Homework 8.2 Question

[10 pts] In an experiment to compare the tensile strengths of 5 different types of copper wire, 4 samples of each type were used. We calculated SSTr = 10693.2 and SSE = 16413.

Homework 8.2

Solution: Let μ_i be the mean tensile strength of copper wire type i. Hypotheses:

$$H_0 : \mu_1 = \ldots = \mu_5 \text{ versus } H_1 : \text{ At least 2 of the } \mu_i\text{'s are different}$$

Rejection region: We would reject the null at $\alpha = 0.05$ if $F \geq F_{I-1,N-I,\alpha} = F_{4,15,0.05} = 3.06$. With MSTr and MSE, the F-test statistics is

$$F = 2673.3/1094.2 = 2.443155$$

Since F is not in the rejection region, we would not reject the null hypothesis at $\alpha = 0.05$. Thus p-value is greater than 0.05. We would conclude that it is plausible that the mean tensile strengths for all 5 types of copper wire are equal.

Homework 8.6

Solution	Temperature		Yield Stress (MPa)				
NaCl	25°C	138.40	130.89	94.646	96.653	116.90	88.215
NaCl	37°C	92.312	147.28	116.48	88.802	114.37	90.737
Na_2HPO_4	25°C	120.18	129.43	139.76	132.75	137.23	121.73
Na_2HPO_4	37°C	123.50	128.94	102.86	99.941	161.68	136.44

Homework 8.6 ANOVA Table

Source	df	SS	MS	F	p-value
Solution	1	1993.9	1993.9	5.1983	0.034
Temperature	1	78.634	78.634	0.20500	0.656
Interaction	1	5.9960	5.9960	0.015632	0.902
Error	20	7671.4	383.57	-	
Total	12	9750.0	-	-	

Homework 8.6 Answer

Is the additive model plausible? Provide the value of the test statistic and the p-value.

Solution: Yes. $F_{1,20} = 0.015632$ and p-value > 0.10.

Can the effect of solution (NaCl versus Na2HPO4) on yield stress be described by interpreting the main effects of solution? If so, interpret the main effects, including the appropriate test statistic and P-value. If not, explain why not.

Solution: Yes, since the additive model is plausible. The mean yield stress differs between NaCl and Na2HPO4 because $F_{1,20} = 5.1983$ and p-value < 0.05 (small enough).

Can the effect of temperature on yield stress be described by interpreting the main effects of temperature? If so, interpret the main effects, including the appropriate test statistic and P-value. If not, explain why not.

Solution: There is no evidence that the temperature affects yield stress because $F_{1,20} = 0.20500$ and p-value is large.

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