

**AP<sup>®</sup> STATISTICS**  
**2014 SCORING GUIDELINES**

**Question 1**

**Intent of Question**

The primary goals of this question were to assess a student's ability to (1) calculate conditional proportions from a two-way table; (2) comment on association between two categorical variables as displayed in a graph; and (3) draw an appropriate conclusion from the  $p$ -value of a chi-square test.

**Solution**

**Part (a):**

The proportion of on campus residents who participate in at least one extracurricular activity is

$$\frac{17 + 7}{33} = \frac{24}{33} \approx 0.727. \text{ The proportion of off campus residents who participate in at least one}$$

$$\text{extracurricular activity is } \frac{25 + 12}{67} = \frac{37}{67} \approx 0.552.$$

**Part (b):**

The graph reveals that on campus residents in this sample are more likely to participate in extra-curricular activities than off campus residents. The proportions who participate in two or more extra-curricular activities are similar between the two groups but slightly greater for on campus residents (on campus: 0.212, off campus: 0.179). On campus residents have a greater proportion who participate in one activity (on campus: 0.515, off campus: 0.373) and a smaller proportion who participate in no extracurricular activities (on campus: 0.273, off campus: 0.448) than off campus residents.

**Part (c):**

The  $p$ -value of 0.23 is greater than conventional significance levels such as  $\alpha = 0.10$  or  $\alpha = 0.05$  or  $\alpha = 0.01$ . Therefore, the  $p$ -value indicates that the sample data do not provide strong enough evidence to conclude that participation in extracurricular activities differs between on and off campus residents in the population of all students at the university.

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**Question 1 (continued)**

**Scoring**

Parts (a), (b), and (c) were scored as essentially correct (E), partially correct (P), or incorrect (I).

**Part (a)** is scored as follows:

Essentially correct (E) if the response correctly performs *both* calculations with work shown.

Partially correct (P) if the response correctly performs one of the two calculations with work shown;

*OR*

if the response provides both correct answers with no work shown;

*OR*

if the response calculates the proportion of students involved in exactly one extracurricular activity rather than the proportion of students involved in at least one extracurricular activity for both groups, with work shown.

Incorrect (I) if the response does not meet the criteria for E or P.

*Note:* Answers reported as fractions rather than decimals are acceptable.

**Part (b)** is scored as follows:

Essentially correct (E) if the response correctly compares proportions between the two groups of students for at least two of the three categories.

Partially correct (P) if the response correctly lists proportions for at least two categories for the two groups but does not make an explicit comparison between the two groups;

*OR*

if the response correctly compares the relative values of the proportions between the two groups of students for only one of the three categories.

Incorrect (I) if the response does not meet the criteria for E or P.

*Notes:*

- A response without any reference to percentages or proportions is scored as at most P, (for example, a response that attempts to compare counts).
- A response that treats bar graphs as distributions of a quantitative variable lowers the score one level (that is, from E to P, or from P to I) in part (b).

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### Question 1 (continued)

**Part (c)** is scored as follows:

Essentially correct (E) if the response states a correct conclusion in the context of the study *AND* provides correct justification/decision of that conclusion based on linkage to the  $p$ -value.

Partially correct (P) if the response provides no conclusion in context but does provide correct justification/decision based on linkage to the  $p$ -value;

*OR*

if the response provides a correct conclusion in context but with incorrect or missing justification/decision based on linkage to the  $p$ -value;

*OR*

if the response provides the conclusion in context and correct justification/decision based on linkage to the  $p$ -value but states a conclusion equivalent to accepting the null hypothesis.

Incorrect (I) if the response does not meet the criteria for E or P.

*Notes:*

- Justification based on the  $p$ -value can be given by stating a significance level and noting that the  $p$ -value is larger than the significance level *OR* by simply stating that the  $p$ -value is large.
- A conclusion that is equivalent to “accept the null hypothesis”, either as a stated decision or as a conclusion in context, cannot be scored as E. Such a response is scored as P if it includes both content and correct justification based on linkage to  $p$ -value. If such a response lacks either context or linkage, it is scored as I.

#### 4 Complete Response

All three parts essentially correct

#### 3 Substantial Response

Two parts essentially correct and one part partially correct

#### 2 Developing Response

Two parts essentially correct and one part incorrect

*OR*

One part essentially correct and one or two parts partially correct

*OR*

Three parts partially correct

#### 1 Minimal Response

One part essentially correct and two parts incorrect

*OR*

Two parts partially correct and one part incorrect