Classical one-way ANOVA formulation:

$$\boxed{y_{ij} = \mu_i + \boxed{\varepsilon_{ij}}}$$

- μ_i = population means for group $i = 1, 2, \ldots, g$
- $\varepsilon_{ij} \sim N(0, \sigma^2)$

Residuals (observed ε_{ij})

$$e_{ij} = y_{ij} - \hat{\mu}_i$$

Rewriting the ANOVA model

say we have $g = 3$ $\boxed{y_{ij} = \mu_i + \varepsilon_{ij}}$

$$y_i = \mu_1 x_{1i} + \mu_2 \boxed{x_2}_i + \mu_3 \boxed{x_3}_i + \varepsilon_i$$

x_1 $= 1$ if observation comes from group 1, 0 otherwise.

$$= \alpha + \beta x_2 + \gamma x_3 + \varepsilon$$

$\alpha = \mu_1$

$\beta = (\mu_2 - \mu_1)$ ← difference between group 1 and 2

$\gamma = (\mu_3 - \mu_1)$

$$\begin{array}{ccc} \underset{\sim}{1} & \underset{\sim}{x_2} & \underset{\sim}{x_3} \end{array}$$
$$\begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$$