AP Statistics – Chapter 14 Practice Test Solutions

Multiple Choice

1. b 2. a 3. a 4. d 5. c 6. a 7. e 8. e 9. c 10. c

Free Response

1. Goodness of Fit Test – Equal Proportions

a) Since there are 5 groups, the probability is 1/5 = 0.2

b) Since there are 500 numbers generated, expected counts are 500(0.2) = 100

c) The formula for χ^2 statistic is $\chi^2 = \sum \frac{(\text{obs} - \text{exp})^2}{\text{exp}}$. For this data, the calculation is

$$\frac{(113-100)^2}{100} + \frac{(95-100)^2}{100} + \frac{(108-100)^2}{100} + \frac{(99-100)^2}{100} + \frac{(85-100)^2}{100} = 4.84$$

There are 4 degrees of freedom here, so the p-value is .3041.

Conclusion: Since the p-value is high (p>.05), we fail to reject the null hypothesis. So we can conclude that the random numbers are uniformly distributed among the 5 groups.

2. Goodness of Fit Test – Unequal Proportions

a) Ho: Data matches the given ratios Ha: Data does not match the given ratios

b) All expected counts are greater than 5. We also require that data is randomly selected.

c) For the ratios 9:3:3:1, we have 16 total parts (9+3+3+1=16). So we divide the total 1611 by 16 which equals 100.69. So using the ratios given, a 9:3:3: the expected counts would be 9(100.69), 3(100.69), 3(100.69) and 1(100.69) = 906.19, 302.06, 302.06 and 100.69.

d) There are 3 degrees of freedom here, so χ^2 = 1.468 and the p-value is .6900.

e) Since the p-value is high (p>.05), we fail to reject the null hypothesis. So we can conclude that the numbers in our sample are consistent with genetic law (matches the expected ratios).

3. Test of Association Between Categorical Variables – Two-Way Table

a) Only one expected count is less than 5. The count for (*Men*, *Economics*) = 4.59. Since this is only 1 out of 8 counts (12.5%) we are OK to use the chi-square test.

b) Expected counts are found by $\frac{(row\ tot)(col\ tot)}{table\ tot} = \frac{(11)(225)}{386} = 6.412$.

c) There are 3 degrees of freedom here, so χ^2 = 10.827 and the p-value is .0127

d) Since the p-value is less than .05, we reject the null hypothesis. So we can conclude that there is a relationship between gender and their choice of major. Stated another way, men and women do not choose majors in the same way.