

Red-Team-Defects_R

Red Team

Problem 1

Defects By Day

```
library("dplyr")
```

```
##  
## Attaching package: 'dplyr'  
  
## The following objects are masked from 'package:stats':  
##  
##   filter, lag  
  
## The following objects are masked from 'package:base':  
##  
##   intersect, setdiff, setequal, union
```

```
library("ggplot2")  
library("egg")
```

```
## Loading required package: gridExtra
```

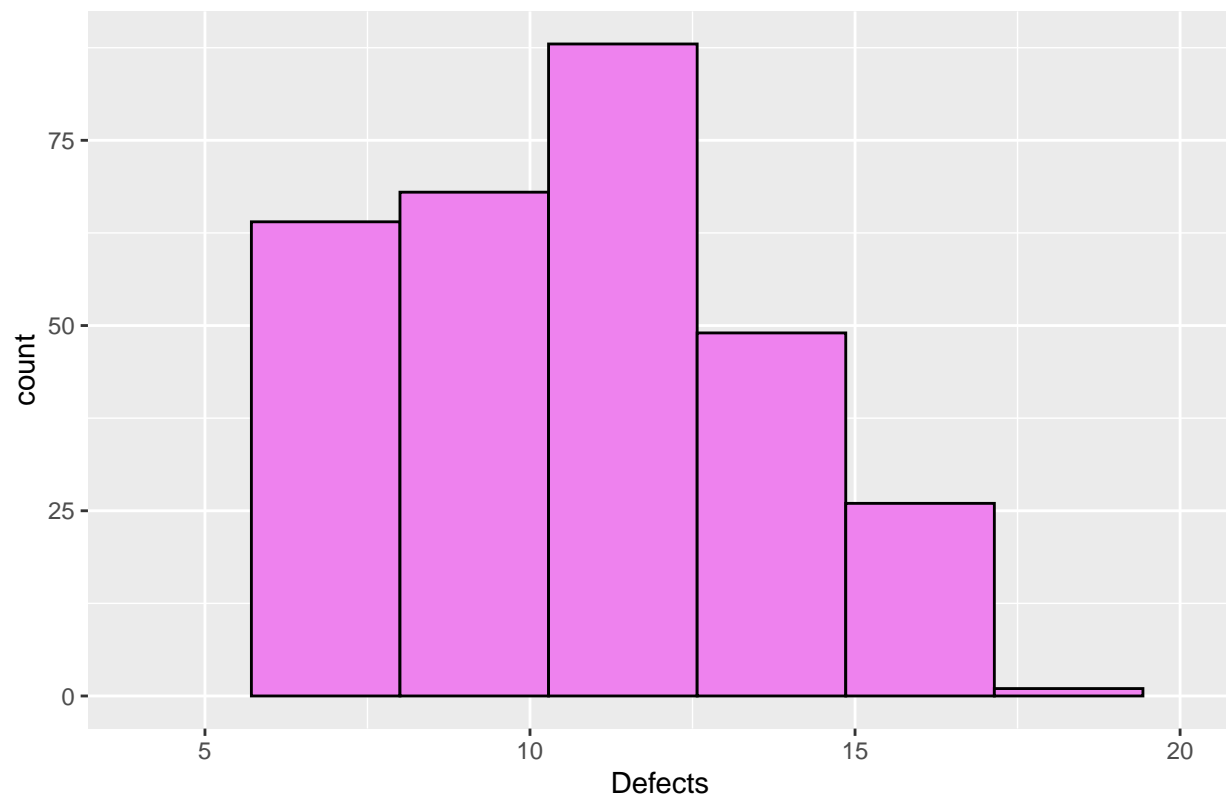
```
##  
## Attaching package: 'gridExtra'  
  
## The following object is masked from 'package:dplyr':  
##  
##   combine
```

```
dat <- read.csv("defects.csv")  
hist <- ggplot(dat, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet") + gg  
hist
```

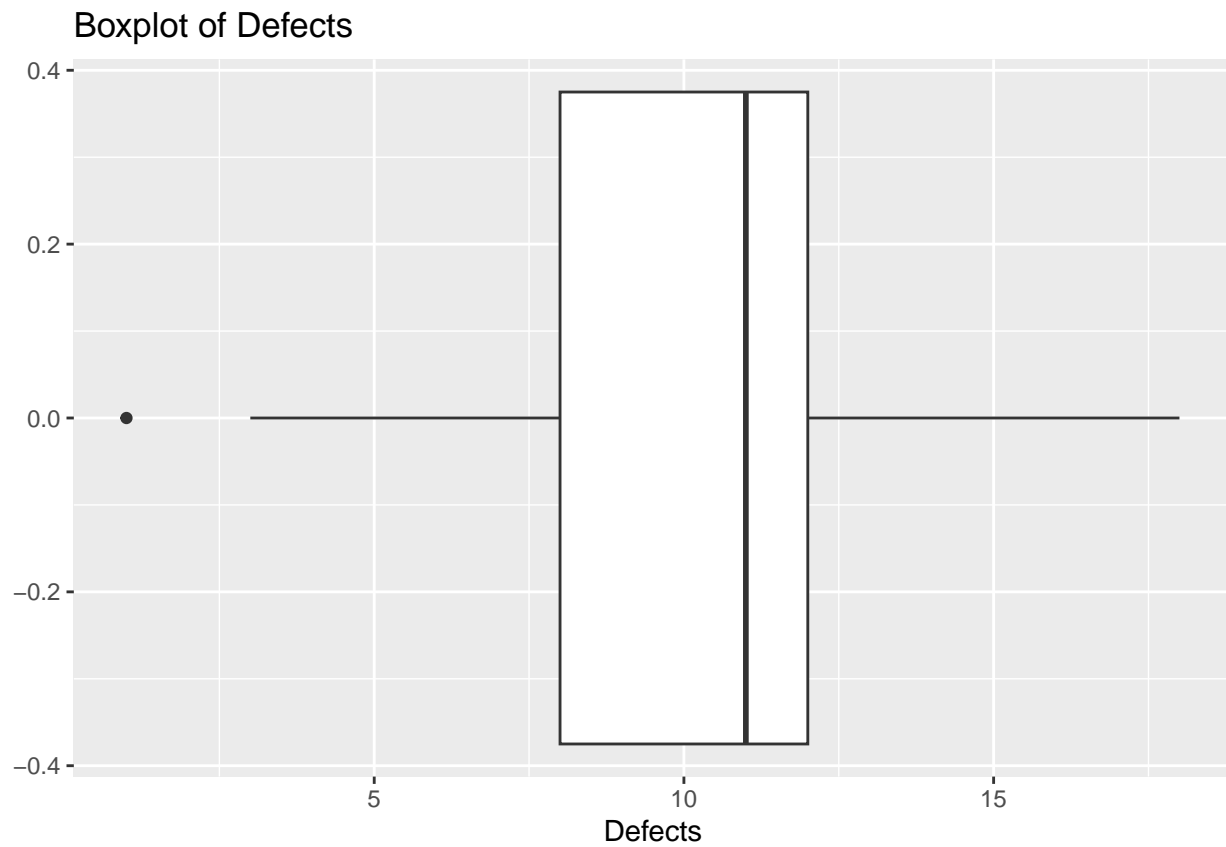
```
## Warning: Removed 7 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

Histogram of Defects



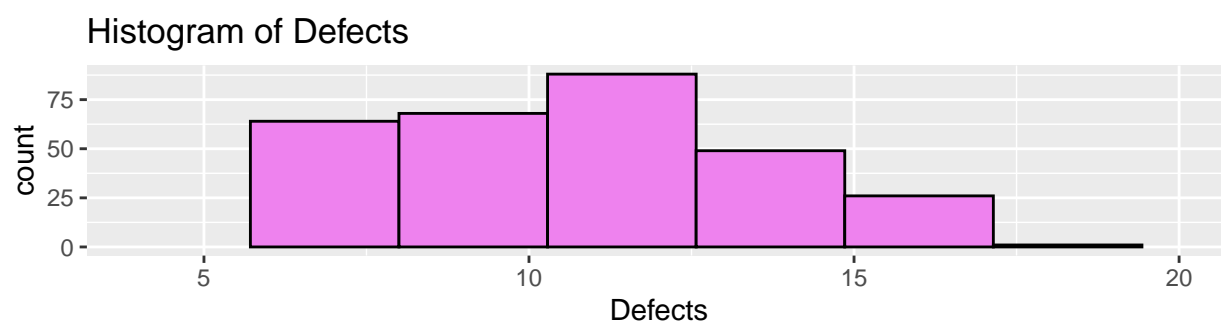
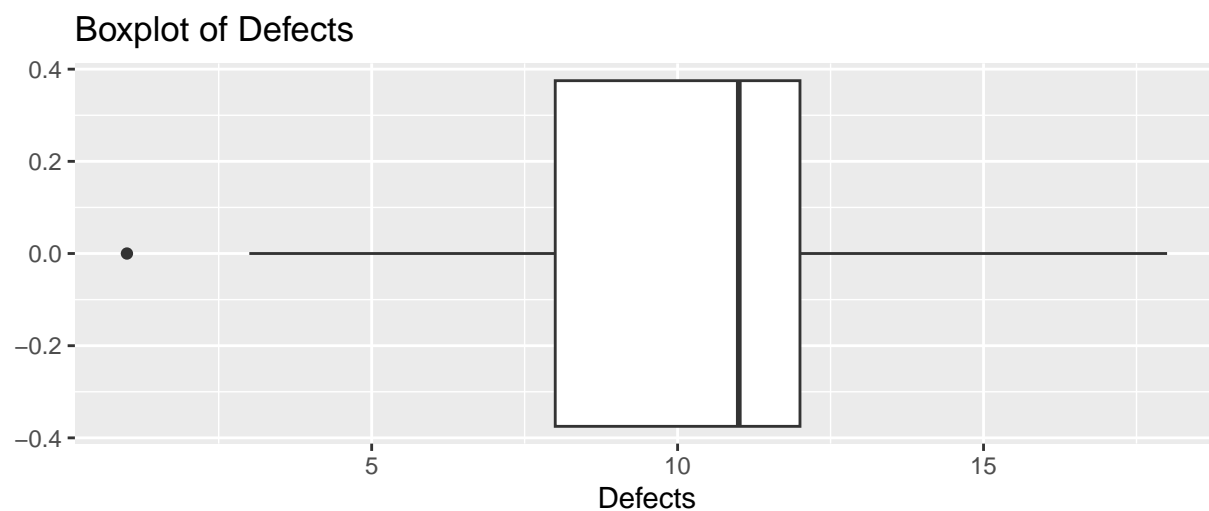
```
box<- ggplot(dat, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 7 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(dat$Defects)
xbar
```

```
## [1] 10.325
```

```
sd <- sd(dat$Defects)
sd
```

```
## [1] 3.172274
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 1.003161
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)
margin
```

```
## [1] 2.269308
```

```
lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 8.055692
```

```
upperinterval <- xbar + margin  
upperinterval
```

```
## [1] 12.59431
```

Defects at 9:30

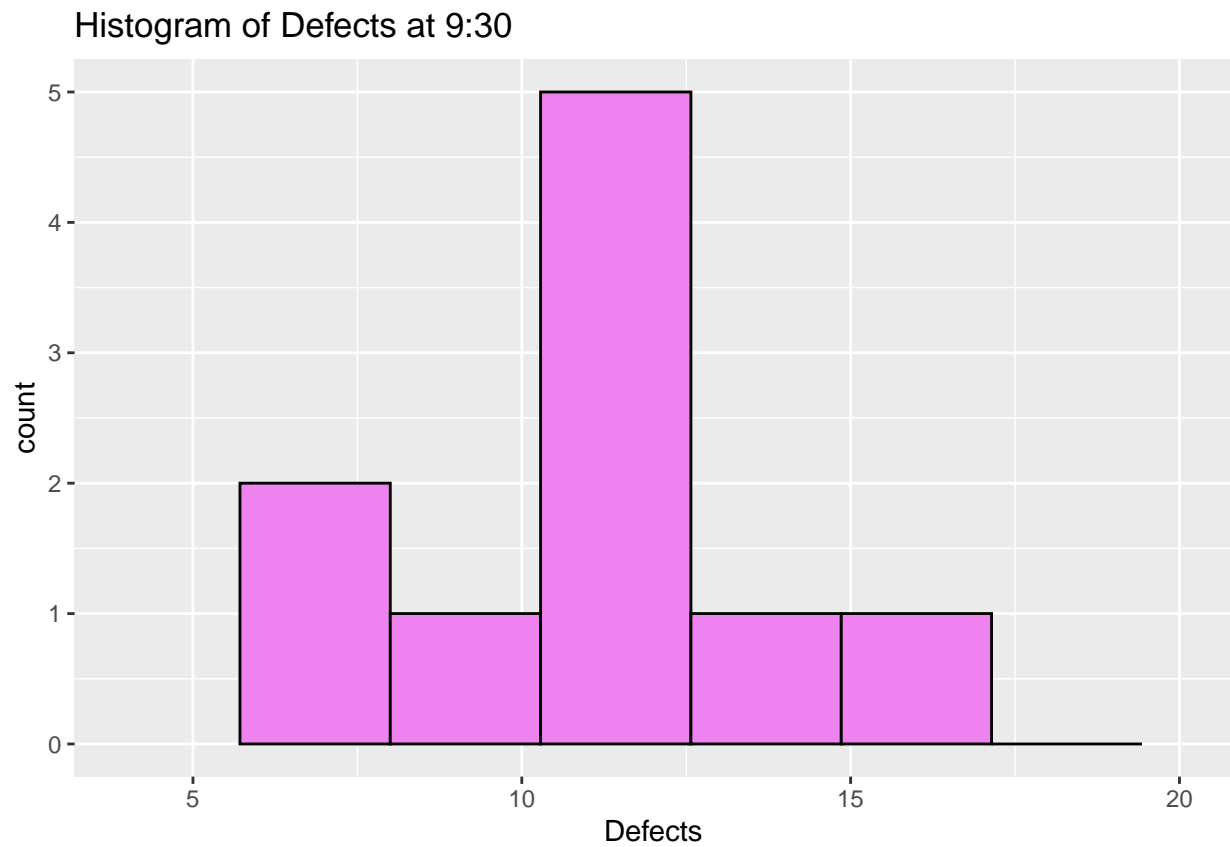
```
library("dplyr")  
library("ggplot2")  
library("egg")
```

```
dat2 <- filter(dat, Sample == '09:30')  
dat2 <- subset(dat2, select = -Sample)  
dat2$n <- c(1,1,1,1,1,1,1,1,1,1)  
dat2
```

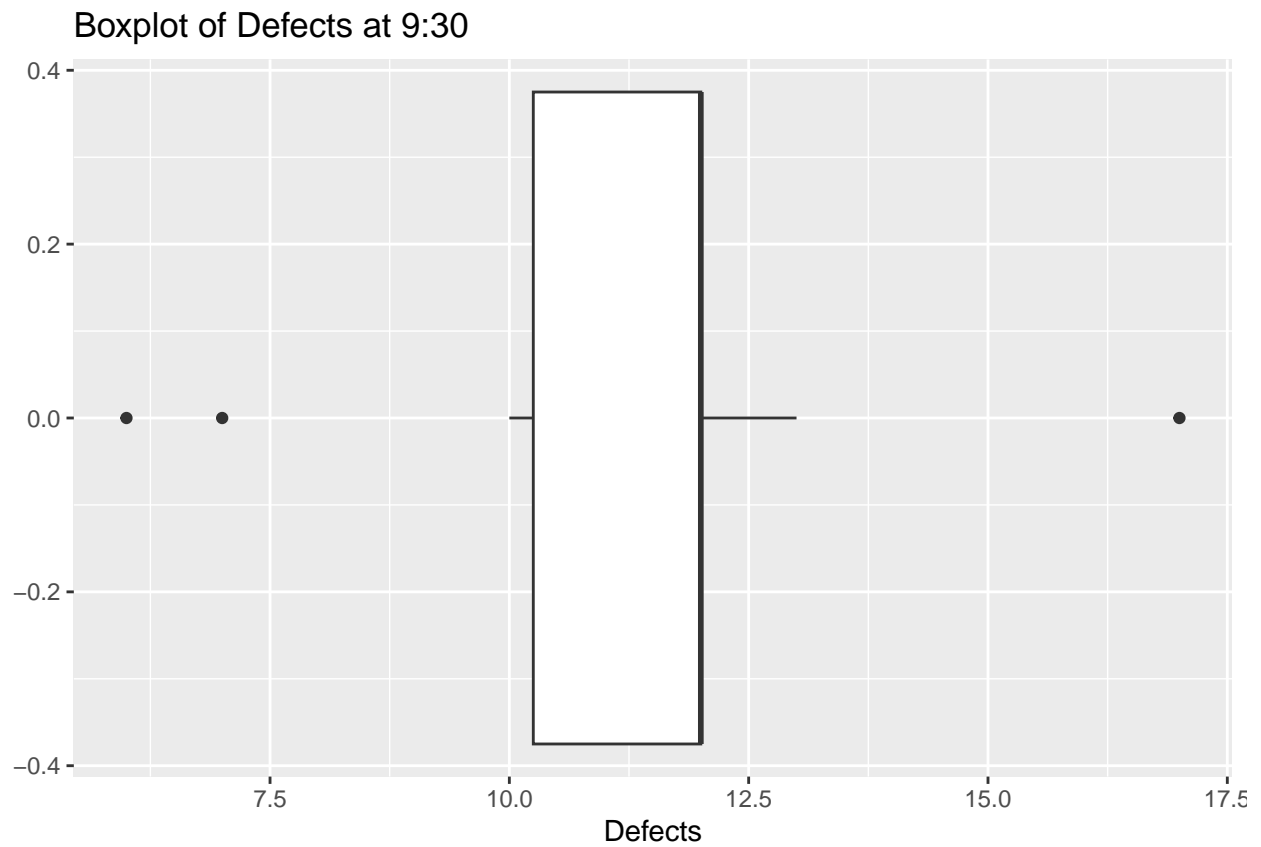
```
##      Day Defects n  
## 1      1      10 1  
## 2      2       6 1  
## 3      3      12 1  
## 4      4      11 1  
## 5      5      17 1  
## 6      6       7 1  
## 7      7      12 1  
## 8      8      12 1  
## 9      9      13 1  
## 10     10      12 1
```

```
hist <- ggplot(dat2, aes(x = Defects)) + geom_histogram(bins=8, color = "black", fill = "violet") +  
  ggtitle("Histogram of Defects at 9:30") + scale_x_continuous(limits = c(4,20))  
hist
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

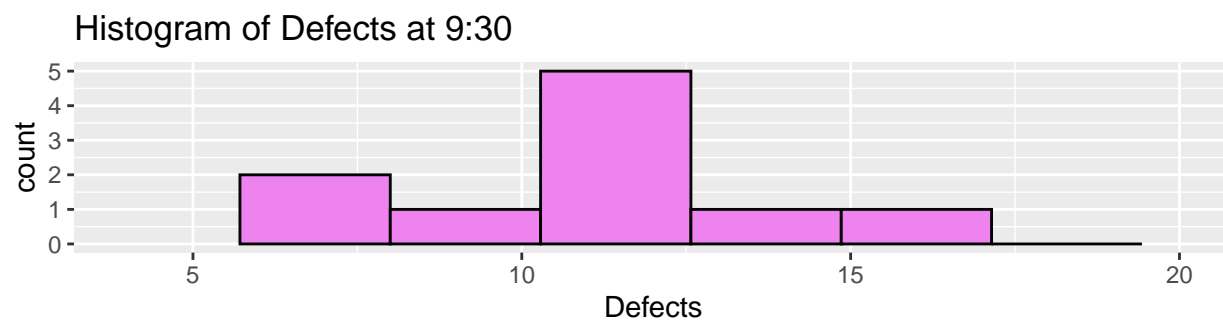
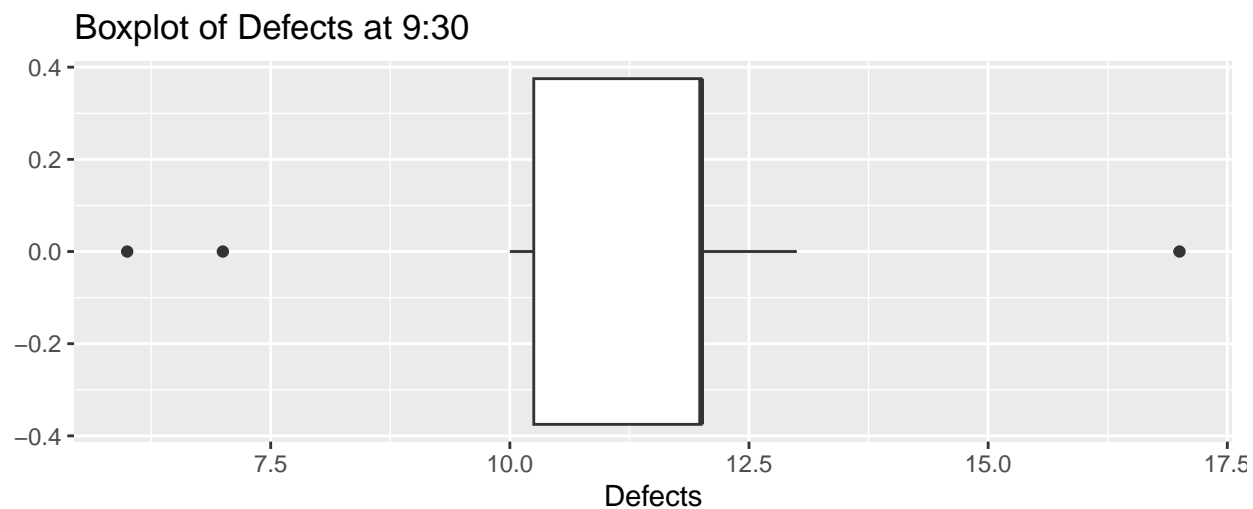


```
box<- ggplot(dat2, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects at 9:30")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(dat2$Defects)
xbar
```

```
## [1] 11.2
```

```
sd <- sd(dat2$Defects)
sd
```

```
## [1] 3.084009
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 0.9752493
```

```
margin <- qt(0.975,df=n-1)*sd/sqrt(n)
margin
```

```
## [1] 2.206167
```

```
lowerinterval <- xbar - margin
lowerinterval
```



```
## [1] 8.993833
```

```
upperinterval <- xbar + margin  
upperinterval
```

```
## [1] 13.40617
```

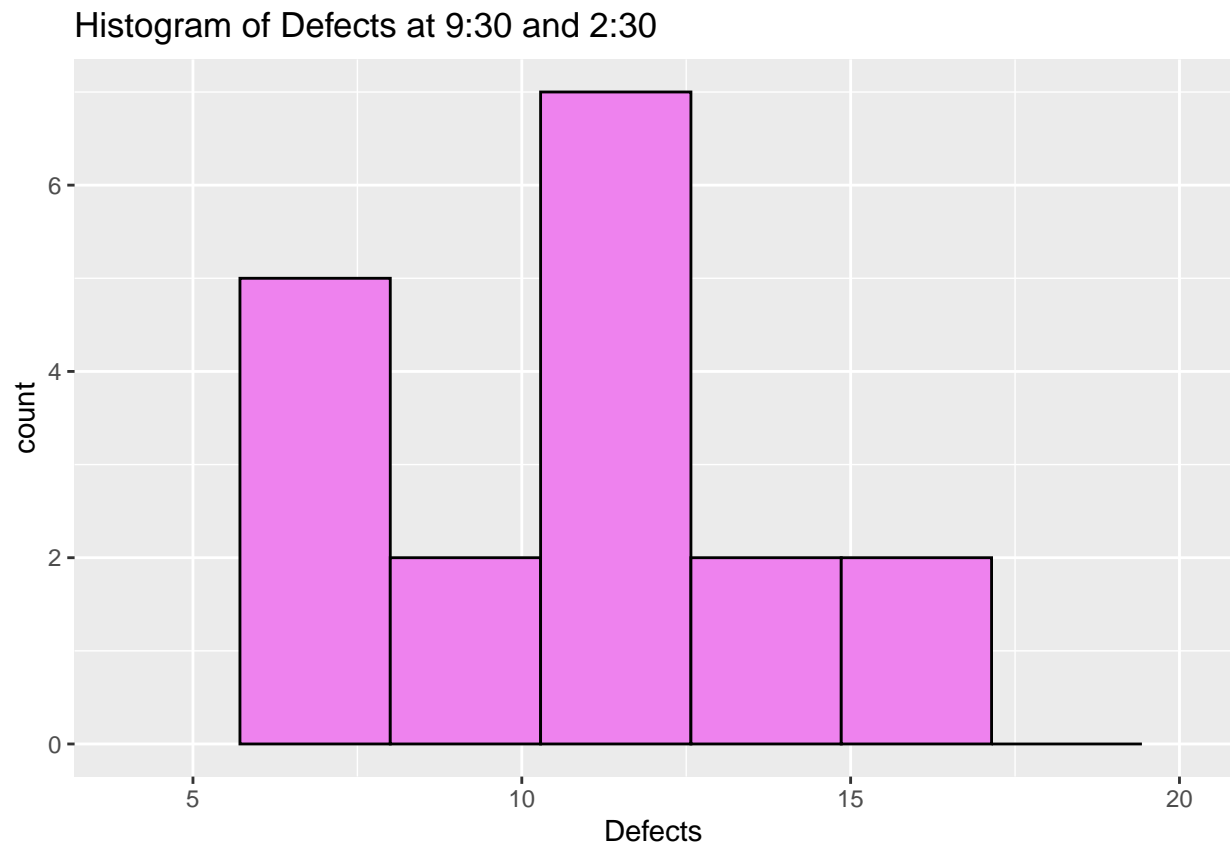
SCHEME Two Per day 9:30am and 2:30 pm

```
dat3 <- filter(dat, Sample == '09:30' | Sample == '14:30')  
dat3 <- subset(dat3, select = -Sample)  
dat3$n <- c(2, 2, 2, 2, 2, 2, 2, 2, 2, 2)  
dat3
```

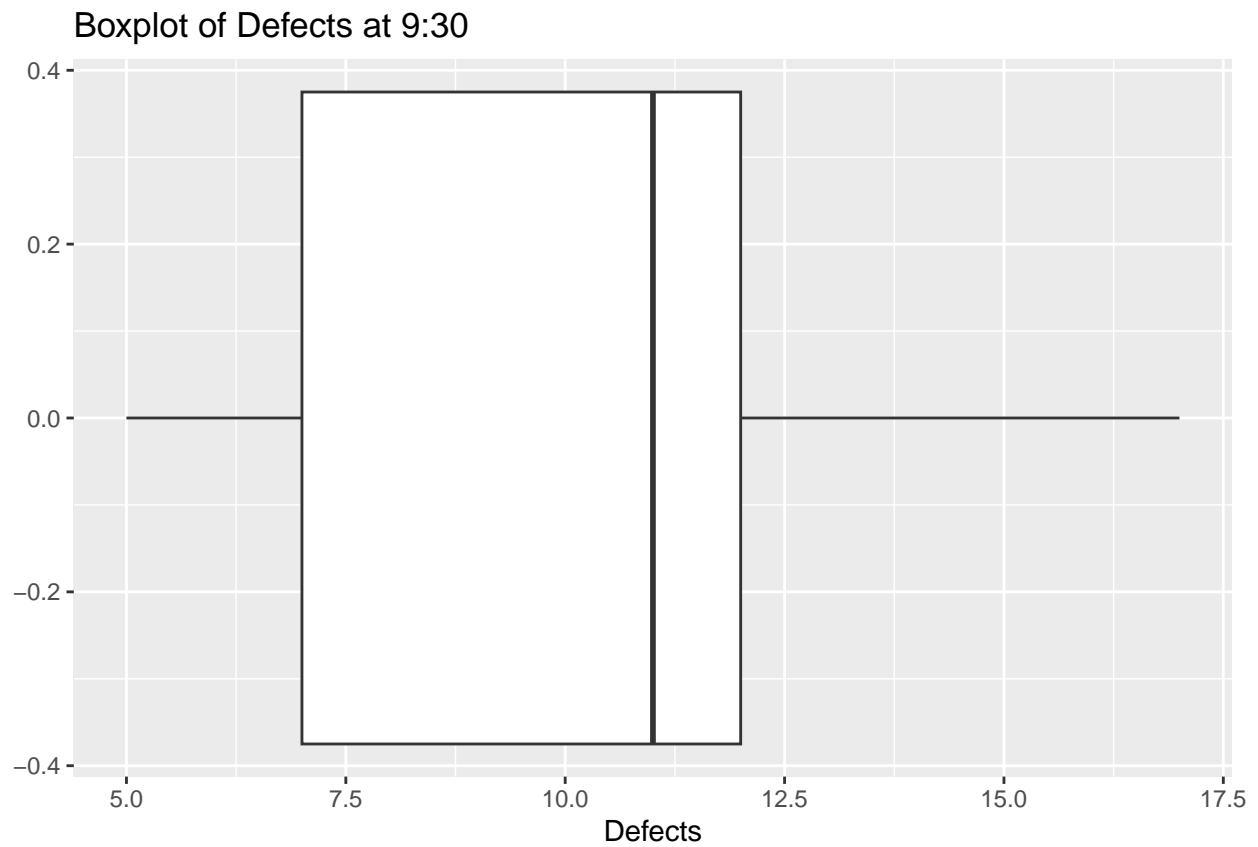
```
##      Day Defects n  
## 1      1      10 2  
## 2      1      11 2  
## 3      2       6 2  
## 4      2      15 2  
## 5      3      12 2  
## 6      3       6 2  
## 7      4      11 2  
## 8      4       7 2  
## 9      5      17 2  
## 10     5       9 2  
## 11     6       7 2  
## 12     6       5 2  
## 13     7      12 2  
## 14     7      14 2  
## 15     8      12 2  
## 16     8       8 2  
## 17     9      13 2  
## 18     9       5 2  
## 19    10      12 2  
## 20    10      11 2
```

```
hist <- ggplot(dat3, aes(x = Defects)) + geom_histogram(bins=8, color = "black", fill = "violet") + ggtitle("Histogram of Defects")  
hist
```

```
## Warning: Removed 2 rows containing missing values (‘geom_bar()’).
```

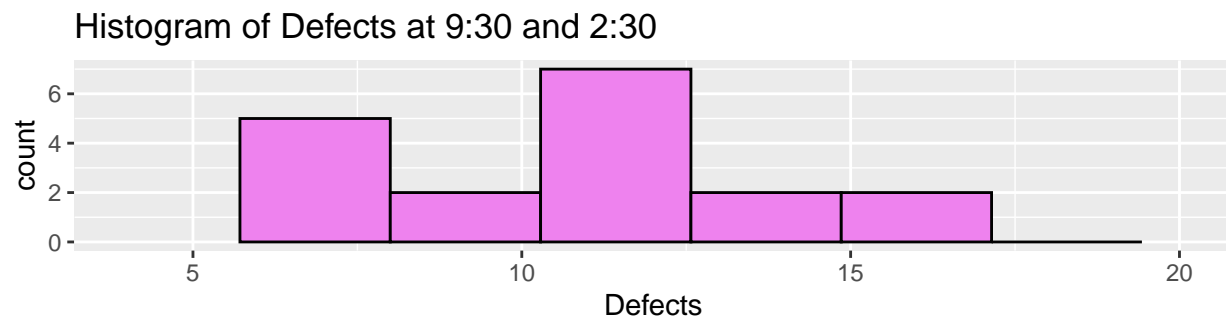
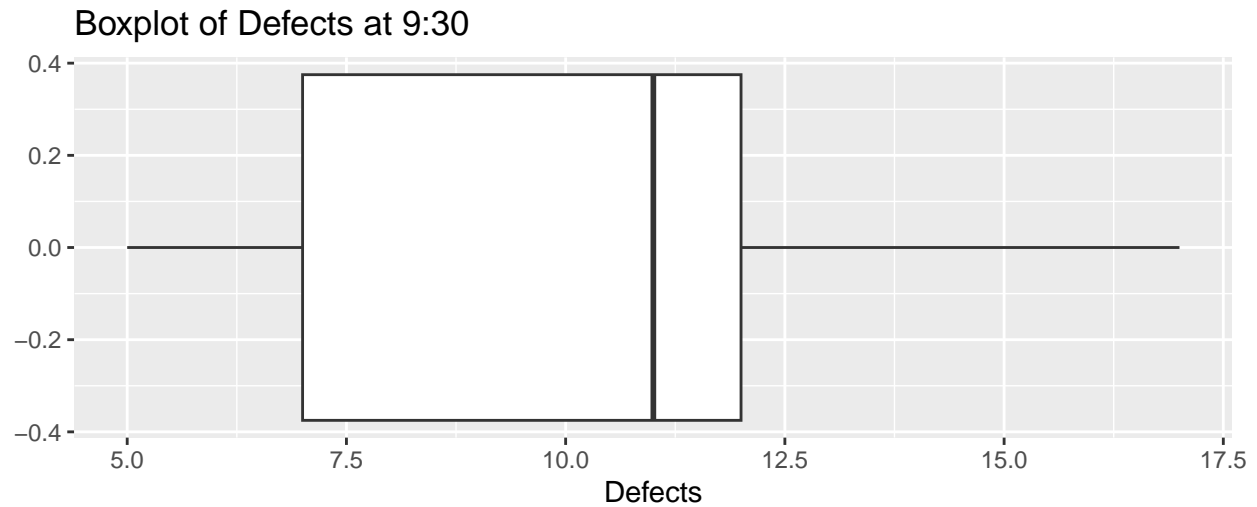


```
box<- ggplot(dat3, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects at 9:30")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(dat3$Defects)
xbar
```

```
## [1] 10.15
```

```
sd <- sd(dat3$Defects)
sd
```

```
## [1] 3.422449
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 1.082273
```

```
margin <- qt(0.975,df=n-1)*sd/sqrt(n)
margin
```

```
## [1] 2.448273
```

```
lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 7.701727
```

```
upperinterval <- xbar + margin  
upperinterval
```

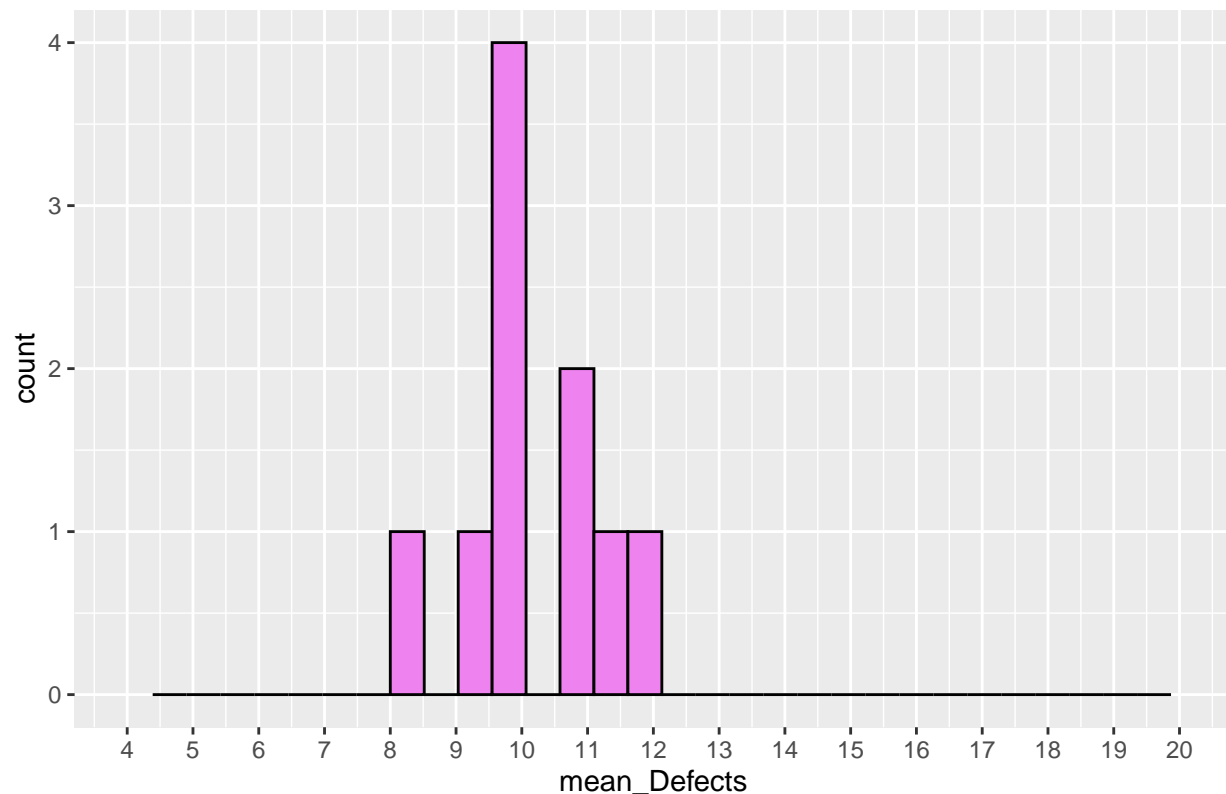
```
## [1] 12.59827
```

Eight samples per day every hour starting 8:30 am

```
dat4 <- filter(dat, Sample == '08:30' | Sample == '09:30' | Sample == '10:30' |  
                Sample == '11:30' | Sample == '12:30' | Sample == '13:30' |  
                Sample == '14:30' | Sample == '15:30' )  
dat4 <- subset(dat4, select = -Sample)  
  
num4 <-  
  dat4 |>  
  group_by(Day) |>  
  summarize(mean_Defects = mean(Defects))  
  
hist <- ggplot(num4, aes(x = mean_Defects)) + geom_histogram(bins=32, color = "black", fill = "violet")  
  ggtitle("Histogram of Defects at Every Hour Starting at 8:30") + scale_x_continuous(limits = c(4,20),  
hist
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

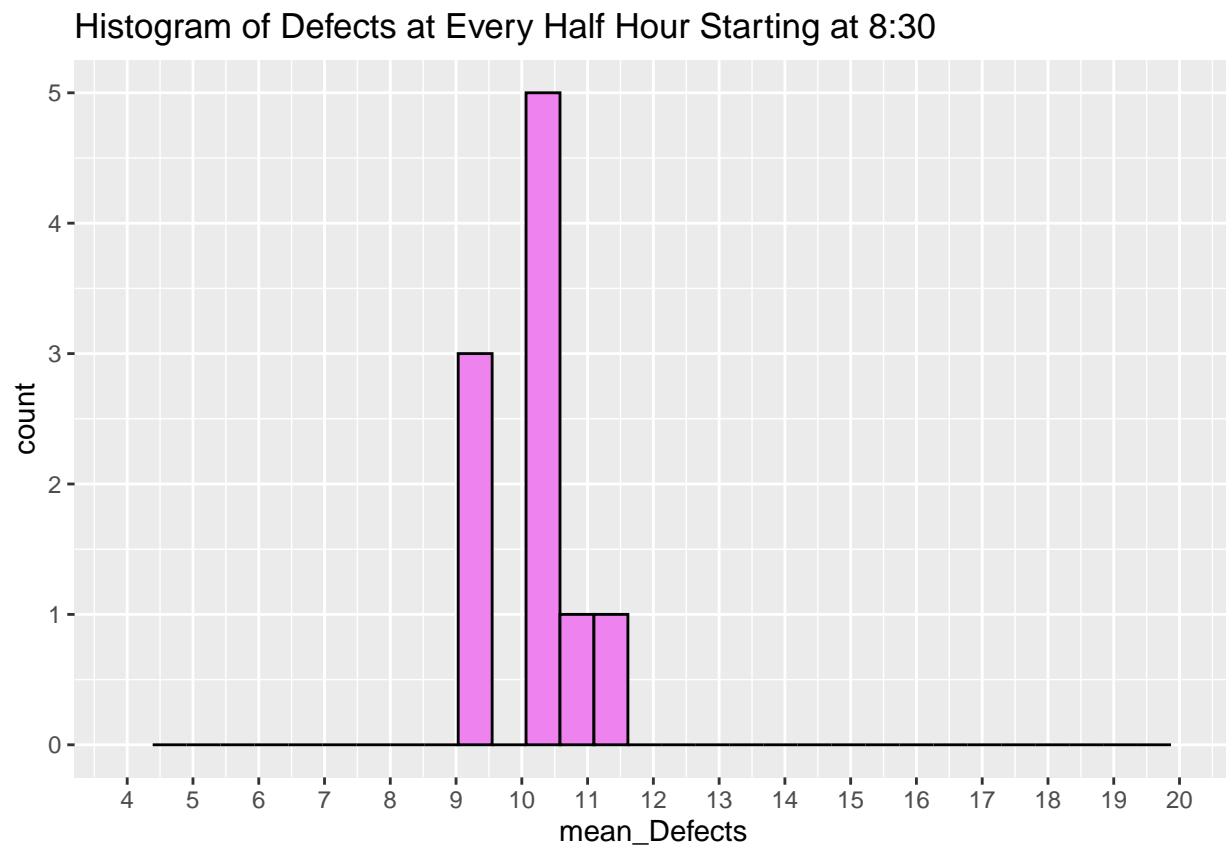
Histogram of Defects at Every Hour Starting at 8:30



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

```
dat5 <- filter(dat, Sample == '08:30' | Sample == '09:00' | Sample == '09:30' |  
  Sample == '10:00' | Sample == '10:30' | Sample == '11:00' |  
  Sample == '11:30' | Sample == '12:00' | Sample == '12:30' |  
  Sample == '13:00' | Sample == '13:30' | Sample == '14:00' |  
  Sample == '14:30' | Sample == '15:00' | Sample == '15:30' |  
  Sample == '16:00')  
dat5 <- subset(dat5, select = -Sample)  
  
num5 <-  
  dat5 |>  
  group_by(Day) |>  
  summarize(mean_Defects = mean(Defects))  
  
hist <- ggplot(num5, aes(x = mean_Defects)) + geom_histogram(bins=32, color = "black", fill = "violet")  
  ggtitle("Histogram of Defects at Every Half Hour Starting at 8:30") + scale_x_continuous(limits = c(4  
hist
```

Warning: Removed 2 rows containing missing values ('geom_bar()').

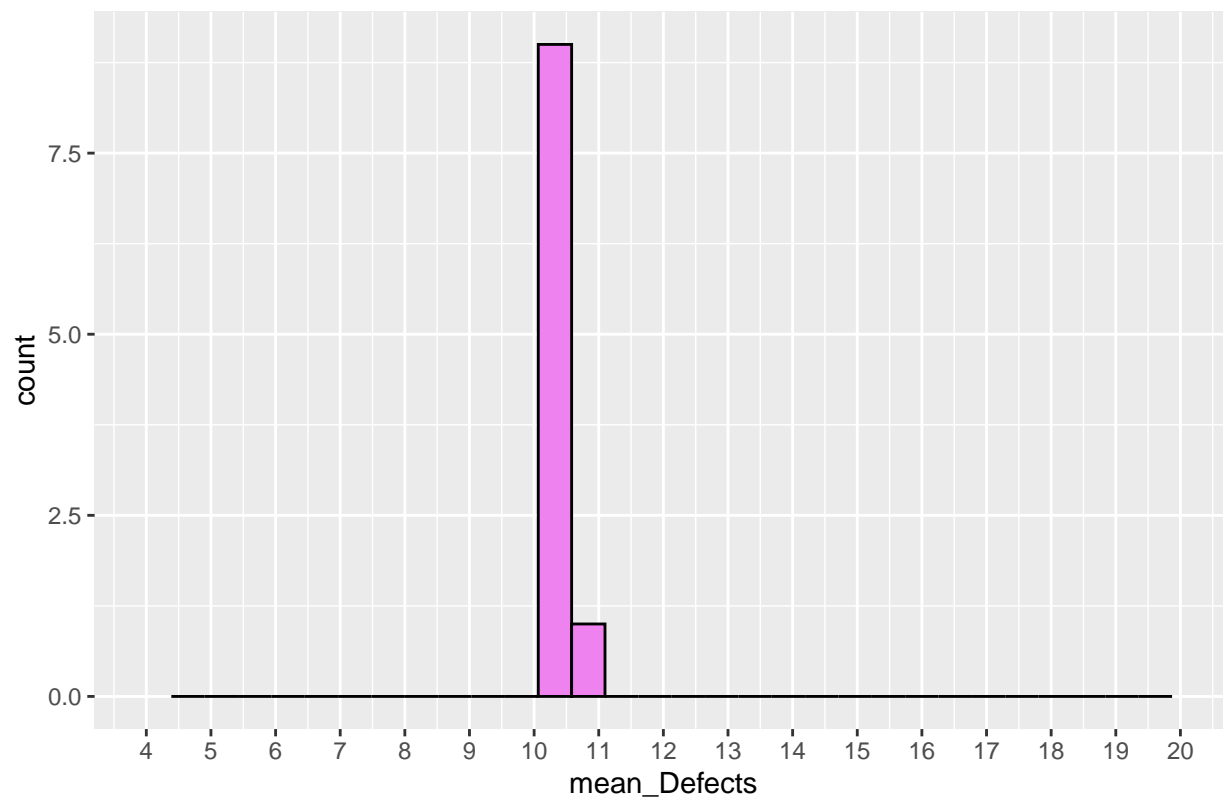


32 samples per day every 15-minutes starting 8:15 am

```
dat6<- filter(dat, Sample == '08:15' | Sample == '08:30' | Sample == '08:45' |  
              Sample == '09:00' | Sample == '09:15' | Sample == '09:30' |  
              Sample == '09:45' | Sample == '10:00' | Sample == '10:15' |  
              Sample == '10:30' | Sample == '10:45' | Sample == '11:00' |  
              Sample == '11:15' | Sample == '11:30' | Sample == '11:45' |  
              Sample == '12:00' | Sample == '12:30' | Sample == '12:45' |  
              Sample == '13:00' | Sample == '13:15' | Sample == '13:30' |  
              Sample == '13:45' | Sample == '14:00' | Sample == '14:15' |  
              Sample == '14:30' | Sample == '14:45' | Sample == '15:00' |  
              Sample == '15:15' | Sample == '15:30' | Sample == '15:45' |  
              Sample == '16:00')  
dat6 <- subset(dat6, select = -Sample)  
num6 <-  
  dat |>  
  group_by(Day) |>  
  summarize(mean_Defects = mean(Defects))  
  
hist <- ggplot(num6, aes(x = mean_Defects)) + geom_histogram(bins=32, color = "black", fill = "violet")  
  ggtitle("Histogram of Defects at Every 15 Mins Starting at 8:15") + scale_x_continuous(limits = c(4,20))  
hist
```

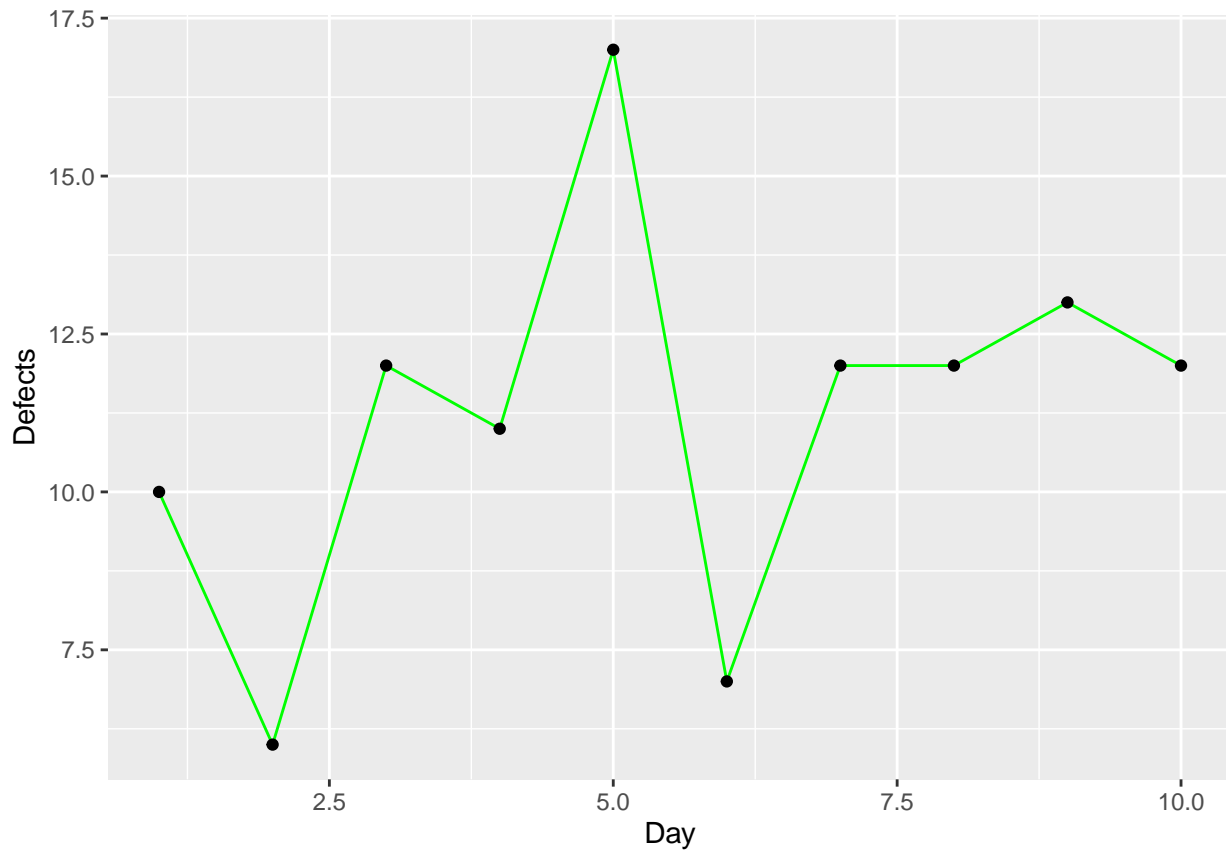
Warning: Removed 2 rows containing missing values ('geom_bar()').

Histogram of Defects at Every 15 Mins Starting at 8:15



line plot at 9:30

```
dat2 <- filter(dat, Sample == '09:30')
dat2 <- subset(dat2, select = -Sample)
dat2$n <- c(1,1,1,1,1,1,1,1,1,1)
line2 <- ggplot(dat = dat2, aes(x=Day, y=Defects)) +
  geom_line(color = "green") +
  geom_point()
line2
```



Line plot every half hour at 8:30

```
dat5 <- filter(dat, Sample == '08:30' | Sample == '09:00' | Sample == '09:30' |
  Sample == '10:00' | Sample == '10:30' | Sample == '11:00' |
  Sample == '11:30' | Sample == '12:00' | Sample == '12:30' |
  Sample == '13:00' | Sample == '13:30' | Sample == '14:00' |
  Sample == '14:30' | Sample == '15:00' | Sample == '15:30' |
  Sample == '16:00')
dat5 <- subset(dat, select = -Sample)

num5 <-
  dat |>
  group_by(Day) |>
```

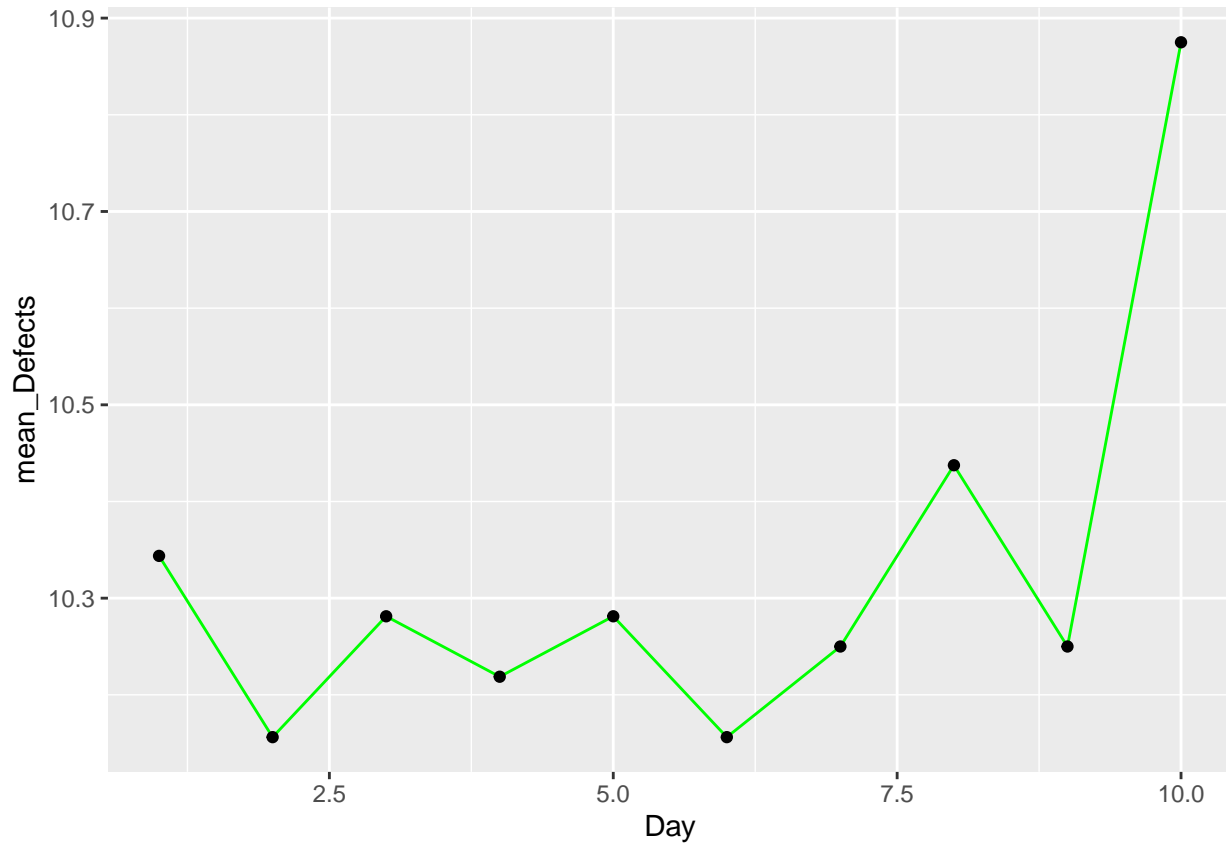


```

summarize(mean_Defects = mean(Defects))

line5 <- ggplot(dat = num5, aes(x=Day, y=mean_Defects)) +
  geom_line(color = "green") +
  geom_point()
line5

```



Line plot every hour at 8:30

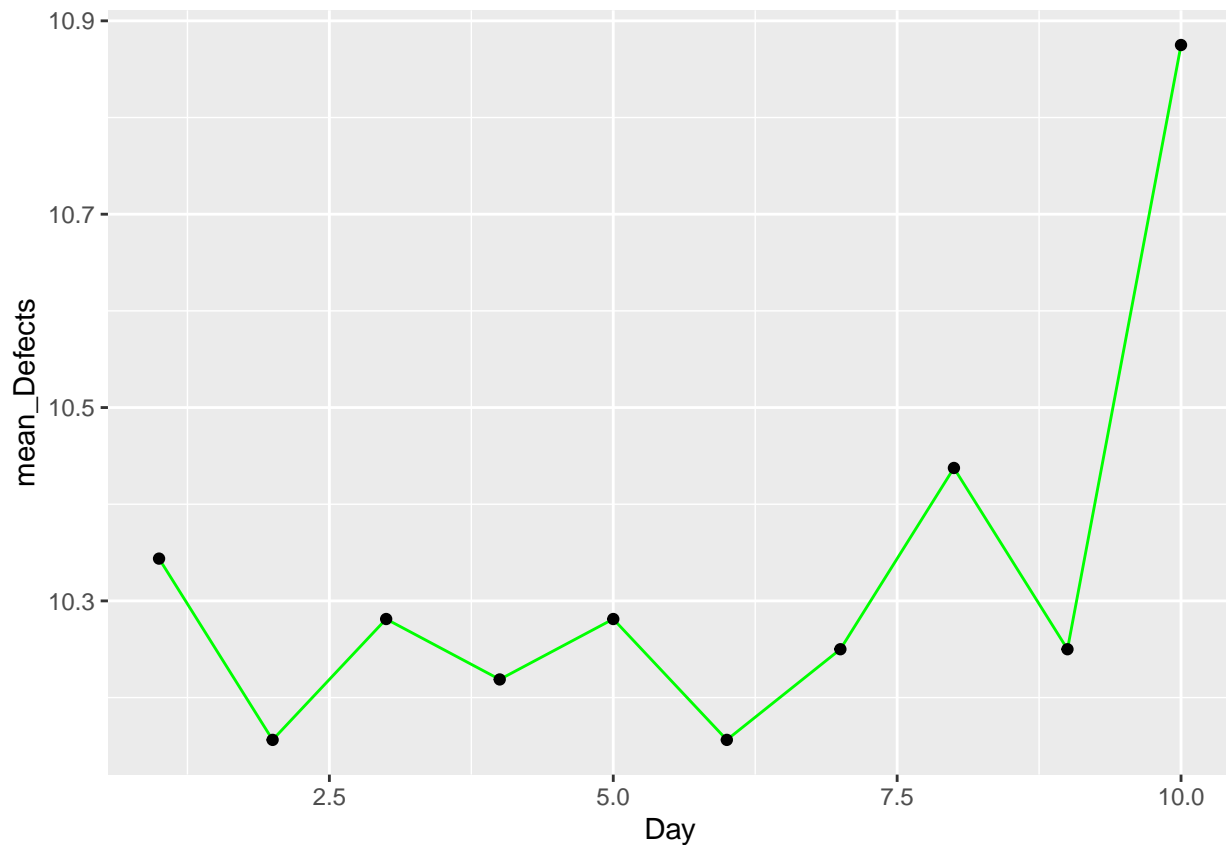
```

dat4 <- filter(dat, Sample == '08:30' | Sample == '09:30' | Sample == '10:30' |
  Sample == '11:30' | Sample == '12:30' | Sample == '13:30' |
  Sample == '14:30' | Sample == '15:30' )
dat4 <- subset(dat, select = -Sample)

num4 <-
  dat |>
  group_by(Day) |>
  summarize(mean_Defects = mean(Defects))

line4 <- ggplot(dat = num4, aes(x=Day, y=mean_Defects)) +
  geom_line(color = "green") +
  geom_point()
line4

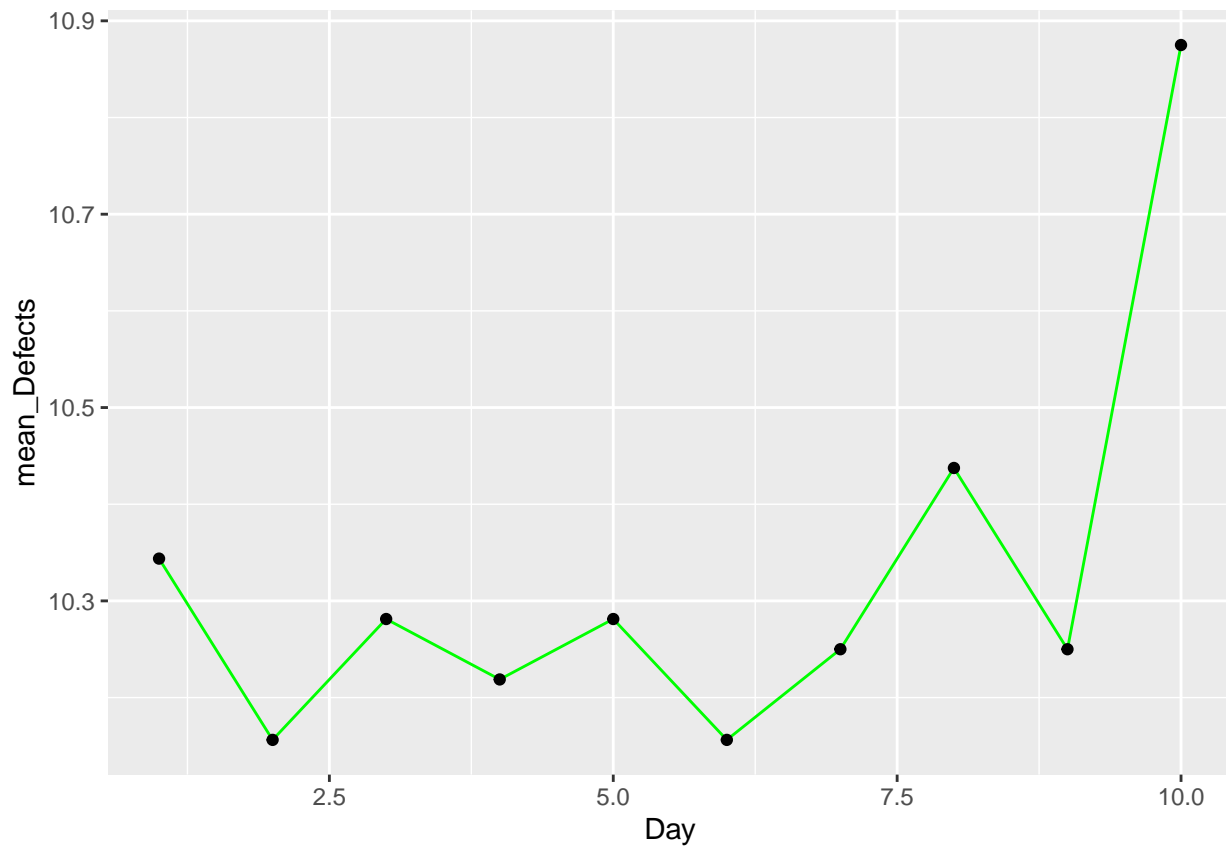
```



Line plot every 15 mins at 8:15

```
dat6<- filter(dat, Sample == '08:15' | Sample == '08:30' | Sample == '08:45' |
              Sample == '09:00' | Sample == '09:15' | Sample == '09:30' |
              Sample == '09:45' | Sample == '10:00' | Sample == '10:15' |
              Sample == '10:30' | Sample == '10:45' | Sample == '11:00' |
              Sample == '11:15' | Sample == '11:30' | Sample == '11:45' |
              Sample == '12:00' | Sample == '12:15' | Sample == '12:30' | Sample == '12:45' |
              Sample == '13:00' | Sample == '13:15' | Sample == '13:30' |
              Sample == '13:45' | Sample == '14:00' | Sample == '14:15' |
              Sample == '14:30' | Sample == '14:45' | Sample == '15:00' |
              Sample == '15:15' | Sample == '15:30' | Sample == '15:45' |
              Sample == '16:00')
dat6 <- subset(dat, select = -Sample)
num6 <-
  dat |>
  group_by(Day) |>
  summarize(mean_Defects = mean(Defects))

line6 <- ggplot(dat = num6, aes(x=Day, y=mean_Defects)) +
  geom_line(color = "green") +
  geom_point()
line6
```



8-10 am Graph

```
dat8 <- filter(dat, Sample == '8:00' | Sample == '08:15' | Sample == '08:30' | Sample == '08:45' |
               Sample == '09:00' | Sample == '09:15' | Sample == '09:30' |
               Sample == '09:45' | Sample == '10:00')
dat8 <- subset(dat8, select = -Sample)
dat8$n <- c(1,1,1,1,1,1,1,1,1,1,1)
dat8
```

```
##   Day Defects n
## 1    1      12 1
## 2    1       8 1
## 3    1       9 1
## 4    1      11 1
## 5    1       9 1
## 6    1      10 1
## 7    1      12 1
## 8    1       9 1
## 9    2      17 1
## 10   2      12 1
## 11   2       7 1
## 12   2      11 1
## 13   2       7 1
## 14   2       6 1
## 15   2      10 1
```

## 16	2	11 1
## 17	3	7 1
## 18	3	11 1
## 19	3	9 1
## 20	3	16 1
## 21	3	8 1
## 22	3	12 1
## 23	3	14 1
## 24	3	5 1
## 25	4	11 1
## 26	4	11 1
## 27	4	8 1
## 28	4	12 1
## 29	4	12 1
## 30	4	11 1
## 31	4	12 1
## 32	4	13 1
## 33	5	7 1
## 34	5	8 1
## 35	5	7 1
## 36	5	11 1
## 37	5	7 1
## 38	5	17 1
## 39	5	7 1
## 40	5	8 1
## 41	6	13 1
## 42	6	9 1
## 43	6	14 1
## 44	6	10 1
## 45	6	7 1
## 46	6	7 1
## 47	6	11 1
## 48	6	12 1
## 49	7	10 1
## 50	7	8 1
## 51	7	15 1
## 52	7	3 1
## 53	7	8 1
## 54	7	12 1
## 55	7	5 1
## 56	7	5 1
## 57	8	10 1
## 58	8	11 1
## 59	8	11 1
## 60	8	11 1
## 61	8	14 1
## 62	8	12 1
## 63	8	15 1
## 64	8	10 1
## 65	9	11 1
## 66	9	12 1
## 67	9	10 1
## 68	9	12 1
## 69	9	14 1

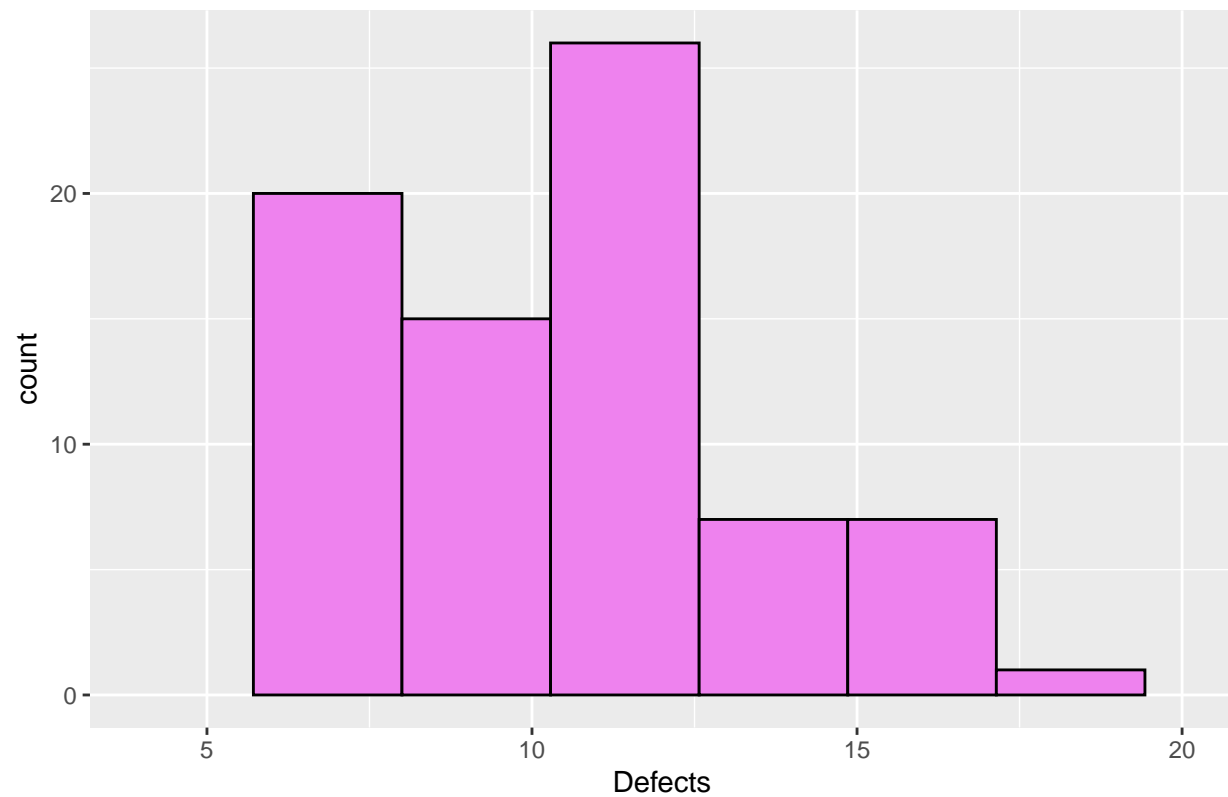
```
## 70  9      13 1
## 71  9       6 1
## 72  9       8 1
## 73 10       9 1
## 74 10      18 1
## 75 10      17 1
## 76 10      16 1
## 77 10      10 1
## 78 10      12 1
## 79 10       8 1
## 80 10       9 1
```

```
hist <- ggplot(dat8, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet") + g
hist
```

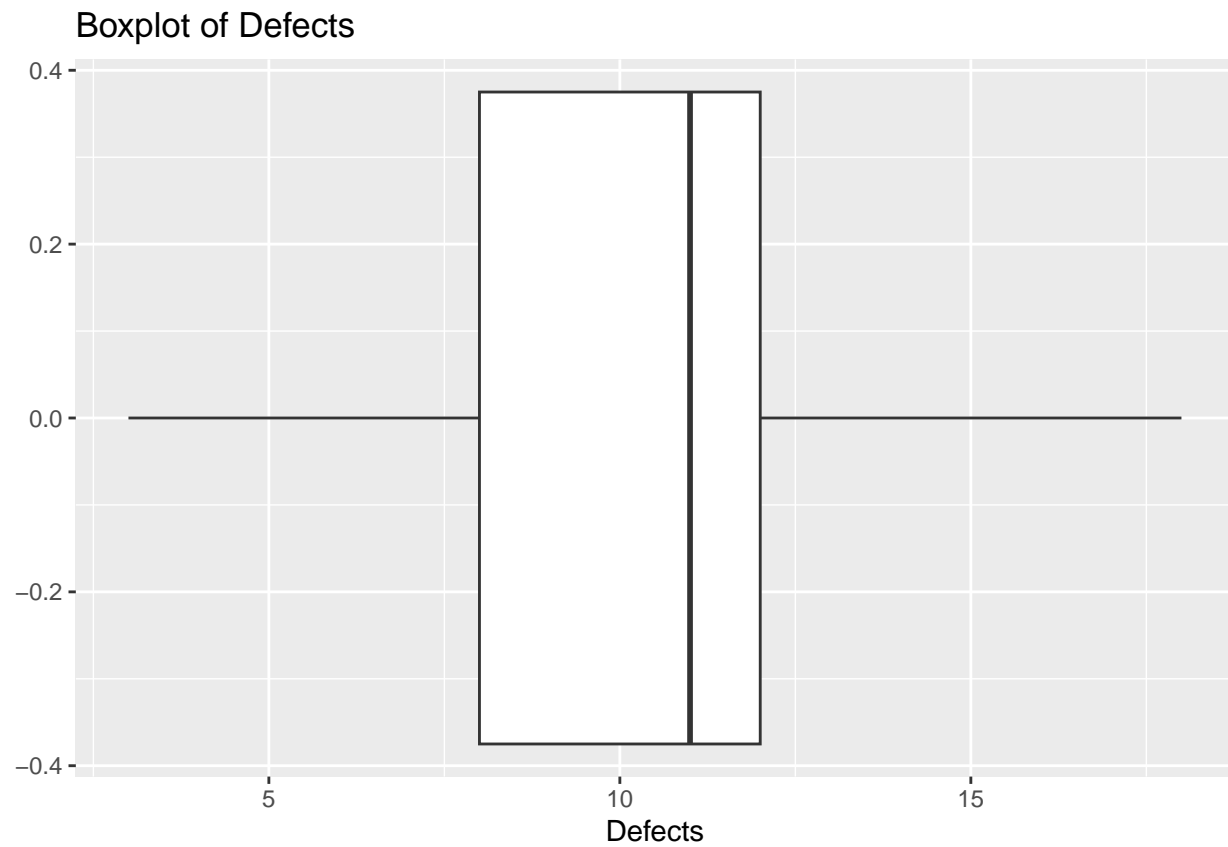
```
## Warning: Removed 1 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

Histogram of Defects from 8–10 am

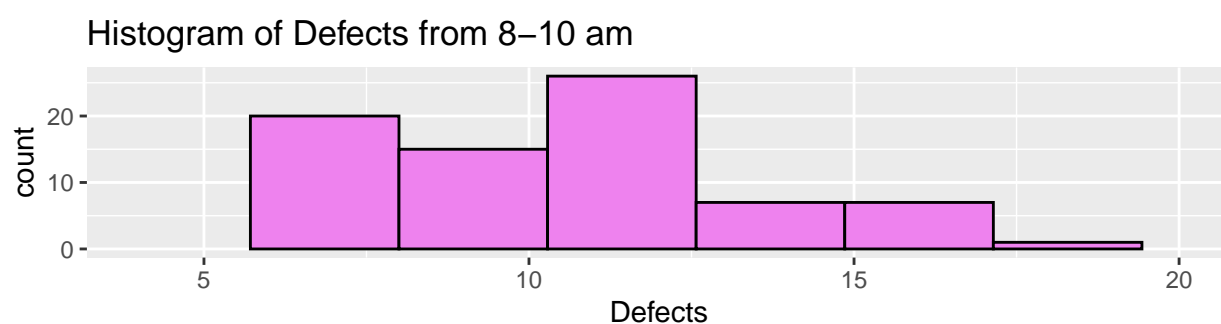
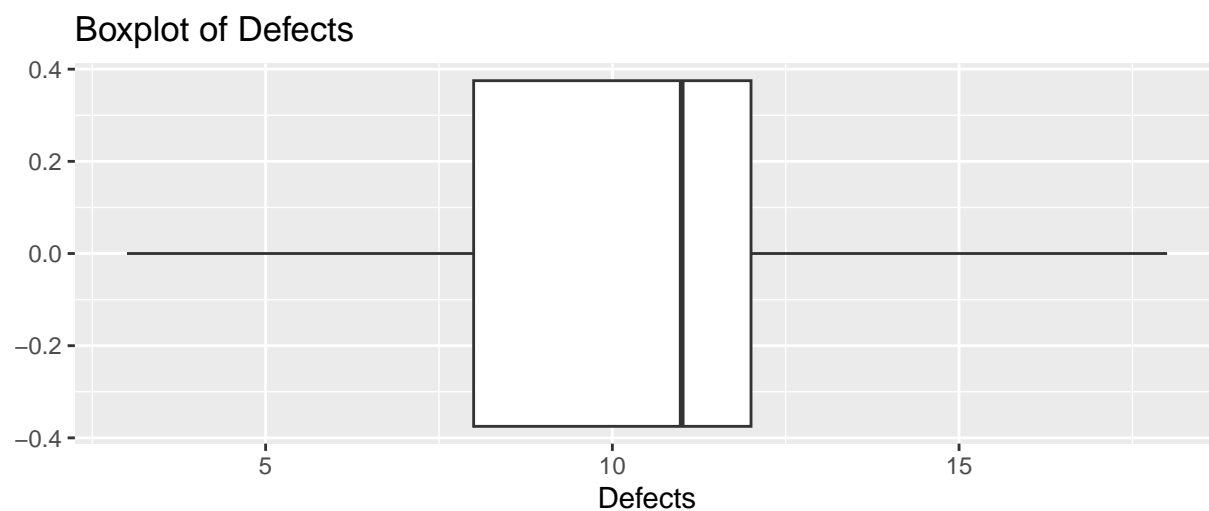


```
box<- ggplot(dat8, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 1 rows containing non-finite values ('stat_bin()').  
## Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(dat8$Defects)
xbar
```

```
## [1] 10.4125
```

```
sd <- sd(dat8$Defects)
sd
```

```
## [1] 3.092227
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 0.977848
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)

lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 8.200454
```

```
upperinterval <- xbar + margin
upperinterval
```

```
## [1] 12.62455
```

Prbolem 2

10:15-12 pm Graph

```
dat9 <- filter(dat, Sample == '10:15' | Sample == '10:30' | Sample == '10:45' |
               Sample == '11:00' | Sample == '11:15' | Sample == '11:30' | Sample == '11:45' |
               Sample == '12:00')
dat9 <- subset(dat9, select = -Sample)
dat9$n <- c(1,1,1,1,1,1,1,1,1,1)
dat9
```

```
##      Day Defects n
## 1      1      12 1
## 2      1       4 1
## 3      1      11 1
## 4      1       8 1
## 5      1      12 1
## 6      1      12 1
## 7      1       9 1
## 8      1       8 1
## 9      2      12 1
## 10     2       7 1
## 11     2      11 1
## 12     2       6 1
## 13     2      12 1
## 14     2      13 1
## 15     2       1 1
## 16     2      12 1
## 17     3      13 1
## 18     3      14 1
## 19     3       6 1
## 20     3       4 1
## 21     3      14 1
## 22     3       8 1
## 23     3      11 1
## 24     3      10 1
## 25     4      10 1
## 26     4      15 1
## 27     4      12 1
## 28     4       6 1
## 29     4       7 1
## 30     4       5 1
## 31     4       3 1
## 32     4      13 1
## 33     5      11 1
## 34     5       3 1
```



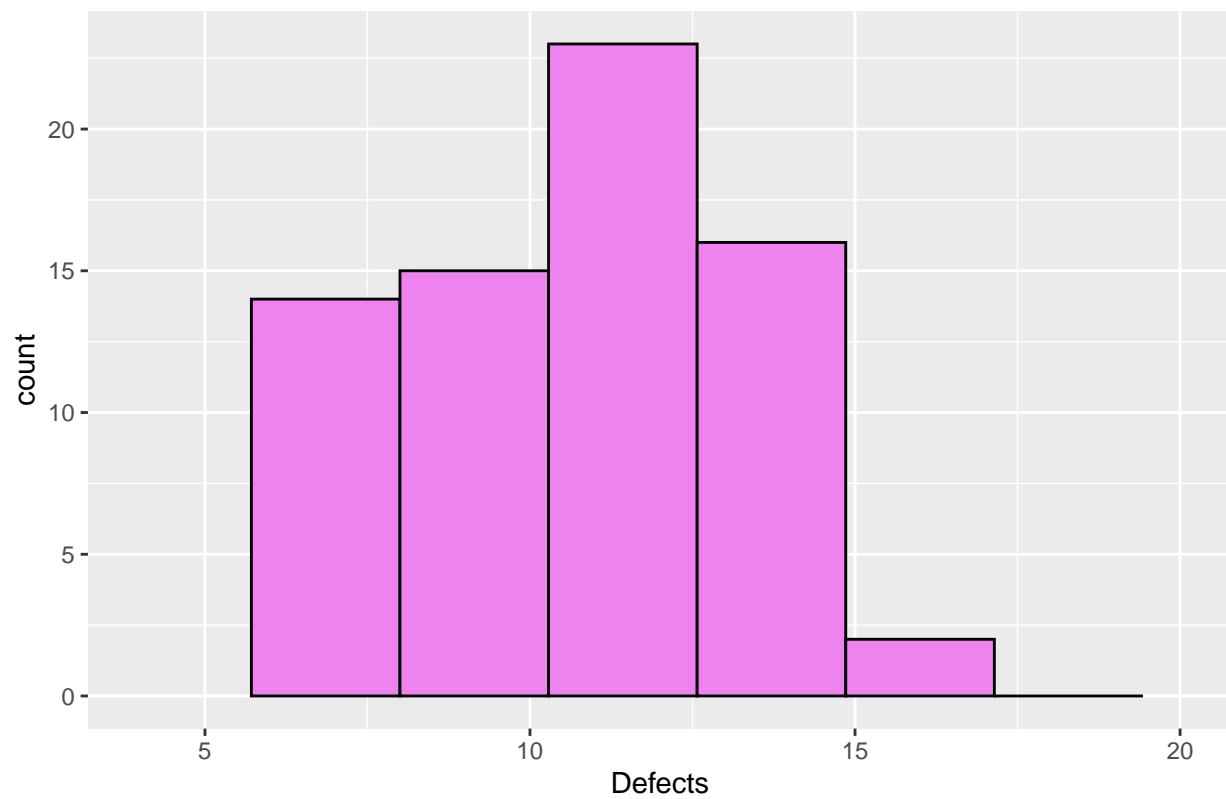
```
## 35 5 14 1
## 36 5 7 1
## 37 5 10 1
## 38 5 3 1
## 39 5 11 1
## 40 5 14 1
## 41 6 9 1
## 42 6 11 1
## 43 6 13 1
## 44 6 11 1
## 45 6 12 1
## 46 6 6 1
## 47 6 14 1
## 48 6 12 1
## 49 7 14 1
## 50 7 12 1
## 51 7 16 1
## 52 7 9 1
## 53 7 10 1
## 54 7 10 1
## 55 7 12 1
## 56 7 4 1
## 57 8 6 1
## 58 8 13 1
## 59 8 14 1
## 60 8 10 1
## 61 8 11 1
## 62 8 10 1
## 63 8 9 1
## 64 8 9 1
## 65 9 9 1
## 66 9 13 1
## 67 9 5 1
## 68 9 11 1
## 69 9 6 1
## 70 9 8 1
## 71 9 11 1
## 72 9 14 1
## 73 10 11 1
## 74 10 13 1
## 75 10 11 1
## 76 10 8 1
## 77 10 9 1
## 78 10 14 1
## 79 10 9 1
## 80 10 4 1
```

```
hist <- ggplot(dat9, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet") + g
hist
```

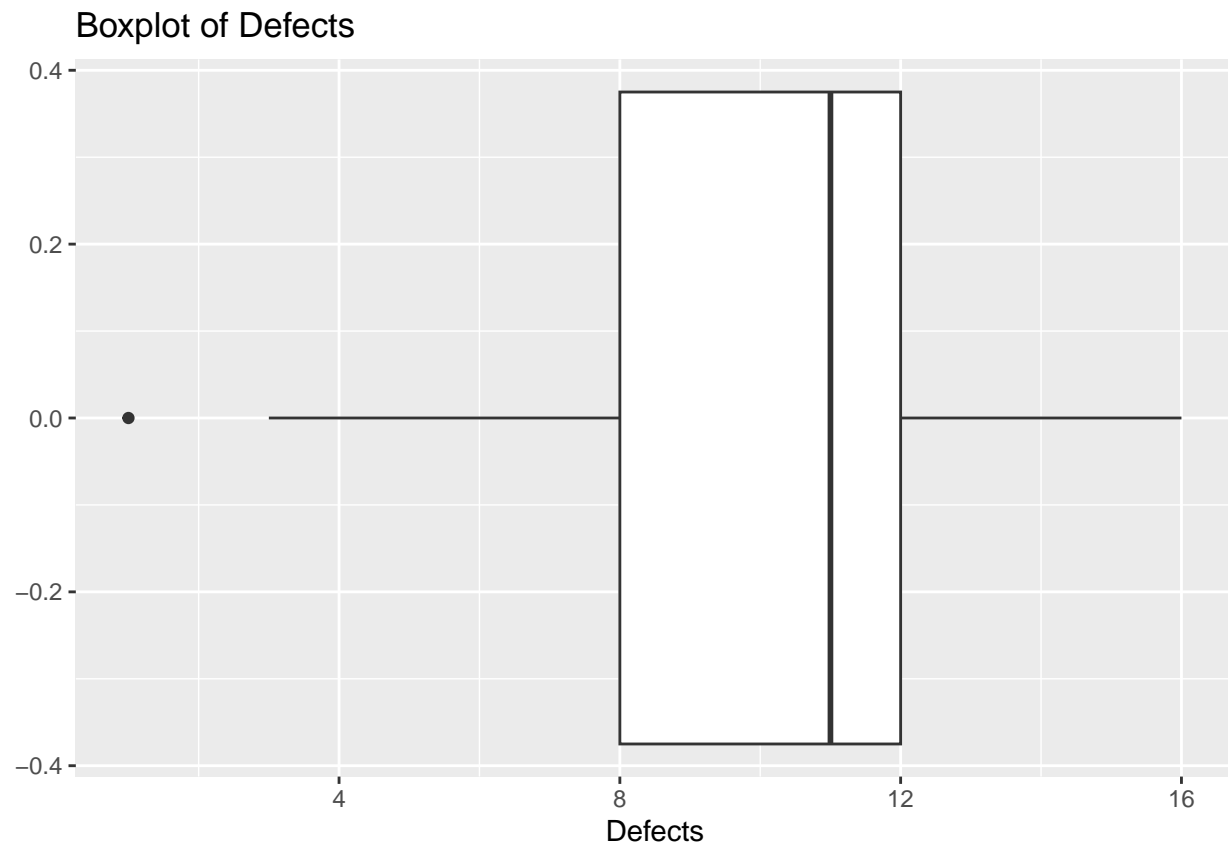
```
## Warning: Removed 4 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

Histogram of Defects from 10:15–12 pm

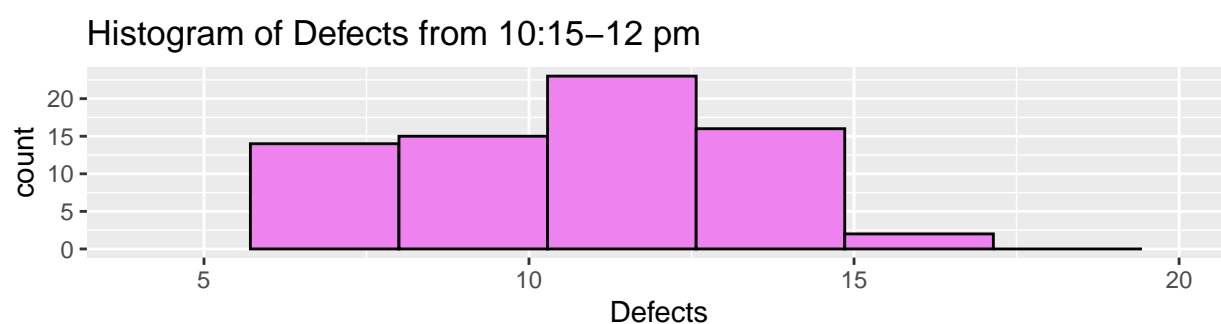
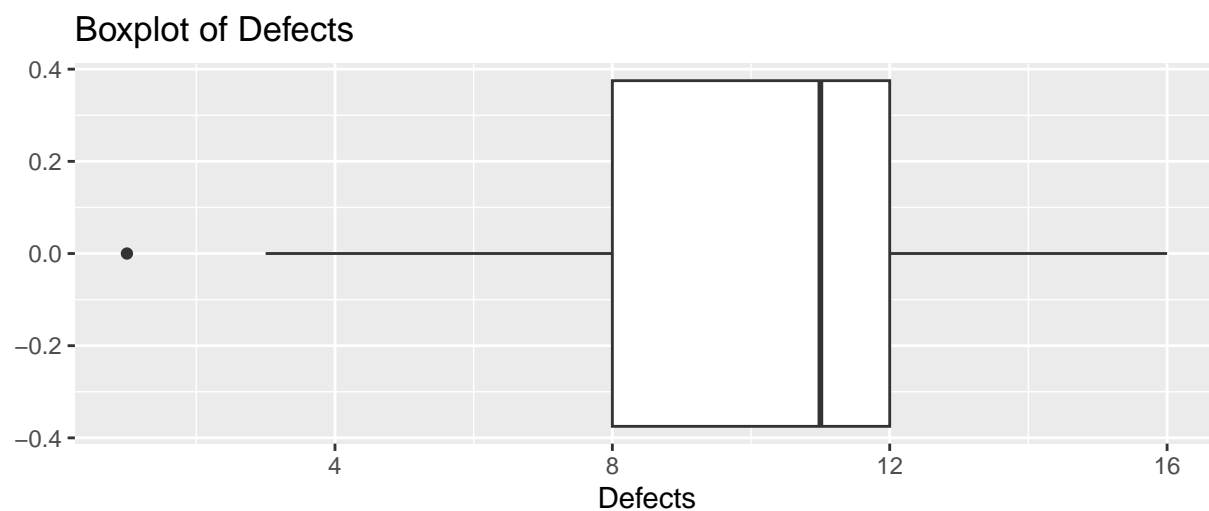


```
box<- ggplot(dat9, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_bin()').  
## Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(dat9$Defects)
xbar
```

```
## [1] 9.8375
```

```
sd <- sd(dat9$Defects)
sd
```

```
## [1] 3.365663
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 1.064316
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)
lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 7.429849
```

```
upperinterval <- xbar + margin
upperinterval
```

```
## [1] 12.24515
```

12:15-2 pm Graph

```
dat10 <- filter(dat, Sample == '12:15' | Sample == '12:30' | Sample == '12:45' |
  Sample == '13:00' | Sample == '13:15' | Sample == '13:30' |
  Sample == '13:45' | Sample == '14:00')
dat10 <- subset(dat10, select = -Sample)
dat10$n <- c(1,1,1,1,1,1,1,1,1,1)
dat10
```

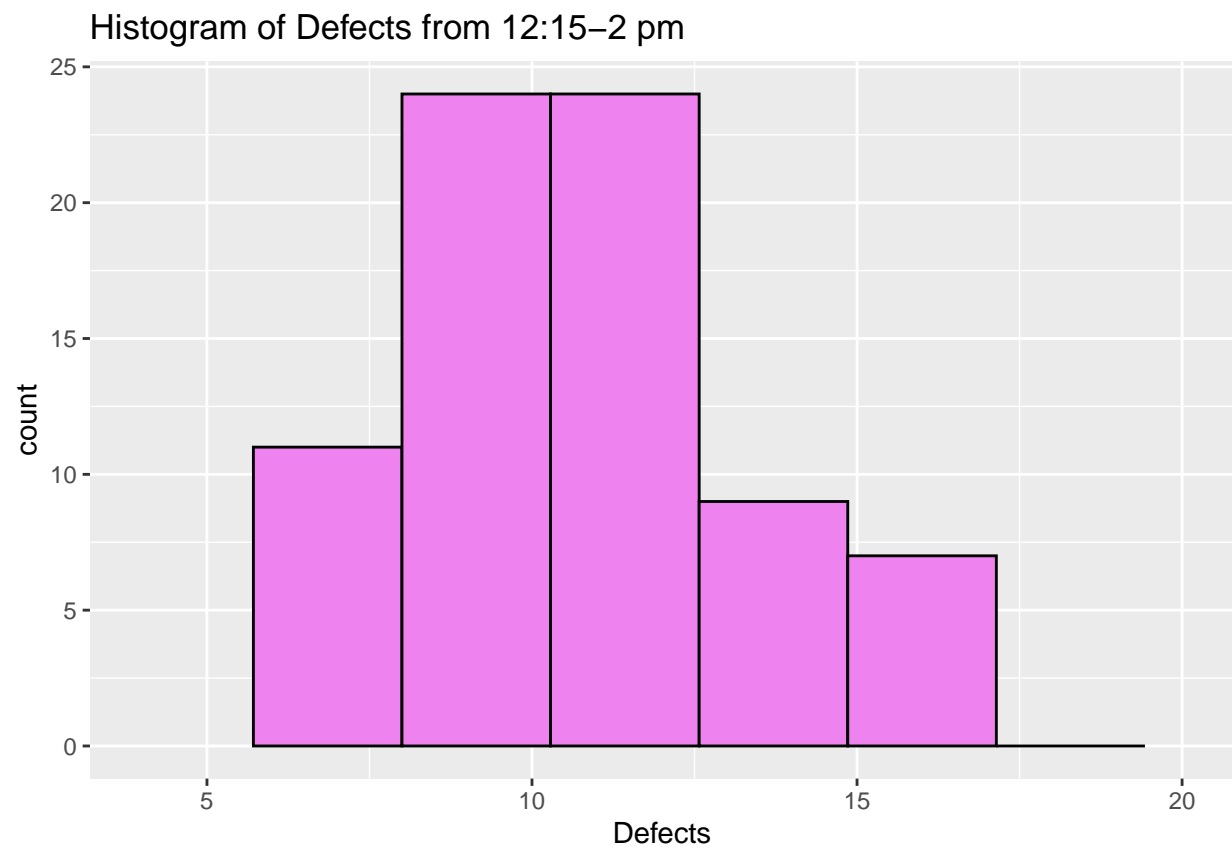
```
##      Day Defects n
## 1      1         9 1
## 2      1        10 1
## 3      1        15 1
## 4      1        11 1
## 5      1        14 1
## 6      1        11 1
## 7      1         9 1
## 8      1         7 1
## 9      2        13 1
## 10     2         8 1
## 11     2        14 1
## 12     2        12 1
## 13     2         8 1
## 14     2        12 1
## 15     2        12 1
## 16     2        10 1
## 17     3         6 1
## 18     3        10 1
## 19     3         5 1
## 20     3         9 1
## 21     3        12 1
## 22     3        12 1
## 23     3        10 1
## 24     3        13 1
## 25     4         9 1
## 26     4        11 1
## 27     4         9 1
## 28     4        15 1
## 29     4        12 1
## 30     4         6 1
## 31     4         8 1
## 32     4        11 1
## 33     5        10 1
## 34     5        13 1
## 35     5        16 1
## 36     5        12 1
```

```
## 37  5      10 1
## 38  5      11 1
## 39  5      11 1
## 40  5      13 1
## 41  6      10 1
## 42  6       9 1
## 43  6       9 1
## 44  6       5 1
## 45  6      11 1
## 46  6      17 1
## 47  6      13 1
## 48  6      10 1
## 49  7      13 1
## 50  7       9 1
## 51  7      11 1
## 52  7      12 1
## 53  7      12 1
## 54  7       7 1
## 55  7       8 1
## 56  7      15 1
## 57  8      12 1
## 58  8      12 1
## 59  8       3 1
## 60  8      10 1
## 61  8       9 1
## 62  8       9 1
## 63  8       9 1
## 64  8       5 1
## 65  9      11 1
## 66  9      12 1
## 67  9      16 1
## 68  9      11 1
## 69  9       7 1
## 70  9       5 1
## 71  9      16 1
## 72  9       7 1
## 73 10      12 1
## 74 10      13 1
## 75 10      11 1
## 76 10       9 1
## 77 10      10 1
## 78 10       8 1
## 79 10      10 1
## 80 10       9 1
```

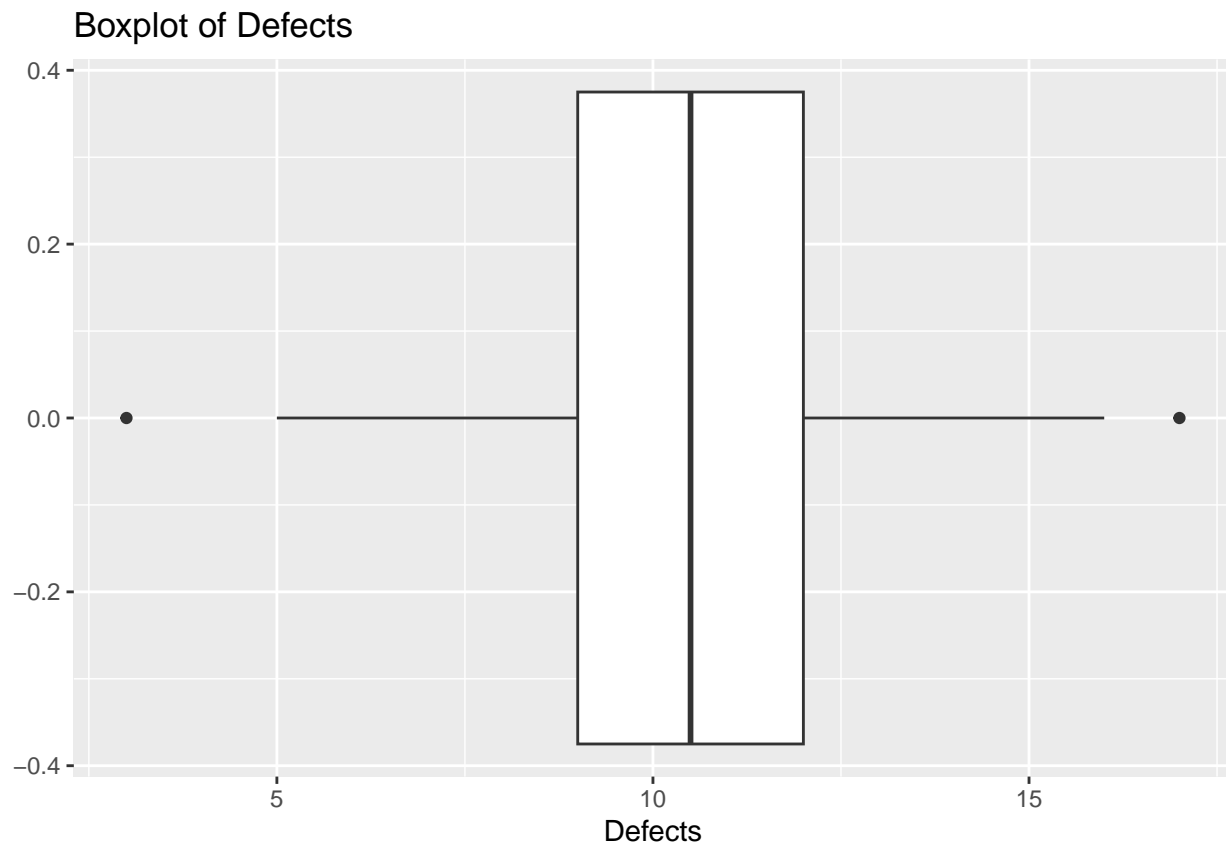
```
hist <- ggplot(dat10, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet") +
hist
```

```
## Warning: Removed 1 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

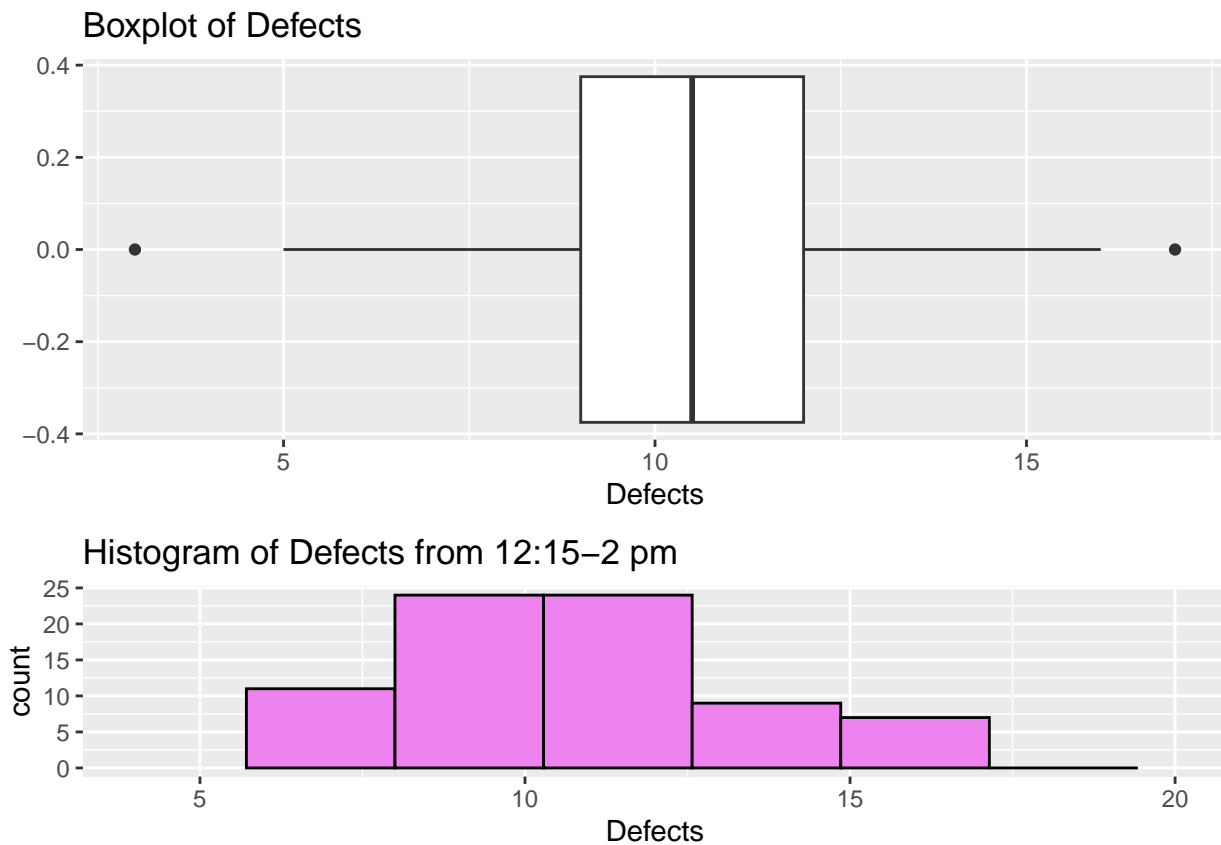


```
box<- ggplot(dat10, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 1 rows containing non-finite values ('stat_bin()').  
## Removed 2 rows containing missing values ('geom_bar()').
```

```
xbar <- mean(dat10$Defects)
xbar
```

```
## [1] 10.45
```

```
sd <- sd(dat10$Defects)
sd
```

```
## [1] 2.810018
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 0.8886058
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)
lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 8.439834
```

```
upperinterval <- xbar + margin
upperinterval
```

```
## [1] 12.46017
```

2:15 - 4 pm Graph

```
dat11 <- filter(dat, Sample == '14:15' |
                Sample == '14:30' | Sample == '14:45' | Sample == '15:00' |
                Sample == '15:15' | Sample == '15:30' | Sample == '15:45' |
                Sample == '16:00')
dat11 <- subset(dat11, select = -Sample)
dat11$n <- c(1,1,1,1,1,1,1,1,1,1)
dat11
```

```
##      Day Defects n
## 1     1      15 1
## 2     1      11 1
## 3     1      13 1
## 4     1       9 1
## 5     1      15 1
## 6     1       8 1
## 7     1       7 1
## 8     1      11 1
## 9     2      10 1
## 10    2      15 1
## 11    2       6 1
## 12    2      12 1
## 13    2      13 1
## 14    2       7 1
## 15    2       7 1
## 16    2      11 1
## 17    3       4 1
## 18    3       6 1
## 19    3      13 1
## 20    3       9 1
## 21    3      17 1
## 22    3      15 1
## 23    3      14 1
## 24    3      12 1
## 25    4      14 1
## 26    4       7 1
## 27    4       7 1
## 28    4      16 1
## 29    4       3 1
## 30    4      13 1
## 31    4      16 1
## 32    4       9 1
## 33    5       9 1
## 34    5       9 1
## 35    5       9 1
```

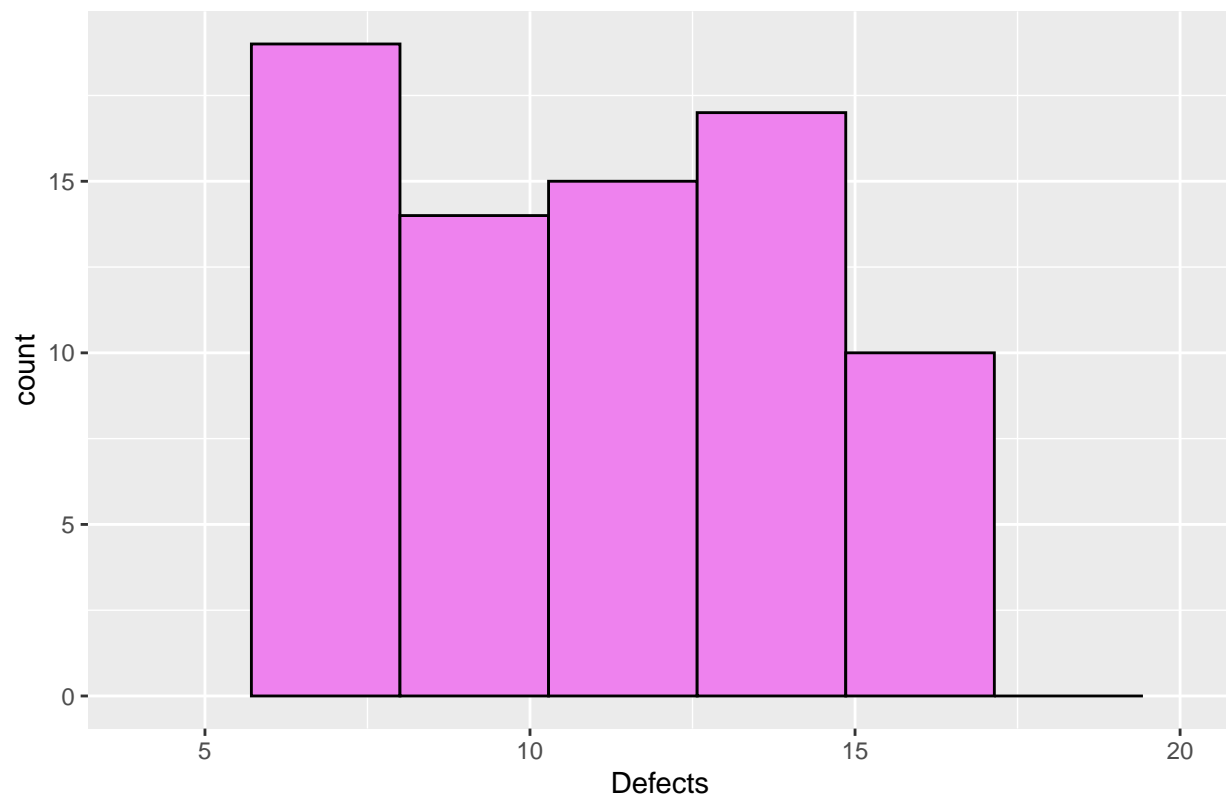
```
## 36 5      13 1
## 37 5      12 1
## 38 5      14 1
## 39 5      14 1
## 40 5       8 1
## 41 6       7 1
## 42 6       5 1
## 43 6      12 1
## 44 6       6 1
## 45 6      12 1
## 46 6       4 1
## 47 6      10 1
## 48 6      14 1
## 49 7      11 1
## 50 7      14 1
## 51 7      13 1
## 52 7       7 1
## 53 7      10 1
## 54 7      16 1
## 55 7      10 1
## 56 7       7 1
## 57 8      11 1
## 58 8       8 1
## 59 8      14 1
## 60 8      17 1
## 61 8       7 1
## 62 8      14 1
## 63 8      12 1
## 64 8       6 1
## 65 9      11 1
## 66 9       5 1
## 67 9       8 1
## 68 9      14 1
## 69 9      10 1
## 70 9       9 1
## 71 9      11 1
## 72 9      12 1
## 73 10     14 1
## 74 10     11 1
## 75 10       8 1
## 76 10     15 1
## 77 10     10 1
## 78 10       8 1
## 79 10       9 1
## 80 10     13 1
```

```
hist <- ggplot(dat11, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet") +
hist
```

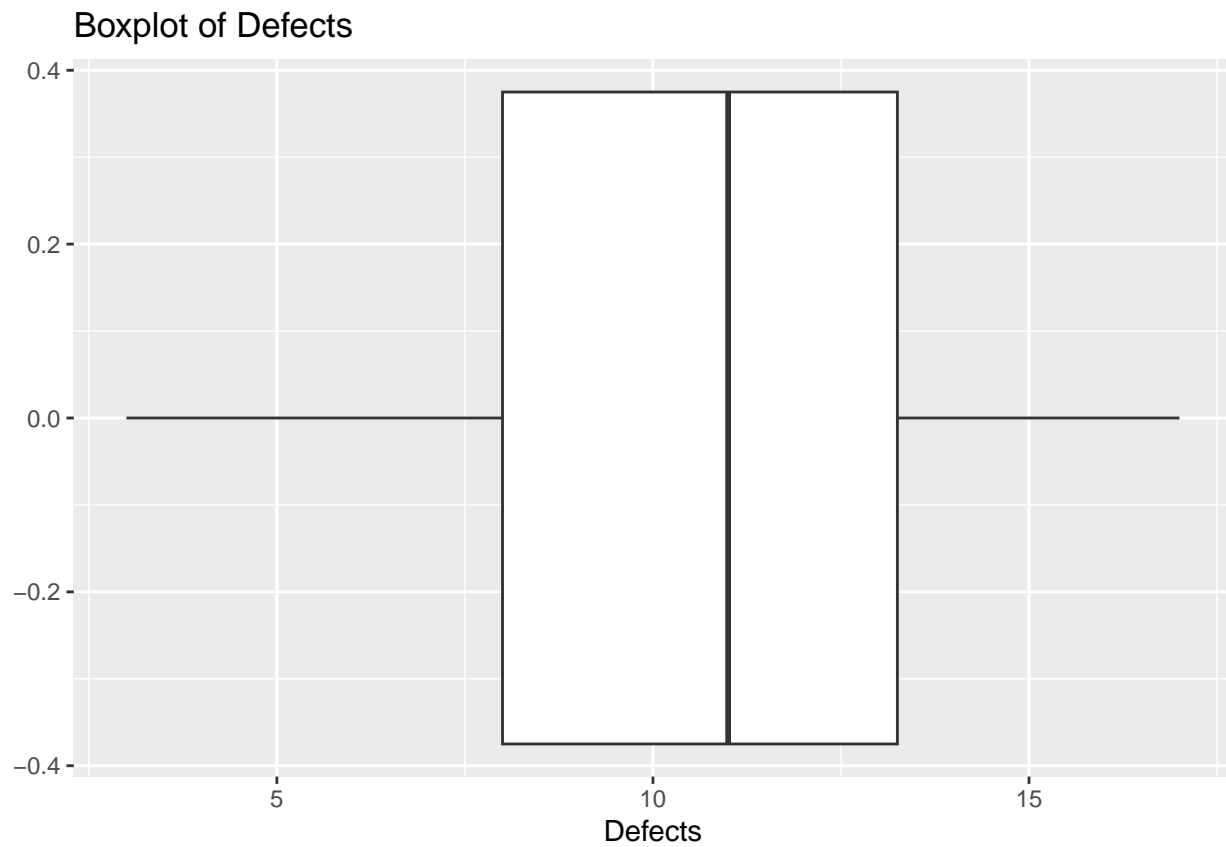
```
## Warning: Removed 1 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

Histogram of Defects from 2:15 – 4 pm

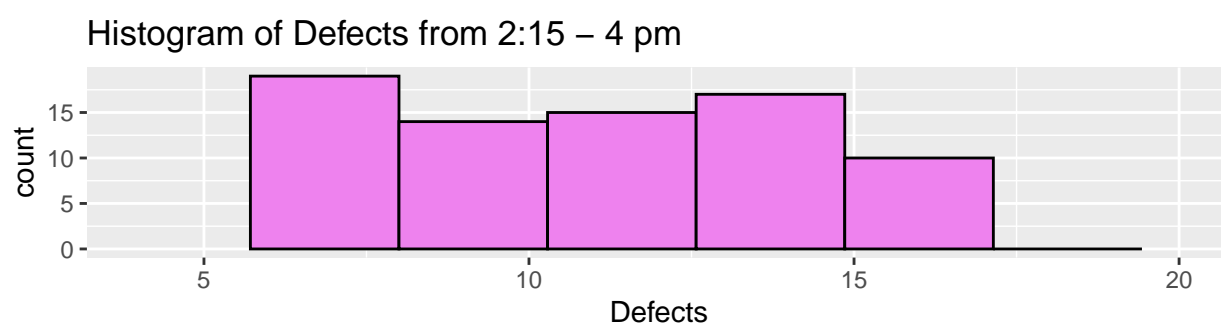
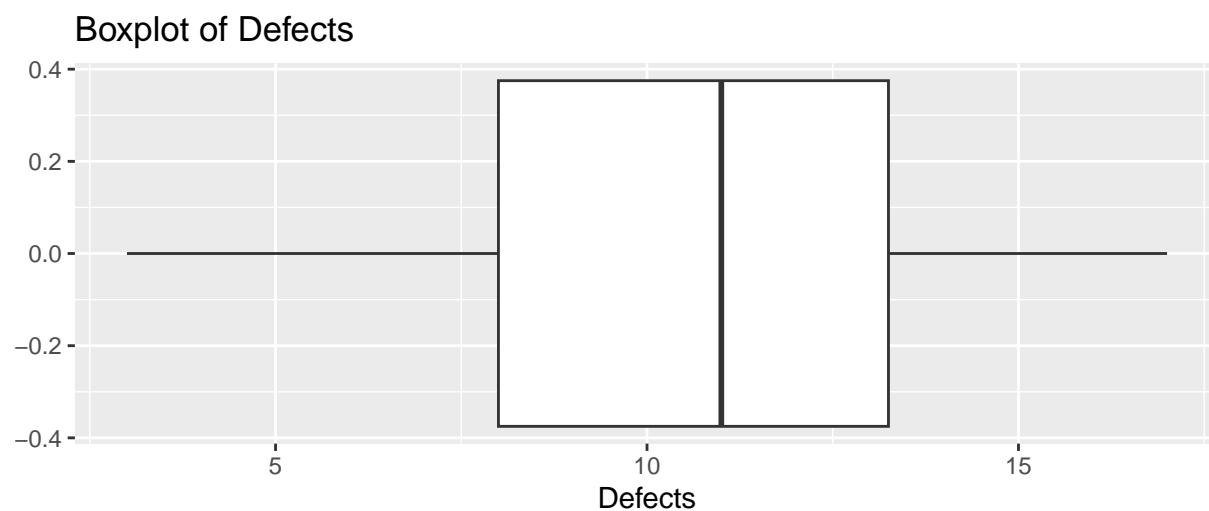


```
box<- ggplot(dat11, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 1 rows containing non-finite values ('stat_bin()').  
## Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(dat11$Defects)
xbar
```

```
## [1] 10.6
```

```
sd <- sd(dat11$Defects)
sd
```

```
## [1] 3.392471
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 1.072794
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)
lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 8.173172
```

```
upperinterval <- xbar + margin
upperinterval
```

```
## [1] 13.02683
```

Problem 3

Week One

```
weekOne <- filter(dat, Day == '1' | Day == '2' | Day == '6' | Day == '7')
weekOne <- subset(weekOne, select = -Day)
weekOne
```

##	Sample	Defects
## 1	08:15	12
## 2	08:30	8
## 3	08:45	9
## 4	09:00	11
## 5	09:15	9
## 6	09:30	10
## 7	09:45	12
## 8	10:00	9
## 9	10:15	12
## 10	10:30	4
## 11	10:45	11
## 12	11:00	8
## 13	11:15	12
## 14	11:30	12
## 15	11:45	9
## 16	12:00	8
## 17	12:15	9
## 18	12:30	10
## 19	12:45	15
## 20	13:00	11
## 21	13:15	14
## 22	13:30	11
## 23	13:45	9
## 24	14:00	7
## 25	14:15	15
## 26	14:30	11
## 27	14:45	13
## 28	15:00	9
## 29	15:15	15
## 30	15:30	8
## 31	15:45	7
## 32	16:00	11
## 33	08:15	17
## 34	08:30	12
## 35	08:45	7
## 36	09:00	11
## 37	09:15	7

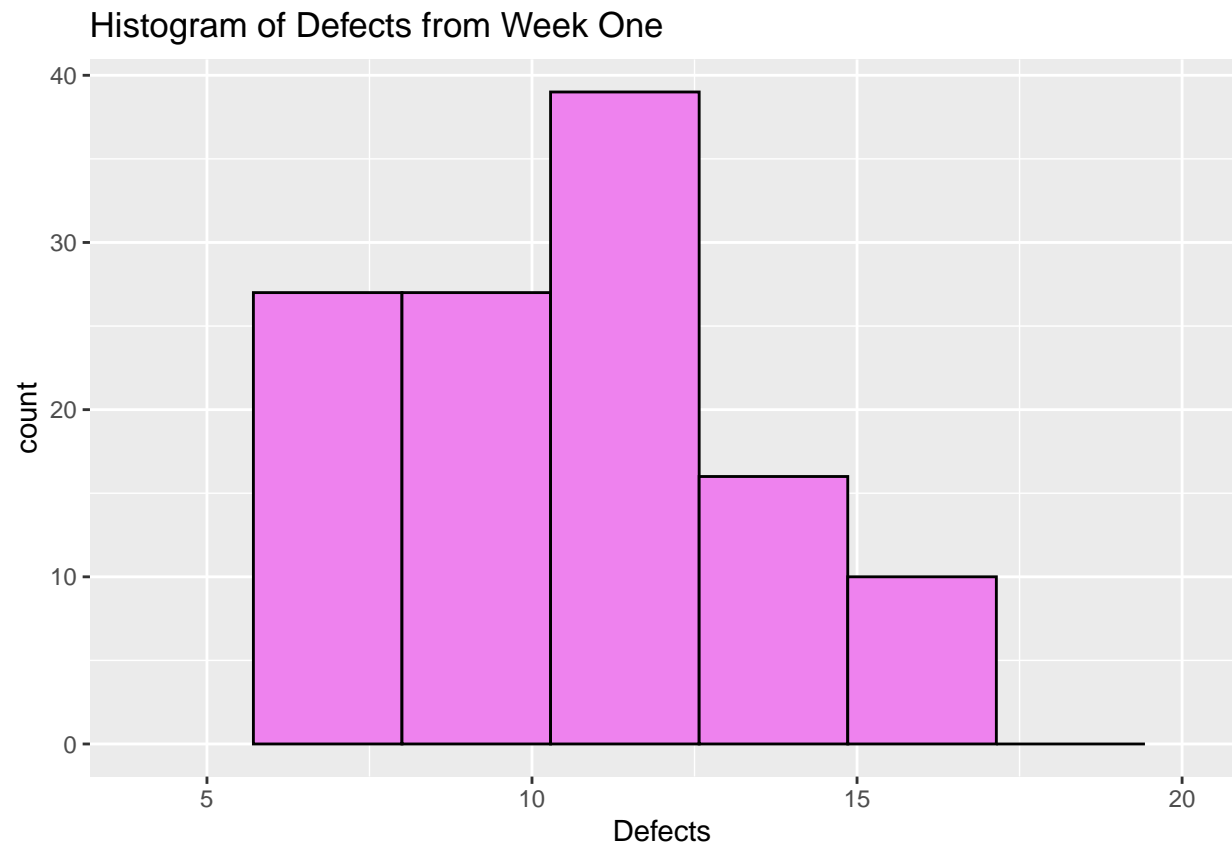
## 38	09:30	6
## 39	09:45	10
## 40	10:00	11
## 41	10:15	12
## 42	10:30	7
## 43	10:45	11
## 44	11:00	6
## 45	11:15	12
## 46	11:30	13
## 47	11:45	1
## 48	12:00	12
## 49	12:15	13
## 50	12:30	8
## 51	12:45	14
## 52	13:00	12
## 53	13:15	8
## 54	13:30	12
## 55	13:45	12
## 56	14:00	10
## 57	14:15	10
## 58	14:30	15
## 59	14:45	6
## 60	15:00	12
## 61	15:15	13
## 62	15:30	7
## 63	15:45	7
## 64	16:00	11
## 65	08:15	13
## 66	08:30	9
## 67	08:45	14
## 68	09:00	10
## 69	09:15	7
## 70	09:30	7
## 71	09:45	11
## 72	10:00	12
## 73	10:15	9
## 74	10:30	11
## 75	10:45	13
## 76	11:00	11
## 77	11:15	12
## 78	11:30	6
## 79	11:45	14
## 80	12:00	12
## 81	12:15	10
## 82	12:30	9
## 83	12:45	9
## 84	13:00	5
## 85	13:15	11
## 86	13:30	17
## 87	13:45	13
## 88	14:00	10
## 89	14:15	7
## 90	14:30	5
## 91	14:45	12


```
## 92 15:00 6
## 93 15:15 12
## 94 15:30 4
## 95 15:45 10
## 96 16:00 14
## 97 08:15 10
## 98 08:30 8
## 99 08:45 15
## 100 09:00 3
## 101 09:15 8
## 102 09:30 12
## 103 09:45 5
## 104 10:00 5
## 105 10:15 14
## 106 10:30 12
## 107 10:45 16
## 108 11:00 9
## 109 11:15 10
## 110 11:30 10
## 111 11:45 12
## 112 12:00 4
## 113 12:15 13
## 114 12:30 9
## 115 12:45 11
## 116 13:00 12
## 117 13:15 12
## 118 13:30 7
## 119 13:45 8
## 120 14:00 15
## 121 14:15 11
## 122 14:30 14
## 123 14:45 13
## 124 15:00 7
## 125 15:15 10
## 126 15:30 16
## 127 15:45 10
## 128 16:00 7
```

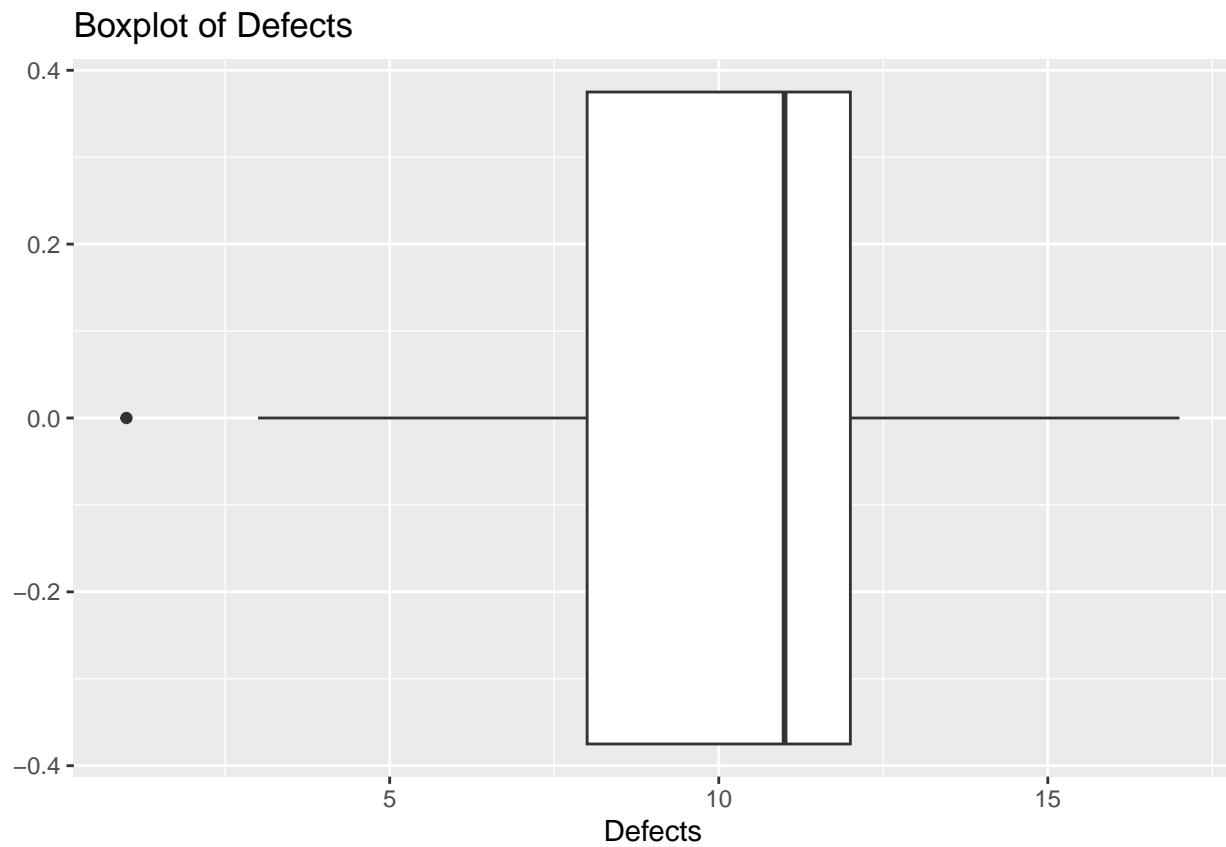
```
hist <- ggplot(weekOne, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet")
hist
```

```
## Warning: Removed 2 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

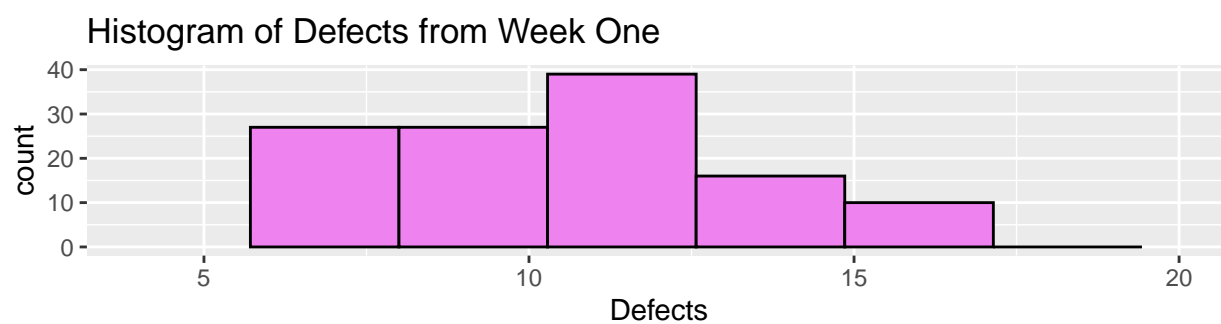
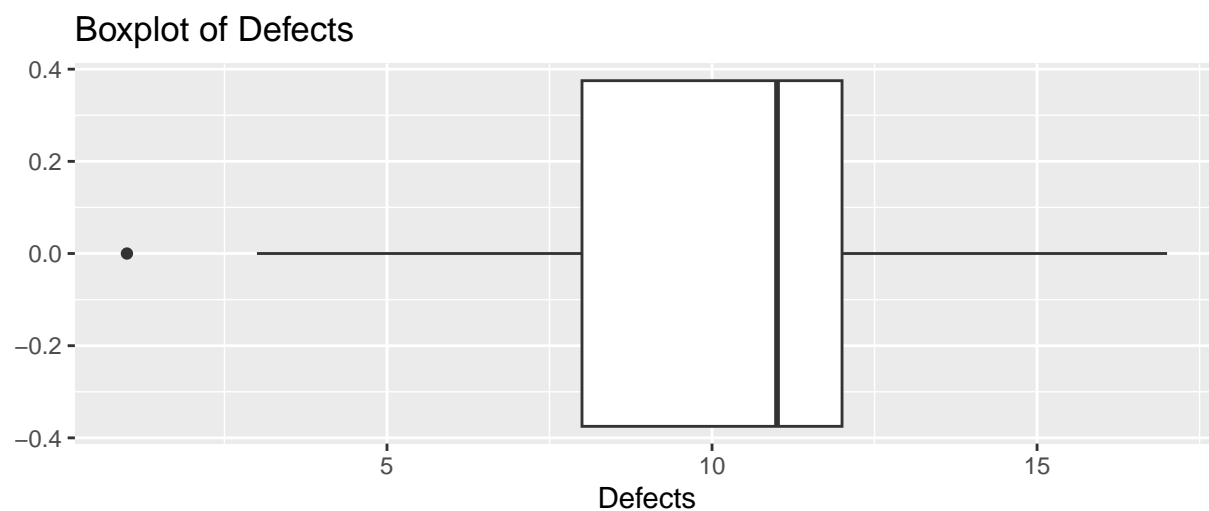


```
box<- ggplot(weekOne, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```



```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 2 rows containing non-finite values ('stat_bin()').  
## Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(weekOne$Defects)
xbar
```

```
## [1] 10.22656
```

```
sd <- sd(weekOne$Defects)
sd
```

```
## [1] 3.071881
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 0.9714141
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)

lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 8.029071
```

```
upperinterval <- xbar + margin
upperinterval
```

```
## [1] 12.42405
```

Week Two

```
weekTwo <- filter(dat, Day == '4' | Day == '5' | Day == '9' | Day == '10')
weekTwo <- subset(weekTwo, select = -Day)
weekTwo
```

##	Sample	Defects
## 1	08:15	11
## 2	08:30	11
## 3	08:45	8
## 4	09:00	12
## 5	09:15	12
## 6	09:30	11
## 7	09:45	12
## 8	10:00	13
## 9	10:15	10
## 10	10:30	15
## 11	10:45	12
## 12	11:00	6
## 13	11:15	7
## 14	11:30	5
## 15	11:45	3
## 16	12:00	13
## 17	12:15	9
## 18	12:30	11
## 19	12:45	9
## 20	13:00	15
## 21	13:15	12
## 22	13:30	6
## 23	13:45	8
## 24	14:00	11
## 25	14:15	14
## 26	14:30	7
## 27	14:45	7
## 28	15:00	16
## 29	15:15	3
## 30	15:30	13
## 31	15:45	16
## 32	16:00	9
## 33	08:15	7
## 34	08:30	8
## 35	08:45	7
## 36	09:00	11
## 37	09:15	7
## 38	09:30	17
## 39	09:45	7

## 40	10:00	8
## 41	10:15	11
## 42	10:30	3
## 43	10:45	14
## 44	11:00	7
## 45	11:15	10
## 46	11:30	3
## 47	11:45	11
## 48	12:00	14
## 49	12:15	10
## 50	12:30	13
## 51	12:45	16
## 52	13:00	12
## 53	13:15	10
## 54	13:30	11
## 55	13:45	11
## 56	14:00	13
## 57	14:15	9
## 58	14:30	9
## 59	14:45	9
## 60	15:00	13
## 61	15:15	12
## 62	15:30	14
## 63	15:45	14
## 64	16:00	8
## 65	08:15	11
## 66	08:30	12
## 67	08:45	10
## 68	09:00	12
## 69	09:15	14
## 70	09:30	13
## 71	09:45	6
## 72	10:00	8
## 73	10:15	9
## 74	10:30	13
## 75	10:45	5
## 76	11:00	11
## 77	11:15	6
## 78	11:30	8
## 79	11:45	11
## 80	12:00	14
## 81	12:15	11
## 82	12:30	12
## 83	12:45	16
## 84	13:00	11
## 85	13:15	7
## 86	13:30	5
## 87	13:45	16
## 88	14:00	7
## 89	14:15	11
## 90	14:30	5
## 91	14:45	8
## 92	15:00	14
## 93	15:15	10

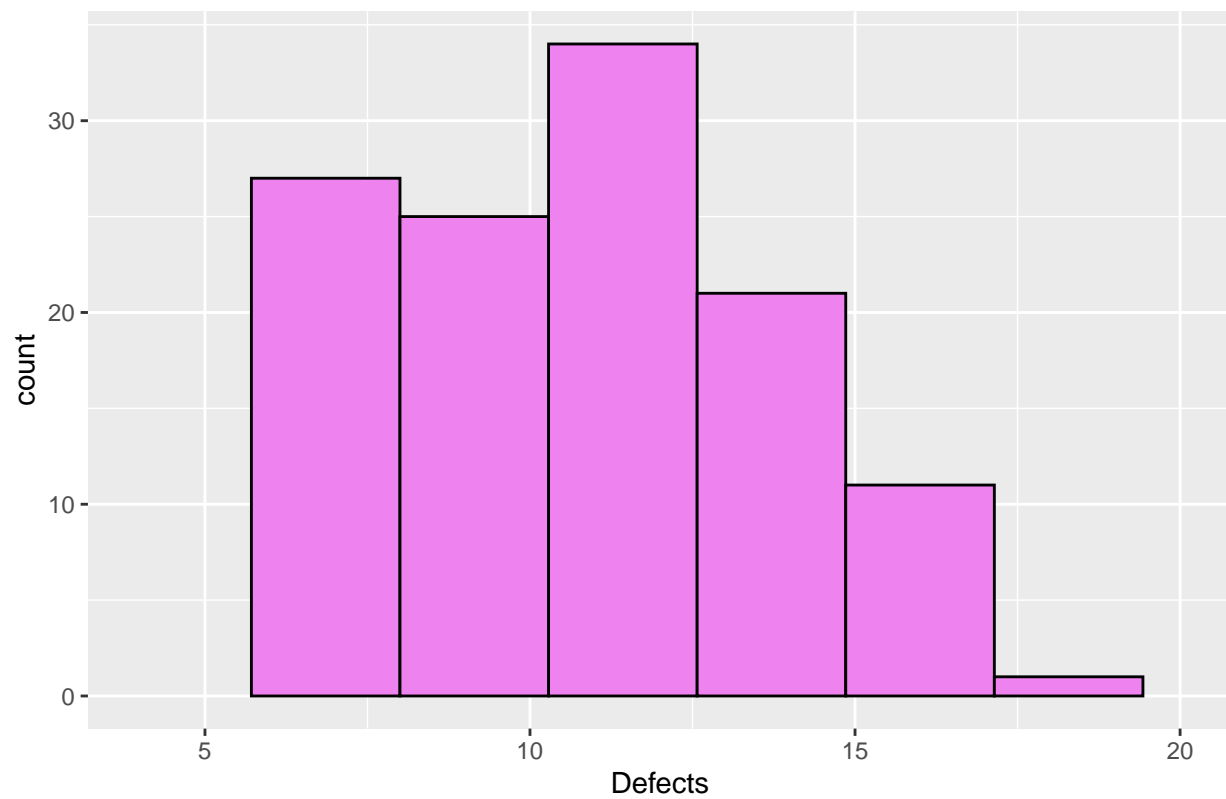
```
## 94 15:30 9
## 95 15:45 11
## 96 16:00 12
## 97 08:15 9
## 98 08:30 18
## 99 08:45 17
## 100 09:00 16
## 101 09:15 10
## 102 09:30 12
## 103 09:45 8
## 104 10:00 9
## 105 10:15 11
## 106 10:30 13
## 107 10:45 11
## 108 11:00 8
## 109 11:15 9
## 110 11:30 14
## 111 11:45 9
## 112 12:00 4
## 113 12:15 12
## 114 12:30 13
## 115 12:45 11
## 116 13:00 9
## 117 13:15 10
## 118 13:30 8
## 119 13:45 10
## 120 14:00 9
## 121 14:15 14
## 122 14:30 11
## 123 14:45 8
## 124 15:00 15
## 125 15:15 10
## 126 15:30 8
## 127 15:45 9
## 128 16:00 13
```

```
hist <- ggplot(weekTwo, aes(x = Defects)) + geom_histogram(bins = 8, color = "black", fill = "violet")
hist
```

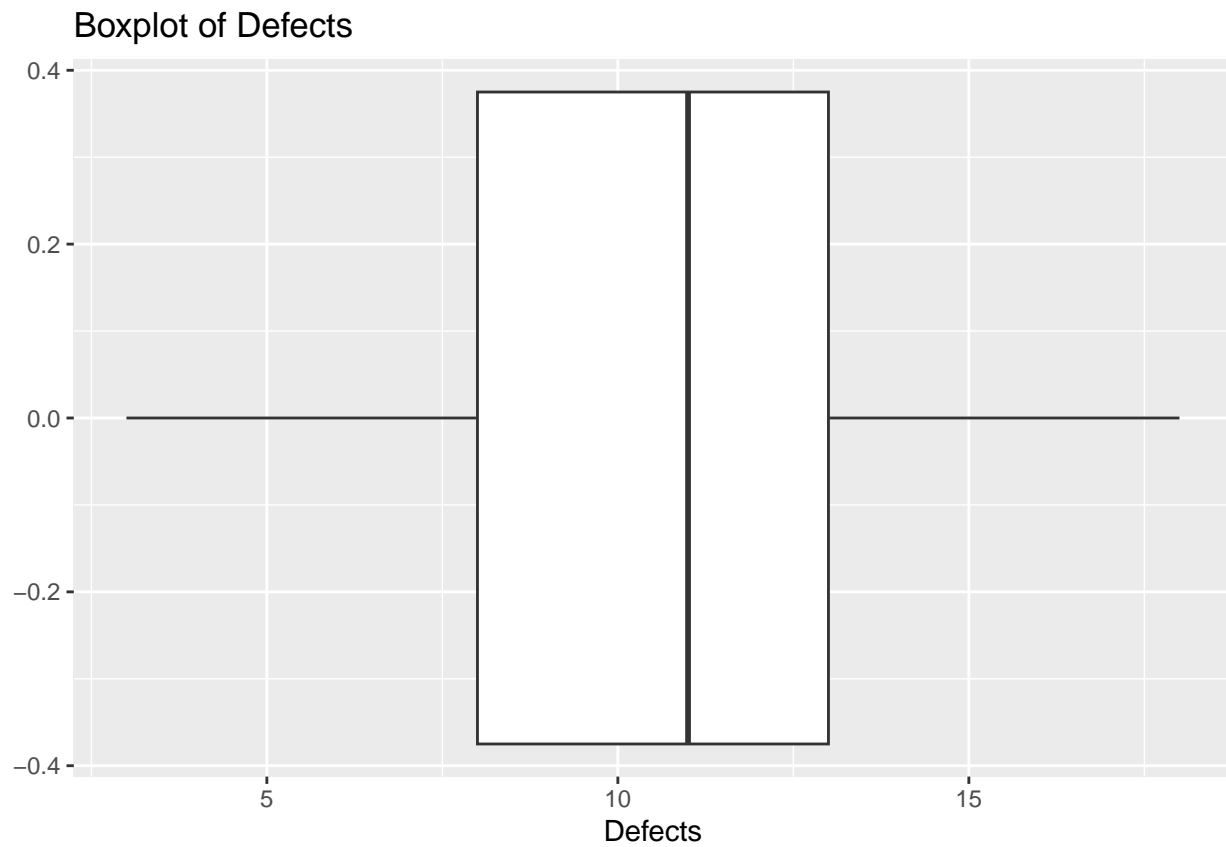
```
## Warning: Removed 4 rows containing non-finite values ('stat_bin()').
```

```
## Warning: Removed 2 rows containing missing values ('geom_bar()').
```

Histogram of Defects from Week One

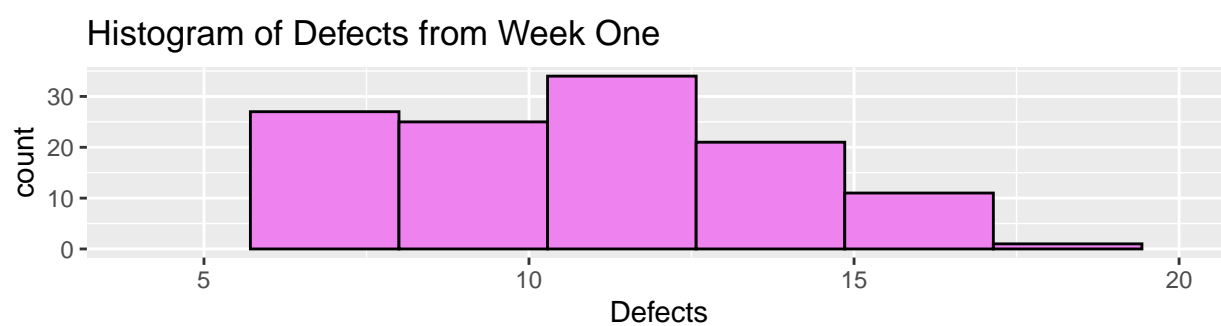
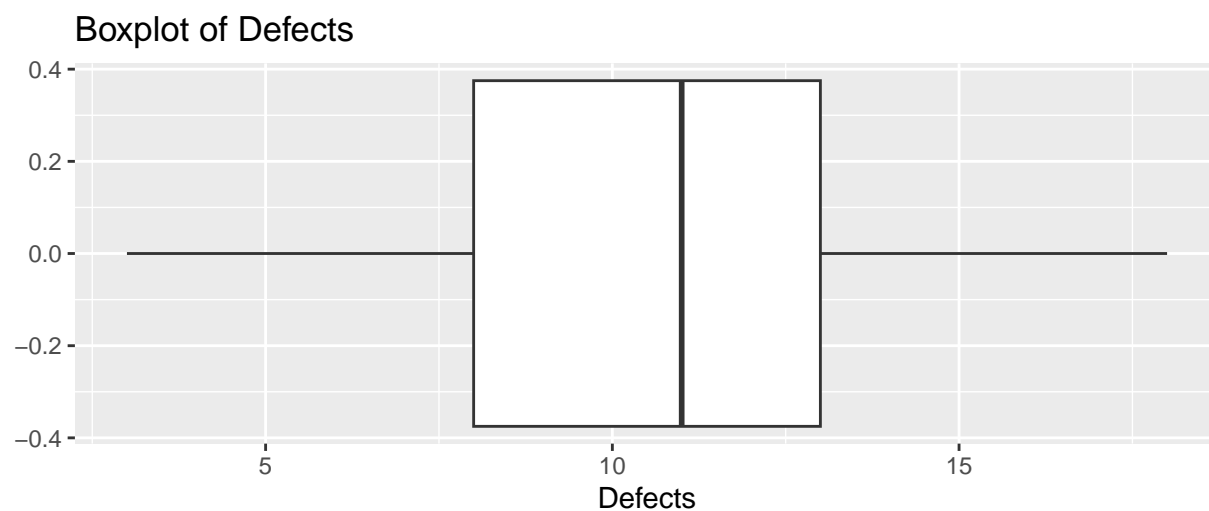


```
box<- ggplot(weekTwo, aes(x=Defects)) + geom_boxplot() + ggtitle("Boxplot of Defects")
box
```

```
egg::ggarrange(box, hist, heights = 2:1)
```

```
## Warning: Removed 4 rows containing non-finite values ('stat_bin()').  
## Removed 2 rows containing missing values ('geom_bar()').
```



```
xbar <- mean(weekTwo$Defects)
xbar
```

```
## [1] 10.40625
```

```
sd <- sd(weekTwo$Defects)
sd
```

```
## [1] 3.220108
```

```
n = 10
standard_error_mean <- sd/sqrt(n)
standard_error_mean
```

```
## [1] 1.018288
```

```
margin <- qt(0.975,df = n-1) * sd/sqrt(n)
lowerinterval <- xbar - margin
lowerinterval
```

```
## [1] 8.102724
```

```
upperinterval <- xbar + margin  
upperinterval
```

```
## [1] 12.70978
```