$o = lm(y \sim a + b + a:b)$

$summary(o)$

Parameter	Estimate	SE	t	P-VALUE
μ	$\hat{\mu}$	$SE(\hat{\mu})$	$\hat{\mu}/SE(\hat{\mu})$	
a_6	$\hat{a}_6$	$SE(\hat{a}_6)$	$\hat{a}_6/SE(\hat{a}_6)$	
b_{30}	$\hat{b}_{30}$	$SE(\hat{b}_{30})$	$\hat{b}_{30}/SE(\hat{b}_{30})$	
$\gamma_{6,30}$	$\hat{\gamma}_{6,30}$	$SE(\hat{\gamma}_{6,30})$	$\hat{\gamma}_{6,30}/SE(\hat{\gamma}_{6,30})$	

Full Model For Treatment Means

Time \ Temp	20	30
3	μ	$\mu + b_{30}$
6	$\mu + a_6$	$\mu + a_6 + b_{30} + \gamma_{6,30}$

$\Longleftrightarrow$

μ_{11}	μ_{12}
μ_{21}	μ_{22}

Reduced Model For Test of $H_0: \mu = 0$

Time \ Temp	20	30
3	0	b_{30}
6	a_6	$a_6 + b_{30} + \gamma_{6,30}$

Equivalent To Testing

$H_0: \mu_{11} = 0$

Full Model For Treatment Means

Time \ Temp	20	30
3	μ	$\mu + b_{30}$
6	$\mu + a_6$	$\mu + a_6 + b_{30} + \gamma_{6,30}$

$\Longleftrightarrow$

μ_{11}	μ_{12}
μ_{21}	μ_{22}

Reduced Model For Test of $H_0: a_6 = 0$

Time \ Temp	20	30
3	μ	$\mu + b_{30}$
6	μ	$\mu + b_{30} + \gamma_{6,30}$

Equivalent To Testing

$\mu_{11} = \mu_{21}$

Full Model For Treatment Means

Time \ Temp	20	30
3	μ	$\mu + b_{30}$
6	$\mu + a_6$	$\mu + a_6 + b_{30} + \gamma_{6,30}$

$\Longleftrightarrow$

μ_{11}	μ_{12}
μ_{21}	μ_{22}

Reduced Model For Test of $H_0: b_{30} = 0$

Time \ Temp	20	30
3	μ	μ
6	$\mu + a_6$	$\mu + a_6 + \gamma_{6,30}$

Equivalent To Testing

$\mu_{11} = \mu_{12}$

Full Model For Treatment Means

Time \ Temp	20	30
3	μ	$\mu + b_{30}$
6	$\mu + a_6$	$\mu + a_6 + b_{30} + \gamma_{6,30}$

$\Longleftrightarrow$

μ_{11}	μ_{12}
μ_{21}	μ_{22}

Reduced Model For Test of $H_0: \gamma_{6,30} = 0$

Time \ Temp	20	30
3	μ	$\mu + b_{30}$
6	$\mu + a_6$	$\mu + a_6 + b_{30}$

Equivalent To Test For Interaction

$$\underset{\sim}{y} = X\underset{\sim}{\beta} + \underset{\sim}{\varepsilon}, \quad X = \left[\underset{\sim}{x}_1, \underset{\sim}{x}_2, \ldots, \underset{\sim}{x}_r\right], \quad \underset{\sim}{x}_1 = \underset{\sim}{1}$$

$$\underset{\sim}{y} = \beta_1 \underset{\sim}{1} + \beta_2 \underset{\sim}{x}_2 + \cdots + \beta_r \underset{\sim}{x}_r + \underset{\sim}{\varepsilon}$$

TYPE III ANOVA TEST FOR $\underset{\sim}{x}_j$

COMPARES FULL MODEL TO THE REDUCED MODEL

$$\underset{\sim}{y} = \beta_1 \underset{\sim}{1} + \beta_2 \underset{\sim}{x}_2 + \cdots + \beta_{j-1} \underset{\sim}{x}_{j-1} + \beta_{j+1} \underset{\sim}{x}_{j+1} + \cdots + \beta_r \underset{\sim}{x}_r + \underset{\sim}{\varepsilon}$$

SAME AS TEST OF $H_0: \beta_j = 0$ THAT IS

PRODUCED BY $t_j = \hat{\beta}_j / SE(\hat{\beta}_j)$.

$$t_j^2 = \left[\frac{\hat{\beta}_j}{SE(\hat{\beta}_j)}\right]^2 = \frac{SS(\underset{\sim}{x}_j \mid 1, \underset{\sim}{x}_2, \ldots \underset{\sim}{x}_{j-1}, \underset{\sim}{x}_{j+1}, \ldots, \underset{\sim}{x}_r)/1}{SSE/(n-r)}$$