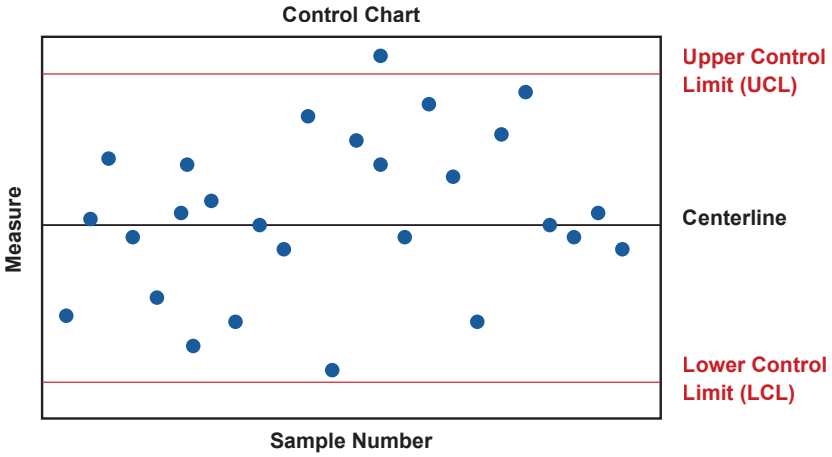


Figure 18.2.1

Definition

Types of Variation

Normal process variation is normal variation in a process in which the data falls within the control limits. **Assignable variation** is random variation that causes data to fall outside the control limits but can be reduced by determining the root cause of the variation.

The Highway Control Chart

When you are driving a car and you stay in your lane, you could say that you are operating the car "in control." The white lines that define your lane are similar to the UCL and LCL. The car would be expected to move around within the lane, which would be normal process variation. Veering outside your lane might have assignable causes such as cell phone usage, children fighting in the back seat, or any number of other distractions.

The control chart with its limits tells us when to stop the process (if it is out of control) and when not to interrupt the process. When data points fall within the UCL and LCL, we think the variation is due to **normal process variation** (also called **common cause variation** or **chance variation**). But when a point or points fall outside the control limits, the cause is said to be **assignable variation** (or **special cause variation**). This type of variation is not random and can be eliminated (or reduced) by investigating the problem and determining the root cause(s). Reducing system variation is the surest path toward continuous improvement. For assignable causes, the system should be stopped and the cause(s) should be found and removed before the process is resumed.

It is important to emphasize that a control chart focuses on the process, not on the product. It does not ensure good quality, but instead allows management to check a quality characteristic of the process at regular intervals in order to determine if the statistical distribution of the characteristic has changed. If it has, then modifications may be needed to correct the process.

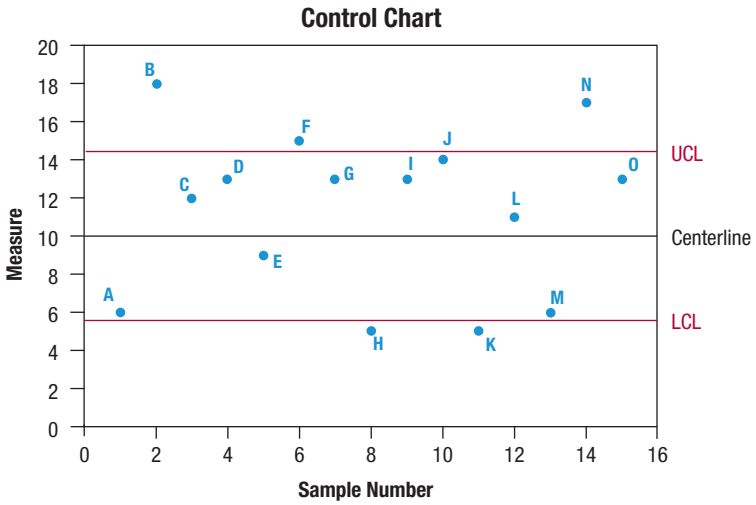
18.2 Exercises

Basic Concepts

1. Identify and describe the two concepts on which the scientific method for attaining quality is based on.
2. What is a control chart? What is the basic purpose of control charts?
3. Identify and define the three basic components of a control chart.
4. What is normal process variation?
5. What is assignable variation?
6. Does a control chart give information about a process or a product? Explain.
7. What does it mean to say that a process is in control?
8. Does an in-control state guarantee quality output? Explain.

Exercises

9. Consider the following control chart.



a. From the chart, estimate the values of the UCL, LCL, and centerline.

b. Interpret the estimated values of the UCL, LCL, and centerline.

c. Which points, if any, are out of control?

10. Consider the following values of the UCL, LCL, and centerline from a control chart.

13.56, 16.56, 10.56

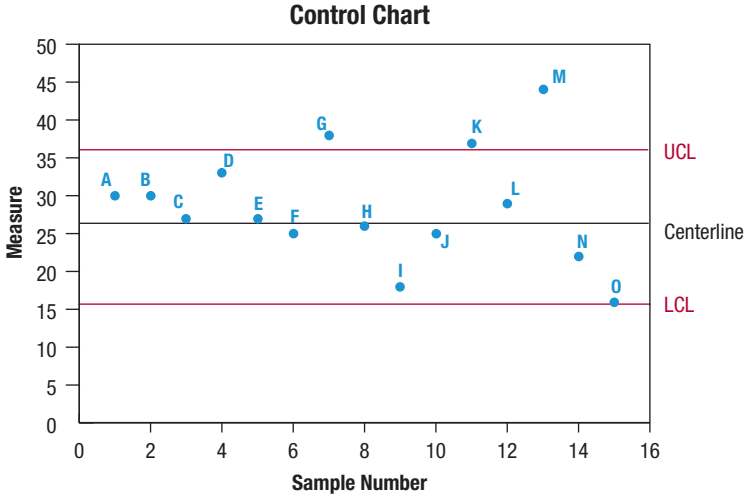
a. Identify which value is the LCL, which is the UCL, and which is the centerline.

b. Plot the UCL, LCL, and centerline on a control chart.

c. Identify three points that would be considered in control and three points that would be considered out of control.

d. Plot these points on the chart that you made in part **b.**

11. Consider the following control chart.



a. From the chart, estimate the values of the UCL, LCL, and centerline.

b. Interpret the estimated values of the UCL, LCL, and centerline.

c. Identify any points that can be attributed to assignable variation.