Problem 1

Is gender independent of education level? A random sample of 395 people were surveyed and each person was asked to report the highest education level they obtained. The data that resulted from the survey is summarized in the following table:

Observed

	High School	**Bachelors**	**Masters**	**PHD**	**Total**
Female	60	54	46	41	**201**
Male	40	44	53	57	**194**
Total	**100**	**98**	**99**	**98**	**395**

Question: Are gender and education level dependent at 5% level of significance? In other words, given the data collected above, is there a relationship between the gender of an individual and the level of education that they have obtained?

Expected

	High School	**Bachelors**	**Masters**	**PHD**	**Total**
Female	50.886	49.868	50.377	49.868	**201**
Male	49.114	48.132	48.623	48.132	**194**
Total	**100**	**98**	**99**	**98**	**395**

E(F,HS) = (F) * (HS) / n
= (201 * 100) / 395
= 50.886

Based on the random sample of people the females who were expected to only having high school education was 50.886. Similarly, we calculate the expected value of the rest of the sample.

Step 1:

State null hypothesis and alternate hypothesis.

H0 : the education is independent upon the gender

H1 : the education is dependent upon the gender

Step 2:

The level of significance is 0.5 or 5%

Step 3:

Find the degree of freedom.

df = (total rows – 1) * (total columns – 1)
= (2 – 1) * (4 – 1)
= 1 * 3
= 3

Step 4:

Based on df and the level of significance find the Critical Value using the Chi Square Table.

CV = 7.81473

Step 5:

Find the Chi Square or the test statistics

X^2 = Sum[(O – E)^2 / E]

= 8.00607

Step 6:

Draw the conclusion

The critical value of X^2 with 3 degree of freedom is 7.81473. The Chi Square calculated is 8.00607, which is greater than 7.81473, there we reject the null hypothesis and conclude that education is dependent upon gender.

Problem 2

Using the following data, perform a oneway analysis of variance using α=.05. Write up the results in APA format.

	Group 1	**Group 2**	**Group 3**
	51	23	56
	45	43	76
	33	23	74
	45	43	87
	67	45	56
Mean (mu)	**48.2**	**35.4**	**69.8**
Grand Mean	**51.13333333**		

Step 1

State null hypothesis and alternate hypothesis.

H0: mu1 = mu2 = mu3

H1: At least 1 difference among the means

Level of Significance is α = 0.05

Step 2

df between groups = k – 1 = 3 – 1 = 2

df within groups = N – k = 15 – 3 = 12

df total = 14

Fcritical value according to the F Distribution at α, 0.05 is 3.89

Step 3

SS total = Sum [(x – Grand mean)^2]
= 3022.933

SS within groups = Sum[(x – mu)^2]
= 1860.8

SS means = sum[(mu – Grand mean)^2]
= 604.58

Step 4

Var means = SS means / df between
= 604.58 / 2
= 302.29
MS between = Var means * n
= 302.29 * 5
= 1511.467

MS within = SS within / df within
= 1860.8 / 12
= 155.067

Step 5

F = MS between / MS within
= 1511.467 / 155.067
= 9.747

F critical (2,12) = 3.89

F > F critical therefore we reject the null hypothesis

Effect size

n^2 = SS total / (SS total + SS within)
= 3022.933 / (3022.933 + 1860.8)
= 0.62

Step 6

Write up the results in APA format.

F(2,12) = 9.747, p < 0.05, n^2 = 0.62

Problem 3

Calculate F Test for given 10, 20, 30, 40, 50 and 5,10,15, 20, 25.

For 10, 20, 30, 40, 50:

	Values 1	Mean	Variance 1	Values 2	Mean	Variance 2
	10	30	100	5	15	25
	20	30	25	10	15	6.25
	30	30	0	15	15	0
	40	30	25	20	15	6.25
	50	30	100	25	15	25
Total Variance			**250**			**62.5**
df = k -1 = 5 -1			**4**			**4**

F test = Variance 1 / Variance 2

= 250 / 62.5

= 4

F critical @ level of significance α = 0.05 with df (4,4) = 6.39

F test < F critical, therefore the variance are equal.