12. (7 pts) To compare **five** different formulations of fuel, **seven** different armored vehicles drove the identical route once with each fuel type. For each vehicle/fuel-type combination a fuel cost-of-operation value was determined. These numbers were analyzed with a **standard Two-Factor ANOVA** model yielding the table which is partially filled in below.

n = 35
35 - (6x4) = 11

$\frac{SS}{DF}$ MSx/MSE

Num DOFx / Den DOFE

Source	D.F.	Sums of Squares	Mean Squares	Fs	F α = .05
Armored Vehicle	6	82	13.667	3.417	0.0372
Fuel Types	4	48	**12**	3	0.0669
Exp. Error	11	44	**4**		
Total	34	**174**			

(total trials) - 1

A) Fill in the missing entries.

4 =

B) Making the normal assumptions, would you accept the hypothesis that there is no significant difference between the fuel cost of operations for each **vehicle type**, with α = .05? Why?

Reject due to p-value 0.0372 for vehicle type.

13. (10) A reduced regression model for predicting Sonar Detection Range included Water Depth (w), Sensor Modification (s), and Water Depth/SensorMod (ws) Interactions in the form:

$$\boxed{\hat{Y} = \beta_0 + \beta_1 w + \beta_2 s + \beta_{12} ws + e}$$

grand mean ½ factor effect for w β_2 = ½ factor effect for s

The 2^k factor settings, calculated factor effects and the grand mean of the data are below:

Factor	Settings
Water Depth (w)	200 ft (-)
	900 ft (+)
Sensor Modifications (s)	Mod I (-)
	Mod II (+)

Factor Effects:

Grand Mean of Data	41.0
Water Depth (w):	3.8
Sensor Modification (s):	- 5.2
Water/Sensor Interaction (ws)	- 2.4

1. (3) Determine the coefficients for the reduced Regression Equation:

$\beta_0 =$ 41 $\beta_1 =$ 1.9 $\beta_2 =$ -2.6 $\beta_{12} =$ -1.2

2. (5) Predict the result for Run (5) (200 ft and Mod II):

$\hat{y} = 41 + 1.9(-1) - 2.6 - 1.2(-1)$
$= 41 - 1.9 - 2.6 + 1.2 = 37.7$

3. (2) The result for Run (5) was 35.5, what was the residual for Run (5)?

35 - 37.7 = -2.7