

Experimental Design – One-at-a-time-experiments:

Crosswalk Table

Var	-1 (Least)	+1 (Greater)
WingLength	6.5 cm	9.5 cm
BodyLength	6.5 cm	9.5 cm
BodyWidth	4 cm	6 cm
PaperClip	n	y
Tape	n	y

Baseline (H1):

- WingLength: 9.5 cm → 1
- BodyLength: 9.5 cm → 1
- BodyWidth: 4 cm → -1
- PaperClip: n → -1
- Tape: n → -1

One Variable at a Time:

1. H2: Change WingLength → 6.5cm (keeping baseline)
2. H3: Change BodyLength → 6.5cm (keeping baseline)
3. H4: Change BodyWidth → 6cm (keeping baseline)
4. H5: Change PaperClip → y (keeping baseline)
5. H6: Change Tape → y (keeping baseline)

Create CSV (**Attachment**)

Matrix/Dataframe Design:

A matrix: 6 × 6 of type dbl

Intercept	WingLength	BodyLength	BodyWidth	PaperClip	Tape
1	1	1	1	-1	-1
1	-1	1	1	-1	-1
1	1	-1	1	-1	-1
1	1	1	-1	-1	-1
1	1	1	1	1	-1
1	1	1	1	-1	1

```
[1] "----- Reduced Row Echelon Form -----"
      Intercept WingLength BodyLength BodyWidth PaperClip Tape
[1,]         1         0         0         0         0      0
[2,]         0         1         0         0         0      0
[3,]         0         0         1         0         0      0
[4,]         0         0         0         1         0      0
[5,]         0         0         0         0         1      0
[6,]         0         0         0         0         0      1
[1] "Rank of Matrix: 6"
```

Comment on whether your design is full rank:

My Design is full rank because all the columns are linearly independent, and rank of the matrix is equal to 6 which is also the same number of columns and confirms that the matrix spans the full column space.

Correlation and Visualization:

	Intercept	WingLength	BodyLength	BodyWidth	PaperClip	Tape
Intercept	1	NA	NA	NA	NA	NA
WingLength	NA	1.0	-0.2	-0.2	0.2	0.2
BodyLength	NA	-0.2	1.0	-0.2	0.2	0.2
BodyWidth	NA	-0.2	-0.2	1.0	0.2	0.2
PaperClip	NA	0.2	0.2	0.2	1.0	-0.2
Tape	NA	0.2	0.2	0.2	-0.2	1.0

