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Practice: Constructing Prediction and Tolerance Intervals

The file **MetalPartsBefore.jmp** includes **Thickness** measurements for 125 parts collected in rational subgroups of size five.

In this practice, you use a control chart to evaluate the stability of the process. Then you construct both a prediction interval and a tolerance interval.

1. Use the Control Chart Builder to create an X-Bar and R chart of **Thickness**, and run the tests for special causes to determine whether the process is stable. What can you conclude?

   Hint: To create the control chart, use **Analyze, Quality and Process, Control Chart Builder**.

   The process is stable.

2. You will construct interval estimates to draw inferences about **Thickness**. Why would you study the process stability before constructing these intervals?

   In order to draw inferences about future process behavior, the process must be stable and predictable. If the process is not stable, then the inferences might not be correct.

3. Construct a 95% prediction interval for the next observation. What is this interval?

   Hint: Use **Analyze, Distribution**. From the red triangle for the analysis, select **Prediction Interval**.

   The 95% PI for the next observation is 37.89 to 44.77.

4. Construct a 95% prediction interval for the next five observations. What is this interval?

   The 95% PI for the next five observations is 36.78 to 45.88.

5. Interpret the interval found in the previous step.

   We are 95% confident that the next five observations will fall in the interval 36.78 to 45.88.

6. Construct a 95% tolerance interval covering 90% of future observations. What is this interval?

   The 95%-90% TI is 38.13 to 44.52.

7. Interpret the tolerance interval found in the previous step.

   We are 95% confident that at least 90% of future **Thickness** values will fall between 38.13 and 44.52.

8. Suppose that the specifications for this process are 35 to 45. Using the tolerance interval, what can we say about the ability of this process to meet the specification?

   The upper specification is 45, and the upper bound on the tolerance interval is 44.52. It is likely that some of the future **Thickness** values will fail to meet the upper specification limit.

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