Week 2 Quiz 8/8 分 (100%)

测验, 8 个问题



# 恭喜!您通过了!

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10

A study suggests that the average college student spends 2 hours per week communicating with others online. You believe that this is an underestimate and decide to collect your own sample for a hypothesis test. You randomly sample 60 students from your dorm and find that on average they spent 3.5 hours a week communicating with others online. Which of the following is the correct set of hypotheses for this scenario?

 $H_A: \mu < 2$ 

 $H_A: \bar{x} < 2$ 

( )  $H_0: \bar{x} = 2$ 

 $H_A: \bar{x} > 2$ 

( )  $H_0: \mu = 3.5$ 

 $H_A: \mu < 3.5$ 

 $H_0: \mu = 2$ 

 $H_A: \mu > 2$ 



This question refers to the following learning objective(s):

- Always construct hypotheses about population parameters (e.g. population mean,  $\mu$ ) and not the sample statistics (e.g. sample mean,  $\bar{x}$ ). Note that the population parameter is unknown while the sample statistic is measured using the observed data and hence there is no point in hypothesizing about it.
- Define the null value as the value the parameter is set to equal in the null hypothesis.
- Note that the alternative hypothesis might be one-sided (μ < or > the null value) or two-sided (μ ≠ the null value), and the choice depends on the research question.

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2。

Your friend likes to show off to his coworkers using statistical terminology, but he makes errors so much that you often have to correct him. He just completed the following hypothesis test:

$$H_0$$
:  $\mu = 100$ ;  $H_A$ :  $\mu \neq 100$ 

$$x = 105$$
,  $s = 10$ ,  $n = 40$ 

p-value = 0.0016

He claims the definition of this p-value is

"the probability of obtaining a sample mean of 105 from a random sample of n = 40 when the true population mean is assumed to be 100."

Which of the following is true? (You may assume his calculations are correct, only focus on his interpretation.)

- Your friend is wrong, the sample size is irrelevant.
- Your friend is wrong, the statement should be revised as "the probability of obtaining a sample mean of 105 from a random sample of n = 40 when the true population mean is assumed to be different than 105."
- Your friend is wrong, the statement should be revised as "the probability of obtaining a sample mean of 105 or more extreme from a random sample of n = 40 when the true population mean is assumed to be 100."



正确

This question refers to the following learning objective(s): Define a p-value as the conditional probability of obtaining a sample statistic at least as extreme as the one observed given that the null hypothesis is true.

p-value = P(observed or more extreme sample statistic |  $H_0$  true)



1/1分

3。

A researcher found a 2006 - 2010 survey showing that the average age of  $Week\ 2\ Quiz_{women\ at\ first\ marriage\ is\ 23.44.\ Suppose\ a\ researcher\ believes\ that\ this$ value may have increased more recently, but as a good scientist he also 测验, 8 个问题 wants to consider the possibility that the average age may have decreased.

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The researcher has set up his hypothesis test; which of the following states the appropriate  $H_A$  correctly?

- $H_A: \mu < 23.44$  years old.
- $H_A: \mu > 23.44$  years old.
- $H_A: \mu = 23.44 \, \text{years old.}$
- $H_A: \mu \neq 23.44$  years old.

#### 正确

This question refers to the following learning objective(s): Note that the alternative hypothesis might be one-sided ( $\mu$  < or > the null value) or two-sided ( $\mu \neq$  the null value), and the choice depends on the research question.

Because the researcher is interested in both an increase or a decrease,  $H_A$  should be two-sided.



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A Type 1 error occurs when the null hypothesis is

- not rejected when it is true
- not rejected when it is false
- rejected when it is true

### 正确

This question refers to the following learning objective(s): Note that the conclusion of a hypothesis test might be erroneous regardless of the decision we make.

- Define a Type 1 error as rejecting the null hypothesis when the null hypothesis is actually true.
- Define a Type 2 error as failing to reject the null hypothesis when the alternative hypothesis is actually true.

( )	rejected	when	it is	false
	,			

# Week 2 Quiz

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5<sub>0</sub>

A statistician is studying blood pressure levels of Italians in the age range 75-80. The following is some information about her study:

- 1. The data were collected by responses to a survey conducted by email, and no measures were taken to get information from those who did not respond to the initial survey email.
- 2. The sample observations only make up about 4% of the population.
- 3. The sample size is 2,047.
- 4. The distribution of sample observations is skewed the skew is easy to see, although not very extreme.

The researcher is ready to use the Central Limit Theorem (CLT) in the main part of her analysis. Which aspect of the her study is most likely to prevent her from using the CLT?



(I), because the sample may not be random and hence observations may not be independent.



正确

The correct answer is that the data arose as a result of an email survey. This data collection would likely result in a sample which is not a simple random sample of Italians aged 75-80, which would violate the independence of observations condition necessary for the CLT.

(II), because she only has data from a small proportion of the whole population.
(III), because the sample size is too small compared to all Italians in the age range 75-80.
(IV), because there is some skew in the sample distribution.



1/1分

6.

SAT scores are distributed with a mean of 1,500 and a standard deviation of 300. You are interested in estimating the average SAT score of first year students at your college. If you would like to limit the margin of error of your 98% confidence interval to 40 points, at least how many students should you sample?

131

# Week 2 Quiz

216

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217

306

#### 正确

This question refers to the following learning objective(s): Calculate the required sample size to obtain a given margin of error at a given confidence level by working backwards from the given margin of error.

$$ME = z^* \frac{s}{\sqrt{n}} \to 40 = 2.33 \frac{300}{\sqrt{n}} \to n = \frac{2.33^2 \times 300^2}{40^2} \to n = 305.3756 \to 0$$

*n* should be at least 306, since rounding down would result in a slightly larger margin of error than we desire.



1/1分

7。

The significance level in hypothesis testing is the probability of



rejecting a true null hypothesis

#### 正确

This question refers to the following learning objective(s): Note that the probability of making a Type 1 error is equivalent to the significance level when the null hypothesis is true, and choose a significance level depending on the risks associated with Type 1 and Type 2 errors.

- Use a smaller  $\alpha$  if Type 1 error is relatively riskier.
- Use a larger α if Type 2 error is relatively riskier.

Note that the probability of making a Type 1 error is equivalent to the significance level when the null hypothesis is true.

(	rejecting a	null hypot	thesis

failing to reject a true null hypothesis

rejecting an alternative hypothesis

failing to reject a false null hypothesis

Week 2 Quiz 1/1分

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8.

The nutrition label on a bag of potato chips says that a one ounce (28 gram) serving of potato chips has 130 calories and contains ten grams of fat, with three grams of saturated fat. A random sample of 35 bags yielded a sample mean of 134 calories with a standard deviation of 17 calories. We are evaluating whether these data provide convincing evidence that the nutrition label does not provide an accurate measure of calories in the bags of potato chips at the 10% significance level. Which of the following is correct?

- The p-value is approximately 8%, which means we should reject the null hypothesis and determine that these data provide convincing evidence the nutrition label does not provide an accurate measure of calories in the bags of potato chips.
- The p-value is approximately 16%, which means we should reject the null hypothesis and determine that these data provide convincing evidence the nutrition label does not provide an accurate measure of calories in the bags of potato chips.
- The p-value is approximately 8%, which means we should fail to reject the null hypothesis and determine that these data do not provide convincing evidence the nutrition label does not provide an accurate measure of calories in the bags of potato chips.
- The p-value is approximately 16%, which means we should fail to reject the null hypothesis and determine that these data **do not** provide convincing evidence the nutrition label does not provide an accurate measure of calories in the bags of potato chips.

正确

This question refers to the following learning objective(s): Calculate a p-value as the area under the normal curve beyond the observed sample mean (either in one tail or both, depending on the alternative hypothesis). Note that in doing so you can use a Z score, where

$$Z = \frac{sample \ statistic - null \ value}{SE} = \frac{\bar{x} - \mu_0}{SE}$$

Always sketch the normal curve when calculating the p-value, and shade the appropriate area(s) depending on whether the alternative hypothesis is one- or two-sided.

$$H_0: \mu = 130; H_A: \mu \neq 130$$

Week 2 Quiz

$$Z = \frac{134 - 130}{\frac{17}{\sqrt{35}}} = 1.39$$

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$$p - value = P(\bar{x} < 122 \text{ OR } \bar{x} > 134 \mid \mu = 130)$$
  
=  $P(z < -1.39) + P(z > 1.39)$   
=  $2 \times 0.0823$   
=  $0.1646$ 

Since p-value > 10%, fail to reject  $H_0$ .

