STATS 528: Exam 1

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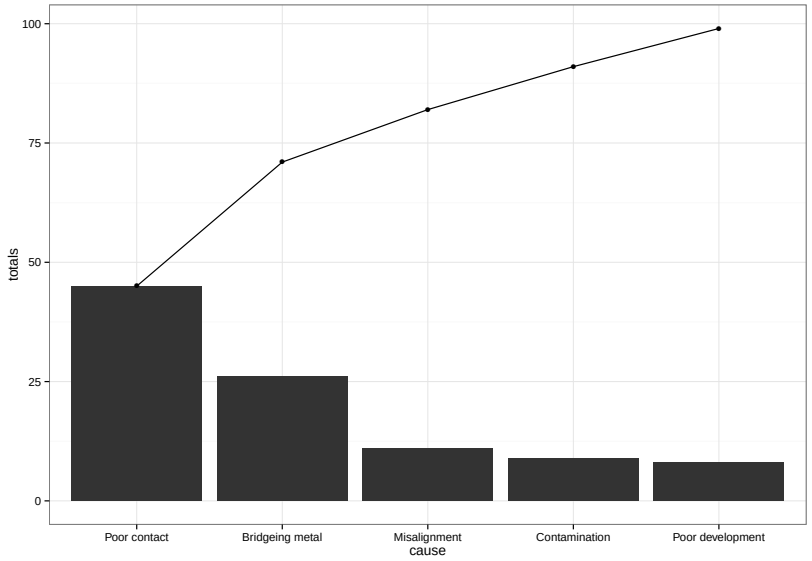
1. (a) $X \sim \text{Bin}(500, 0.002)$

   (b)
   $$(P(X < 2))^{10} = (0.736)^{10} = 0.736^{10}$$

2. (a) $X \sim \text{HyGeom}(N = 1000, K = 5, n = 25)$

   (b)
   $$P(X \leq 1) = P(X = 0) + P(X = 1) = \frac{\binom{5}{0}\binom{1000-5}{25-0}}{\binom{1000}{25}} + \frac{\binom{5}{1}\binom{1000-5}{25-1}}{\binom{1000}{25}} = 0.994$$

3. Pareto chart for a check sheet:



4. (a)
   $$C_P = \frac{USL - LSL}{6\sigma} = \frac{26.2 - 23.4}{6 \cdot .5} = 0.933$$

   (b) Based on Table 8.3 in the text, we have that this process capability ratio does not meet the minimum recommended level of 1.33. While the process may be capable of meeting specifications, it doesn't seem likely that it would happen as consistently as desired.

   (c) The proportion of units currently produces not meeting specifications is given by
   $$\begin{aligned} P(x < 23.4) + P(x > 26.2) &= P\Big(z < \frac{23.4 - 25}{1.25}\Big) + P\Big(z > \frac{26.2 - 25}{1.25}\Big) \\ &= \Phi(-1.28) + (1 - \Phi(0.96)) \\ &= 0.269 \end{aligned}$$

   (d) One way to interpret the C_p value is as the percentage of the specification band being used by the process: $\frac{100}{C_p} = 107.143\%$, which is not just greater that 100%, but *much* larger. Thus it's pretty obvious that the process is not capable meeting specification.