

# Homework week 9

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## Question 5.2

Source	DF	SS	MS	F	P
A	1	<u>0.0002</u>	0.0002	<u>0.00001008</u>	<u>0.998</u>
B	3	180.378	<u>60.126</u>	<u>3.029</u>	<u>0.0934</u>
Interaction	3	8.479	<u>2.826</u>	<u>0.1424</u>	0.932
Error	8	158.797	<u>19.85</u>		
Total	15	347.653			

The above table calculations were computed using calculation that can be seen in the Next pages.

## Calculations done

(2)

For B degree of freedom

$$\begin{aligned} &= DF(\text{total}) - DF(\text{Error}) - DF(\text{Interaction}) - DF(A) \\ &= 15 - 8 - 3 - 1 = 3 \end{aligned}$$

$$\begin{aligned} SS_A &= MSA \times DF(A) \\ &= 0.0002 \times 1 = 0.0002 \end{aligned}$$

$$MS_B = \frac{SS_B}{DF(B)} = \frac{180.378}{3} = 60.126$$

$$MS_{AB} = \frac{SS_{AB}}{DF(AB)} = \frac{8.479}{3} = 2.826$$

$$MSE = \frac{SSE}{DF[\text{Error}]} = \frac{158.797}{8} = 19.85$$

$$F(A) = \frac{MSA}{MSE} = \frac{0.0002}{19.85} = 0.00001008$$

$$F(B) = \frac{MS_B}{MSE} = \frac{60.126}{19.85} = 3.029$$

$$F(AB) = \frac{MS_{AB}}{MSE} = \frac{2.826}{19.85} = 0.1424 //$$

the p-value were generated using a calculator

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P-values of A

$$DF(\text{numerator}) = 1$$

$$DF(\text{denominator}) = 8$$

$$F\text{-value} = 0.00001008$$

the corresponding P-value is 0.99755

P-value for B

$$DF \text{ numerator} = 3$$

$$DF \text{ denominator} = 8$$

$$F\text{-value} = 3.029$$

the corresponding P-value is 0.09335

### Question B

$$\text{Levels of B} = DF(B) + 1 = 3 + 1 = 4$$

### Question C

the number of replicates that the experiment was performed ~~was~~ is

$$DF(\text{total}) = 15 = abn - 1$$

~~with 15 replicates~~

$$abn - 1 = 15$$

$$8n - 1 = 15$$

$$8n = 16 \quad \therefore \boxed{n = 2}$$

## Question d

model Equation

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + \varepsilon_{ijk} \text{ where } \varepsilon_{ijk} \sim N(0, \sigma^2)$$

The hypothesis

$$H_0: \alpha_i = 0 \text{ for } \forall i$$

$$H_a: \alpha_i \neq 0 \text{ for some } i$$

Also

$$H_0: \beta_j = 0 \text{ for } \forall j$$

$$H_a: \beta_j \neq 0 \text{ for some } j$$

$$\text{also, } H_0: \alpha\beta_{ij} = 0 \text{ for } \forall i, j$$

$$H_a: \alpha\beta_{ij} \neq 0 \text{ for some } i, j$$

So with  $\alpha = 0.05$  [Level of significance]

for factor A : p-value  $> \alpha$  : We don't Reject  $H_0$  and hence it is not significant

for factor B : p-value  $> \alpha$  : We don't Reject  $H_0$  and hence it is not significant

For Interaction term factor (AB) p-value  $> \alpha$ , we don't Reject  $H_0$  and hence not significant.