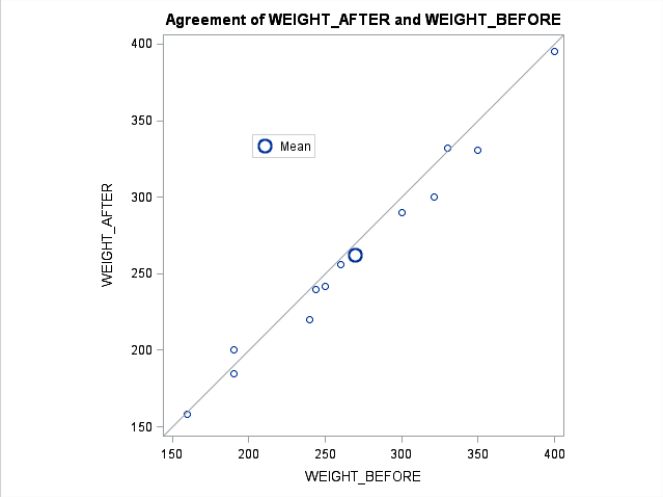
| Quantiles (Definition 5) | |
|---|---|
| **Quantile** | **Estimate** |
| **100% Max** | 395.0 |
| **99%** | 395.0 |
| **95%** | 395.0 |
| **90%** | 332.0 |
| **75% Q3** | 315.5 |
| **50% Median** | 249.0 |
| **25% Q1** | 210.0 |
| **10%** | 185.0 |
| **5%** | 158.0 |
| **1%** | 158.0 |
| **0% Min** | 158.0 |

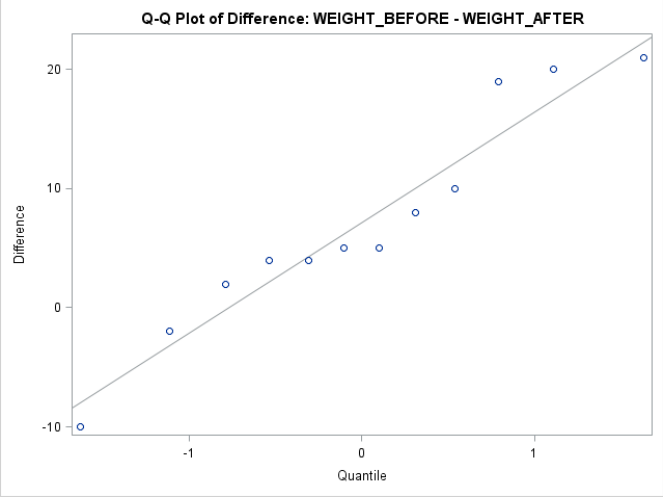
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 158 | 10 | 290 | 1 |
| 185 | 9 | 300 | 6 |
| 200 | 3 | 331 | 2 |
| 220 | 12 | 332 | 7 |
| 240 | 5 | 395 | 4 |

## More on the Difference = Before Weight – After Weight






## Paired T-test

The TTEST Procedure

Difference: WEIGHT_BEFORE - WEIGHT_AFTER

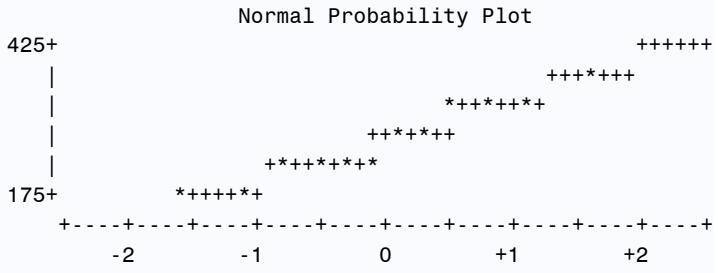
| N | Mean | Std Dev | Std Err | Minimum | Maximum |
|---|---|---|---|---|---|
| 12 | 7.1667 | 9.2425 | 2.6681 | -10.0000 | 21.0000 |

| Mean | 95% CL Mean | | Std Dev | 95% CL Std Dev | |
|---|---|---|---|---|---|
| 7.1667 | 1.2942 | 13.0391 | 9.2425 | 6.5474 | 15.6927 |

| DF | t Value | Pr > \|t\| |
|---|---|---|
| 11 | 2.69 | 0.0212 |

# Variable: WEIGHT_AFTER

```
 Stem Leaf                     #             Boxplot
    4 0                        1                |
    3                                           |
    3 033                      3             +-----+
    2 69                       2             *--+--*
    2 0244                     4             +-----+
    1 68                       2                |
      ----+----+----+----+
  Multiply Stem.Leaf by 10**+2
```



The UNIVARIATE Procedure

# Variable: DIFFERENCE

| Basic Statistical Measures | | | |
|---|---|---|---|
| **Location** | | **Variability** | |
| **Mean** | 7.166667 | **Std Deviation** | 9.24252 |
| **Median** | 5.000000 | **Variance** | 85.42424 |
| **Mode** | 4.000000 | **Range** | 31.00000 |
| | | **Interquartile Range** | 11.50000 |

Note: The mode displayed is the smallest of 2 modes with a count of 2.

| Tests for Normality | | | | |
|---|---|---|---|---|
| **Test** | **Statistic** | | **p Value** | |
| **Shapiro-Wilk** | **W** | 0.932239 | **Pr < W** | 0.4044 |
| **Kolmogorov-Smirnov** | **D** | 0.176005 | **Pr > D** | >0.1500 |
| **Cramer-von Mises** | **W-Sq** | 0.070738 | **Pr > W-Sq** | >0.2500 |
| **Anderson-Darling** | **A-Sq** | 0.422735 | **Pr > A-Sq** | >0.2500 |

| Quantiles (Definition 5) | |
|---|---|
| **Quantile** | **Estimate** |
| **100% Max** | 21.0 |
| **99%** | 21.0 |
| **95%** | 21.0 |
| **90%** | 20.0 |
| **75% Q3** | 14.5 |
| **50% Median** | 5.0 |
| **25% Q1** | 3.0 |
| **10%** | -2.0 |
| **5%** | -10.0 |

| Quantiles (Definition 5) | |
|---|---|
| **Quantile** | **Estimate** |
| **1%** | -10.0 |
| **0% Min** | -10.0 |

| Extreme Observations | | | |
|---|---|---|---|
| **Lowest** | | **Highest** | |
| **Value** | **Obs** | **Value** | **Obs** |
| -10 | 3 | 8 | 8 |
| -2 | 7 | 10 | 1 |
| 2 | 10 | 19 | 2 |
| 4 | 11 | 20 | 12 |
| 4 | 5 | 21 | 6 |

DISCRIPTIVE STATISTICS ON BEFORE AND AFTER WEIGHT FOR PEOPLE ON THE SOUTH BEACH DIET

The UNIVARIATE Procedure
Variable: DIFFERENCE

```
                           Stem Leaf                     #             Boxplot
                              2 01                       2                |
                              1 9                        1                |
                              1 0                        1            +-----+
                              0 558                      3            *--+--*
                              0 244                      3            +-----+
                             -0 2                        1                |
                             -0                                           |
                             -1 0                        1                |
                                ----+----+----+----+
                            Multiply Stem.Leaf by 10**+1


                                          Normal Probability Plot
                         22.5+                                        *  ++*+++
                             |                                    *+++++
                             |                                +*+++
                             |                           +*+++*
                             |                      *+++*+*
                             |                 ++*+++
                             |            ++*++
                        -12.5+  +++++
                              +----+----+----+----+----+----+----+----+----+---
-+
                                   -2        -1         0        +1        +2
```