Problem Statement 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:

High School Bachelors Masters Ph.d. 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?

Here's the table of expected counts:

High School  Bachelors Masters  Ph.d. 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 So, working this out, χ2=(60−50.886)2/50.886+⋯+(57−48.132)2/48.132=8.006χ2=(60−50.886)2/50.886+⋯+(57−48.1 32)2/48.132=8.006 65  The critical value of χ2 with 3 degree of freedom is 7.815. Since 8.006 > 7.815, therefore we reject the null hypothesis and conclude that the education level depends on gender at a 5% level of significance. Using Minitab We can enter the data into Minitab and request that the 'Chi-square test' be conducted for the above hypotheses. The Minitab output for this example is shown below: Chi-Square Test: High School, Bachelors, Masters, Ph.d. Expected counts are printed below observed counts Chi-Square contributions are printed below expected counts

High School Bachelors Masters Ph.d. Total

1 60 54 46 41 201 50.89 49.87 50.38 49.87 1.632 0.342 0.380 1.577

2 40 44 53 57 194 49.11 48.13 48.62 48.13 1.691 0.355 0.394 1.634

Total 100 98 99 98 395

Chi-Sq = 8.006, DF = 3, P-Value = 0.046

Using the following data, perform a oneway analysis of variance using α=.05. Write

up the results in APA format.

[Group1: 51, 45, 33, 45, 67]

[Group2: 23, 43, 23, 43, 45]

[Group3: 56, 76, 74, 87, 56]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Group 1 | Group 2 | Group 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 51 | 23 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 45 | 43 | 76 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 33 | 23 | 74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 45 | 43 | 87 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 67 | 45 | 56 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| means | 48.2 | 35.4 | 69.8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Calculate within group variances:** | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Group 1** |  |  |  |  |  | **Group 2** |  |  |  |  |  | **Group 3** |  |  |  |  |  |  |
|  | value | mean | deviations | sq deviations |  |  | value | mean | deviations | sq deviations |  |  | value | mean | deviations | sq deviations |  |  |
|  | 51 | 48.2 | 2.8 | 7.84 |  |  | 23 | 35.4 | -12.4 | 153.76 |  |  | 56 | 69.8 | -13.8 | 190.44 |  |  |
|  | 45 | 48.2 | -3.2 | 10.24 |  |  | 43 | 35.4 | 7.6 | 57.76 |  |  | 76 | 69.8 | 6.2 | 38.44 |  |  |
|  | 33 | 48.2 | -15.2 | 231.04 |  |  | 23 | 35.4 | -12.4 | 153.76 |  |  | 74 | 69.8 | 4.2 | 17.64 |  |  |
|  | 45 | 48.2 | -3.2 | 10.24 |  |  | 43 | 35.4 | 7.6 | 57.76 |  |  | 87 | 69.8 | 17.2 | 295.84 |  |  |
|  | 67 | 48.2 | 18.8 | 353.44 |  |  | 45 | 35.4 | 9.6 | 92.16 |  |  | 56 | 69.8 | -13.8 | 190.44 |  |  |
| **SS** |  |  |  | 612.8 |  | **SS** |  |  |  | 515.2 |  | **SS** |  |  |  | 732.8 |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mean Square (Error or within group) | | | | 155.07 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Degrees of Freedom (Error or within group) | | | | 12 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sum of Squares (Within Group) | | |  | 1860.8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Calculate F Test for given 10,20,30,40,50 and 5,10,15,20,25.  
For 10, 20,30,40,50:  
  
**Calculate Variance of first set**  
  
Total Inputs (N) =(10,20,30,40,50)  
Total Inputs (N)=5  
Mean (xm)= (x1+x1+x2...xn)/N  
Mean (xm)= 150/5  
Means(xm)= 30  
SD=sqrt(1/(N-1)\*((x1-xm)2+(x2-xm)2+..+(xn-xm)2))  
=sqrt(1/(5-1)((10-30)2+(20-30)2+(30-30)2+(40-30)2+(50-30)2))  
=sqrt(1/4((-20)2+(-10)2+(0)2+(10)2+(20)2))  
=sqrt(1/4((400)+(100)+(0)+(100)+(400)))  
=sqrt(250)  
=15.8114  
Variance=SD2  
Variance=15.81142  
Variance=250  
  
**Calculate Variance of second set**  
For 5, 10,15,20,25:  
Total Inputs(N) =(5,10,15,20,25)  
Total Inputs(N)=5  
Mean (xm)= (x1+x2+x3...xN)/N  
Mean (xm)= 75/5  
Means (xm)= 15  
SD=sqrt(1/(N-1)\*((x1-xm)2+(x2-xm)2+..+(xn-xm)2))  
=sqrt(1/(5-1)((5-15)2+(10-15)2+(15-15)2+(20-15)2+(25-15)2))  
=sqrt(1/4((-10)2+(-5)2+(0)2+(5)2+(10)2))  
=sqrt(1/4((100)+(25)+(0)+(25)+(100)))  
=sqrt(62.5)  
=7.9057  
Variance=SD2  
Variance=7.90572  
Variance=62.5  
  
**To calculate F Test**  
F Test = (variance of 10, 20,30,40,50) / (variance of 5, 10, 15, 20, 25)  
= 250/62.5  
= 4.  
  
The F Test value is 4.