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3. A humane society wanted to estimate with 95 percent confidence the proportion of households in its county that own at least one dog.

(a) Interpret the 95 percent confidence level in this context.

The humane society selected a random sample of households in its county and used the sample to estimate the proportion of all households that own at least one dog. The conditions for calculating a 95 percent confidence interval for the proportion of households in this county that own at least one dog were checked and verified, and the resulting confidence interval was  $0.417 \pm 0.119$ .

- (b) A national pet products association claimed that 39 percent of all American households owned at least one dog. Does the humane society's interval estimate provide evidence that the proportion of dog owners in its county is different from the claimed national proportion? Explain.
- (c) How many households were selected in the humane society's sample? Show how you obtained your answer.

**AP<sup>®</sup> STATISTICS**  
**2010 SCORING GUIDELINES**

**Question 3**

**Intent of Question**

The primary goals of this question were to assess students' ability to (1) interpret the meaning of a confidence level; (2) use a confidence interval to test the plausibility of a claim about the value of a population parameter; (3) perform a sample size calculation related to a confidence interval.

**Solution**

**Part (a):**

The 95 percent confidence level means that if one were to repeatedly take random samples of the same size from the population and construct a 95 percent confidence interval from each sample, then in the long run 95 percent of those intervals would succeed in capturing the actual value of the population proportion of households in the county that own at least one dog.

**Part (b):**

No. The 95 percent confidence interval  $0.417 \pm 0.119$  is the interval  $(0.298, 0.536)$ . This interval includes the value 0.39 as a plausible value for the population proportion of households in the county that own at least one dog. Therefore, the confidence interval does not provide evidence that the proportion of dog owners in this county is different from the claimed national proportion.

**Part (c):**

The sample proportion is 0.417, and the margin of error is 0.119. Determining the sample size requires solving the equation  $0.119 = 1.96 \times \sqrt{\frac{0.417 \times (1 - 0.417)}{n}}$  for  $n$ .

Thus,  $n = \frac{1.96^2 \times 0.417 \times (1 - 0.417)}{0.119^2} \approx 65.95$ , so the humane society must have selected 66 households for its sample.