

SIE 330R Homework, Spring 2023

HW 4 (Chapter 3)

Homework must be readable! Do not just send in numbers or charts. You must explain the homework answers Preferred to receive homework in Word doc format with any excel or Minitab results pasted into word document. You may choose to use pdf which is also OK.

- Homework #5 3.5, 3.7, 3.9, 3.12

3.5. The mean square for error in the ANOVA provides an estimate of

- (a) The variance of the random error
- (b) The variance of an individual treatment average
- (c) The standard deviation of an individual observation
- (d) None of the above

3.7. A computer ANOVA output is shown below. Fill in the blanks. You may give bounds on the P -value.

One-way ANOVA					
Source	DF	SS	MS	F	P
Factor	?	?	246.93	?	?
Error	25	186.53	?		
Total	29	1174.24			

3.9. The tensile strength of Portland cement is being studied. Four different mixing techniques can be used economically. A completely randomized experiment was conducted and the following data were collected.

Mixing Technique	Tensile Strength (lb/in ²)			
1	3129	3000	2865	2890
2	3200	3300	2975	3150

3	2800	2900	2985	3050
4	2600	2700	2600	2765

- (a) Test the hypothesis that mixing techniques affect the strength of the cement. Use $\alpha = 0.05$.
- (b) Use the Tukey Pairwise Comparison method with $\alpha=0.05$ to make comparisons between pairs of means.
- (c) Construct a normal probability plot of the residuals. What conclusion would you draw about the validity of the normality assumption?
- (d) Plot the residuals versus the predicted tensile strength. Comment on the plot.

3.12. A product developer is investigating the tensile strength of a new synthetic fiber that will be used to make cloth for men's shirts. Strength is usually affected by the percentage of cotton used in the blend of materials for the fiber. The engineer conducts a completely randomized experiment with five levels of cotton content and replicated the experiment five times. The data are shown in the following table.

Cotton					
Weight Percentage			Observations		
15	7	7	15	11	9
20	12	17	12	18	18
25	14	19	19	18	18
30	19	25	22	19	23
35	7	10	11	15	11

- (a) Is there evidence to support the claim that cotton content affects the mean tensile strength? Use $\alpha = 0.05$.
- (b) Use the Tukey method to make comparisons between the pairs of means. What conclusions can you draw?
- (c) Analyze the residuals from this experiment and comment on model adequacy.