

STATS Quiz 16 Review

Situation 1: A company manufactures a synthetic rubber (jumping) bungee cord with a braided covering of natural rubber and a mean breaking strength of 450 kg. If the mean breaking strength of a sample drops below 450 kg, the production process is halted and the machinery inspected.

Describe the hypotheses to test an assumption that the mean breaking strength has dropped.

Which of the following is the result of a Type I error?

- a. Halting the production process when too many cords break.
- b. Halting the production process when the breaking strength is below the specified level.
- c. Halting the production process when the breaking strength is within specifications.
- d. Allowing the production process to continue when the breaking strength is below specifications.
- e. Allowing the production process to continue when the breaking strength is within specification.

The sample mean of 50 cords is 415kg with p-value is 0.041. Describe the meaning of the p-value.

What is the conclusion at the $\alpha = .05$ level?

The team assumes the strength is affected by the air temperature and conducts a linear regression analysis. The correlation between the breaking strength and the air temperature is found to be 0.78. What conclusion can be made between the breaking strength and air temperature?

What percent of the variation in the breaking strength is accounted for by the line?

CH 9 Review

From pages 594-596

- R9.1a
- R9.2
- R9.3
- R9.6
- R9.7
- R9.8
- R9.9

From pages 597-599

- T9.2
- T9.4
- T9.6
- T9.7
- T9.9
- T9.10
- T9.12
- T9.13

Situation 2: A fast food chain advertises that their large bag of French fries has a weight of 150 grams. Some high school students, who enjoy French fries at every lunch, suspect that they are getting less than the advertised amount. With a scale borrowed from their physics teacher, they weigh a random sample of 15 bags. What is the conclusion if the sample mean is 145.8 g and standard deviation is 12.81 g? Use $\alpha = 0.05$.

- There is sufficient evidence to prove the fast food chain advertisement is true.
- There is sufficient evidence to prove the fast food chain advertisement is false.
- The students have sufficient evidence to reject the fast food chain's claim.
- The students do NOT have sufficient evidence to reject the fast food chain's claim.
- There is NOT sufficient data to reach any conclusion.

If the test changes to check if the mean weight is different from 150g, then how do the hypotheses, p-value, and conclusion change?

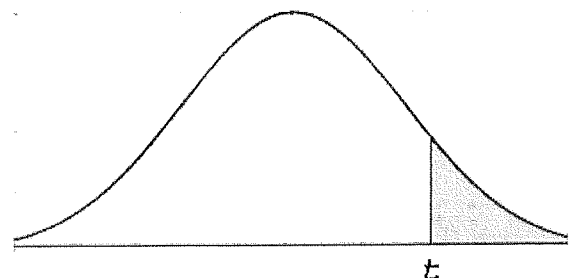
Create a 95% confidence interval for the mean weight of a bag of French fries.

Which of the following is a true statement?

- A well-planned hypothesis test should result in a statement either that the null hypothesis is true or that it is false.
- The alternative hypothesis is stated in terms of a sample statistic.
- If a sample is large enough, the necessity for it to be a simple random sample is diminished.
- When the null hypothesis is rejected, it is because it is not true.
- Hypothesis tests are designed to measure the strength of evidence against the null hypothesis.

In the curve at the right, the t-value is equal to 1.925 for a sample of 60 values. Find the area of the shaded region.

In the curve at the right, the area to the right is 0.03 for a sample of 50 values. Find the t-value.



Situation 5 - Claim: the mean weight of beauty pageant winners is 124 lbs. A study of randomly selected pageants resulted in a mean winner weight of 125 lbs.

Create the appropriate hypotheses to test if the 124 lb. claim is accurate.

If the sample standard deviation was 8 lbs and a total of 40 pageant winners was collected, then find the T-value, p-value, and conclusion.

Situation 6 - White blood cells counts are normally distributed. A doctor claims the true mean is greater than 8.39. A sample of 42 females taken at a hospital finds the sample mean to be 8.9 with sample standard deviation of 2.2. Create the proper hypotheses, find the T-value, find the p-value, describe the proper conclusion.

Situation 7 - Jen claimed women have heights with a mean equal to 158 cm. Kelly thinks Jen is wrong and conducts a hypothesis test. The test resulted in a p-value of 0.0724.

State the conclusion about the null hypothesis at the $\alpha = 0.1$ level

- Fail to reject the the null because the p-value is greater than alpha
- Reject the null because the p-value is less than alpha
- Fail to reject the null because the p-value is less than alpha
- Reject the null because the p-value is greater than alpha

State the final conclusion in common language:

- There is sufficient evidence to warrant rejection of the claim that the mean height of women is equal to 158 cm.
- There is sufficient evidence to support the claim that the mean height of women is equal to 158 cm.
- There is not sufficient evidence to warrant rejection of the claim that the mean height of women is equal to 158 cm.
- There is not sufficient evidence to support the claim that the mean height of women is equal to 158 cm.

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Describe the hypotheses to test an assumption that the mean breaking strength has dropped.

$$H_0: \mu = 450$$
$$H_a: \mu < 450$$

Which of the following is the result of a Type I error?

Null $\mu = 450$ is true, mistakenly rejected
↓
strength OK
↓
production halted

- Halting the production process when too many cords break.
- Halting the production process when the breaking strength is below the specified level.
- Halting the production process when the breaking strength is within specifications.
- Allowing the production process to continue when the breaking strength is below specifications.
- Allowing the production process to continue when the breaking strength is within specification.

The sample mean of 50 cords is 415kg with p-value is 0.041. Describe the meaning of the p-value.

If μ is truly 450kg, then the chance of $\bar{x} = 415$ or less is .041

What is the conclusion at the alpha = .05 level?

Since $.041 < .05$
Reject the null

The team assumes the strength is affected by the air temperature and conducts a linear regression analysis. The correlation between the breaking strength and the air temperature is found to be 0.78. What conclusion can be made between the breaking strength and air temperature?

There appears to be a moderately strong positive association between air temp and

What percent of the variation in the breaking strength is accounted for by the line?

$$r = .78 \quad r^2 = .6084$$

So 61% of the variation in br. str. is accounted for by the line

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Situation 2: A fast food chain advertises that their large bag of French fries has a weight of 150 grams. Some high school students, who enjoy French fries at every lunch, suspect that they are getting less than the advertised amount. With a scale borrowed from their physics teacher, they weigh a random sample of 15 bags. What is the conclusion if the sample mean is 145.8 g and standard deviation is 12.81 g? Use $\alpha = 0.05$.

- There is sufficient evidence to prove the fast food chain advertisement is true.
- There is sufficient evidence to prove the fast food chain advertisement is false.
- The students have sufficient evidence to reject the fast food chain's claim.
- The students do NOT have sufficient evidence to reject the fast food chain's claim.
- There is NOT sufficient data to reach any conclusion.

$$n=15 \quad H_0: \mu=150 \quad H_a: \mu < 150 \quad \bar{x}=145.8 \quad s_x=12.81 \quad \boxed{p=.11}$$

If the test changes to check if the mean weight is different from 150g, then how do the hypotheses, p-value, and conclusion change?

$$H_a: \mu \neq 150 \quad \rightarrow \quad \text{two sided test} \\ p = 2(.11) = .22$$

Conclusion: Fail to Reject H_0

Create a 95% confidence interval for the mean weight of a bag of French fries.

$$\bar{x} = 145.8 \\ s_x = 12.81 \\ n = 15 \\ T = 2.145$$

We are 95% conf that the true mean weight of a bag of fries falls in the interval from 138.7g to 152.9g

Which of the following is a true statement?

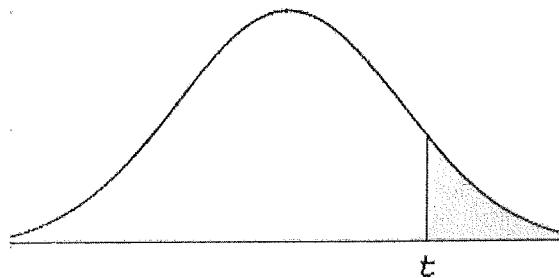
- A well-planned hypothesis test should result in a statement either that the null hypothesis is true or that it is false. *NO*
- The alternative hypothesis is stated in terms of a sample statistic. *NO*
- If a sample is large enough, the necessity for it to be a simple random sample is diminished. *NO*
- When the null hypothesis is rejected, it is because it is not true. *NO*
- Hypothesis tests are designed to measure the strength of evidence against the null hypothesis.

In the curve at the right, the t-value is equal to 1.925 for a sample of 60 values. Find the area of the shaded region. *APP: Find z/T Know T=1.925 DF=59*

$$\text{Area} = .0295$$

In the curve at the right, the area to the right is 0.03 for a sample of 50 values. Find the t-value.

$$\text{APP: Find z/T Know Area Right} = .03 \\ \text{DF} = 49 \\ t = 1.9253$$



Situation 3: A company selling home appliances claims that the accompanying instruction guides are written at a 6th grade reading level. An English teacher believes that the true figure is higher and with the help of an AP Statistics student runs a hypothesis test. The student randomly picks one page from each of 25 of the company's instruction guides, and the teacher subjects the pages to a standard readability test. The reading levels of the 25 pages are given in the following table:

L ₁	Reading grade level	5	6	7	8	9	10
L ₂	Number of pages	6	10	4	2	2	1

Basic Stats on L₁, L₂
 $n=25$ $\bar{x}=6.48$ $S_x=1.36$
 $T=1.76$ $p=.045$
 YES, Reject H₀ It appears the teacher is right.

Is there statistical evidence to support the English teacher's belief?

H₀: $\mu=6$
 H_a: $\mu>6$

Situation 4: A football coach claims the average bench press for his team is 200lbs. An assistant is unsure if the mean bench press is really 200lbs and wants to verify that the coach's claim with a hypothesis test.

≠

Part 1: Define the appropriate hypotheses for this test

H₀: $\mu=200$ H_a: $\mu \neq 200$

Parameter of interest: true mean bench

Will this test be one-sided or two-sided? Explain: ≠

After testing the bench press for a random sample of 30 players, the assistant coach found that the mean bench press for the sample was 208lbs with a sample standard deviation of 24lbs.

Part 2: Is this a T-Test or Z-Test? Explain: Sample

Fill in the table with the correct values (round values to 3 decimal places)

Standard Deviation of the sample mean	Z or T Value	P-value
4.38	T = 1.83	.039

Part 3: What is the correct conclusion if $\alpha = .05$?

Reject H₀

Would you conclude that the coach's claim is accurate? Explain.

NO it appears the mean is not 200

Part 4: What is the correct conclusion if $\alpha = .1$?

Fail to Reject H₀

Would you conclude that the coach's claim is accurate? Explain.

YES, no evidence to think otherwise

Part 5: Describe what a type I error would mean in the context of this situation.

null is true, mean is 200
 we conclude the mean is not 200

* **Situation 4** - Claim: the mean weight of beauty pageant winners is 124 lbs. A study of randomly selected pageants resulted in a mean winner weight of 125 lbs.

Create the appropriate hypotheses to test if the 124 lb. claim is accurate.

$$H_0: \mu = 124$$

$$H_a: \mu \neq 124$$

* If the sample standard deviation was .8 lbs and a total of 40 pageant winners was collected, then find the T-value, p-value, and conclusion.

$$\bar{x} = 125$$

$$s_x = .8$$

$$n = 40$$

$$T = .79 \quad p = .43$$

Fail to reject H_0

No evidence to say the mean

is not 124

~~Reject H_0~~

~~It appears winners do not weigh 124~~

* **Situation 5** - White blood cells counts are normally distributed. A doctor claims the true mean is greater than 8.39. A sample of 42 females taken at a hospital finds the sample mean to be 8.9 with sample standard deviation of 2.2. Create the proper hypotheses, find the T-value, find the p-value, describe the proper conclusion.

$$H_0: \mu = 8.39$$

$$n = 42$$

$$T = 1.5$$

$$H_a: \mu > 8.39$$

$$\bar{x} = 8.9$$

$$p\text{-val} = .07$$

$$s_x = 2.2$$

Fail to reject. No evidence to verify the Dr's claim

* **Situation 6** - Jen claimed women have heights with a mean equal to 158 cm. Kelly thinks Jen is wrong and conducts a hypothesis test. The test resulted in a p-value of 0.0724.

State the conclusion about the null hypothesis at the alpha = 0.1 level

$$.0724 < .1$$

- a. Fail to reject the the null because the p-value is greater than alpha
- b. Reject the null because the p-value is less than alpha
- c. Fail to reject the null because the p-value is less than alpha
- d. Reject the null because the p-value is greater than alpha

State the final conclusion in common language:

- a. There is sufficient evidence to warrant rejection of the claim that the mean height of women is equal to 158 cm.
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