



## AP<sup>®</sup> Statistics 2002 Sample Student Responses Form B

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4. Each person in a random sample of 1,026 adults in the United States was asked the following question.

“Based on what you know about the Social Security system today, what would you like Congress and the President to do during this next year?”

The response choices and the percentages selecting them are shown below.

Completely overhaul the system	19%
Make some major changes	39%
Make some minor adjustments	30%
Leave the system the way it is now	11%
No opinion	1%

- (a) Find a 95% confidence interval for the proportion of all United States adults who would respond “Make some major changes” to the question. Give an interpretation of the confidence interval and give an interpretation of the confidence level.

Confidence interval: ~~X~~

$$CI = p \pm z \cdot \sqrt{\frac{p(1-p)}{n}}$$

$$p = 0.39$$

standard deviation =  $\sqrt{\frac{p(1-p)}{n}}$

$$\sigma = \sqrt{\frac{0.39(1-0.39)}{1026}}$$

$$\sigma = 0.035$$

Z for 95% confidence level = 1.96

$$CI = 0.39 \pm 1.96 \times 0.035$$

$$CI = 0.39 \pm 0.0294$$

So 95% confidence interval would be (36.06%; 43.94%)

The confidence interval means that we expect the ~~mean~~ proportion of the population to be in this interval for the sample.

The confidence level means that if we make 100 random samples like it was above, 95 of them will include the ~~prop.~~ real proportion of the population and 5 will not. (The explanation for the confidence level = 95%)

If you need more room for your response to part (a), use the space below.

- (b) An advocate for leaving the system as it is now commented, "Based on this poll, only 39% of adults in the sample responded that they want some major changes made to the system, while 41% responded that they want only minor changes or no changes at all. Therefore, we should not change the system." Explain why this statement, while technically correct, is misleading.

It is misleading because the statement ignored the 59% of people who are ~~ag~~ totally against the system as it is now. So 58% of people wants major changes in the system while only 43% will agree with no changes in the system. The 58% of adults are against the system as it is now so the statement is misleading.

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proper procedure is to do a 1-sample Z test for proportions:

assumptions	justification
1) data is from a random sample of adult population	question // says "random sample ... adults"
2) $np \geq 10$ & $n(1-p) \geq 10$	$(.39)(1026) = 400$ $(.61)(1026) = 625$
3) population is at least 10 times as large as sample	reasonable that pop. adults $> 10260$

$$\hat{p} = .39, \quad \hat{p} \pm Z_c \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.39 \pm 1.96 \sqrt{\frac{(.39)(.61)}{1026}}$$

$$= .39 \pm .058$$

Based on sample, we can be 95% confident that proportion of adults that want the Congress & Pres to make major changes <sup>to the social security</sup> is between 33 and 44.8%.

The procedure used for this confidence interval would contain true population proportion 95% of time.

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In order to evaluate statement it is necessary to include where the data were from (a sample of 1026 adults) and that the sample has some error associated with it.

The major reason why this is misleading is because out of the 41%, 30% said to make minor adjustments. By grouping both responses into 1, the person is masking the true data which would not lead to the conclusion that the system shouldn't

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be changed.