



## AP<sup>®</sup> Statistics 2003 Sample Student Responses

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5. A random sample of 200 students was selected from a large college in the United States. Each selected student was asked to give his or her opinion about the following statement.

“The most important quality of a person who aspires to be the President of the United States is a knowledge of foreign affairs.”

Each response was recorded in one of five categories. The gender of each selected student was noted. The data are summarized in the table below.

	Response Category				
	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
Male	10	15	15	25	25
Female	20	25	25	25	15

Is there sufficient evidence to indicate that the response is dependent on gender? Provide statistical evidence to support your conclusion.

I.  $H_0$ : the response to the statement is independent of gender

$H_a$ : the response to the statement is dependent on gender

II.  $\chi^2$  test

$$\alpha = .05$$

Expected

13.5	18	18	22.5	18
16.5	22	22	27.5	22

all expected counts are greater than 5

$$\text{III. } \chi^2 = \sum \frac{(O - E)^2}{E}$$

$$\chi^2 = 8.923 \quad df = 4 \quad p = .063$$

IV. Since  $p$  is larger than .05 we will fail to reject the null hypothesis. It appears as though the responses to the statement are independent of gender.

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B

Each response was recorded in one of five categories. The gender of each selected student was noted. The data are summarized in the table below.

	Response Category				
	Strongly Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Strongly Agree
Male	10 13.5	15 18	15 18	25 22.5	25 18
Female	20 16.5	25 22	25 22	25 27.5	15 22

Is there sufficient evidence to indicate that the response is dependent on gender? Provide statistical evidence to support your conclusion.

$H_0$ : There is no relationship between the response and gender  
 $H_a$ : There is a relationship between the response and gender

$$\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

$$\chi^2 = \frac{(10-13.5)^2}{13.5} + \frac{(15-18)^2}{18} + \frac{(15-18)^2}{18} + \frac{(25-22.5)^2}{22.5} + \frac{(25-18)^2}{18} + \frac{(20-16.5)^2}{16.5} + \frac{(25-22)^2}{22} + \frac{(25-22)^2}{22} + \frac{(25-27.5)^2}{27.5} + \frac{(15-22)^2}{22}$$

$$\chi^2 = 8.92$$



Conclusions

- 6.3% of the time the observed values would occur by chance alone if there was no relationship between response and gender.
- Moderate evidence supporting the claim that there is a relationship between gender and response.

Assumptions

- Simple Random Sample from population of interest  
 Yes - it says the sample was random.
- All individual expected counts are  $\geq 5$   
 Yes - the smallest expected count was 11.35.

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