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Assignment 01

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1. Design with 2 factors, 2 levels and 3 factors, 2 levels:

Full Factorial	Half Factorial	Saturation	Total number of experiments
$2^2 = 4$	4	4	$1 + 2*(2-1) = 3$
$3^2 = 9$	9	9	$1 + 3*(2-1) = 4$

Since: Total no of experiments $= 1 + factors * (level - 1)$

2. We know:

$$Cp = \pm \frac{SL}{3\sigma}$$

Therefore,
$$SL = \pm Cp * 3\sigma$$

For Cp = 1.33 and Cp = 1

$$SL(Cp = 1.33) = \pm 1.33 * 3\sigma = \pm 4\sigma$$
$$SL(Cp = 1) = \pm 1 * 3\sigma = \pm 3\sigma$$

Using Standard Distribution Chart (which is symmetric, hence Z= - Z) to find the expected defect rate:

Z	f(Z)	One sided	Two-sided
-4 (or 4)	0.000032	32 ppm	64 ppm
-3 (or 3)	0.00135	1350 ppm	2700 ppm

3. Defect rate: 5 parts/1000 tested = 0.005 (for 2-sided)
   Therefore, defect rate for one-sided: **0.0025**
   From Standard Distribution Chart:

f(Z)	Z
0.0025	2.81

Therefore,
$$Cpk = Z/3$$

$$Cpk = \frac{2.81}{3} = \mathbf{0.9366}$$