# JMP Case Study for Defective Parts

### The CONTENTS Procedure

| | | | |
|---|---|---|---|
| **Data Set Name** | WORK.NEWDATA | **Observations** | 321 |
| **Member Type** | DATA | **Variables** | 3 |
| **Engine** | V9 | **Indexes** | 0 |
| **Created** | 09/18/2023 16:17:49 | **Observation Length** | 24 |
| **Last Modified** | 09/18/2023 16:17:49 | **Deleted Observations** | 0 |
| **Protection** | | **Compressed** | NO |
| **Data Set Type** | | **Sorted** | NO |
| **Label** | | | |
| **Data Representation** | SOLARIS_X86_64, LINUX_X86_64, ALPHA_TRU64, LINUX_IA64 | | |
| **Encoding** | utf-8 Unicode (UTF-8) | | |

| Engine/Host Dependent Information | |
|---|---|
| **Data Set Page Size** | 131072 |
| **Number of Data Set Pages** | 1 |
| **First Data Page** | 1 |
| **Max Obs per Page** | 5431 |
| **Obs in First Data Page** | 321 |
| **Number of Data Set Repairs** | 0 |
| **Filename** | /saswork/SAS_work5D1C00014874_odaws01-usw2-2.oda.sas.com/SAS_work6CF600014874_odaws01-usw2-2.oda.sas.com/newdata.sas7bdat |
| **Release Created** | 9.0401M7 |
| **Host Created** | Linux |
| **Inode Number** | 1342180259 |
| **Access Permission** | rw-r--r-- |
| **Owner Name** | u63549661 |
| **File Size** | 256KB |
| **File Size (bytes)** | 262144 |

| Alphabetic List of Variables and Attributes | | | |
|---|---|---|---|
| **#** | **Variable** | **Type** | **Len** |
| **1** | Day | Num | 8 |
| **3** | Defects | Num | 8 |
| **2** | Sample | Char | 8 |

## Variable Types

### The UNIVARIATE Procedure
### Variable: Defects

| Moments | | | |
|---|---|---|---|
| **N** | 320 | **Sum Weights** | 320 |
| **Mean** | 10.325 | **Sum Observations** | 3304 |
| **Std Deviation** | 3.17227409 | **Variance** | 10.0633229 |
| **Skewness** | -0.1850724 | **Kurtosis** | -0.2466066 |
| **Uncorrected SS** | 37324 | **Corrected SS** | 3210.2 |

| Moments | | | |
|---|---|---|---|
| Coeff Variation | 30.7242042 | Std Error Mean | 0.17733551 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.32500 | Std Deviation | 3.17227 |
| Median | 11.00000 | Variance | 10.06332 |
| Mode | 11.00000 | Range | 17.00000 |
| | | Interquartile Range | 4.00000 |

Note: The mode displayed is the smallest of 2 modes with a count of 44.

| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 58.22297 | Pr > \|t\| | <.0001 |
| Sign | M | 160 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 25680 | Pr >= \|S\| | <.0001 |

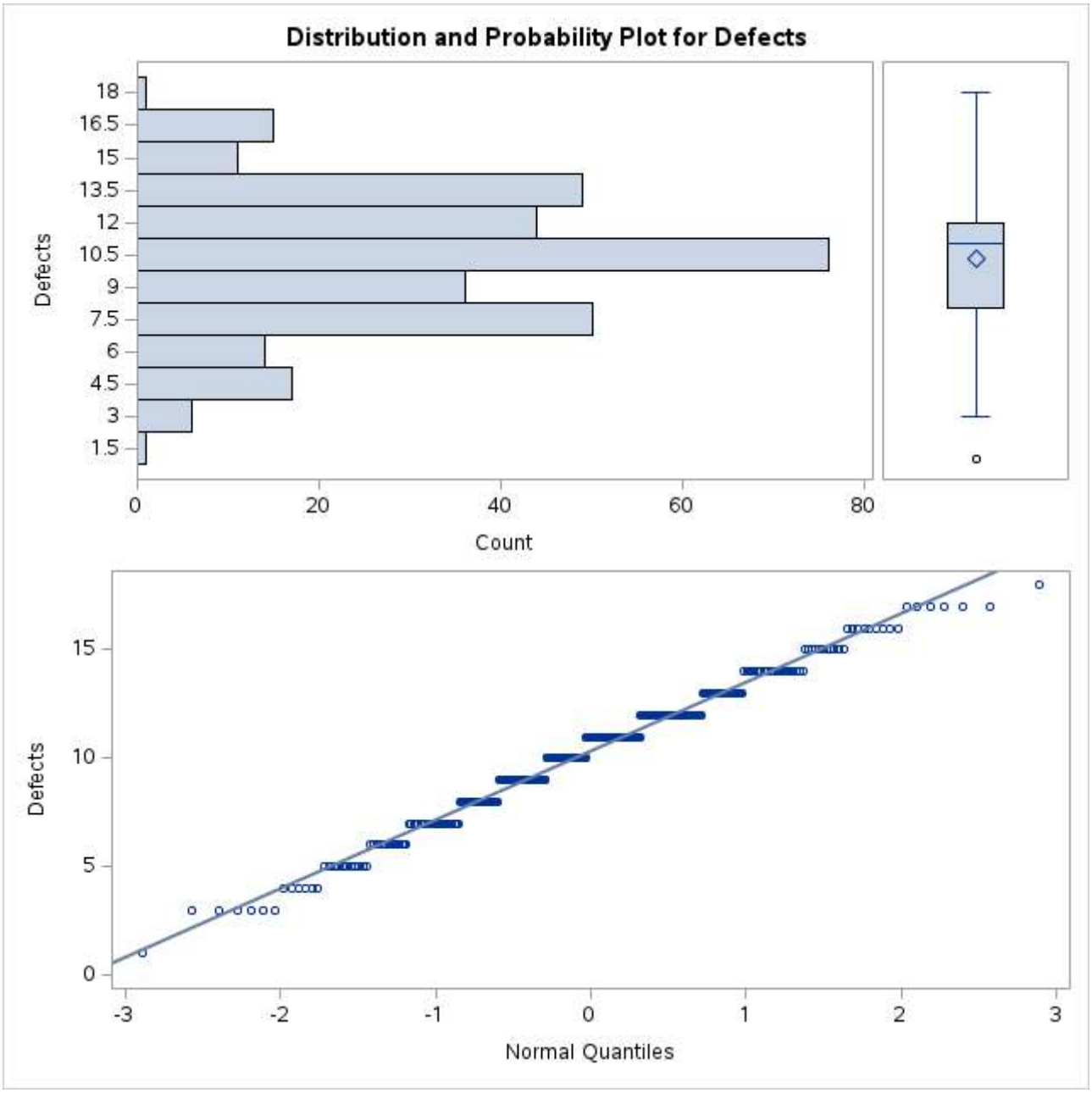
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.986183 | Pr < W | 0.0037 |
| Kolmogorov-Smirnov | D | 0.096751 | Pr > D | <0.0100 |
| Cramer-von Mises | W-Sq | 0.318788 | Pr > W-Sq | <0.0050 |
| Anderson-Darling | A-Sq | 1.694159 | Pr > A-Sq | <0.0050 |

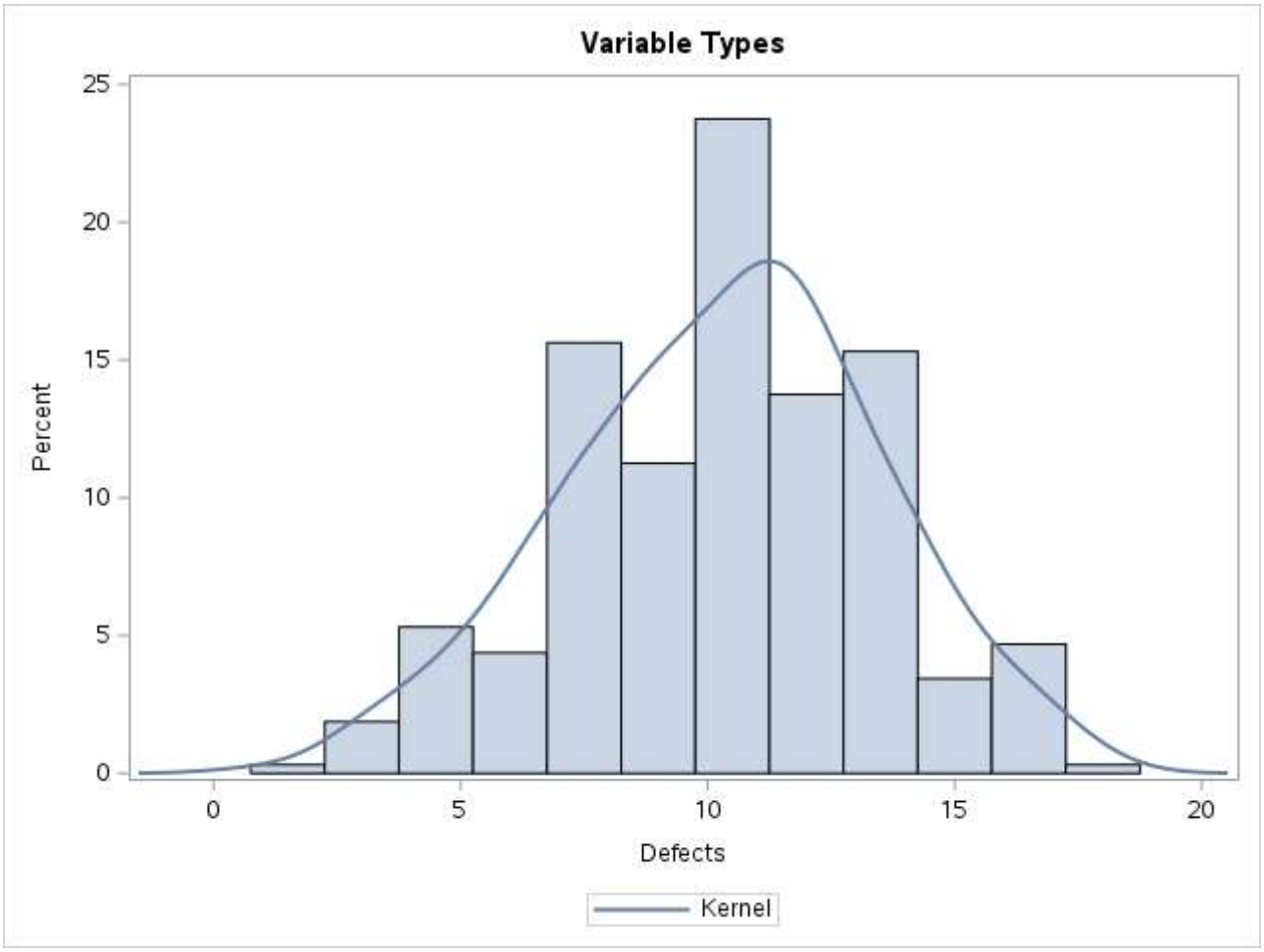
| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 18.0 |
| 99% | 17.0 |
| 95% | 15.5 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 11.0 |
| 25% Q1 | 8.0 |
| 10% | 6.0 |
| 5% | 5.0 |
| 1% | 3.0 |
| 0% Min | 1.0 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 1 | 48 | 17 | 135 |
| 3 | 244 | 17 | 183 |
| 3 | 197 | 17 | 253 |
| 3 | 143 | 17 | 292 |
| 3 | 139 | 18 | 291 |

| Missing Values | | | |
|---|---|---|---|
| Missing Value | Count | Percent Of | |
| | | All Obs | Missing Obs |

| Missing Values | | | |
|---|---|---|---|
| Missing Value | Count | Percent Of | |
| | | All Obs | Missing Obs |
| . | 1 | 0.31 | 100.00 |






## Variable Types

### The MEANS Procedure

**Day=.**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 0 | . | . | . | . |

**Day=1**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.3437500 | 2.5350367 | 4.0000000 | 15.0000000 |

**Day=2**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.1562500 | 3.2834814 | 1.0000000 | 17.0000000 |

**Day=3**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.2812500 | 3.6210351 | 4.0000000 | 17.0000000 |

**Day=4**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.2187500 | 3.5079116 | 3.0000000 | 16.0000000 |

**Day=5**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.2812500 | 3.3334509 | 3.0000000 | 17.0000000 |

**Day=6**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.1562500 | 3.0911880 | 4.0000000 | 17.0000000 |

**Day=7**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.2500000 | 3.4454271 | 3.0000000 | 16.0000000 |

**Day=8**

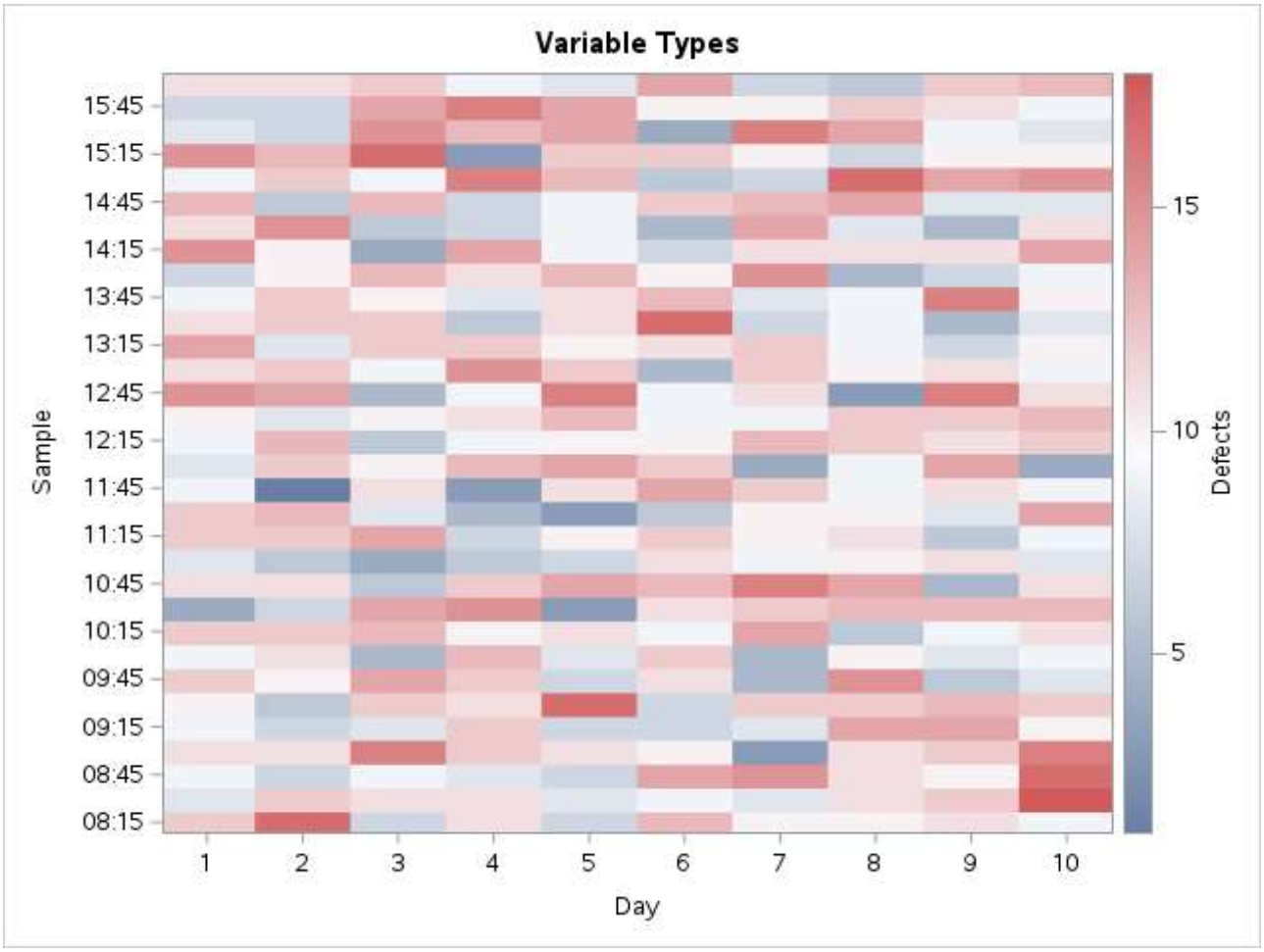
| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.4375000 | 3.0367374 | 3.0000000 | 17.0000000 |

**Day=9**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.2500000 | 3.1004682 | 5.0000000 | 16.0000000 |

**Day=10**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 32 | 10.8750000 | 3.0240968 | 4.0000000 | 18.0000000 |




## One sample per day at 9:30 am

**The UNIVARIATE Procedure**
**Variable: Defects**

| Moments | | | |
|---|---|---|---|
| N | 10 | Sum Weights | 10 |
| Mean | 11.2 | Sum Observations | 112 |
| Std Deviation | 3.08400893 | Variance | 9.51111111 |
| Skewness | -0.0636385 | Kurtosis | 0.94012032 |
| Uncorrected SS | 1340 | Corrected SS | 85.6 |
| Coeff Variation | 27.5357941 | Std Error Mean | 0.97524926 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 11.20000 | Std Deviation | 3.08401 |
| Median | 12.00000 | Variance | 9.51111 |
| Mode | 12.00000 | Range | 11.00000 |
| | | Interquartile Range | 2.00000 |

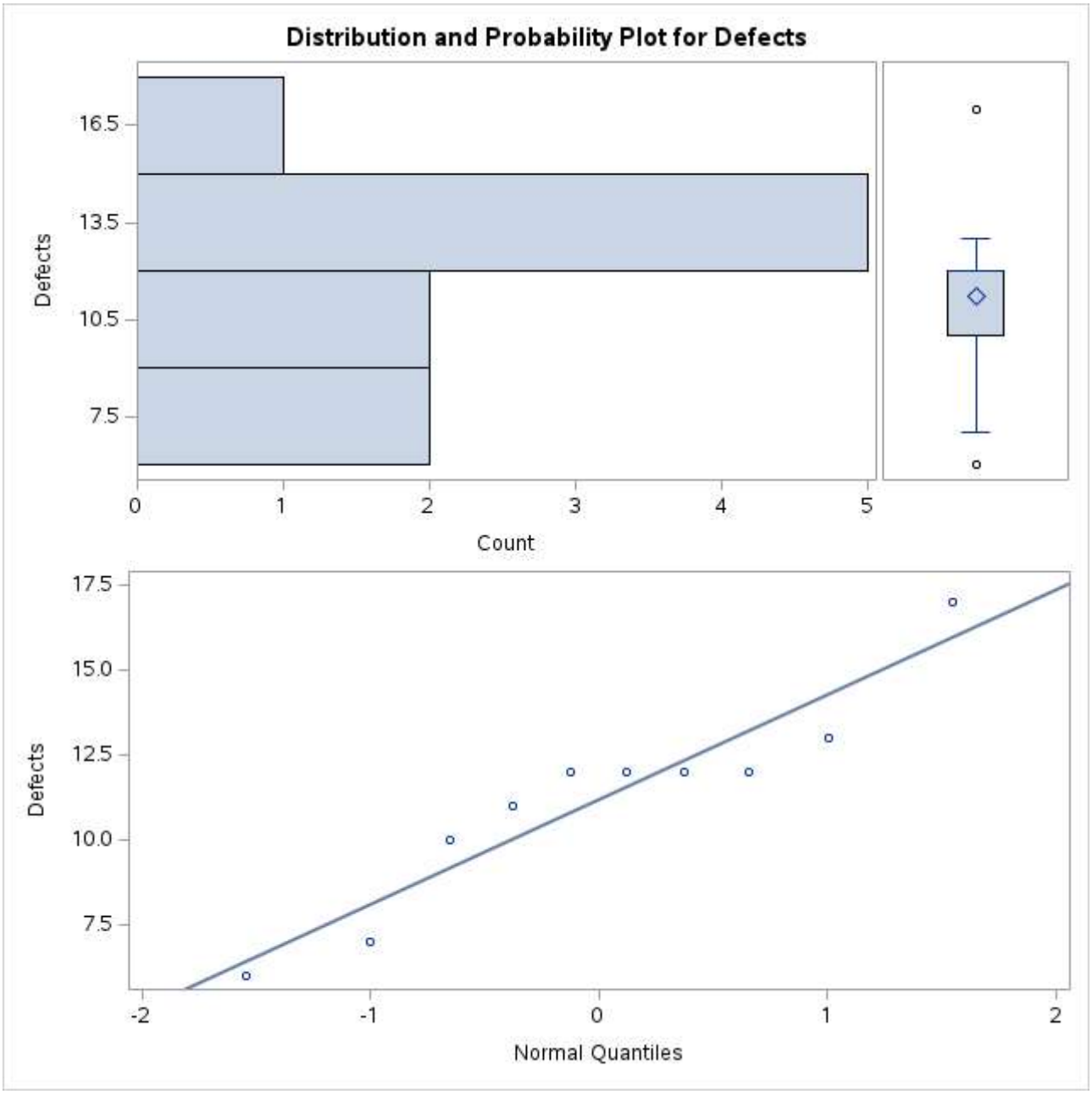
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 11.48424 | Pr > \|t\| | <.0001 |
| Sign | M | 5 | Pr >= \|M\| | 0.0020 |

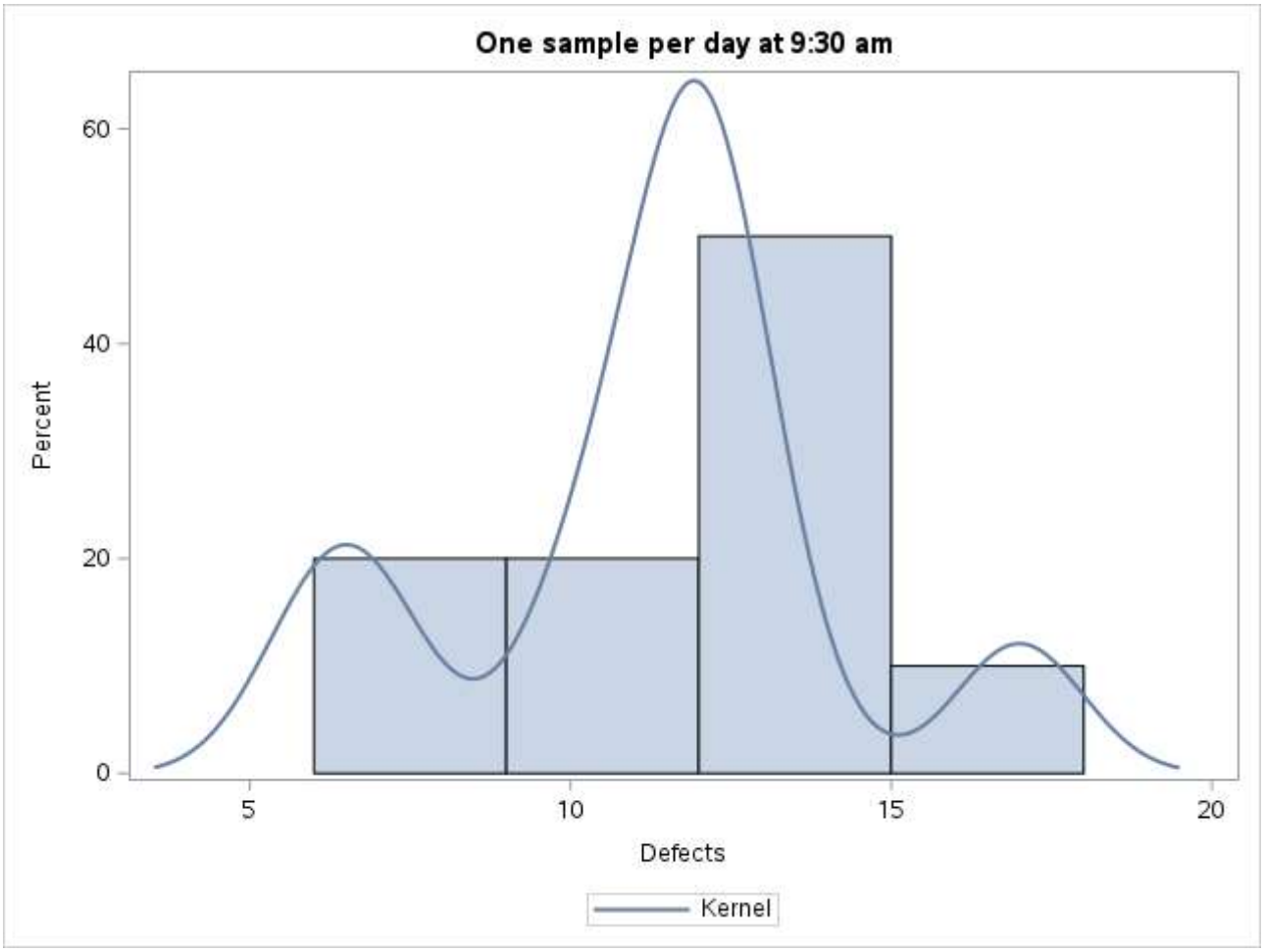
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Signed Rank | S | 27.5 | Pr >= \|S\| | 0.0020 |

| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.912125 | Pr < W | 0.2959 |
| Kolmogorov-Smirnov | D | 0.202338 | Pr > D | >0.1500 |
| Cramer-von Mises | W-Sq | 0.104752 | Pr > W-Sq | 0.0864 |
| Anderson-Darling | A-Sq | 0.545775 | Pr > A-Sq | 0.1229 |

| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 17.0 |
| 99% | 17.0 |
| 95% | 17.0 |
| 90% | 15.0 |
| 75% Q3 | 12.0 |
| 50% Median | 12.0 |
| 25% Q1 | 10.0 |
| 10% | 6.5 |
| 5% | 6.0 |
| 1% | 6.0 |
| 0% Min | 6.0 |

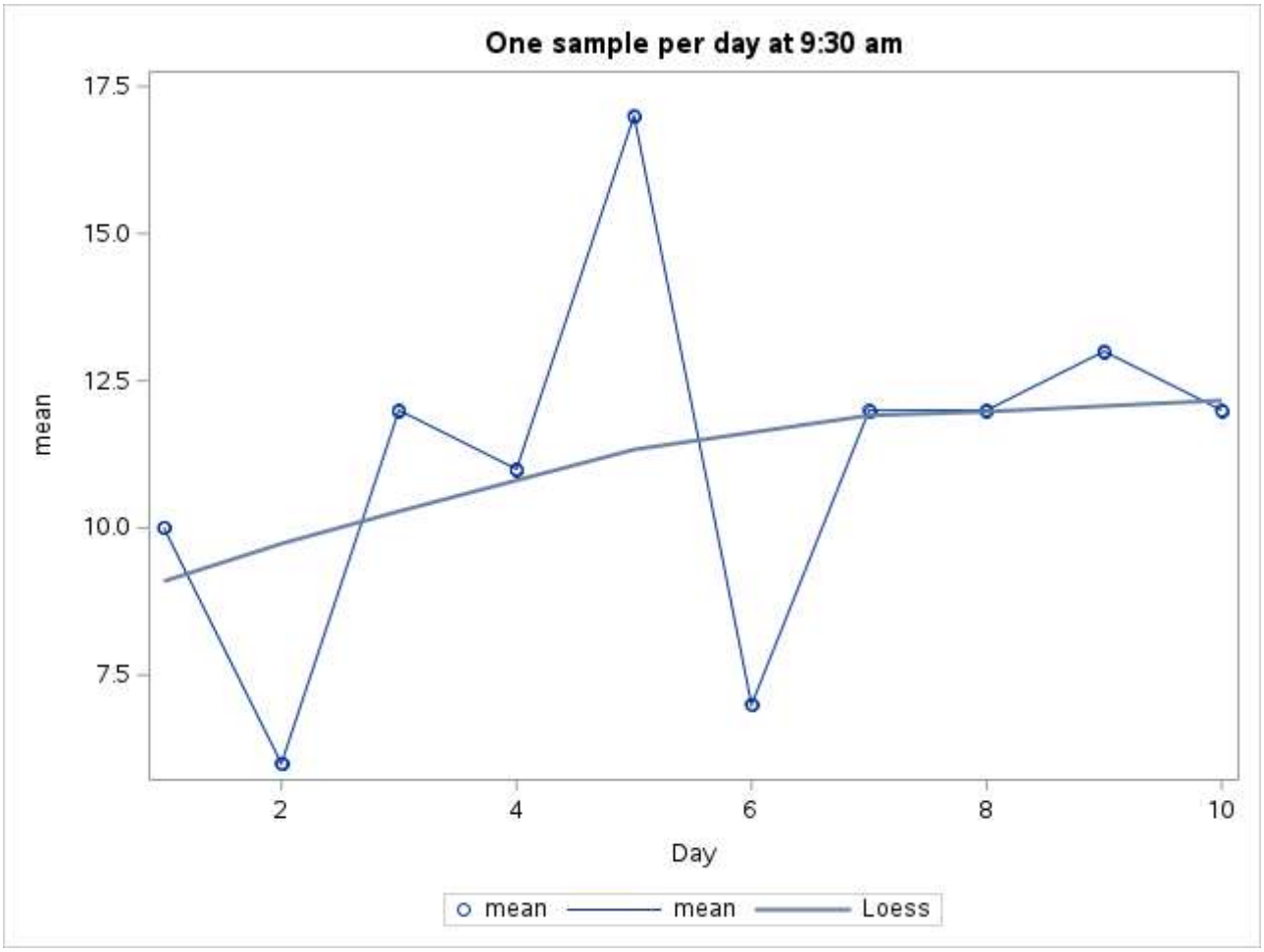
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 6 | 2 | 12 | 7 |
| 7 | 6 | 12 | 8 |
| 10 | 1 | 12 | 10 |
| 11 | 4 | 13 | 9 |
| 12 | 10 | 17 | 5 |

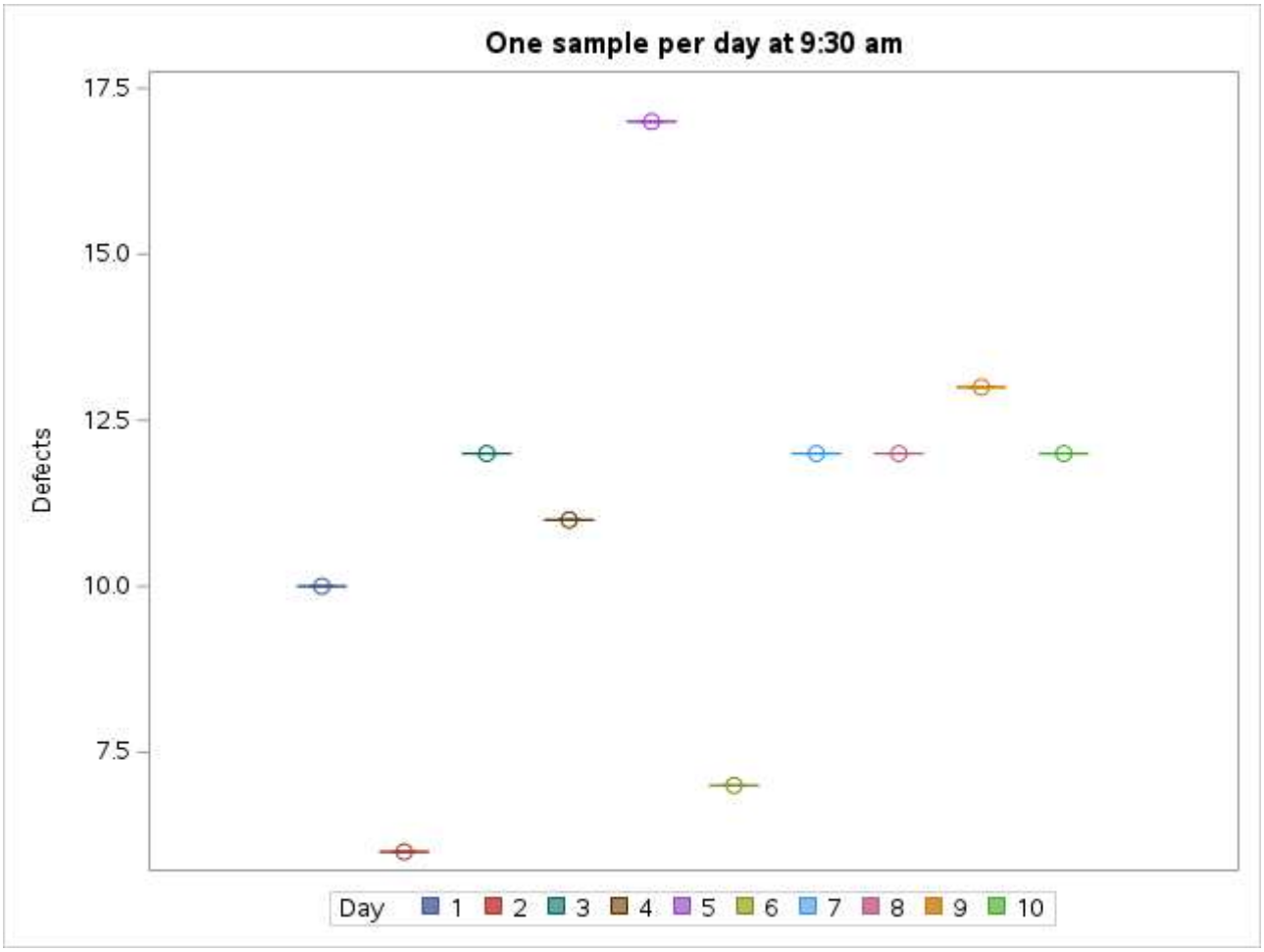

Distribution and Probability Plot for Defects
Defects
16.5
13.5
10.5
7.5
0
1
2
3
4
5
Count
Defects
17.5
15.0
12.5
10.0
7.5
-2
-1
0
1
2
Normal Quantiles

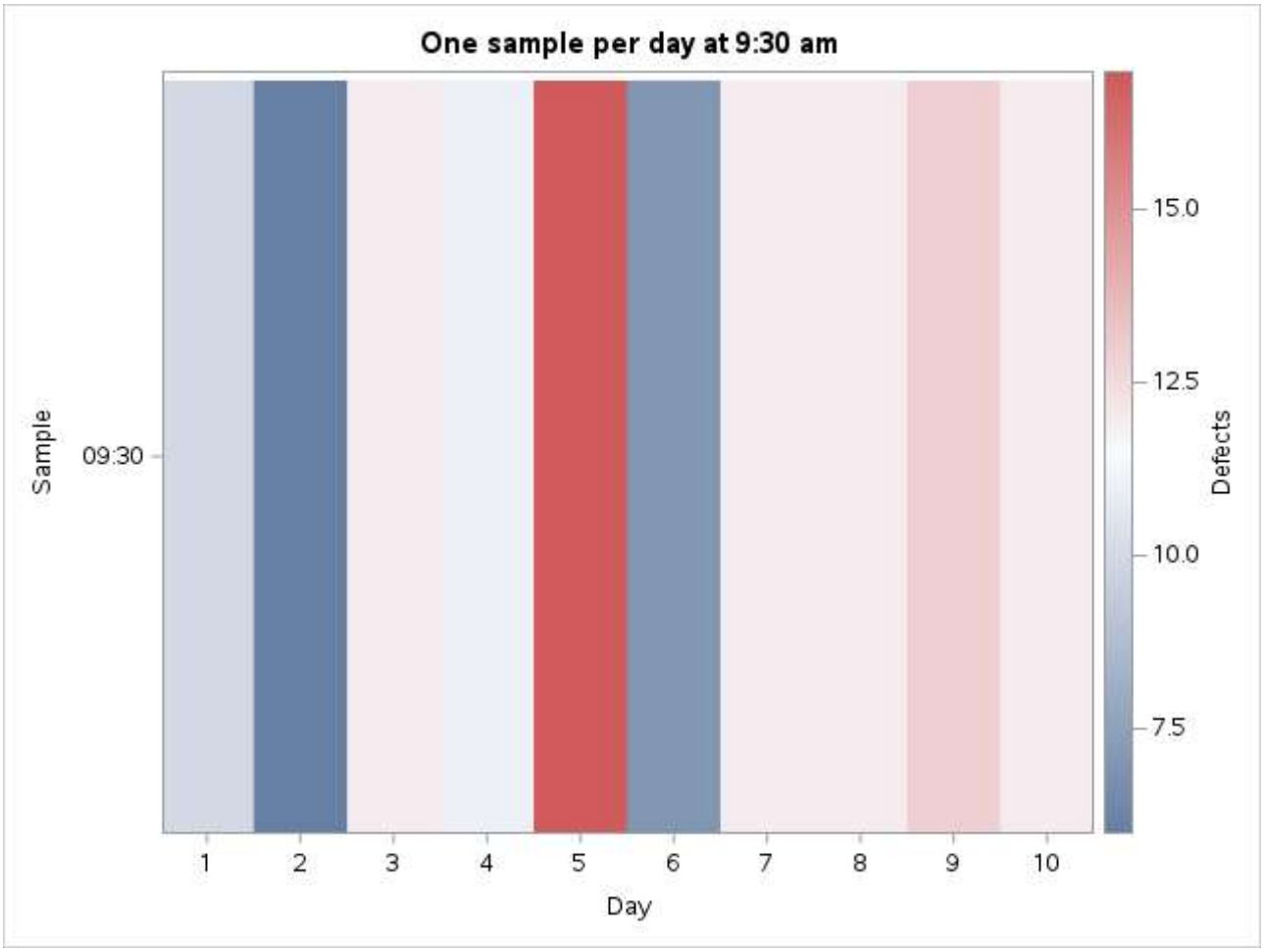



## One sample per day at 9:30 am

| Obs | Day | Sample | Defects |
|---|---|---|---|
| 1 | 1 | 09:30 | 10 |
| 2 | 2 | 09:30 | 6 |
| 3 | 3 | 09:30 | 12 |
| 4 | 4 | 09:30 | 11 |
| 5 | 5 | 09:30 | 17 |
| 6 | 6 | 09:30 | 7 |
| 7 | 7 | 09:30 | 12 |
| 8 | 8 | 09:30 | 12 |
| 9 | 9 | 09:30 | 13 |
| 10 | 10 | 09:30 | 12 |


One sample per day at 9:30 am
17.5
15.0
12.5
10.0
7.5
mean
2
4
6
8
10
Day
mean
mean
Loess


One sample per day at 9:30 am
Defects
17.5
15.0
12.5
10.0
7.5
Day 1 2 3 4 5 6 7 8 9 10




## Two samples per day at 9:30 am and 2:30 pm

| Obs | Day | Sample | Defects |
|---|---|---|---|
| 1 | 1 | 09:30 | 10 |
| 2 | 1 | 14:30 | 11 |
| 3 | 2 | 09:30 | 6 |
| 4 | 2 | 14:30 | 15 |
| 5 | 3 | 09:30 | 12 |
| 6 | 3 | 14:30 | 6 |
| 7 | 4 | 09:30 | 11 |
| 8 | 4 | 14:30 | 7 |
| 9 | 5 | 09:30 | 17 |
| 10 | 5 | 14:30 | 9 |
| 11 | 6 | 09:30 | 7 |
| 12 | 6 | 14:30 | 5 |
| 13 | 7 | 09:30 | 12 |
| 14 | 7 | 14:30 | 14 |
| 15 | 8 | 09:30 | 12 |
| 16 | 8 | 14:30 | 8 |
| 17 | 9 | 09:30 | 13 |
| 18 | 9 | 14:30 | 5 |
| 19 | 10 | 09:30 | 12 |
| 20 | 10 | 14:30 | 11 |

## Two samples per day at 9:30 am and 2:30 pm

The UNIVARIATE Procedure
Variable: Defects

| Moments | | | |
|---|---|---|---|
| N | 20 | Sum Weights | 20 |
| Mean | 10.15 | Sum Observations | 203 |
| Std Deviation | 3.42244911 | Variance | 11.7131579 |
| Skewness | 0.07700225 | Kurtosis | -0.7437031 |
| Uncorrected SS | 2283 | Corrected SS | 222.55 |
| Coeff Variation | 33.7187104 | Std Error Mean | 0.76528289 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.15000 | Std Deviation | 3.42245 |
| Median | 11.00000 | Variance | 11.71316 |
| Mode | 12.00000 | Range | 12.00000 |
| | | Interquartile Range | 5.00000 |

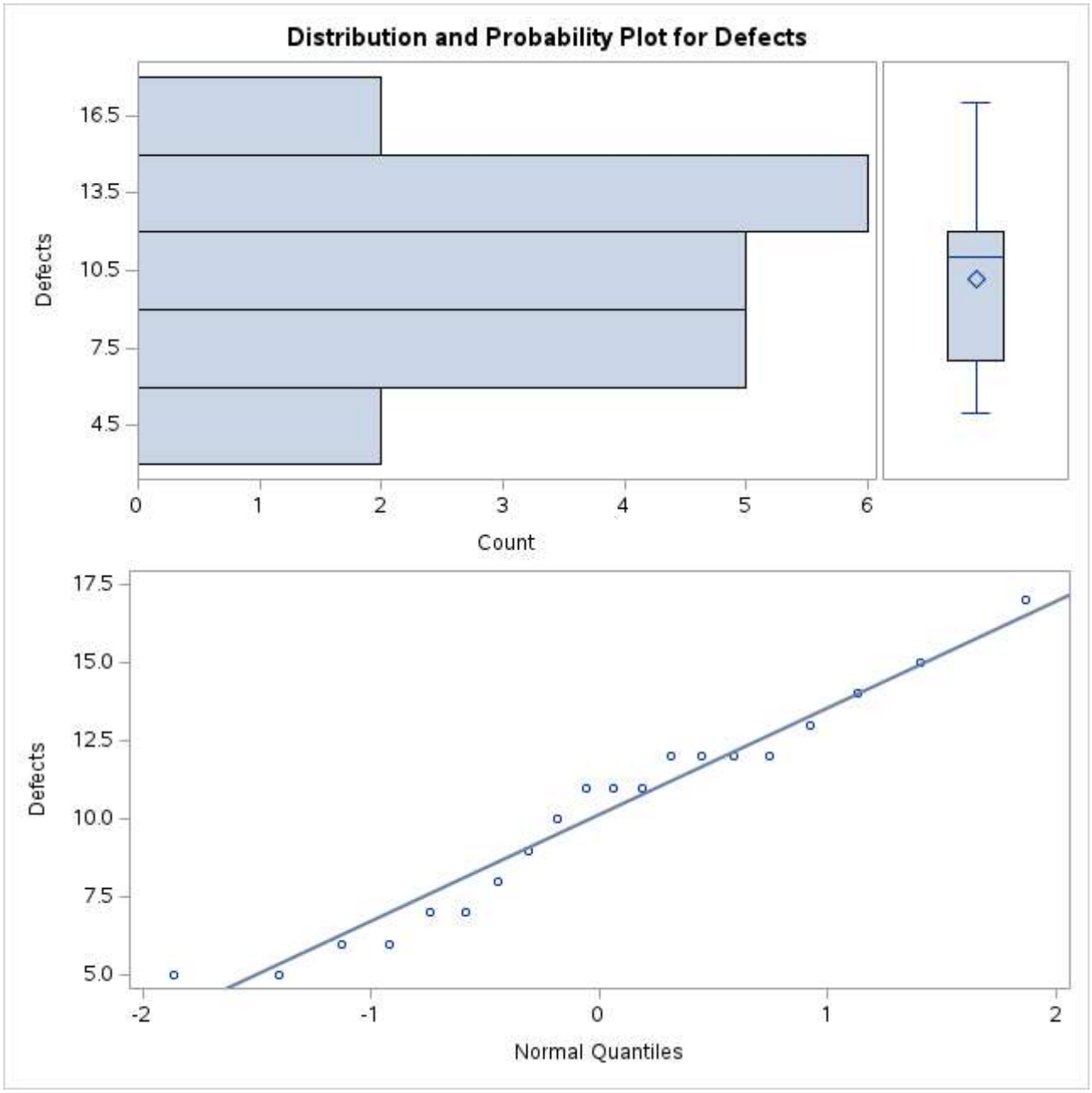
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 13.26307 | Pr > \|t\| | <.0001 |
| Sign | M | 10 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 105 | Pr >= \|S\| | <.0001 |

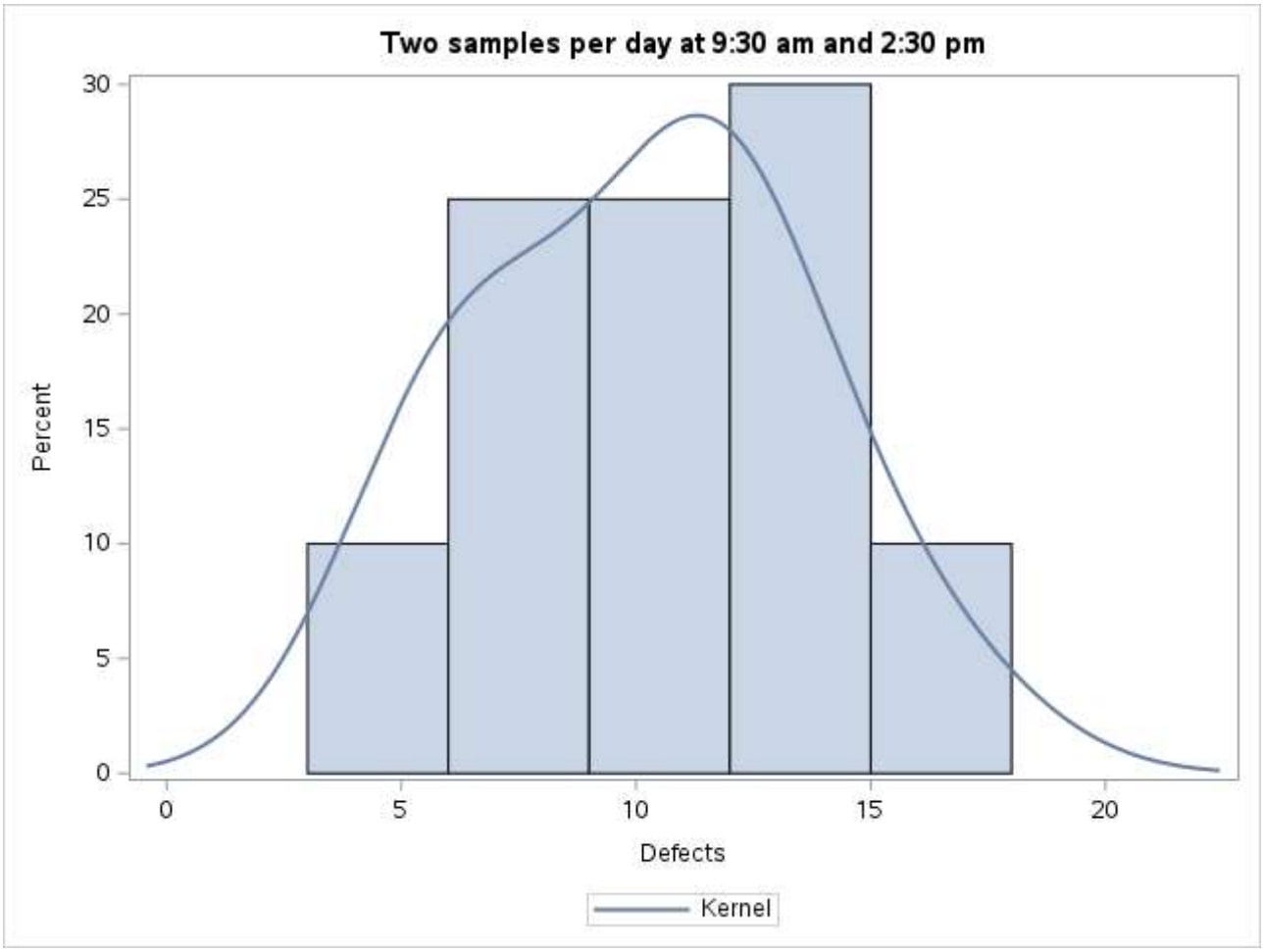
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.954458 | Pr < W | 0.4398 |
| Kolmogorov-Smirnov | D | 0.148072 | Pr > D | >0.1500 |
| Cramer-von Mises | W-Sq | 0.062807 | Pr > W-Sq | >0.2500 |
| Anderson-Darling | A-Sq | 0.369181 | Pr > A-Sq | >0.2500 |

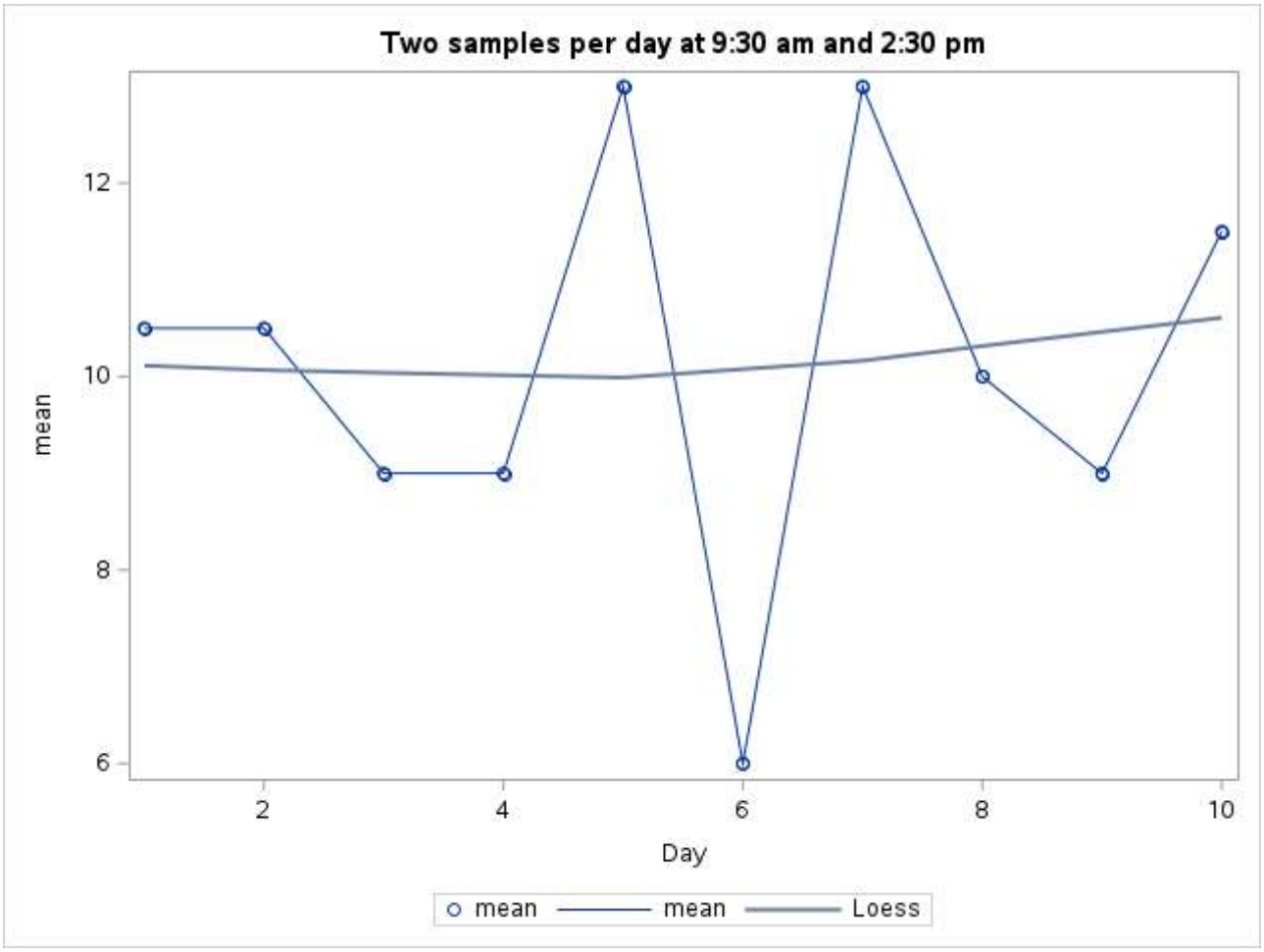
| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 17.0 |
| 99% | 17.0 |
| 95% | 16.0 |
| 90% | 14.5 |
| 75% Q3 | 12.0 |
| 50% Median | 11.0 |
| 25% Q1 | 7.0 |
| 10% | 5.5 |
| 5% | 5.0 |
| 1% | 5.0 |
| 0% Min | 5.0 |

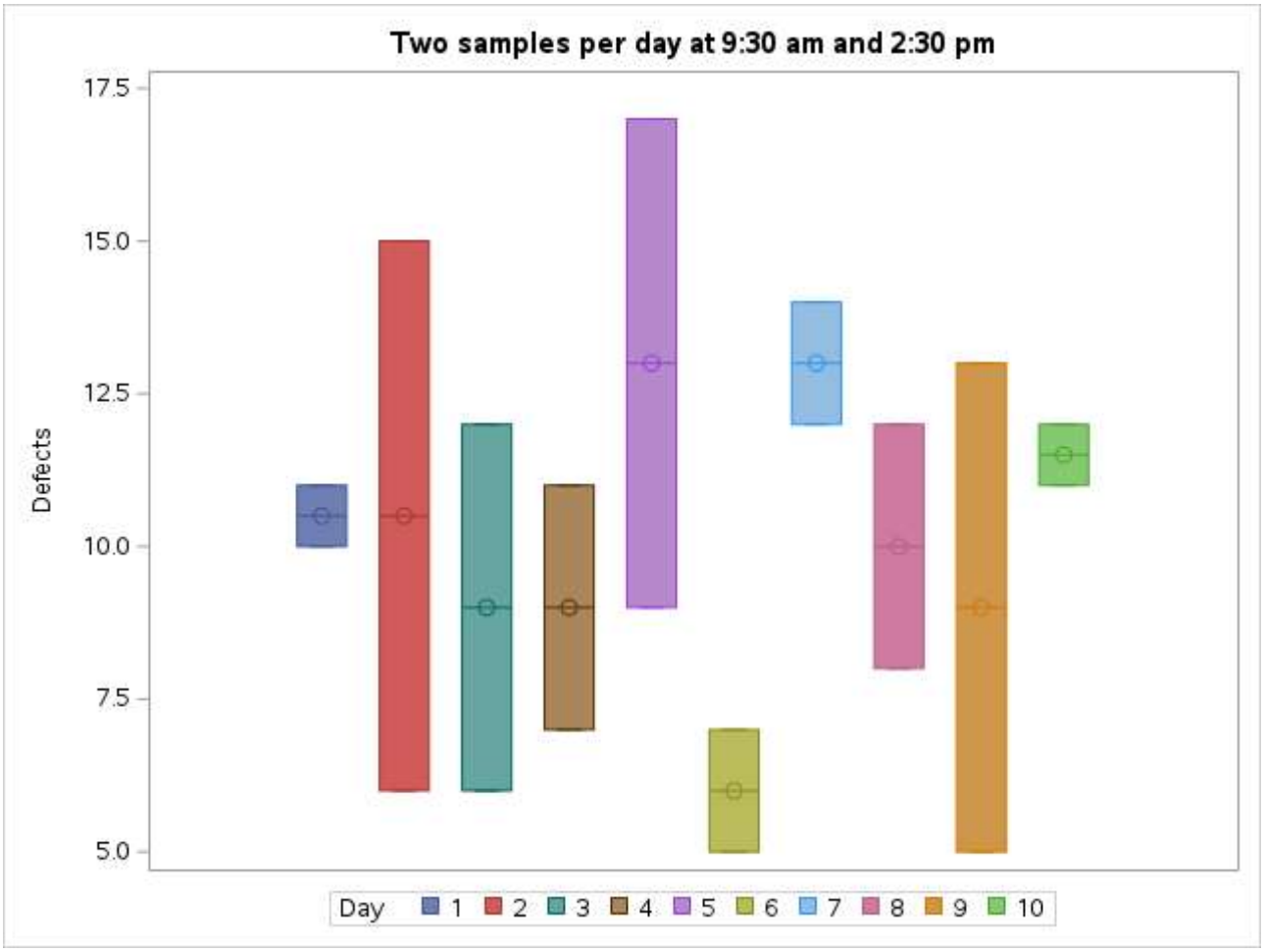
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 5 | 18 | 12 | 19 |

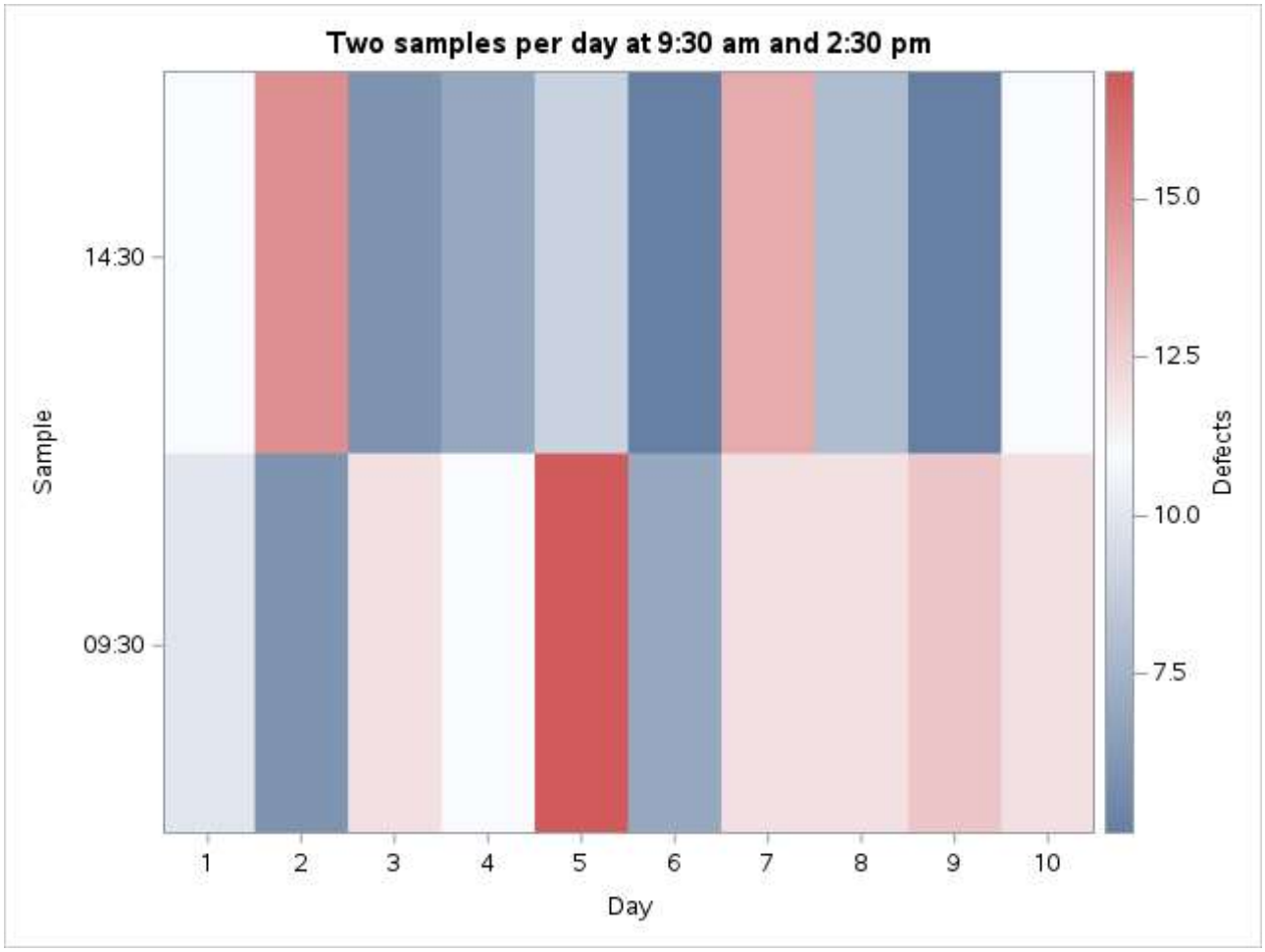
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 5 | 12 | 13 | 17 |
| 6 | 6 | 14 | 14 |
| 6 | 3 | 15 | 4 |
| 7 | 11 | 17 | 9 |




Two samples per day at 9:30 am and 2:30 pm
Percent
30
25
20
15
10
5
0
0
5
10
15
20
Defects
Kernel


Two samples per day at 9:30 am and 2:30 pm
mean
12
10
8
6
2
4
6
8
10
Day
mean
mean
Loess


Two samples per day at 9:30 am and 2:30 pm
Defects
17.5
15.0
12.5
10.0
7.5
5.0
Day 1 2 3 4 5 6 7 8 9 10




## Eight samples per day every hour starting 8:30 am

**The UNIVARIATE Procedure**
**Variable: Defects**

| Moments | | | |
|---|---|---|---|
| N | 80 | Sum Weights | 80 |
| Mean | 10.25 | Sum Observations | 820 |
| Std Deviation | 2.99154928 | Variance | 8.94936709 |
| Skewness | 0.03709721 | Kurtosis | -0.3286711 |
| Uncorrected SS | 9112 | Corrected SS | 707 |
| Coeff Variation | 29.1858466 | Std Error Mean | 0.33446538 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.25000 | Std Deviation | 2.99155 |
| Median | 10.00000 | Variance | 8.94937 |
| Mode | 9.00000 | Range | 14.00000 |
| | | Interquartile Range | 4.00000 |

**Note: The mode displayed is the smallest of 3 modes with a count of 10.**

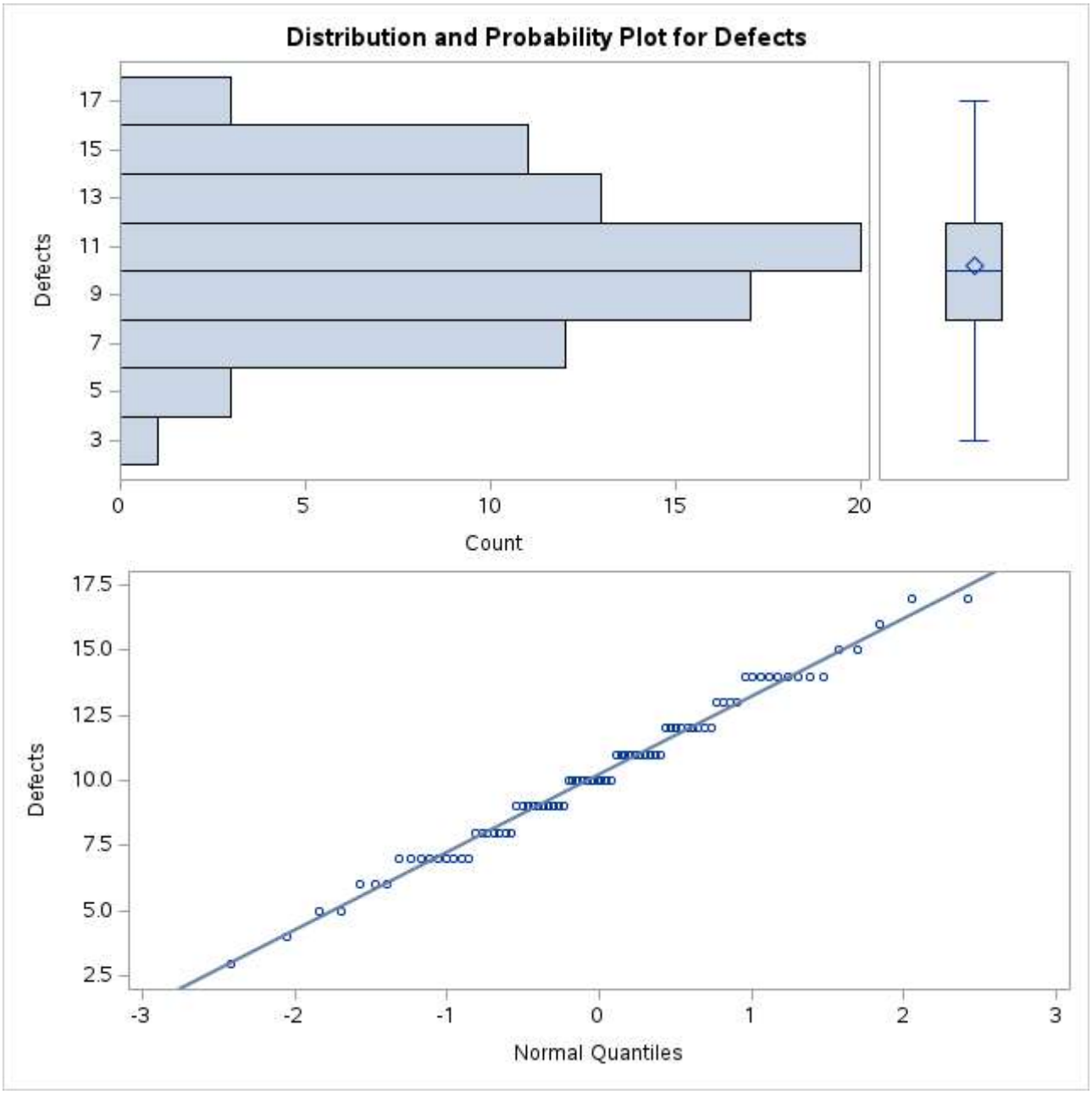
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 30.64592 | Pr > \|t\| | <.0001 |
| Sign | M | 40 | Pr >= \|M\| | <.0001 |

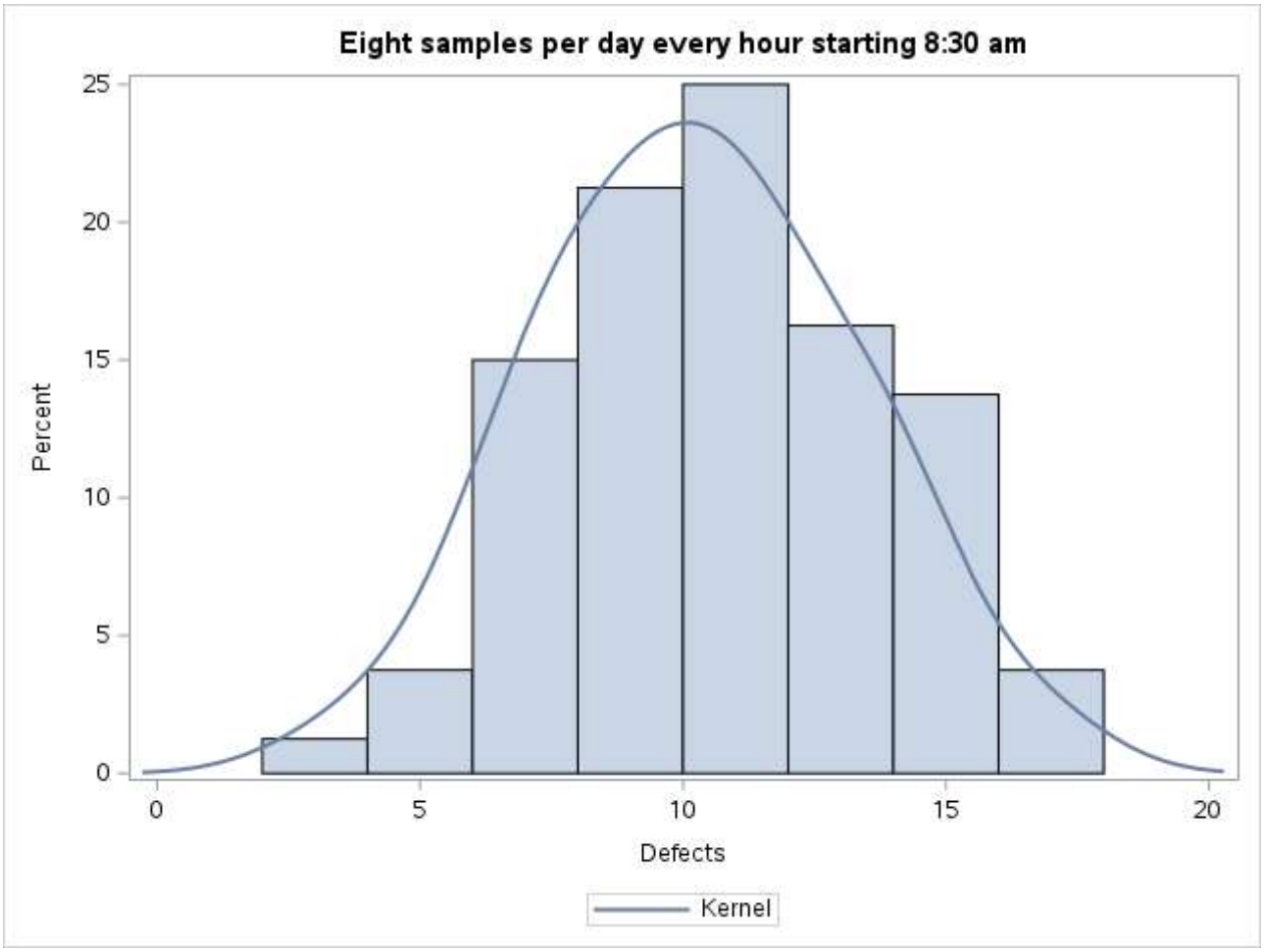
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Signed Rank | S | 1620 | Pr >= \|S\| | <.0001 |

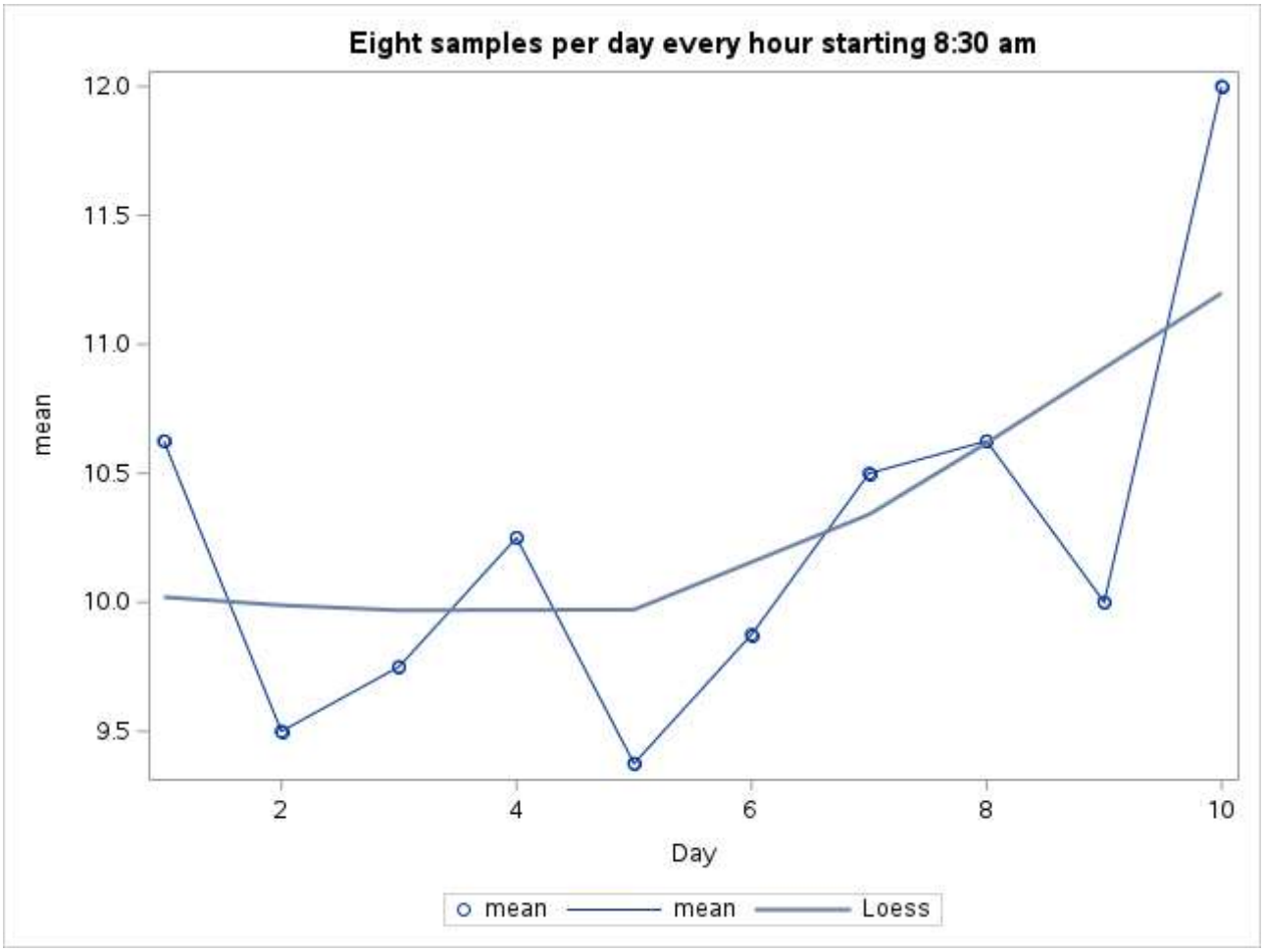
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.984645 | Pr < W | 0.4541 |
| Kolmogorov-Smirnov | D | 0.074469 | Pr > D | >0.1500 |
| Cramer-von Mises | W-Sq | 0.081962 | Pr > W-Sq | 0.2002 |
| Anderson-Darling | A-Sq | 0.49435 | Pr > A-Sq | 0.2180 |

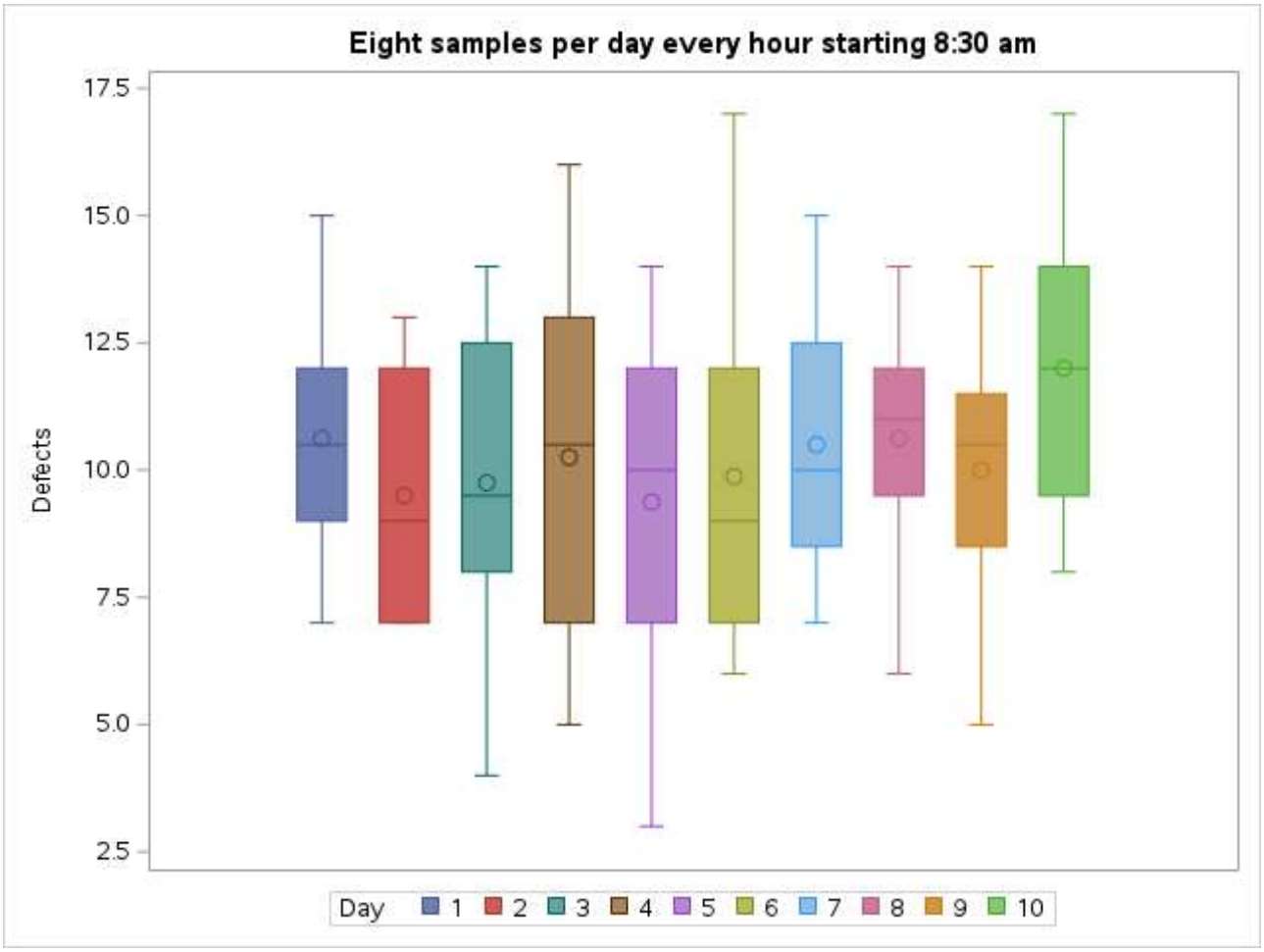
| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 17.0 |
| 99% | 17.0 |
| 95% | 15.0 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 10.0 |
| 25% Q1 | 8.0 |
| 10% | 7.0 |
| 5% | 5.5 |
| 1% | 3.0 |
| 0% Min | 3.0 |

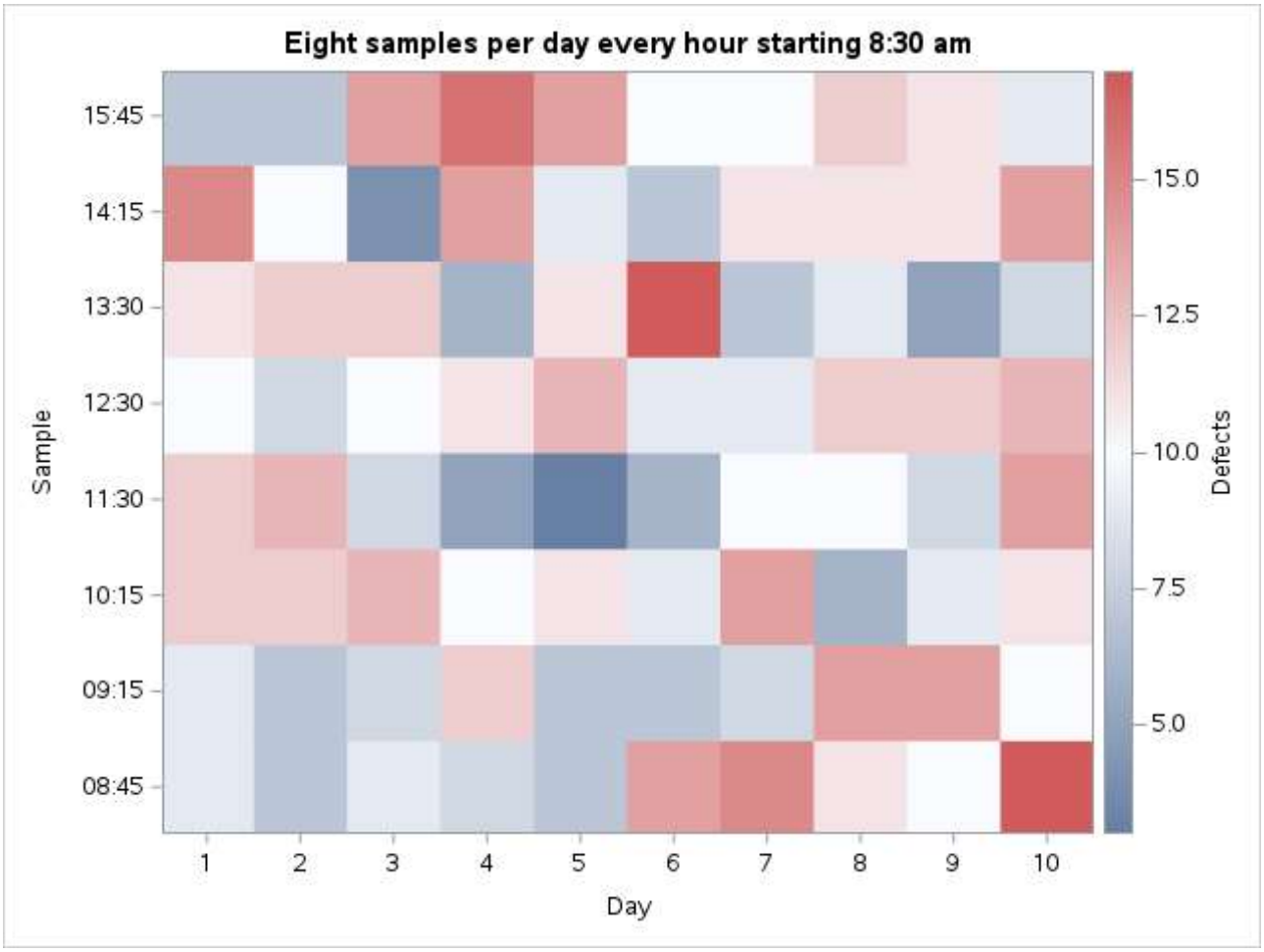
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 36 | 15 | 7 |
| 4 | 23 | 15 | 49 |
| 5 | 70 | 16 | 32 |
| 5 | 28 | 17 | 46 |
| 6 | 59 | 17 | 73 |


Distribution and Probability Plot for Defects
Defects
17
15
13
11
9
7
5
3
0
5
10
15
20
Count
Defects
17.5
15.0
12.5
10.0
7.5
5.0
2.5
-3
-2
-1
0
1
2
3
Normal Quantiles


Eight samples per day every hour starting 8:30 am
Percent
25
20
15
10
5
0
0
5
10
15
20
Defects
Kernel


Eight samples per day every hour starting 8:30 am
12.0
11.5
11.0
10.5
10.0
9.5
mean
2
4
6
8
10
Day
mean
mean
Loess


Eight samples per day every hour starting 8:30 am
Defects
17.5
15.0
12.5
10.0
7.5
5.0
2.5
Day 1 2 3 4 5 6 7 8 9 10




## 16 samples per day every hour starting 8:30 am

**The UNIVARIATE Procedure**
**Variable: Defects**

| Moments | | | |
|---|---|---|---|
| N | 160 | Sum Weights | 160 |
| Mean | 10.2 | Sum Observations | 1632 |
| Std Deviation | 3.20141478 | Variance | 10.2490566 |
| Skewness | -0.1651923 | Kurtosis | -0.1577048 |
| Uncorrected SS | 18276 | Corrected SS | 1629.6 |
| Coeff Variation | 31.3864194 | Std Error Mean | 0.25309406 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.20000 | Std Deviation | 3.20141 |
| Median | 10.00000 | Variance | 10.24906 |
| Mode | 9.00000 | Range | 17.00000 |
| | | Interquartile Range | 4.00000 |

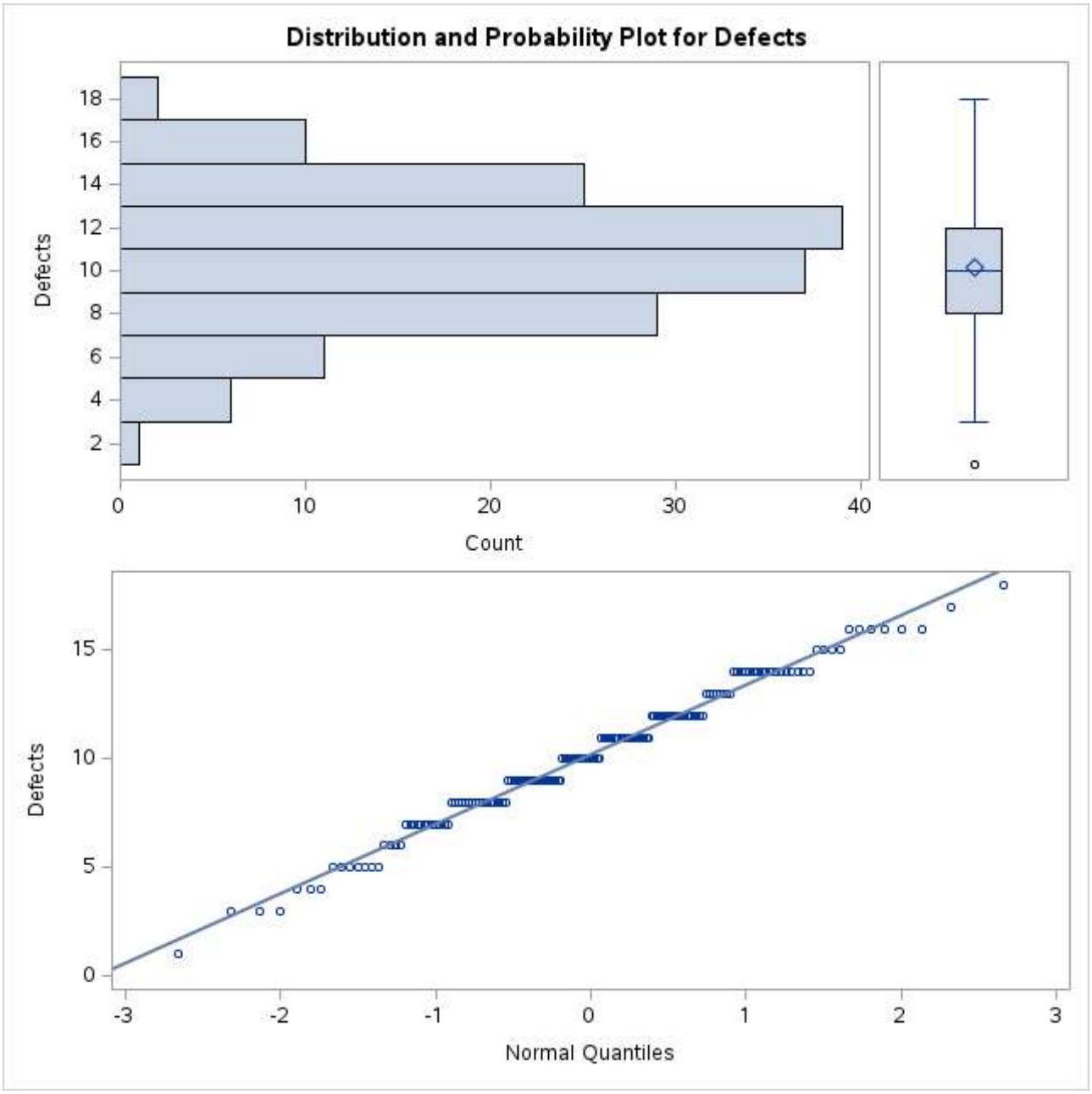
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 40.30122 | Pr > \|t\| | <.0001 |
| Sign | M | 80 | Pr >= \|M\| | <.0001 |

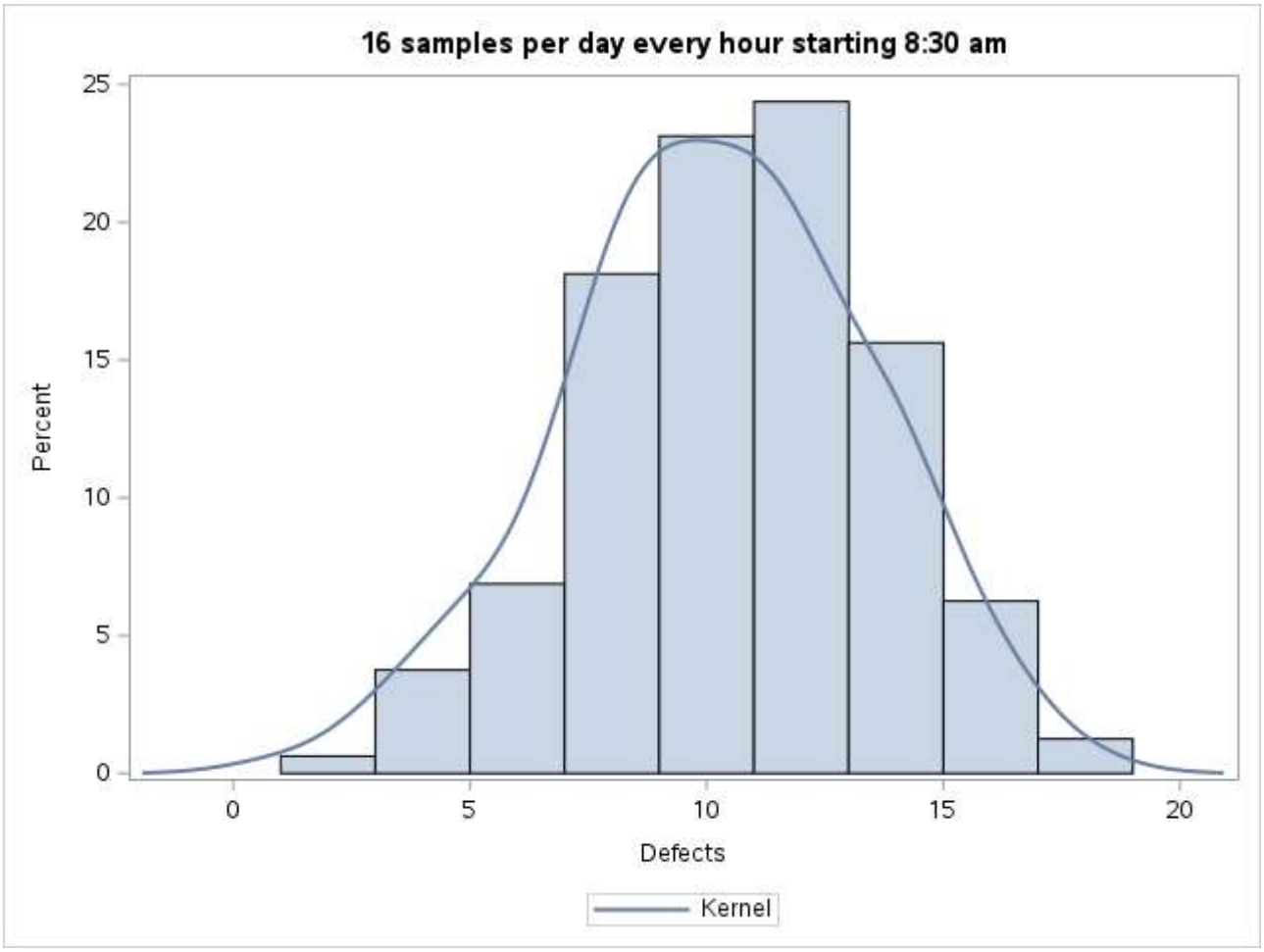
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Signed Rank | S | 6440 | Pr >= \|S\| | <.0001 |

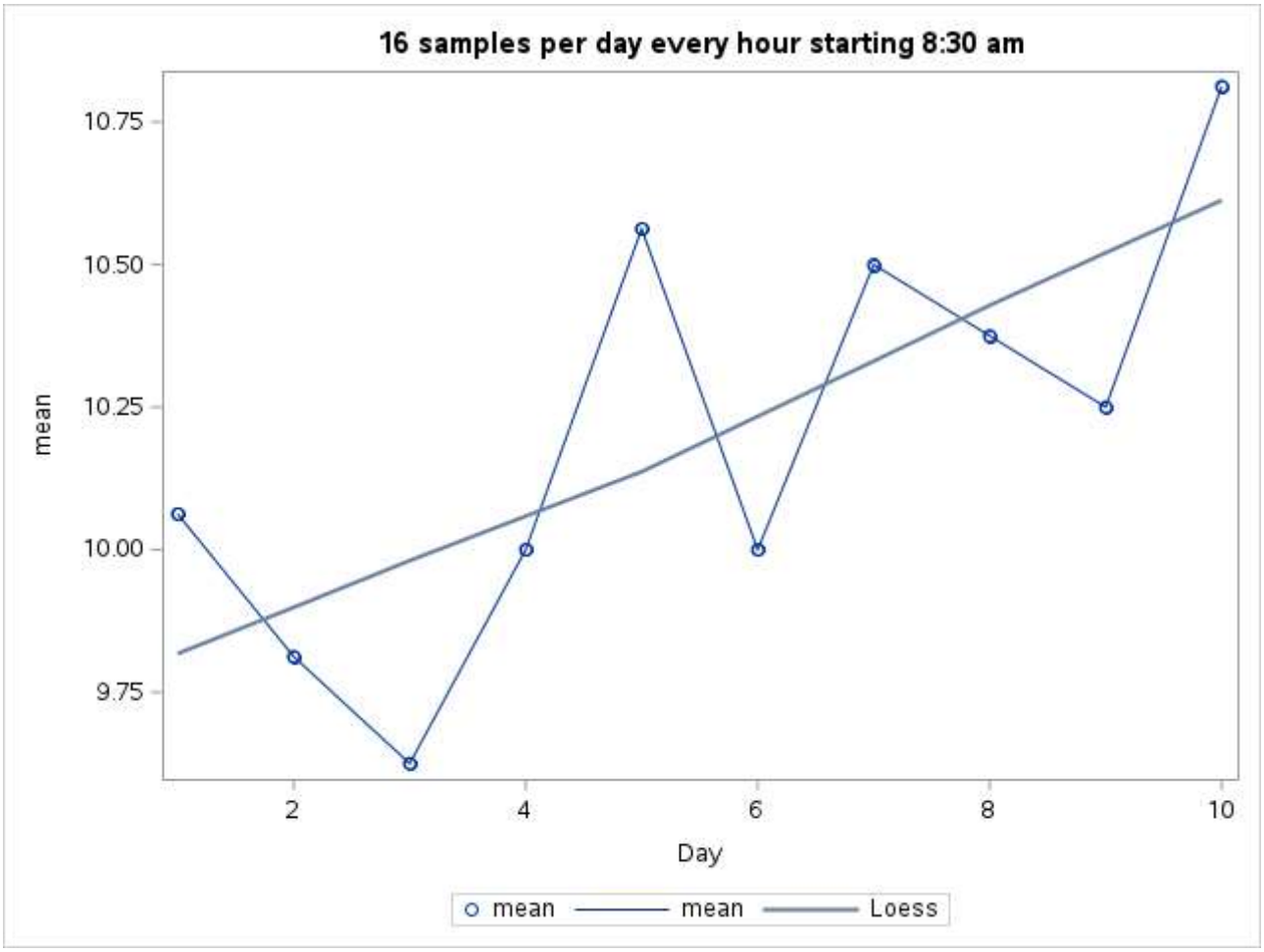
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.986112 | Pr < W | 0.1117 |
| Kolmogorov-Smirnov | D | 0.073664 | Pr > D | 0.0329 |
| Cramer-von Mises | W-Sq | 0.147078 | Pr > W-Sq | 0.0255 |
| Anderson-Darling | A-Sq | 0.865486 | Pr > A-Sq | 0.0257 |

| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 18.0 |
| 99% | 17.0 |
| 95% | 15.5 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 10.0 |
| 25% Q1 | 8.0 |
| 10% | 6.0 |
| 5% | 5.0 |
| 1% | 3.0 |
| 0% Min | 1.0 |

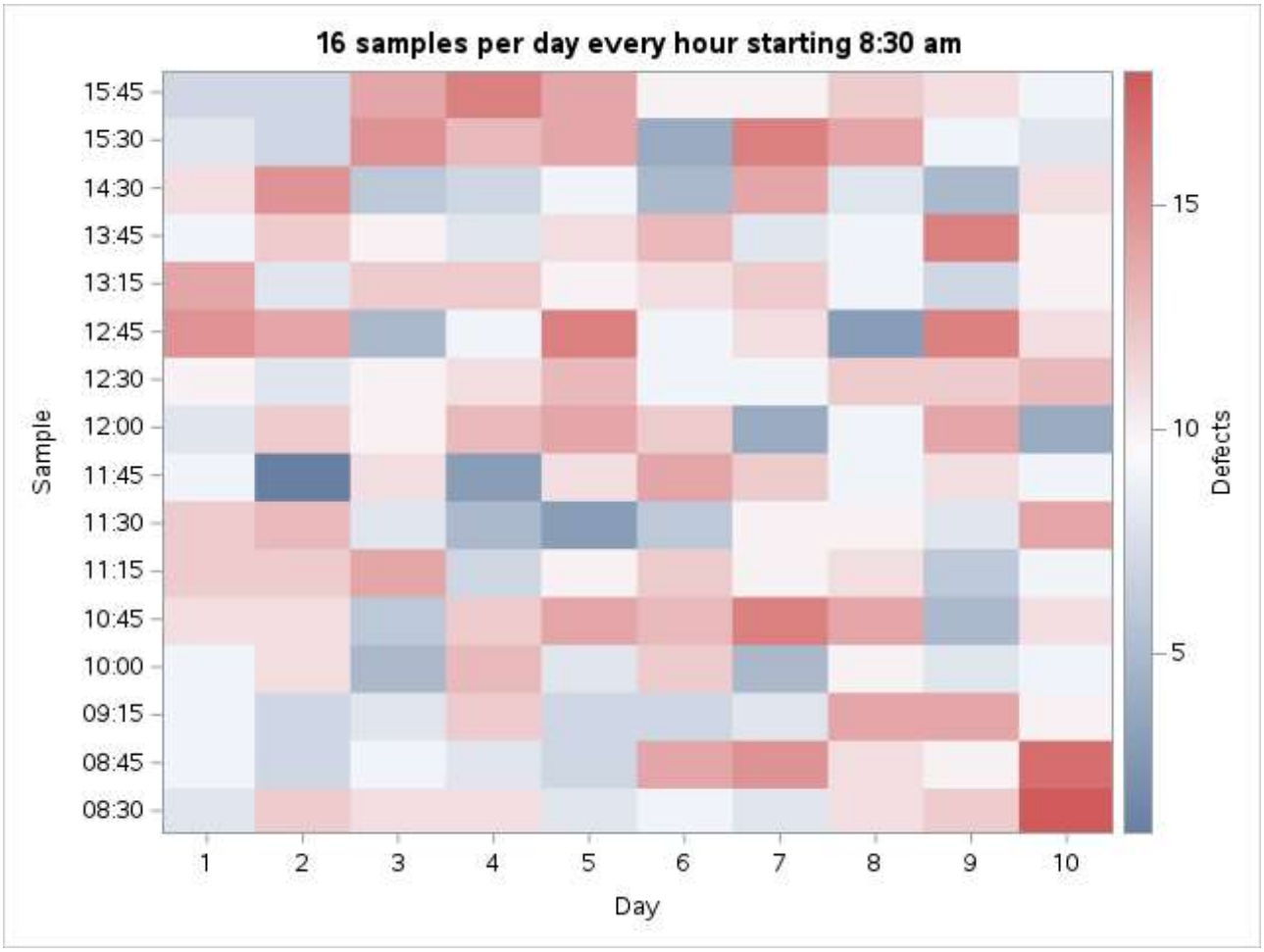
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 1 | 24 | 16 | 111 |
| 3 | 123 | 16 | 139 |
| 3 | 71 | 16 | 141 |
| 3 | 56 | 17 | 146 |
| 4 | 153 | 18 | 145 |


Distribution and Probability Plot for Defects
Defects
18
16
14
12
10
8
6
4
2
0
10
20
30
40
Count
Defects
15
10
5
0
-3
-2
-1
0
1
2
3
Normal Quantiles


16 samples per day every hour starting 8:30 am
Percent
25
20
15
10
5
0
0
5
10
15
20
Defects
Kernel


16 samples per day every hour starting 8:30 am
10.75
10.50
10.25
10.00
9.75
mean
2
4
6
8
10
Day
mean
mean
Loess


16 samples per day every hour starting 8:30 am
Defects
0
5
10
15
Day 1 2 3 4 5 6 7 8 9 10




## 32 samples per day every 15-minutes starting 8:15 am

**The UNIVARIATE Procedure**
**Variable: Defects**

| Moments | | | |
|---|---|---|---|
| N | 320 | Sum Weights | 320 |
| Mean | 10.325 | Sum Observations | 3304 |
| Std Deviation | 3.17227409 | Variance | 10.0633229 |
| Skewness | -0.1850724 | Kurtosis | -0.2466066 |
| Uncorrected SS | 37324 | Corrected SS | 3210.2 |
| Coeff Variation | 30.7242042 | Std Error Mean | 0.17733551 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.32500 | Std Deviation | 3.17227 |
| Median | 11.00000 | Variance | 10.06332 |
| Mode | 11.00000 | Range | 17.00000 |
| | | Interquartile Range | 4.00000 |

**Note: The mode displayed is the smallest of 2 modes with a count of 44.**

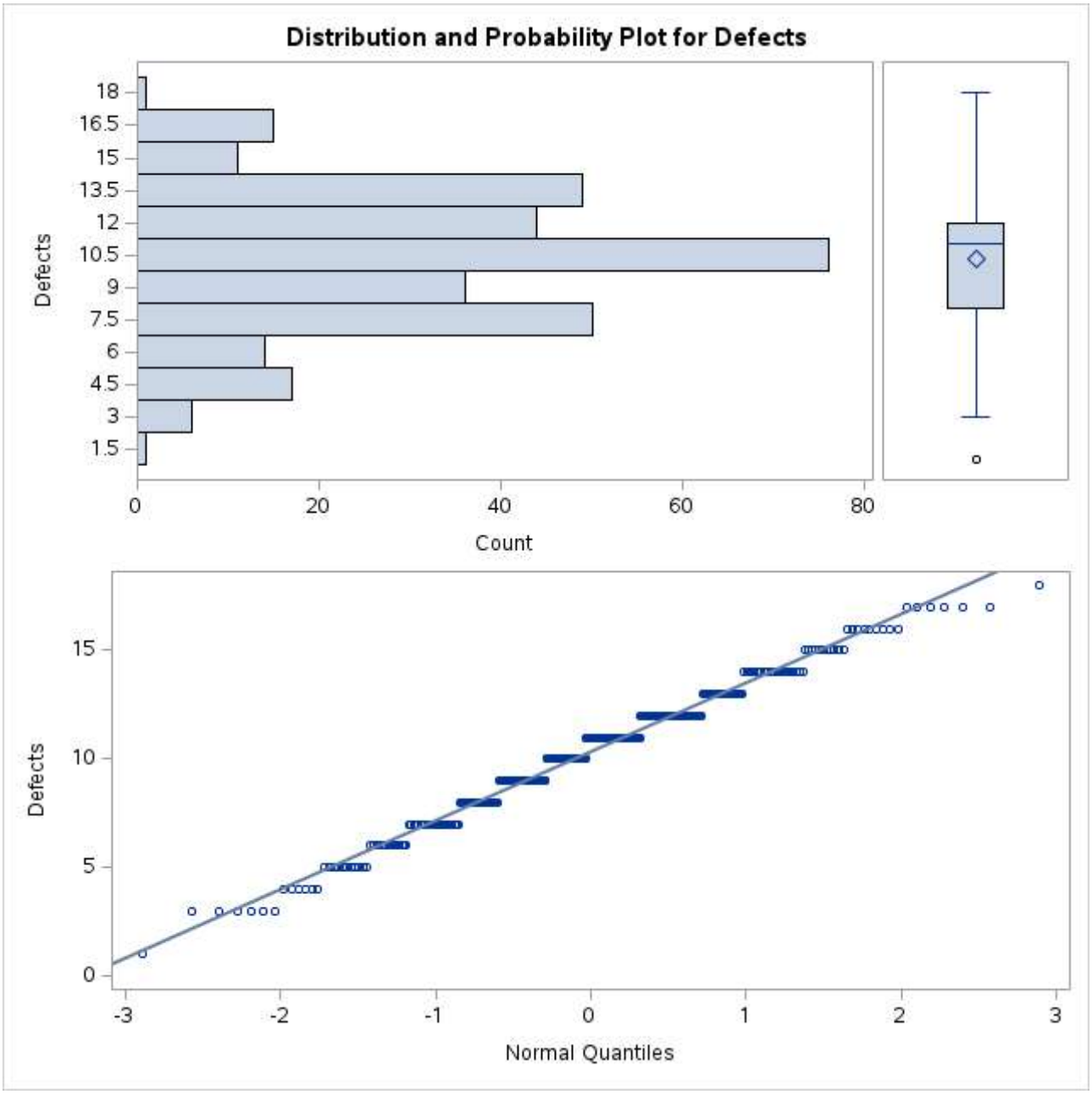
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 58.22297 | Pr > \|t\| | <.0001 |
| Sign | M | 160 | Pr >= \|M\| | <.0001 |

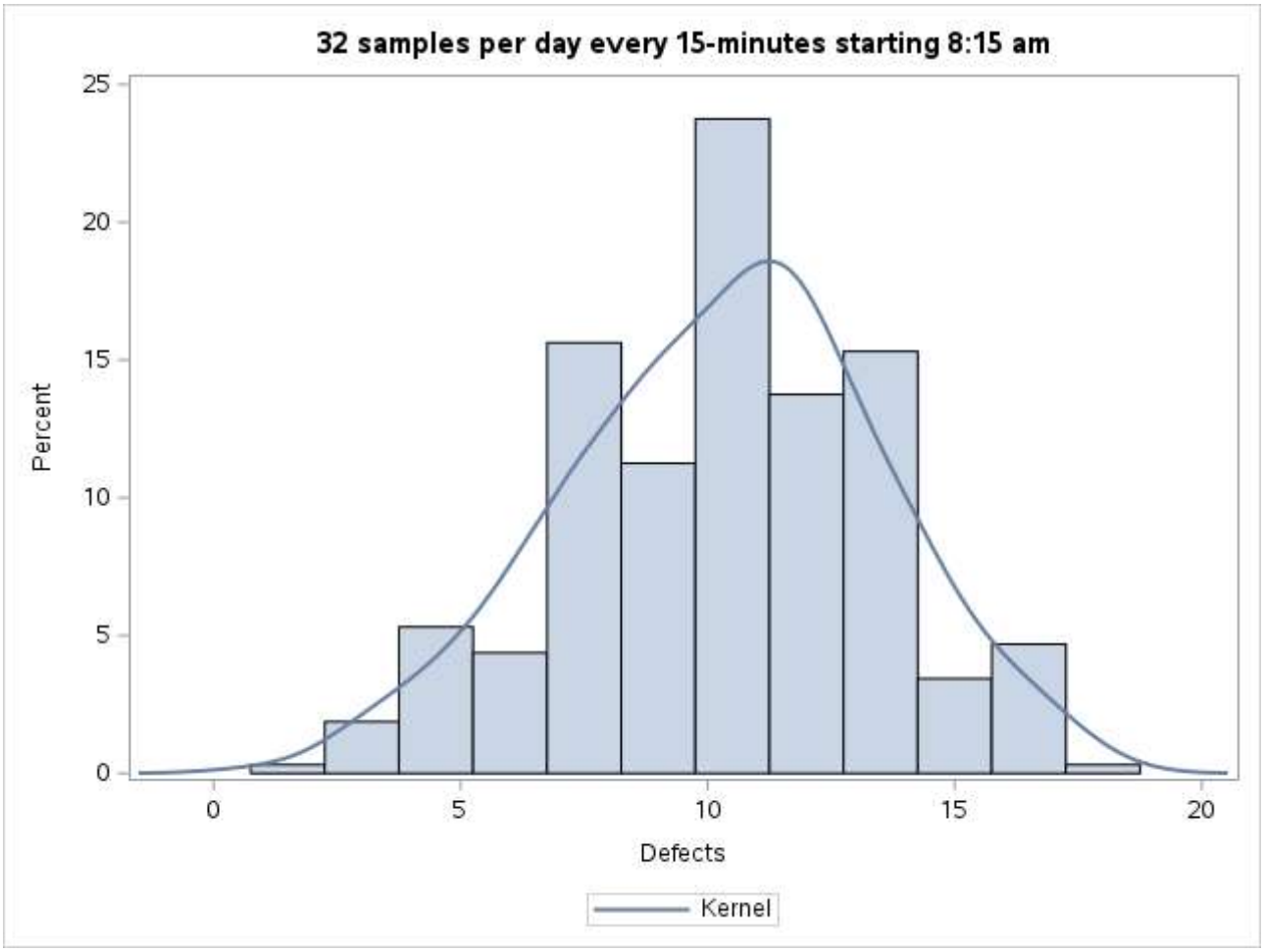
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Signed Rank | S | 25680 | Pr >= \|S\| | <.0001 |

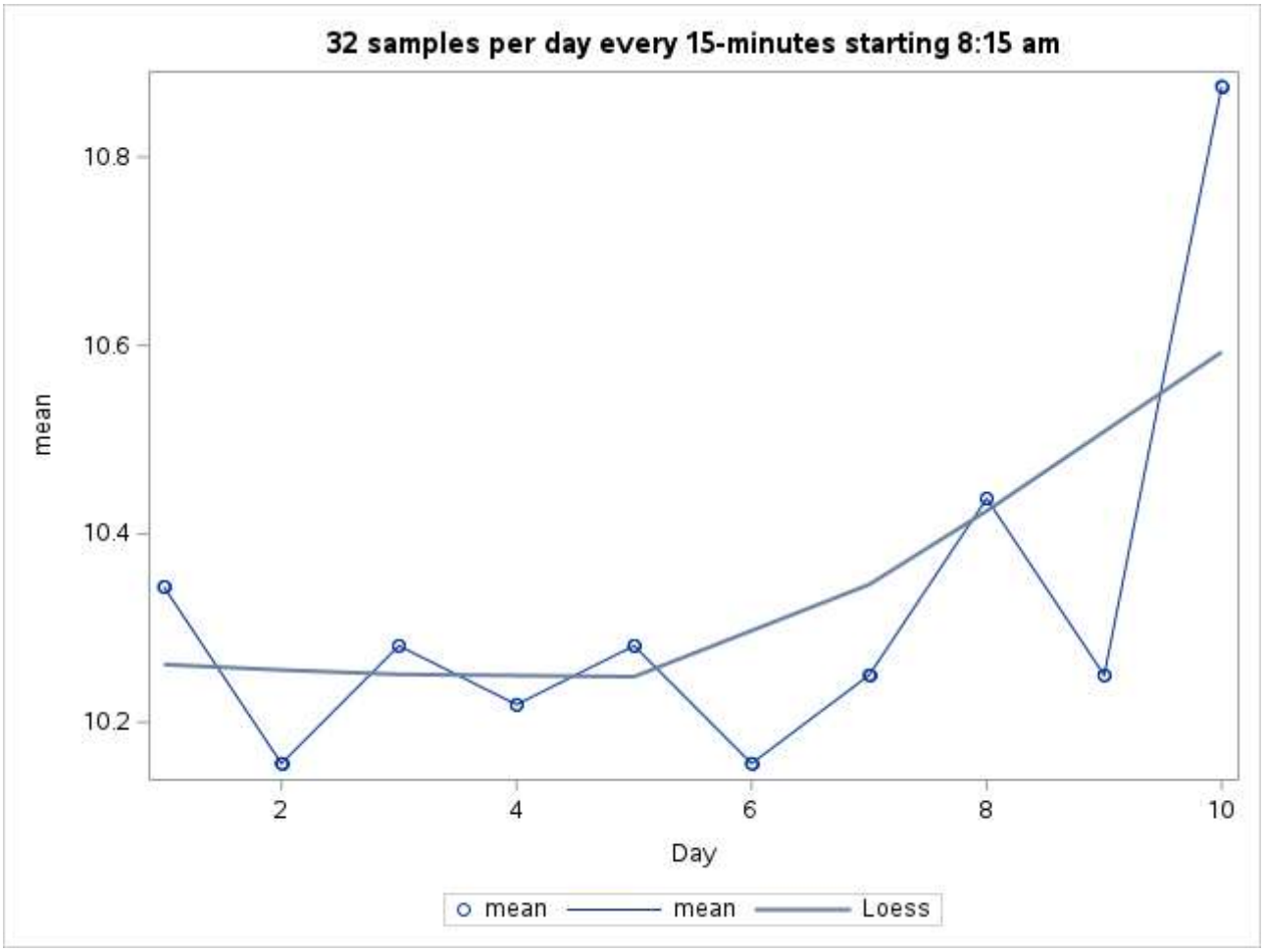
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.986183 | Pr < W | 0.0037 |
| Kolmogorov-Smirnov | D | 0.096751 | Pr > D | <0.0100 |
| Cramer-von Mises | W-Sq | 0.318788 | Pr > W-Sq | <0.0050 |
| Anderson-Darling | A-Sq | 1.694159 | Pr > A-Sq | <0.0050 |

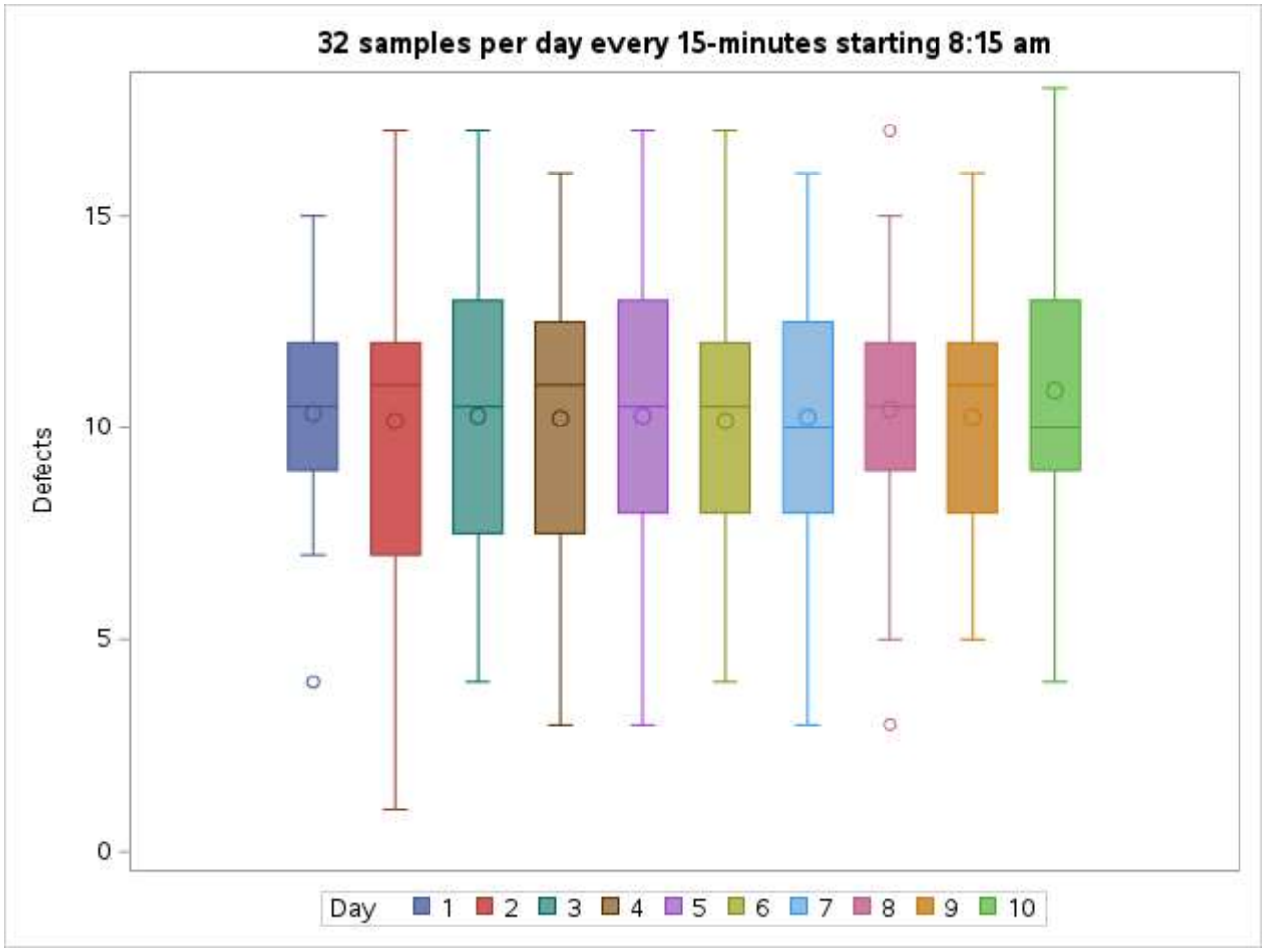
| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 18.0 |
| 99% | 17.0 |
| 95% | 15.5 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 11.0 |
| 25% Q1 | 8.0 |
| 10% | 6.0 |
| 5% | 5.0 |
| 1% | 3.0 |
| 0% Min | 1.0 |

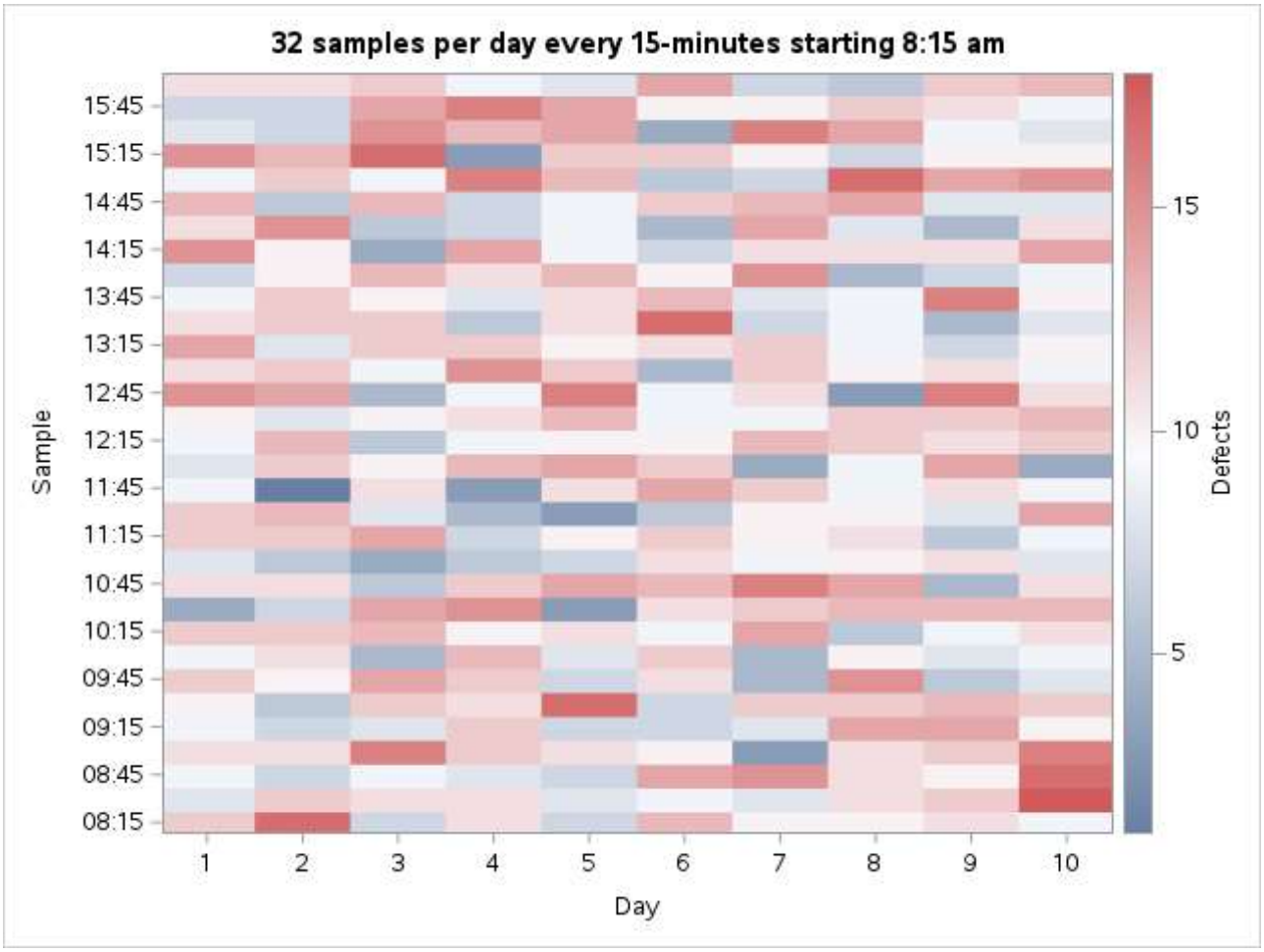
| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 1 | 47 | 17 | 134 |
| 3 | 243 | 17 | 182 |
| 3 | 196 | 17 | 252 |
| 3 | 142 | 17 | 291 |
| 3 | 138 | 18 | 290 |


Distribution and Probability Plot for Defects
Defects
18
16.5
15
13.5
12
10.5
9
7.5
6
4.5
3
1.5
0
20
40
60
80
Count
Defects
15
10
5
0
-3
-2
-1
0
1
2
3
Normal Quantiles


32 samples per day every 15-minutes starting 8:15 am
Percent
25
20
15
10
5
0
0
5
10
15
20
Defects
Kernel


32 samples per day every 15-minutes starting 8:15 am
mean
10.8
10.6
10.4
10.2
2
4
6
8
10
Day
mean
mean
Loess


32 samples per day every 15-minutes starting 8:15 am
Defects
0
5
10
15
Day 1 2 3 4 5 6 7 8 9 10




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The UNIVARIATE Procedure**
**Variable: Defects**

**timeofday=' '**

| Missing Values | | | |
|---|---|---|---|
| Missing Value | Count | Percent Of | |
| | | All Obs | Missing Obs |
| . | 1 | 100.00 | 100.00 |

## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The UNIVARIATE Procedure**
**Variable: Defects**

**timeofday=early**

| Moments | | | |
|---|---|---|---|
| N | 80 | Sum Weights | 80 |
| Mean | 10.4125 | Sum Observations | 833 |
| Std Deviation | 3.09222688 | Variance | 9.56186709 |
| Skewness | 0.24966382 | Kurtosis | -0.0424583 |
| Uncorrected SS | 9429 | Corrected SS | 755.3875 |

| Moments | | | |
|---|---|---|---|
| Coeff Variation | 29.697257 | Std Error Mean | 0.34572148 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.41250 | Std Deviation | 3.09223 |
| Median | 11.00000 | Variance | 9.56187 |
| Mode | 11.00000 | Range | 15.00000 |
| | | Interquartile Range | 4.00000 |

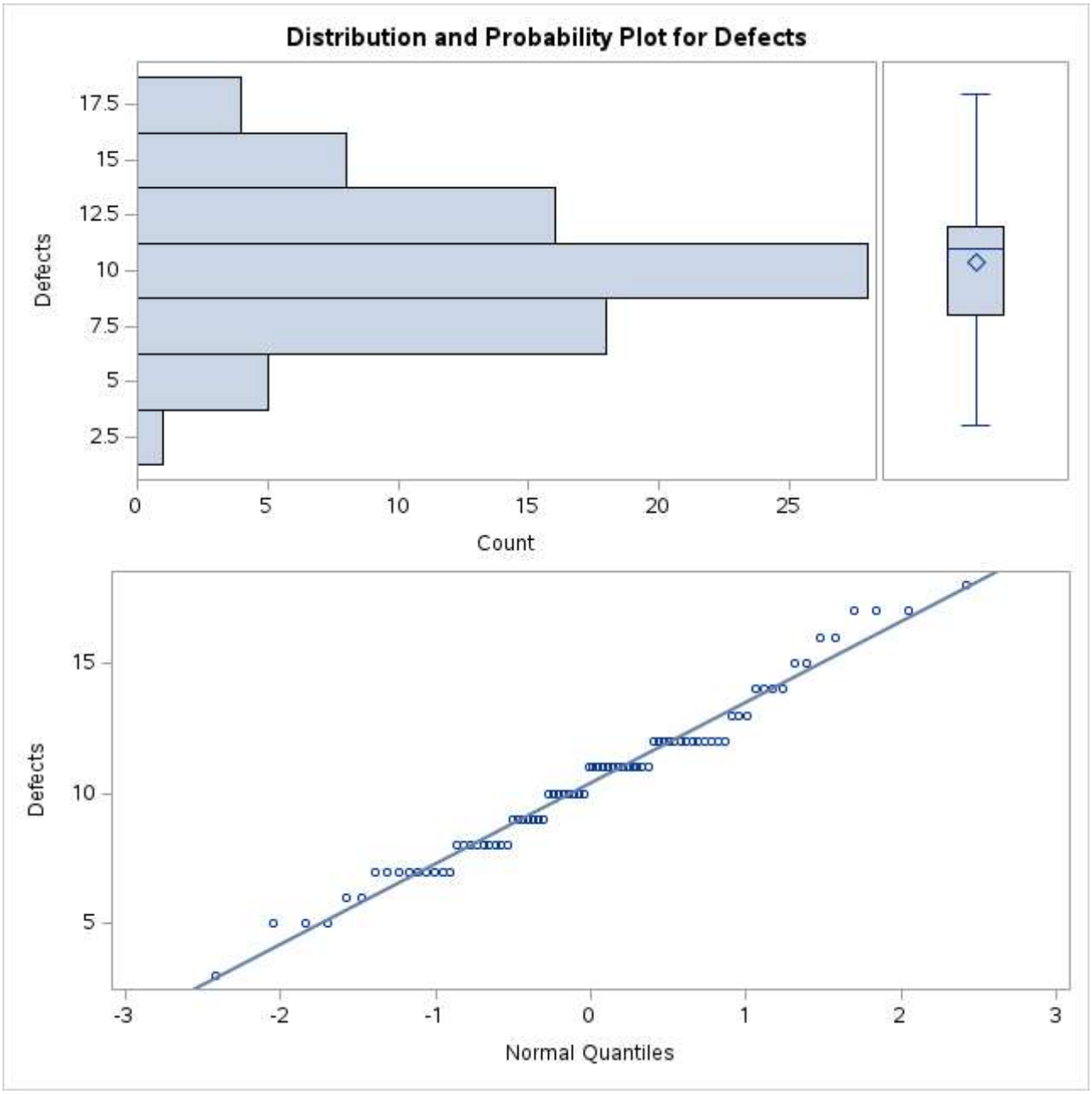
Note: The mode displayed is the smallest of 2 modes with a count of 13.

| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 30.11818 | Pr > \|t\| | <.0001 |
| Sign | M | 40 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 1620 | Pr >= \|S\| | <.0001 |

| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.97659 | Pr < W | 0.1494 |
| Kolmogorov-Smirnov | D | 0.116341 | Pr > D | <0.0100 |
| Cramer-von Mises | W-Sq | 0.122507 | Pr > W-Sq | 0.0562 |
| Anderson-Darling | A-Sq | 0.732972 | Pr > A-Sq | 0.0549 |

| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 18.0 |
| 99% | 18.0 |
| 95% | 16.5 |
| 90% | 14.5 |
| 75% Q3 | 12.0 |
| 50% Median | 11.0 |
| 25% Q1 | 8.0 |
| 10% | 7.0 |
| 5% | 5.5 |
| 1% | 3.0 |
| 0% Min | 3.0 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 53 | 16 | 77 |
| 5 | 57 | 17 | 10 |
| 5 | 56 | 17 | 39 |
| 5 | 25 | 17 | 76 |
| 6 | 72 | 18 | 75 |




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The UNIVARIATE Procedure**
**Variable: Defects**

**timeofday=late**

| Moments | | | |
|---|---|---|---|
| **N** | 80 | **Sum Weights** | 80 |
| **Mean** | 10.6 | **Sum Observations** | 848 |
| **Std Deviation** | 3.39247119 | **Variance** | 11.5088608 |
| **Skewness** | -0.12697 | **Kurtosis** | -0.8382361 |
| **Uncorrected SS** | 9898 | **Corrected SS** | 909.2 |
| **Coeff Variation** | 32.0044452 | **Std Error Mean** | 0.37928981 |

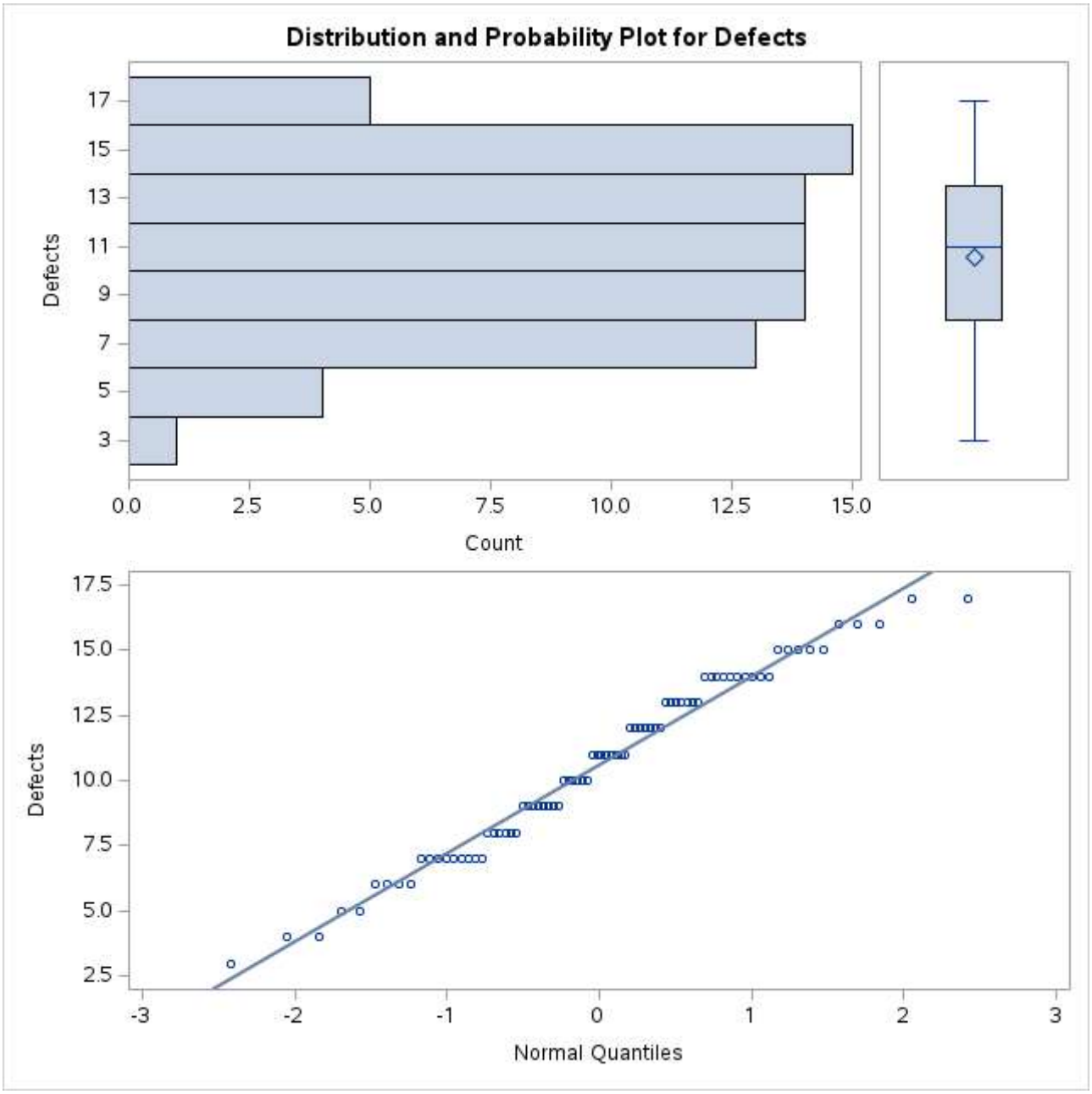
| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.60000 | Std Deviation | 3.39247 |
| Median | 11.00000 | Variance | 11.50886 |
| Mode | 14.00000 | Range | 14.00000 |
| | | Interquartile Range | 5.50000 |

| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 27.94697 | Pr > \|t\| | <.0001 |
| Sign | M | 40 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 1620 | Pr >= \|S\| | <.0001 |

| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.972777 | Pr < W | 0.0854 |
| Kolmogorov-Smirnov | D | 0.097856 | Pr > D | 0.0575 |
| Cramer-von Mises | W-Sq | 0.123193 | Pr > W-Sq | 0.0546 |
| Anderson-Darling | A-Sq | 0.745278 | Pr > A-Sq | 0.0499 |

| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 17.0 |
| 99% | 17.0 |
| 95% | 16.0 |
| 90% | 15.0 |
| 75% Q3 | 13.5 |
| 50% Median | 11.0 |
| 25% Q1 | 8.0 |
| 10% | 6.0 |
| 5% | 5.0 |
| 1% | 3.0 |
| 0% Min | 3.0 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 110 | 16 | 109 |
| 4 | 127 | 16 | 112 |
| 4 | 98 | 16 | 135 |
| 5 | 147 | 17 | 102 |
| 5 | 123 | 17 | 141 |




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The UNIVARIATE Procedure**
**Variable: Defects**

**timeofday=midaf**

| Moments | | | |
|---|---|---|---|
| **N** | 80 | **Sum Weights** | 80 |
| **Mean** | 10.45 | **Sum Observations** | 836 |
| **Std Deviation** | 2.81001824 | **Variance** | 7.89620253 |
| **Skewness** | -0.1073217 | **Kurtosis** | 0.1377812 |
| **Uncorrected SS** | 9360 | **Corrected SS** | 623.8 |
| **Coeff Variation** | 26.8901267 | **Std Error Mean** | 0.31416959 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.45000 | Std Deviation | 2.81002 |
| Median | 10.50000 | Variance | 7.89620 |
| Mode | 9.00000 | Range | 14.00000 |
| | | Interquartile Range | 3.00000 |

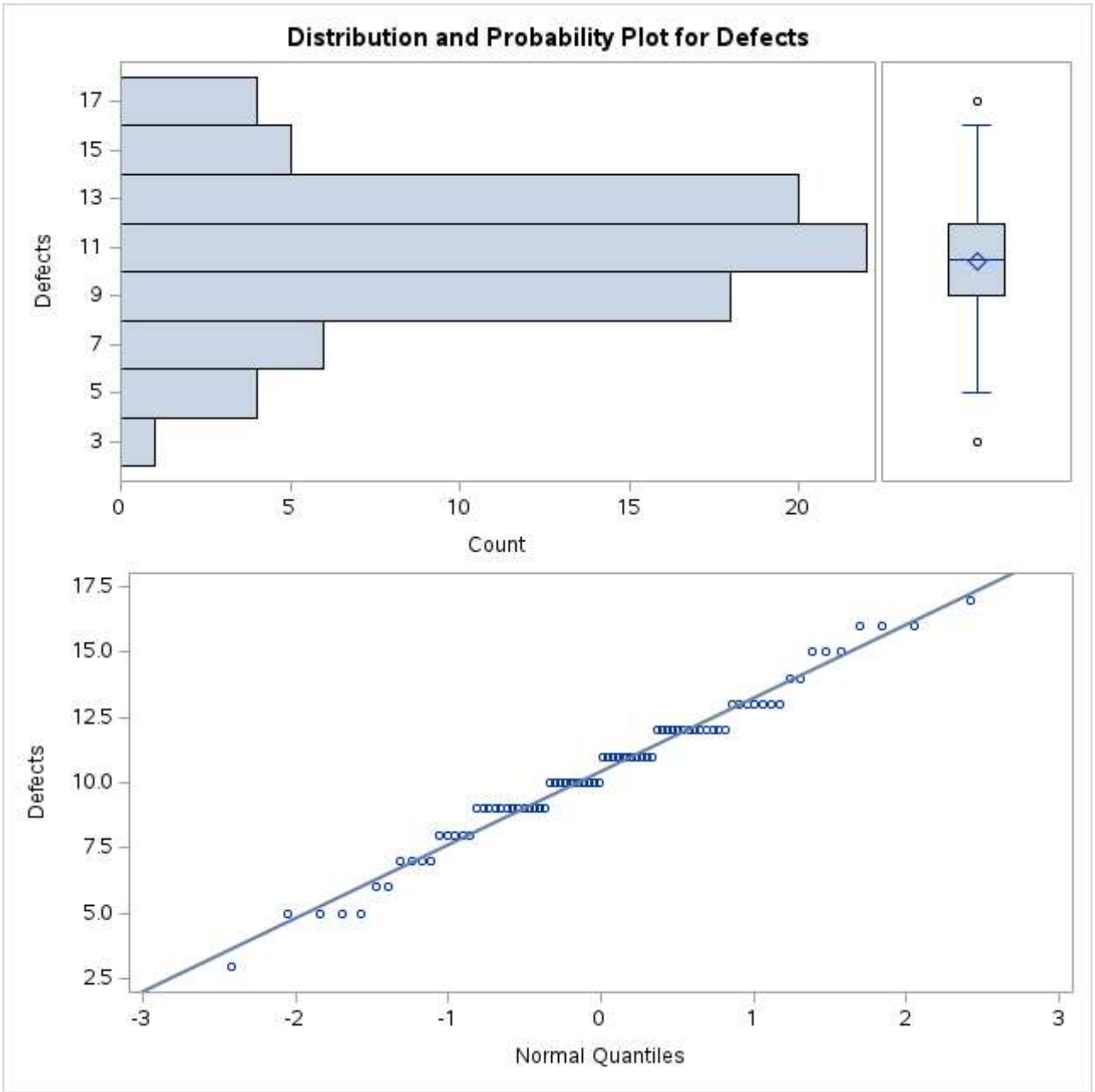
Note: The mode displayed is the smallest of 2 modes with a count of 13.

| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 33.26229 | Pr > \|t\| | <.0001 |
| Sign | M | 40 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 1620 | Pr >= \|S\| | <.0001 |

| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.979968 | Pr < W | 0.2427 |
| Kolmogorov-Smirnov | D | 0.102923 | Pr > D | 0.0357 |
| Cramer-von Mises | W-Sq | 0.118434 | Pr > W-Sq | 0.0655 |
| Anderson-Darling | A-Sq | 0.671999 | Pr > A-Sq | 0.0804 |

| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 17.0 |
| 99% | 17.0 |
| 95% | 15.5 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 10.5 |
| 25% Q1 | 9.0 |
| 10% | 7.0 |
| 5% | 5.0 |
| 1% | 3.0 |
| 0% Min | 3.0 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 220 | 15 | 217 |
| 5 | 231 | 16 | 196 |
| 5 | 225 | 16 | 228 |
| 5 | 205 | 16 | 232 |
| 5 | 180 | 17 | 207 |




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The UNIVARIATE Procedure**
**Variable: Defects**

**timeofday=midmo**

| Moments | | | |
|---|---|---|---|
| **N** | 80 | **Sum Weights** | 80 |
| **Mean** | 9.8375 | **Sum Observations** | 787 |
| **Std Deviation** | 3.36566336 | **Variance** | 11.3276899 |
| **Skewness** | -0.5933404 | **Kurtosis** | -0.3745176 |
| **Uncorrected SS** | 8637 | **Corrected SS** | 894.8875 |
| **Coeff Variation** | 34.2125882 | **Std Error Mean** | 0.3762926 |

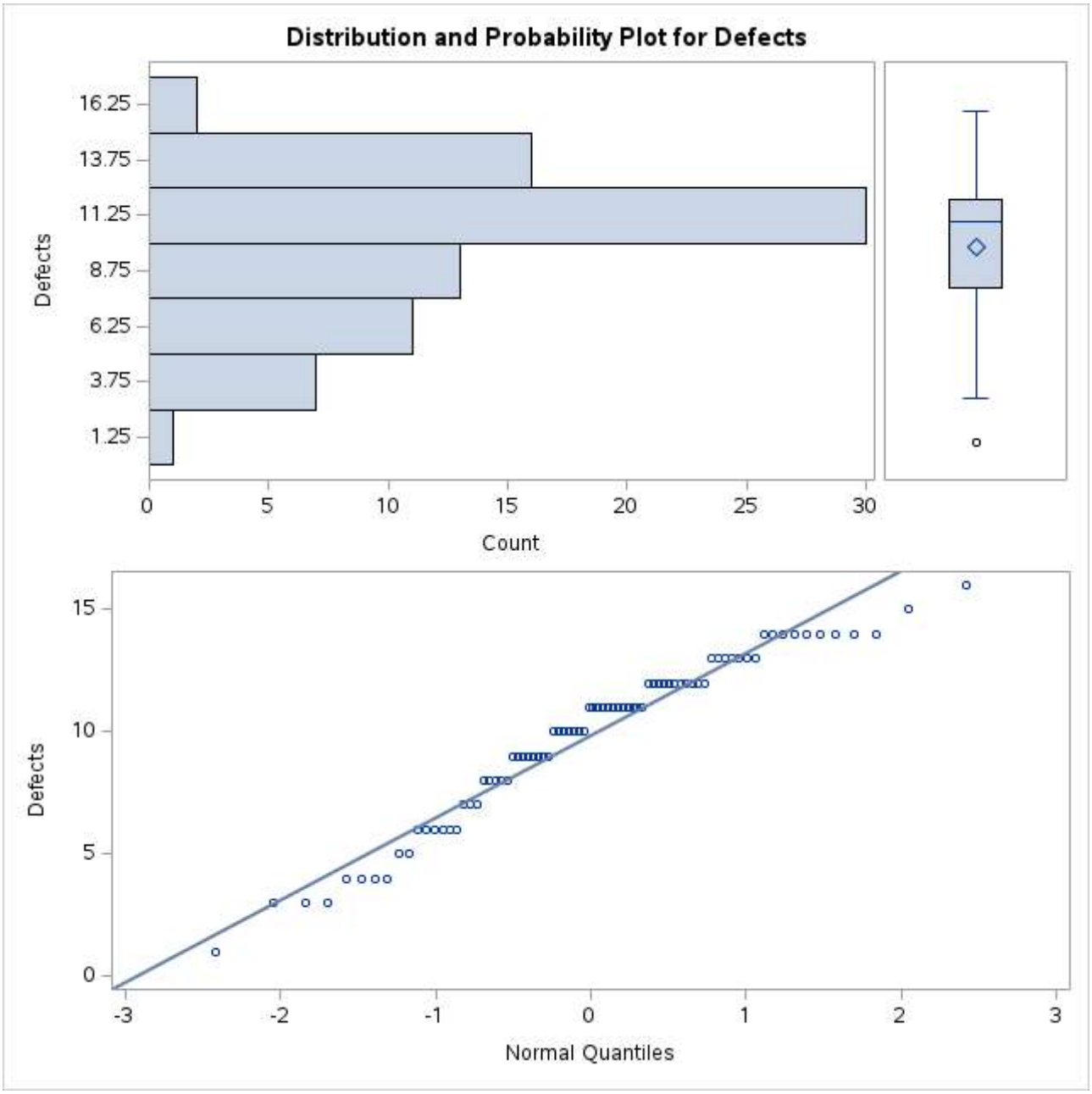
| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 9.83750 | Std Deviation | 3.36566 |
| Median | 11.00000 | Variance | 11.32769 |
| Mode | 11.00000 | Range | 15.00000 |
| | | Interquartile Range | 4.00000 |

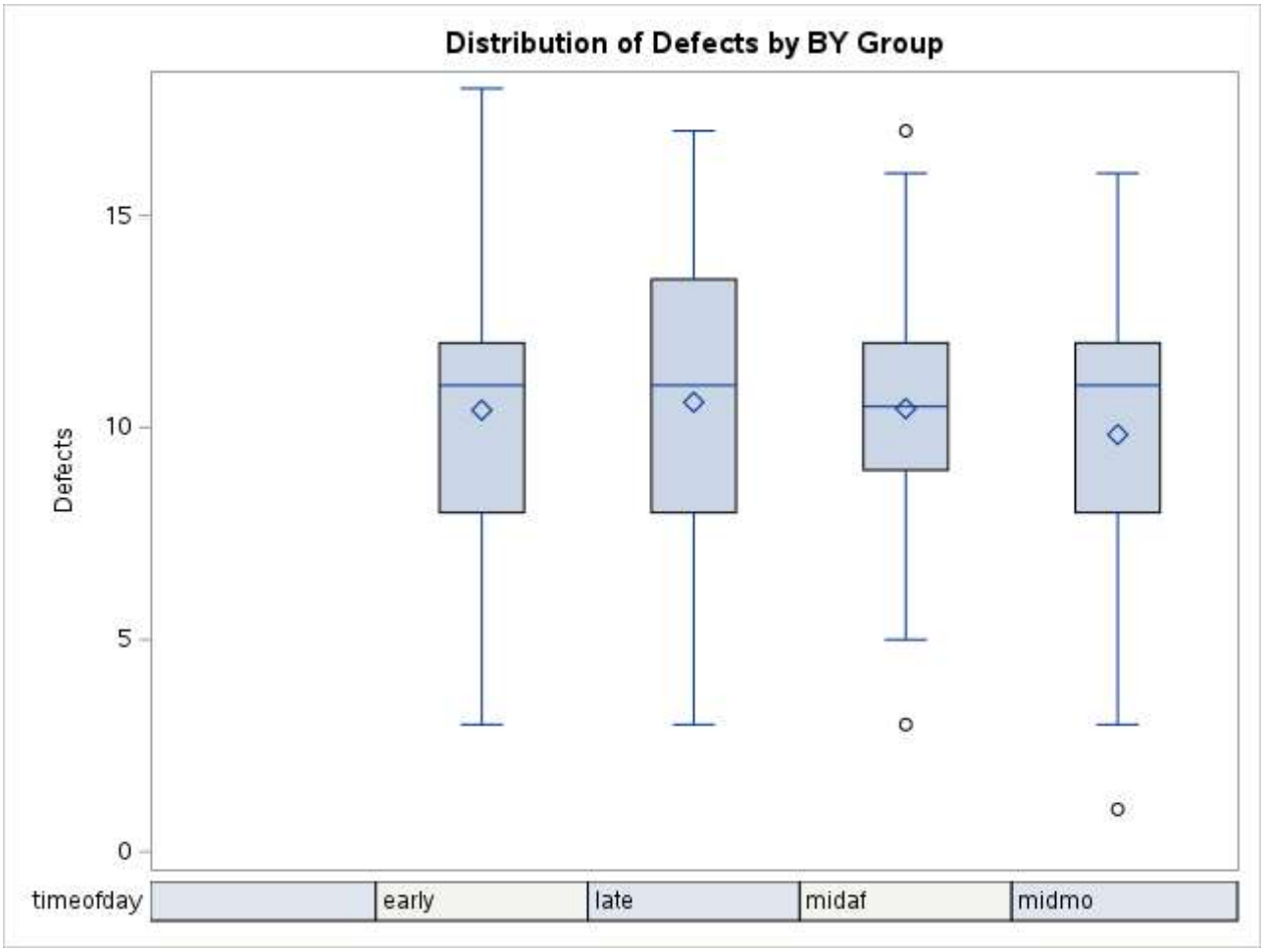
| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 26.14322 | Pr > \|t\| | <.0001 |
| Sign | M | 40 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 1620 | Pr >= \|S\| | <.0001 |

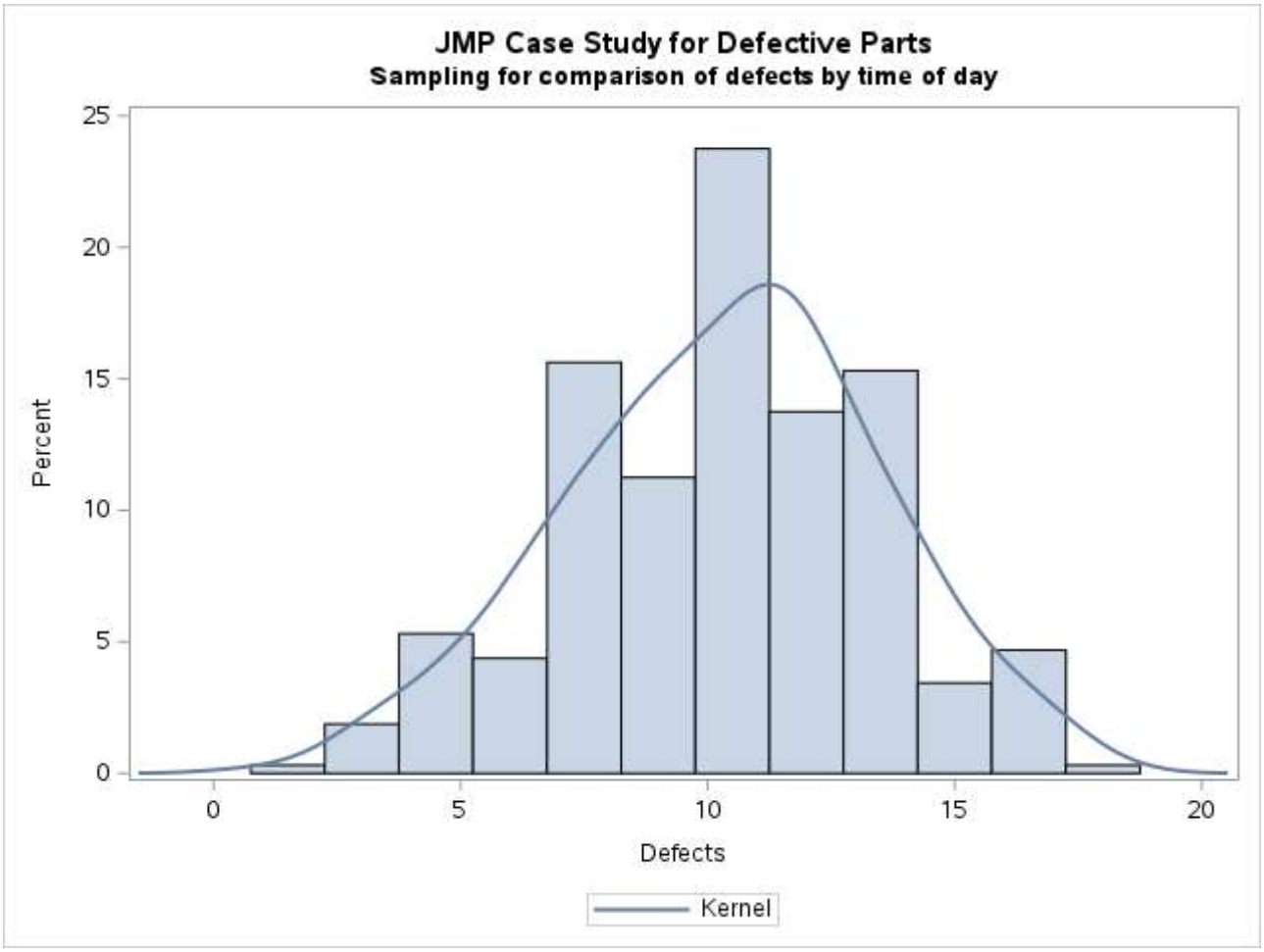
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.950044 | Pr < W | 0.0035 |
| Kolmogorov-Smirnov | D | 0.147603 | Pr > D | <0.0100 |
| Cramer-von Mises | W-Sq | 0.236535 | Pr > W-Sq | <0.0050 |
| Anderson-Darling | A-Sq | 1.407329 | Pr > A-Sq | <0.0050 |

| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 16.0 |
| 99% | 16.0 |
| 95% | 14.0 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 11.0 |
| 25% Q1 | 8.0 |
| 10% | 4.5 |
| 5% | 3.5 |
| 1% | 1.0 |
| 0% Min | 1.0 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 1 | 256 | 14 | 300 |
| 3 | 279 | 14 | 313 |
| 3 | 275 | 14 | 319 |
| 3 | 272 | 15 | 267 |
| 4 | 321 | 16 | 292 |


Distribution and Probability Plot for Defects
Defects
16.25
13.75
11.25
8.75
6.25
3.75
1.25
0
5
10
15
20
25
30
Count
Defects
15
10
5
0
-3
-2
-1
0
1
2
3
Normal Quantiles


Distribution of Defects by BY Group
Defects
15
10
5
0
timeofday
early
late
midaf
midmo




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

### The MEANS Procedure

**timeofday=' '**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 0 | . | . | . | . |

**timeofday=early**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 80 | 10.4125000 | 3.0922269 | 3.0000000 | 18.0000000 |

**timeofday=late**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 80 | 10.6000000 | 3.3924712 | 3.0000000 | 17.0000000 |

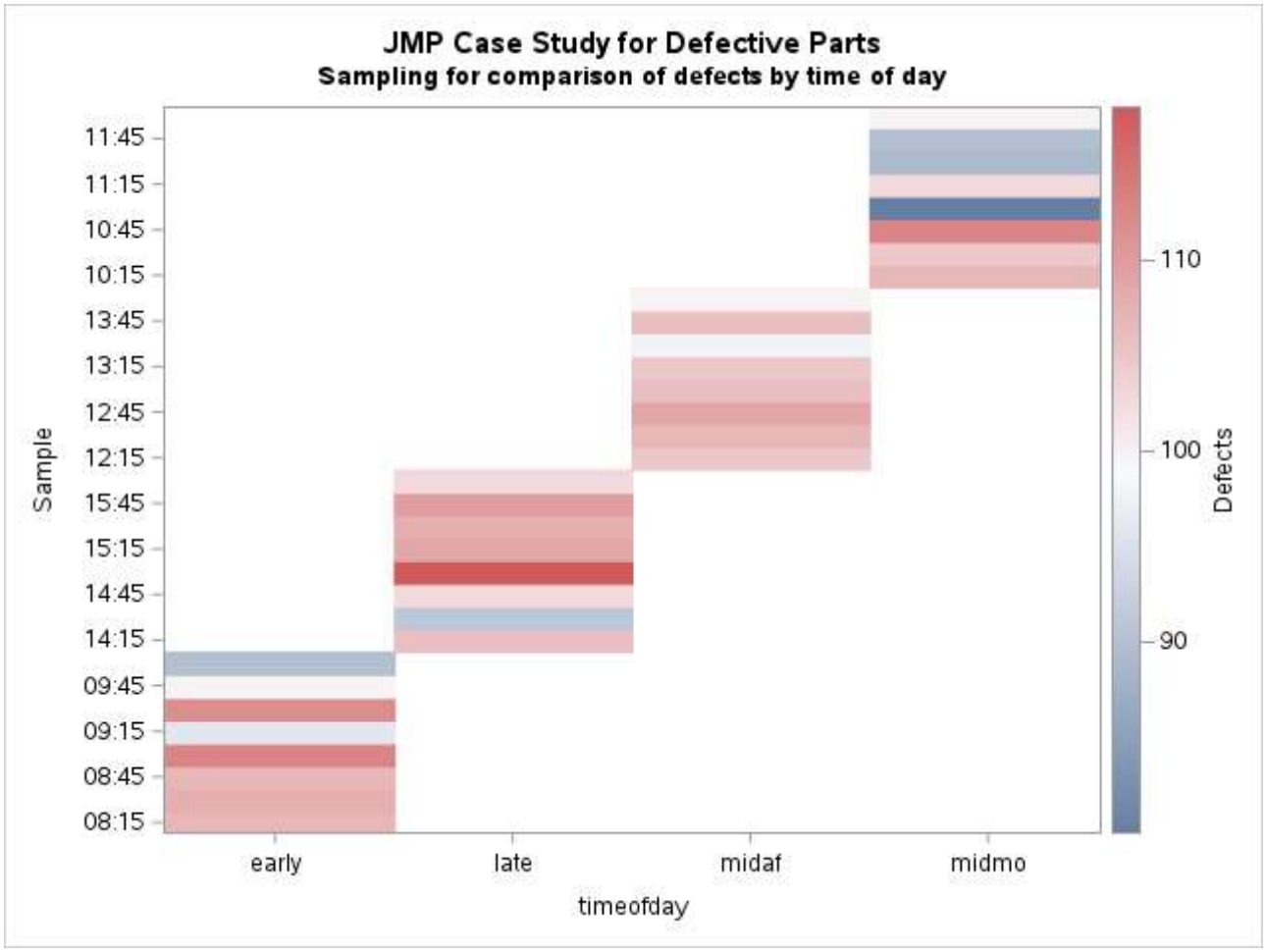
**timeofday=midaf**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 80 | 10.4500000 | 2.8100182 | 3.0000000 | 17.0000000 |

**timeofday=midmo**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 80 | 9.8375000 | 3.3656634 | 1.0000000 | 16.0000000 |




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The GLM Procedure**

| Class Level Information | | |
|---|---|---|
| Class | Levels | Values |
| timeofday | 4 | early late midaf midmo |

| | |
|---|---|
| Number of Observations Read | 321 |
| Number of Observations Used | 320 |

## JMP Case Study for Defective Parts
## Sampling for comparison of defects by time of day

**The GLM Procedure**

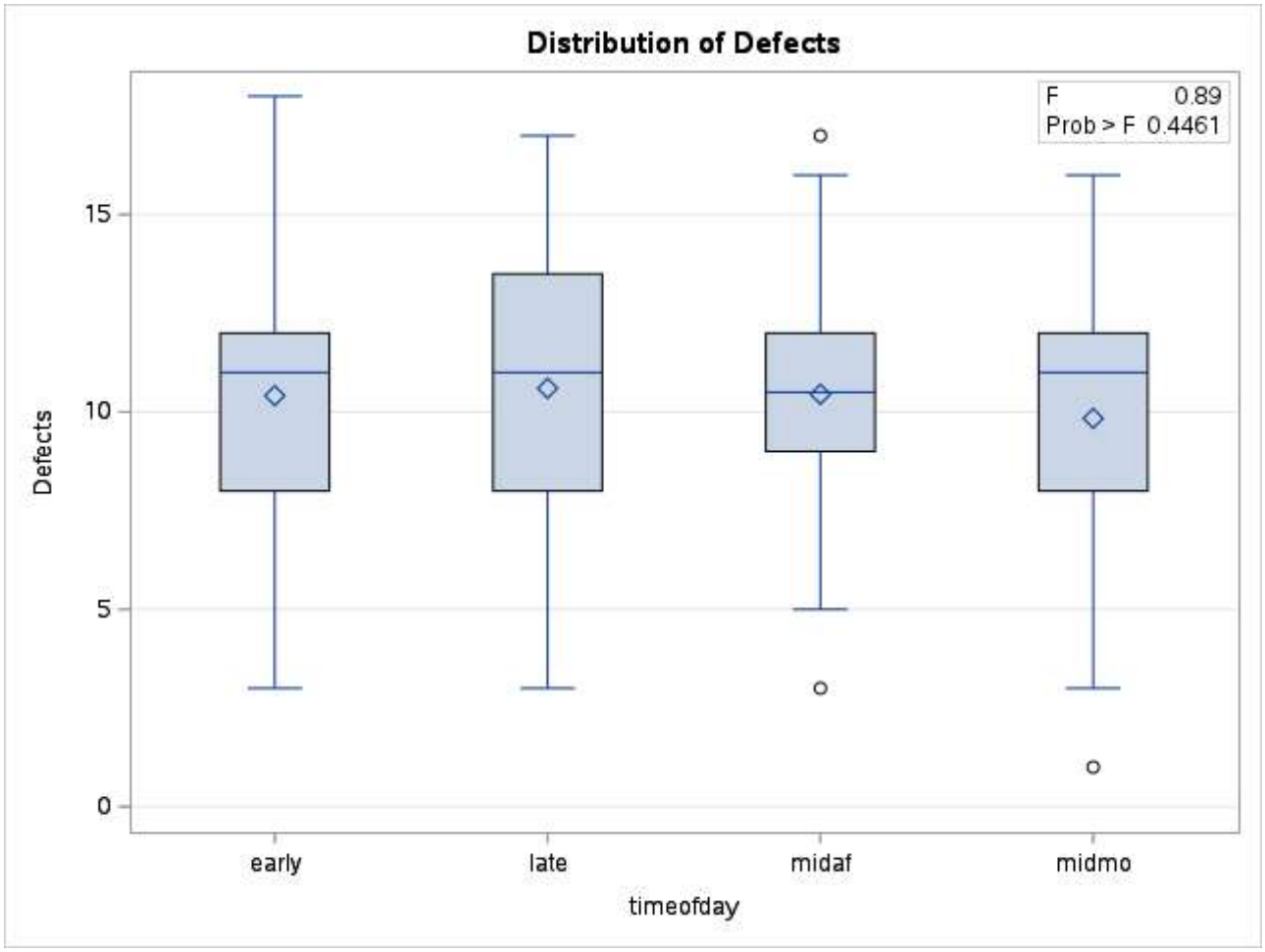
**Dependent Variable: Defects**

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 3 | 26.925000 | 8.975000 | 0.89 | 0.4461 |
| Error | 316 | 3183.275000 | 10.073655 | | |
| Corrected Total | 319 | 3210.200000 | | | |

| R-Square | Coeff Var | Root MSE | Defects Mean |
|---|---|---|---|
| 0.008387 | 30.73997 | 3.173902 | 10.32500 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| timeofday | 3 | 26.92500000 | 8.97500000 | 0.89 | 0.4461 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| timeofday | 3 | 26.92500000 | 8.97500000 | 0.89 | 0.4461 |




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by day of the week

**The UNIVARIATE Procedure**
**Variable: Defects**

| Moments | | | |
|---|---|---|---|
| N | 320 | Sum Weights | 320 |
| Mean | 10.325 | Sum Observations | 3304 |
| Std Deviation | 3.17227409 | Variance | 10.0633229 |
| Skewness | -0.1850724 | Kurtosis | -0.2466066 |
| Uncorrected SS | 37324 | Corrected SS | 3210.2 |
| Coeff Variation | 30.7242042 | Std Error Mean | 0.17733551 |

| Basic Statistical Measures | | | |
|---|---|---|---|
| Location | | Variability | |
| Mean | 10.32500 | Std Deviation | 3.17227 |
| Median | 11.00000 | Variance | 10.06332 |
| Mode | 11.00000 | Range | 17.00000 |
| | | Interquartile Range | 4.00000 |

Note: The mode displayed is the smallest of 2 modes with a count of 44.

| Tests for Location: Mu0=0 | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Student's t | t | 58.22297 | Pr > \|t\| | <.0001 |
| Sign | M | 160 | Pr >= \|M\| | <.0001 |
| Signed Rank | S | 25680 | Pr >= \|S\| | <.0001 |

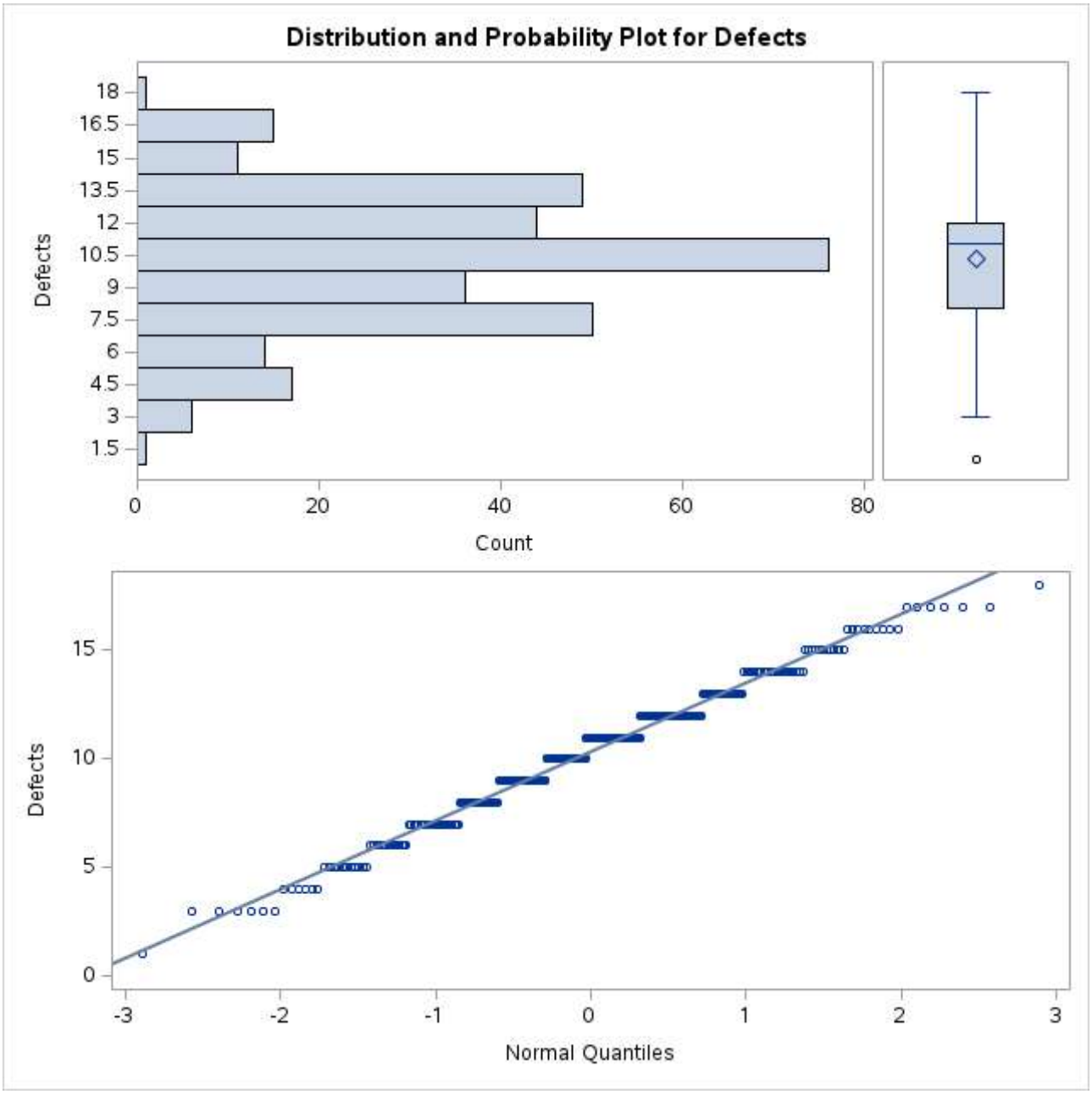
| Tests for Normality | | | | |
|---|---|---|---|---|
| Test | Statistic | | p Value | |
| Shapiro-Wilk | W | 0.986183 | Pr < W | 0.0037 |
| Kolmogorov-Smirnov | D | 0.096751 | Pr > D | <0.0100 |
| Cramer-von Mises | W-Sq | 0.318788 | Pr > W-Sq | <0.0050 |
| Anderson-Darling | A-Sq | 1.694159 | Pr > A-Sq | <0.0050 |

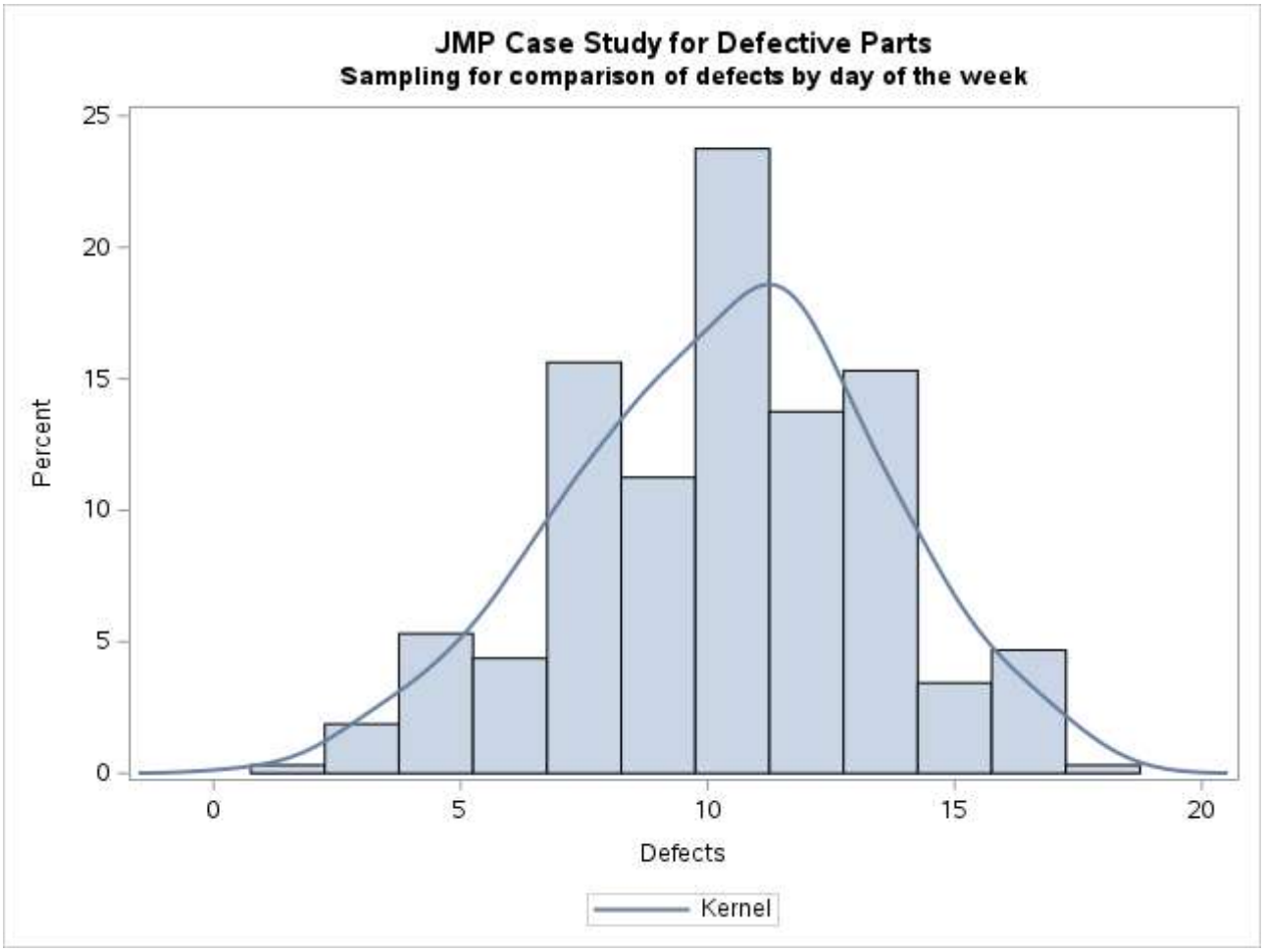
| Quantiles (Definition 5) | |
|---|---|
| Level | Quantile |
| 100% Max | 18.0 |
| 99% | 17.0 |
| 95% | 15.5 |
| 90% | 14.0 |
| 75% Q3 | 12.0 |
| 50% Median | 11.0 |
| 25% Q1 | 8.0 |
| 10% | 6.0 |
| 5% | 5.0 |
| 1% | 3.0 |
| 0% Min | 1.0 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 1 | 48 | 17 | 135 |
| 3 | 244 | 17 | 183 |
| 3 | 197 | 17 | 253 |
| 3 | 143 | 17 | 292 |

| Extreme Observations | | | |
|---|---|---|---|
| Lowest | | Highest | |
| Value | Obs | Value | Obs |
| 3 | 139 | 18 | 291 |

| Missing Values | | | |
|---|---|---|---|
| Missing Value | Count | Percent Of | |
| | | All Obs | Missing Obs |
| . | 1 | 0.31 | 100.00 |






## JMP Case Study for Defective Parts
## Sampling for comparison of defects by day of the week

### The MEANS Procedure

**dayofweek=' '**

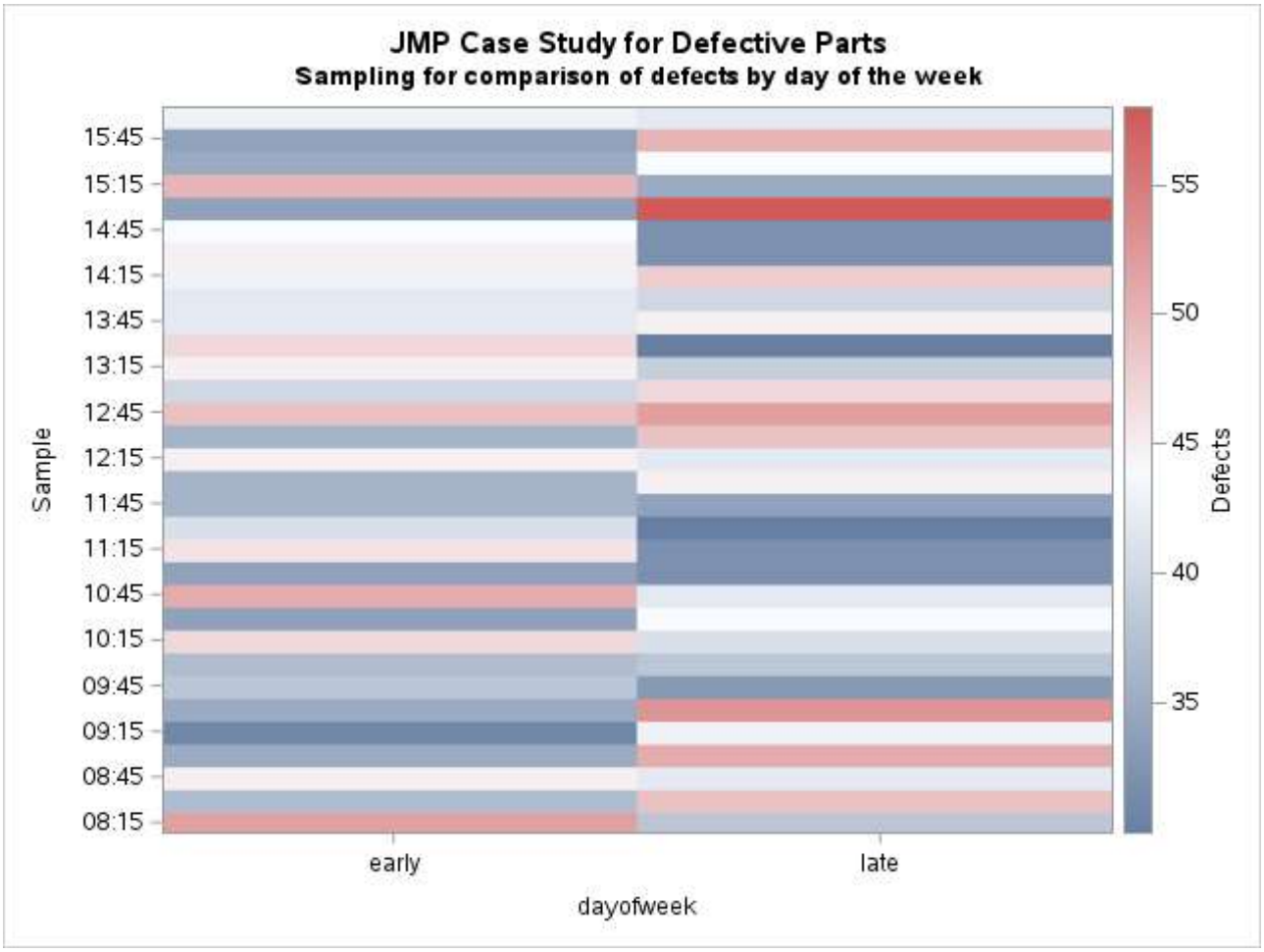
| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 64 | 10.3593750 | 3.3159891 | 3.0000000 | 17.0000000 |

**dayofweek=early**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 128 | 10.2265625 | 3.0718812 | 1.0000000 | 17.0000000 |

**dayofweek=late**

| Analysis Variable : Defects | | | | |
|---|---|---|---|---|
| N | Mean | Std Dev | Minimum | Maximum |
| 128 | 10.4062500 | 3.2201078 | 3.0000000 | 18.0000000 |




## JMP Case Study for Defective Parts
## Sampling for comparison of defects by day of the week

### The GLM Procedure

| Class Level Information | | |
|---|---|---|
| **Class** | **Levels** | **Values** |
| **dayofweek** | 2 | early late |

| | |
|---|---|
| **Number of Observations Read** | 321 |
| **Number of Observations Used** | 256 |

## JMP Case Study for Defective Parts
## Sampling for comparison of defects by day of the week

### The GLM Procedure

### Dependent Variable: Defects

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 1 | 2.066406 | 2.066406 | 0.21 | 0.6482 |
| **Error** | 254 | 2515.304688 | 9.902774 | | |
| **Corrected Total** | 255 | 2517.371094 | | | |

| R-Square | Coeff Var | Root MSE | Defects Mean |
|---|---|---|---|

| R-Square | Coeff Var | Root MSE | Defects Mean |
|---|---|---|---|
| 0.000821 | 30.50352 | 3.146867 | 10.31641 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| dayofweek | 1 | 2.06640625 | 2.06640625 | 0.21 | 0.6482 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| dayofweek | 1 | 2.06640625 | 2.06640625 | 0.21 | 0.6482 |