Reason To use:

- If a nusiance variable cannot be controlled, then we need to block it. In this case, we will use blocking design.
  If each treatment in blocking design contains at least one unit, then we say we have a complete blocking design.
  If we have setup blocking policy and then randomly assign experiment unit to each treatments, then we have randomize complete blocking design.

Model:

- The model will similiar to factorial design with no interaction term because blocking is not real factor or interest.

  → $y_{ijk} = \mu_T + \alpha_j + B_k + \varepsilon_{ijk}$; $\varepsilon_{ijk} \overset{iid}{\sim} N(0, \sigma^2)$

  Note: RCB is two-ways ANOVA without interaction.

  y_{ijk} := represents the ith response value of jth level of factor A and kth group of blocking.

  μ_T := represents the grand mean.

  α_j := represents the main effect of jth level of factor A.

  B_k := represents the blocking effect of kth level of blocking.

  ε_{ijk} := represents the random error.

Analysis:

- If we find out the model of RCB have related small MSE_{RCB} than MSE without RCB, then we want to choose RCB model.

  This is not sure. Need to ask.

  ↳ $RE(MSE_{CR}, MSE_{RCB}) = \frac{MSE_{CR}}{MSE_{RCB}}$

  There is a formula to estimate this without using MSE_{CR}.

  ↳ Interpretation: RCB design is more efficency than CR design in reducing the experimental error.

Question:

When do we choose RCB?

ANOVA :

	df	SS	MS	Fobs
Treatment	$a-1$	SSA	$\frac{SSA}{a-1}$	$\frac{MSA}{MSE}$
Block	$B-1$	SSB	$\frac{SSB}{B-1}$	
Error	$N-a-b+1$	SSE	$\frac{SSE}{N-a-b+1}$	
Total	$N-1$	SST	$\frac{SST}{N-1}$	

$SSA = \sum_{k=1}^{b}\sum_{j=1}^{a} n_{jk} (\overline{y_{Aj}} - \overline{y_T})^2$

$\overline{y_{Aj}}$:= represents the jth row mean.

$\overline{y_{Bk}}$:= represents the kth column mean.

$SSB = \sum_{j=1}^{a}\sum_{k=1}^{b} n_{jk} (\overline{y_{Bk}} - \overline{y_T})^2$

$SST = \sum_{j=1}^{a}\sum_{k=1}^{b}\sum_{i=1}^{n_{jk}} (y_{ijk} - \overline{y_T})^2$

$SSE = SST - SSA - SSB$