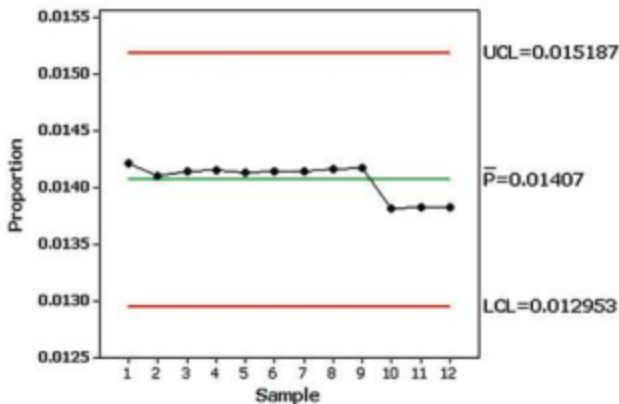
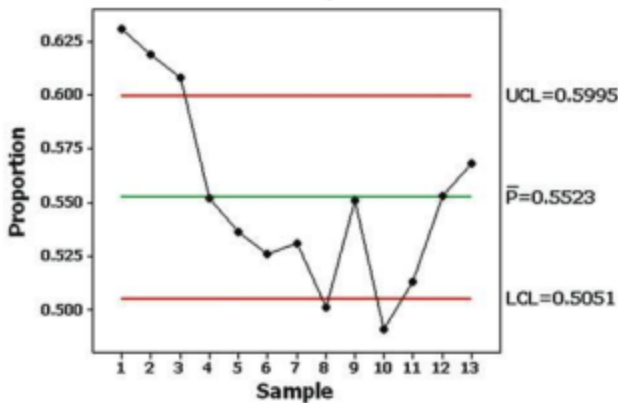


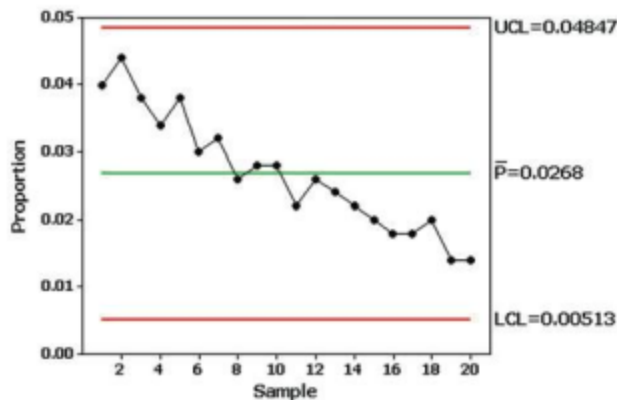
7. Because there appears to be a pattern of a downward shift and there are at least 8 consecutive points all lying above the centerline, the process is not within statistical control.



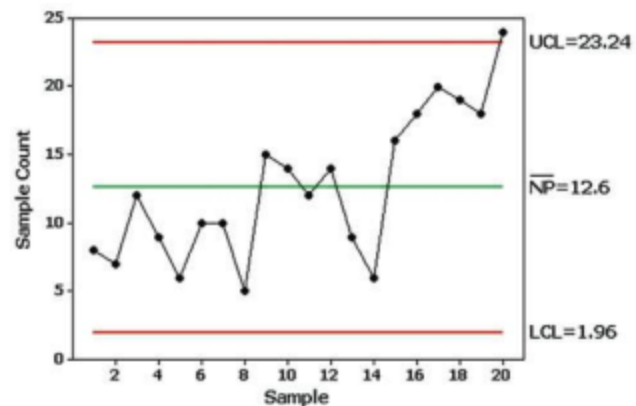
9. The process is out of control because there are points lying beyond the control limits and there are at least 8 points all lying below the centerline. The percentage of voters started to increase in recent years, and it should be much higher than any of the rates shown.



11. There is a pattern of a downward trend and there are at least 8 consecutive points all below the centerline, so the process does not appear to be within statistical control. Because the rate of defects is decreasing, the process is actually improving and we should investigate the cause of that improvement so that it can be continued.



13. Except for the vertical scale, the control chart is identical to the one obtained for Example 1.



Chapter 14: Quick Quiz

1. Process data are data arranged according to some time sequence. They are measurements of a characteristic of goods or services that result from some combination of equipment, people, materials, methods, and conditions.
2. Random variation is due to chance, but assignable variation results from causes that can be identified, such as defective machinery or untrained employees.
3. There is a pattern, trend, or cycle that is obviously not random. There is a point lying outside of the region between the upper and lower control limits. There are at least 8 consecutive points all above or all below the centerline.
4. An R chart uses ranges to monitor variation, but an \bar{x} chart uses sample means to monitor the center (mean) of a process.
5. No. The R chart has at least 8 consecutive points all lying below the centerline and there are points lying beyond the upper control limit. Also, there is a pattern showing that the ranges have jumped in value for the most recent samples.
6. $\bar{R} = 52.8$ ft. In general, a value of \bar{R} is found by first finding the range for the values within each individual subgroup; the mean of those ranges is the value of \bar{R} .
7. No. The \bar{x} chart has a point lying below the lower control limit.
8. $\bar{x} = 3.95$ ft. In general, a value of \bar{x} is found by first finding the mean of the values within each individual subgroup; the mean of those subgroup means is the value of \bar{x} .
9. A p chart is a control chart of the proportions of some attribute, such as defective items.
10. Because there is a downward trend, the process is not within statistical control, but the rate of defects is decreasing, so we should investigate and identify the cause of that trend so that it can be continued.

Chapter 14: Review Exercises

1. $\bar{x} = 2781.71$, $\bar{R} = 1729.38$. R chart: LCL = 0, UCL = 3465.67. \bar{x} chart: LCL = 1946.42, UCL = 3617.00.