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Quiz Chapter 22

Indicate the answer choice that best completes the statement or answers the question.

	1	2	3	4	5	6	7	8	9	10
a										
b										
c										
d										
e										

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Quiz Chapter 22

In a recent poll, 30% of adults said they wanted to "cut down or be free of gluten," according to the NDP Group, the market research company that conducted the poll. A researcher wonders if a smaller proportion of students at her university would respond in the same fashion.

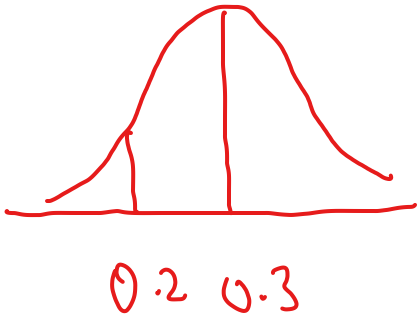
$\hat{p} = \frac{5}{25} = \frac{1}{5} = 0.2$

Suppose the researcher conducts a survey of a random sample of 25 students at her university and 5 of them say they want to at least reduce gluten. A statistician carries out a significance test of the null hypothesis that the proportion wanting to reduce gluten at the university is the same as for all adults versus the alternative hypothesis that a smaller proportion *p* of students would say they want to reduce or be free of gluten.

$H_0: p = 0.3$ vs $H_a: p < 0.3$

1. What is the value of the standardized test statistic for this significance test?

   a. 0.200
   b. –0.100
   c. –1.091
   d. –1.250



$$\frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.2 - 0.3}{\sqrt{\frac{0.3 \times 0.7}{25}}} \approx -1.091089$$

Test statistics are calculated assuming $H_0: p = 0.3$.

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Quiz Chapter 22

A genetic theory says that a cross between two pink flowering plants will produce red flowering plants a proportion $p = 0.25$ of the time. To test the theory, 100 crosses are made and 31 of them produce a red flowering plant. Is this evidence that the theory is wrong?

n

$\hat{p} = \frac{31}{100} = 0.31$

2. What are the null and alternative hypotheses in this situation?

a. H_0: $p = 0.25$ H_a: $p > 0.25$

b. H_0: $p = 0.25$ H_a: $p \neq 0.25$

c. H_0: $p = 0.31$ H_a: $p > 0.31$

d. H_0: $p = 0.31$ H_a: $p \neq 0.31$

"wrong" means either side: $p > 0.25$ or $p < 0.25$. Thus, the alternative $p \neq 0.25$

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Name: _____ Class: _____ Date: _____

Quiz Chapter 22

I think should be "low" here, given that $\bar{x} = 128.2 > 128$

A paint manufacturer fills cans of paint using a machine that has been calibrated to fill the cans to contain an average μ of 1 gallon (128 ounces) each. To test whether their machine has come out of calibration, the manufacturer takes a random sample of 25 cans and finds that they average 128.2 ounces with a standard deviation of 2 ounces. Is this strong evidence that the filling machine is set too high and thus is no longer calibrated properly?

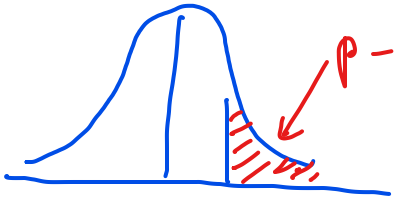
$H_0: \mu = 128$

$H_a: \mu > 128$

$\bar{x} = 128.2$

3. What is the *P*-value for this significance test?

a. 0.0287
b. 0.3085
c. 0.5000
d. 0.6915
e. 0.9713



$$\text{p-value} = P\left(z > \frac{128.2 - 128}{2/\sqrt{25}}\right)$$

$$= P\left(z > \frac{0.2}{2/5}\right)$$

$$= P(z > 0.5)$$

$$= 1 - P(z \leq 0.5)$$

$$= 1 - 0.6915$$

$$= 0.3085$$

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Quiz Chapter 22

4. A scientist is studying the relationship between the depth of a watermelon vines' roots and the weight of the watermelons produced. The scientist collects measurements from a random sample of vines. He then conducts a significance test in which the null hypothesis is that there is no correlation between the two variables (correlation = 0) versus the alternative that the correlation is greater than 0. From this test, he found a *P*-value of 0.0032. What does this tell us?

H_0 : corr = 0 vs H_a : corr > 0

a. There is significant evidence that the correlation is greater than 0 at the 0.05 level.

b. There is no significant evidence that the correlation is greater than 0 at the 0.05 level.

c. The correlation is very small.

d. The correlation is very close to 1.

Since $p = 0.0032 < \alpha = 0.05$,

the evidence is significant.

We reject H_0 in favour of H_a : corr > 0

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Quiz Chapter 22

A genetic theory says that a cross between two pink flowering plants will produce red flowering plants a proportion $p = 0.25$ of the time. To test the theory, 100 crosses are made and 31 of them produce a red flowering plant. Is this evidence that the theory is wrong?

means "≠"

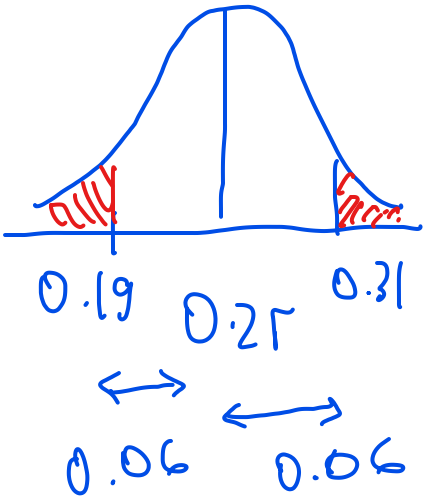
5. What is the *P*-value for this significance test?

a. 0.0808
b. 0.1616
c. 0.5000
d. 0.9192

$H_0 : p = 0.25$

$H_a : p \neq 0.25$

$\hat{p} = \frac{31}{100} = 0.31$



$$\text{p-value} = 2P(\hat{p} > 0.31)$$

$$= 2P\left(Z > \frac{0.31 - 0.25}{\sqrt{\frac{0.25 \times 0.75}{100}}}\right)$$

$$= 2P(Z > 1.385641)$$

$$\approx 2P(Z > 1.4) = 2 \times 0.0808$$

$$= 0.1616$$

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Quiz Chapter 22

A paint manufacturer fills cans of paint using a machine that has been calibrated to fill the cans to contain an average μ of 1 gallon (128 ounces) each. To test whether their machine has come out of calibration, the manufacturer takes a random sample of 25 cans and finds that they average 128.2 ounces with a standard deviation of 2 ounces. Is this strong evidence that the filling machine is set too high and thus is no longer calibrated properly?

low?

6. What is the value of the standardized test statistic for this significance test?

a. –0.02.
b. 0.02.
c. 0.5.
d. –1.918.

$H_0: \mu = 128$ $(\mu_0 = 128)$

$H_a: \mu > 128$

$\bar{x} = 128.2, \; n = 25, \; s = 2$

$$\text{test statistic} = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{128.2 - 128}{2/\sqrt{}}$$

$$= \frac{0.2}{2/5} = 0.5$$

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Quiz Chapter 22

Red blood cell counts are normally distributed with a mean of 5.4 cells per micro liter and standard deviation of 0.68 cells per micro liter. A simple random sample of 50 adults is obtained, and each person's red blood cell count (in cells per microliter) is measured. The sample mean is 5.33 cells per micro liter. Use this sample data to test the claim that the sample is from a population with a mean less than 5.4 cells per microliter.

Since alternative is $H_a: \mu < 5.4$, the null has to be $H_0: \mu = 5.4$

7. What are the correct null and alternate hypotheses?

a. $H_0: \mu = 5.4$ $H_a: \mu < 5.4$

b. $H_0: \mu = 5.33$ $H_a: \mu < 5.33$

c. $H_0: p = 5.4$ $H_a: p < 5.4$

d. $H_0: \mu = 5.4$ $H_a: \mu > 5.4$

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Quiz Chapter 22

8. The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures the motivation, attitude, and study habits of college students. Scores range from 0 to 200 and follow (approximately) a normal distribution with mean of 115 and standard deviation $\sigma = 25$. You suspect that incoming freshman have a mean μ that is different than 115, because they are often excited yet anxious about entering college. To test your suspicion, you test the hypotheses

$$H_0: \mu = 115 \qquad H_a: \mu \neq 115.$$

In testing these hypotheses, which of the following would be strong evidence against the null hypothesis?

a. Using a small level of significance
b. Using a large level of significance
c. Obtaining data with a small *P*-value
d. Obtaining data with a large *P*-value

There would be cheating

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Quiz Chapter 22

A paint manufacturer fills cans of paint using a machine that has been calibrated to fill the cans to contain an average μ of 1 gallon (128 ounces) each. To test whether their machine has come out of calibration, the manufacturer takes a random sample of 25 cans and finds that they average 128.2 ounces with a standard deviation of 2 ounces. Is this strong evidence that the filling machine is set too high and thus is no longer calibrated properly?

low?

9. Based on the *P*-value for a significance test in this situation, we should conclude

a. the null hypothesis provides a reasonable explanation of the data.

given 30.85%, this "a" better answer than "b"

b. the alternative hypothesis provides a reasonable explanation of the data.

c. we should reject the null hypothesis at significance level 0.05.

p-value > 0.05

d. Both B and C are true.

$H_0: \mu = 128$

$H_a: \mu > 128$

We have already calculate the p-value, which is 0.3085 (= 30.85%)

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Quiz Chapter 22

A large company that produces a "fat-burner" pill claims an average loss of 20 pounds in the first month. A consumer advocacy group believes that this claim is actually just "hype" intended to sell more of the compound. The advocacy group would like to obtain statistical evidence about this issue and takes a random sample of 100 consumers who responded that they had purchased the pill but didn't know what the survey was about. They find that these 100 people lost an average of 18 pounds with a standard deviation of 7.5 pounds.

10. What is the *P*-value for this significance test?

a. 0.0228
b. 0.0045
c. 0.3947
d. 0.6093

$H_0: \mu = 20$

$H_a: \mu < 20$

$\bar{x} = 18$

$n = 100$

$s = 7.5$

$p\text{-value} = P(\bar{X} < 18)$

$= P\left(Z < \frac{18-20}{7.5/\sqrt{100}}\right)$

either way, you can guess "b" easily

$= P\left(Z < \frac{-20}{7.5}\right) = P(Z < -2.666\ldots)$

$\approx P(Z < -2.7) = 0.0035$

(if -2.6 then $= 0.0047$)

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Quiz Chapter 22

Answer Key

1. c

2. b

3. b

4. a

5. b

6. c

7. a

8. c

9. a

10. b

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