

AP Statistics AP Exam Review Homework #6

Question 1 is a regular AP question---12 minutes to complete while #2 is a #6 --type question ---25 minutes to complete)

1. An administrator at a large university is interested in determining whether the residential status of a student is associated with level of participation in extracurricular activities. Residential status is categorized as on campus for students living in university housing and off campus otherwise. A simple random sample of 100 students in the university was taken, and each student was asked the following two questions.

- Are you an on campus student or an off campus student?
- In how many extracurricular activities do you participate?

The responses of the 100 students are summarized in the frequency table shown.

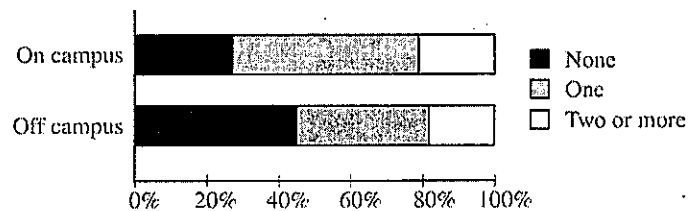
| Level of Participation in Extracurricular Activities | On Campus | Off campus | Total |
|--|-----------|------------|-------|
| No activities | 9 | 30 | 39 |
| One activity | 17 | 25 | 42 |
| Two or more activities | 7 | 12 | 19 |
| Total | 33 | 67 | 100 |

(a) Calculate the proportion of on campus students in the sample who participate in at least one extracurricular activity **and** the proportion of off campus students in the sample who participate in at least one extracurricular activity.

On campus proportion:

Off campus proportion:

The responses of the 100 students are summarized in the segmented bar graph shown.



(b) Write a few sentences summarizing what the graph reveals about the association between residential status and level of participation in extracurricular activities among the 100 students in the sample.

(c) After verifying that the conditions for inference were satisfied, the administrator performed a chi-square test of the following hypotheses. H_0 : There is no association between residential status and level of participation in extracurricular activities among the students at the university. H_a : There is an association between residential status and level of participation in extracurricular activities among the students at the university. The test resulted in a p-value of 0.23. Based on the p-value, what conclusion should the administrator make?

2. Every year, each student in a nationally representative sample is given tests in various subjects. Recently, a random sample of 9,600 twelfth-grade students from the United States were administered a multiple-choice United States history exam. One of the multiple-choice questions is below. (The correct answer is C.)

In 1935 and 1936 the Supreme Court declared that important parts of the New Deal were unconstitutional. President Roosevelt responded by threatening to

(A) impeach several Supreme Court justices
 (B) eliminate the Supreme Court
 (C) appoint additional Supreme Court justices who shared his views
 (D) override the Supreme Court's decisions by gaining three-fourths majorities in both houses of Congress

Of the 9,600 students, 28 percent answered the multiple-choice question correctly.

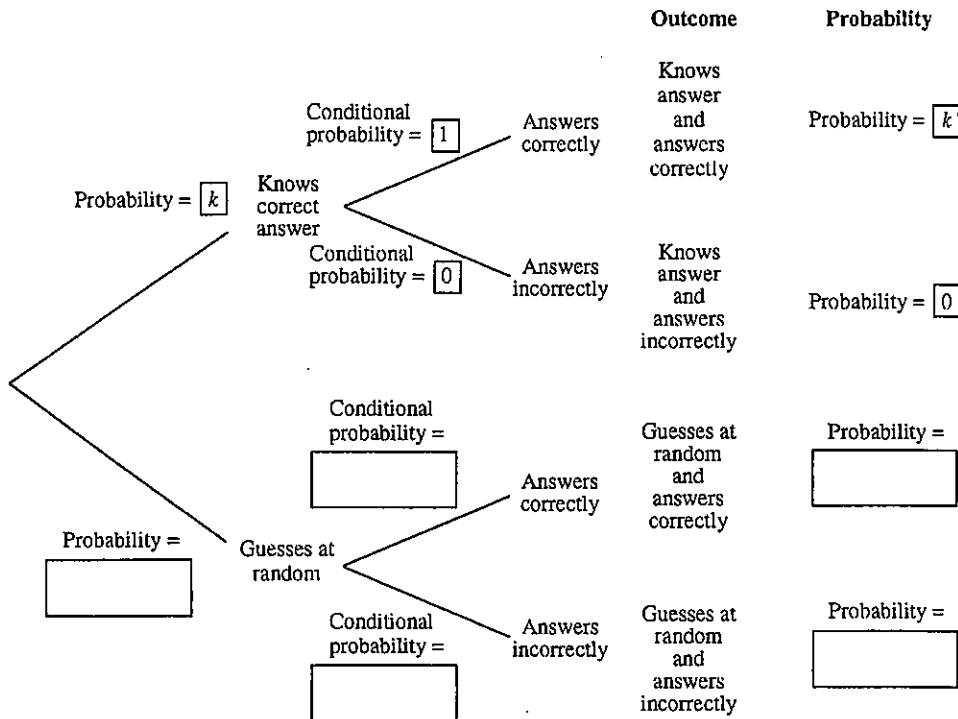
- (a) Let p be the proportion of all United States twelfth-grade students who would answer the question correctly. Construct and interpret a 99 percent confidence interval for p .

Assume that students who actually know the correct answer have a 100 percent chance of answering the question correctly, and students who do not know the correct answer to the question guess completely at random from among the four options.

Let k represent the proportion of all United States twelfth-grade students who actually know the correct answer to the question.

- (b) A tree diagram of the possible outcomes for a randomly selected twelfth-grade student is provided below. Write the correct probability in each of the five empty boxes. Some of the probabilities may be expressions in terms of k .

TREE DIAGRAM OF OUTCOMES FOR A RANDOMLY SELECTED TWELFTH-GRADE STUDENT



- (c) Based on the completed tree diagram, express the probability, in terms of k , that a randomly selected twelfth-grade student would correctly answer the history question.
- (d) Using your interval from part (a) and your answer to part (c), calculate and interpret a 99 percent confidence interval for k , the proportion of all United States twelfth-grade students who actually know the answer to the history question. You may assume that the conditions for inference for the confidence interval have been checked and verified.