

Chapter 14 Worksheet 1  
Quality Control

1. Acme Pipe Company manufactures 3-inch diameter pipe used in residential plumbing systems. If the pipes are too wide or too narrow they will not connect properly with other pieces of pipe. Once each hour, a sample of three sections of pipe is selected and their diameters measured. Eleven hours ago the machine was shut down for repairs. The machine was then restarted and the results of 11 recent samples are in the table below.

Sample				mean	range
1	3.059	2.806	3.006	2.957	0.253
2	3.025	3.065	3.007	3.032	0.058
3	2.886	3.065	2.959	2.970	0.179
4	2.988	3.020	3.030	3.013	0.042
5	2.986	3.037	3.007	3.010	0.051
6	2.911	2.918	2.938	2.922	0.027
7	2.947	2.977	2.986	2.970	0.039
8	3.025	2.947	2.989	2.987	0.078
9	2.939	3.040	3.040		
10	2.959	3.023	3.037		
11	3.002	2.910	2.999		

- a) Compute the mean and range for the last 3 samples.
- b) Construct and interpret the X-bar chart.
2. Construct and interpret the R-chart for Acme Pipe.
3. MicroChip, Inc. makes microprocessor chips for use in consumer electronics devices. To monitor the fraction of defective microprocessors produced, fifty (50) microprocessors are sampled and tested each hour. The results for the most recent 10 hours are given in the table below. Construct and interpret a chart to track the proportion of defectives per sample.

Sample	1	2	3	4	5	6	7	8	9	10
Defective Chips	3	2	6	2	1	3	5	7	9	8

4. A particular shipment consists of a large number of items and has 1% defectives.
  - a) Determine the probability of *accepting* the shipment if the sampling plan calls for a sample size of 15 and an acceptance criterion number of 0.
  - b) Repeat part (a) assuming the shipment contains 5% defects; 10% defects; 20% defects, 30% defects; 40% defects.
  - c) Plot the Operating Characteristics (OC) curve. Mimic Figure 14-13 on page 658. Clearly label both axes.
  
5. A particular shipment consists of a large number of items and has 1% defectives.
  - a) Determine the probability of *accepting* the shipment if the sampling plan calls for a sample size of 15 and an acceptance number of 1.
  - b) Repeat part (a) assuming the shipment contains 5% defects; 10% defects; 20% defects, 30% defects; 40% defects.
  - c) Plot this OC curve on the *same* graph as problem 5c.
  - d) For the  $n=15$  and  $c=1$  sampling plan, assume that  $p_0 = .05$  and  $p_1 = .10$ . Use your OC curve to estimate both the Producer's Risk and Consumer's Risk.
  
6. Company X buys product Y in lots of 1,000 each from Company Z. The negotiated purchasing contract specifies that  $p_0$  and  $p_1$  will both be set at .05 and that the Producer's Risk should be limited to 2% or less. Assume a sample size of 25 will be used.
  - a) Interpret both  $p_0$  and  $p_1$ .
  - b) Interpret the Producer's risk.
  - c) Determine the acceptance number.
  - d) Succinctly summarize the acceptance sampling plan.