

## 3) Statistical Process Control Charts - np & p Charts

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### What is a Statistical Process Control Chart?

In any manufacturing process, the quality of the product is maintained by using a technique known as the **Statistical Process Control**. The method involves collecting data of the raw material used, the manufacturing processes involved, and the final product. Data is mainly extracted from the machines and instruments involved in the manufacturing processes. This collected data, based on its type, is recorded and tracked on various types of control charts. These charts are of different kinds and are collectively known as **Statistical Process Control Charts**. Later, these charts are used to evaluate, monitor and control a process.

### What are np & p charts?

The **np & p charts** are used for monitoring the number (**np chart**) and fraction (**p chart**) of defective items in a subgroup of items. **np chart** is used when the sample size is constant. **p chart** is used when the sample size varies.

### Introduction

The purpose of this experiment is to evaluate a manufacturing process dataset in R, by creating its **np & p charts**.

### Procedure

Step by step procedure to conduct the required experiment -

1. Selecting dataset for the creation of **np & p charts**
2. Creation of **np chart**
3. Creation of **p chart**

*Note : Please make sure that the following package is already installed -*

- qcc

### Code and Results

Data used for analysis

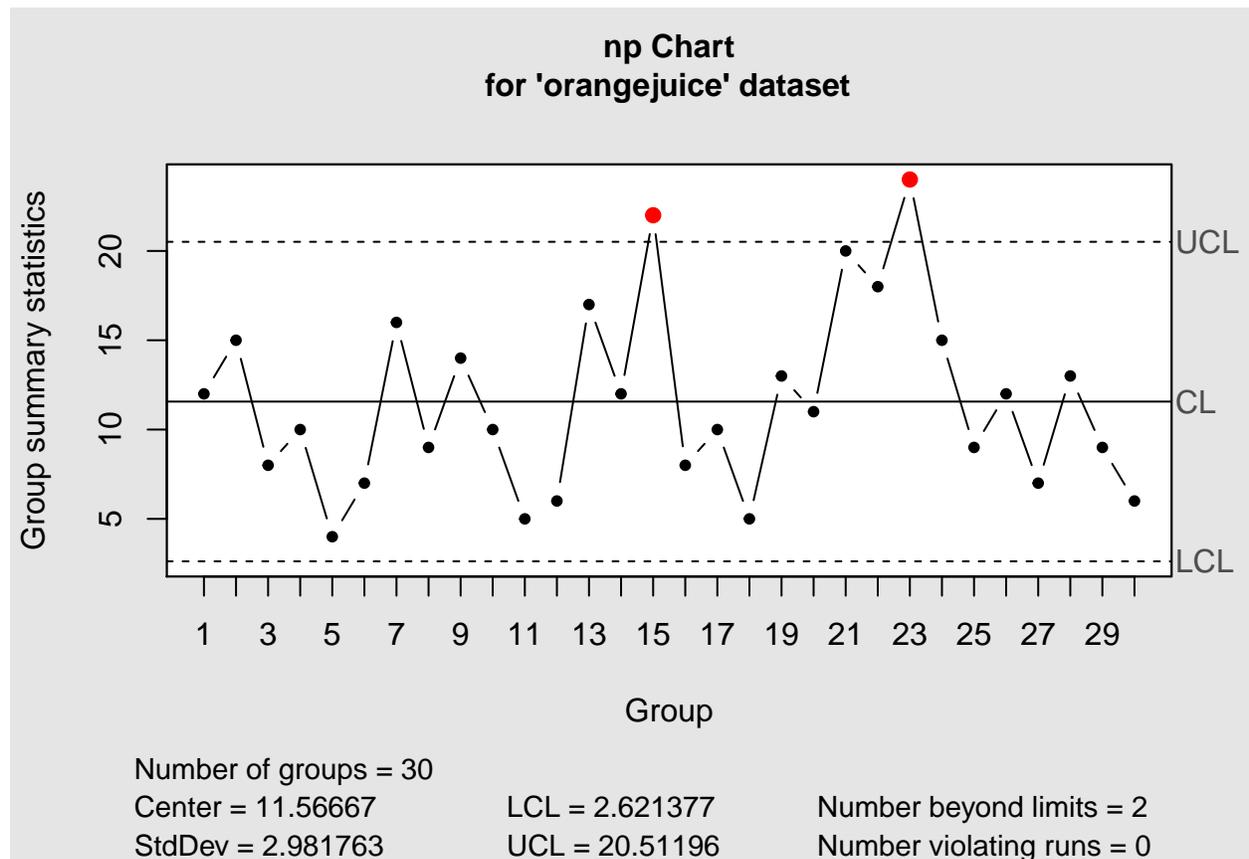
```
## R has a predefined dataset with the name "orangejuice" in the package "qcc"  
# To know more about the dataset, after loading "qcc" package type "?orangejuice" in the  
# console
```

### Selecting dataset for the creation of np & p charts

```
# 1) Selecting appropriate dataset to be used for analysis  
# Run the following command after removing "#" if "qcc" package is not installed  
# install.packages("qcc")  
library(qcc)  
data(orangejuice)
```

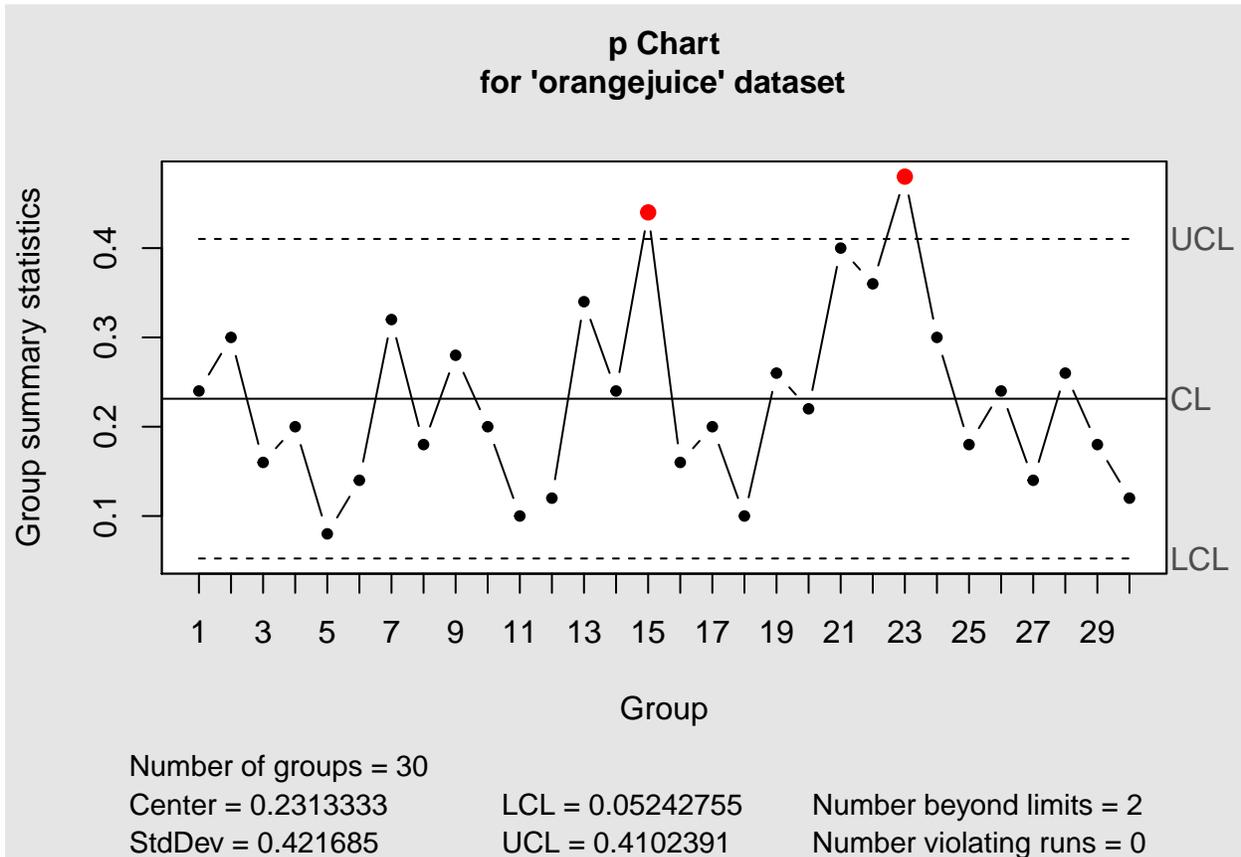
### Creation of np chart

```
# 2) Plotting np chart  
chart <- with(orangejuice ,qcc(D[trial], sizes = size[trial], type="np", data.name =  
paste0(as.character("''),"orangejuice",as.character("'')," dataset")))  
plot(chart, chart.all=FALSE)
```



## Creation of p chart

```
# 3) Plotting p chart
chart <- with(orangejuice ,qcc(D[trial], sizes = size[trial], type="p", data.name =
paste0(as.character("'"),"orangejuice",as.character("'")," dataset")))
plot(chart, chart.all=FALSE)
```



## Conclusion

In the above plots, we can observe that multiple data points are lying beyond limits. Hence, the process is not under control.