https://quizlet.com/82214574/choosing-the-correct-inference-procedure-flash-cards/

http://www.ltcconline.net/greenL/java/statistics/catstatprob/categorizingstatproblemsjavascript.htm

Pick Up
the Warm Up

EXPERIMENTAL DESIGN 23

To conduct a survey on holiday shopping patterns, a researcher opens a telephone book to a random page, closes his eyes, puts his finger down on the page, and then reads off the next 100 names. Which of the following is *not* a true statement?

(A) The survey incorporates chance.

(B) The procedure results in a systematic sample.

(C) The procedure could easily result in selection bias.

(D) The procedure is not a simple random sample.

(E) The use of a phone book will result in undercoverage bias.

Answer: (B) A systematic sample involves picking every *n*th name on the list not *n* in a row. There is a very real chance of *selection bias*. For example, a number of relatives with the same name and similar holiday shopping patterns might be selected. All possible groups of size 100 do not have the same chance of being picked, and so the result is not a simple random sample. Undercoverage bias is present because those with unlisted land phones or with cell phones are not in the phone book, and so are not part of the sampling frame.

EXPERIMENTAL DESIGN 25

A telephone survey with regard to support of a bond issue resulted in:

Age:	21–30	31–40	41–50	51–60	61–70	71–80	Total
For:	45	32	28	25	15	8	153
Against:	30	43	47	50	60	67	297

Which of the following sampling strategies was most likely used?

(A) Cluster sampling

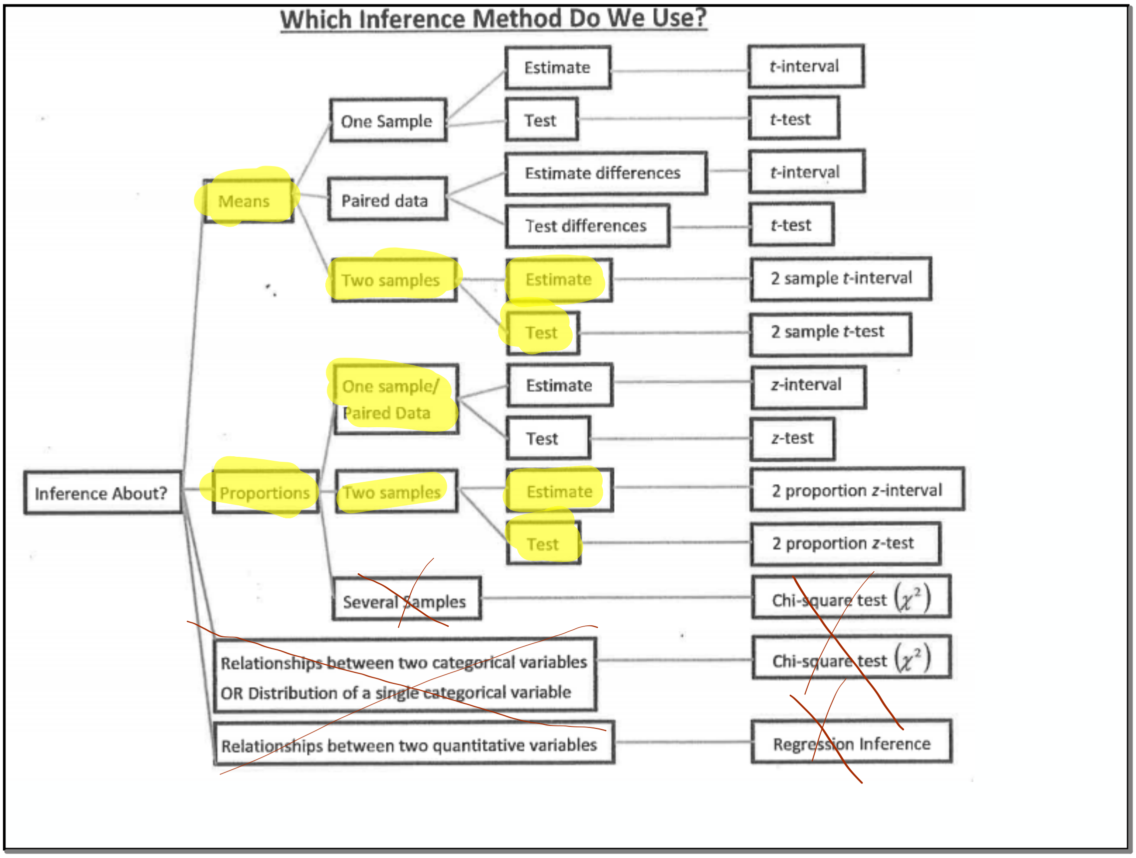
(B) Proportional sampling

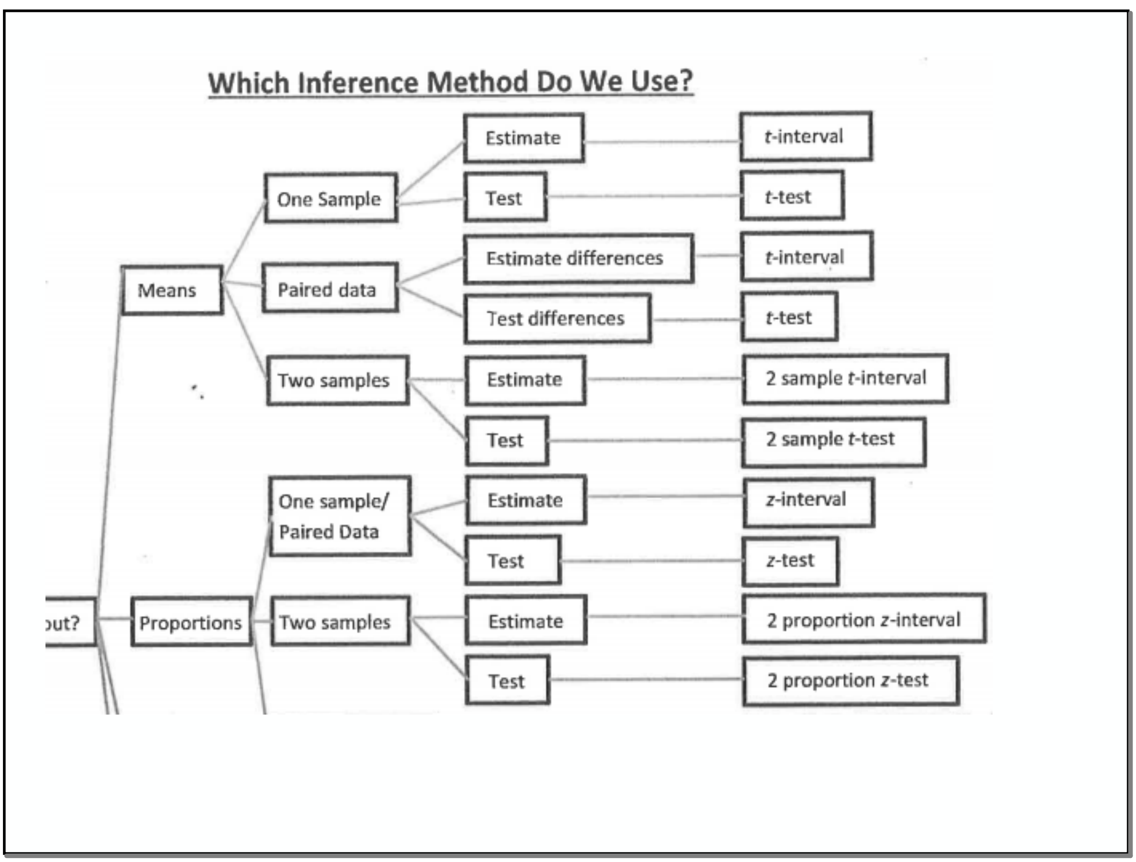
(C) Simple random sampling

(D) Stratified sampling

(E) Systematic sampling

Answer: (D) Given the exact same number of people surveyed in each age group, stratified sampling was probably the strategy used. In stratified sampling, the population is divided into homogeneous groups called strata (for example, by age), and random samples of persons from all strata are chosen. We could further do proportional sampling where the sizes of the random samples from each stratum depend on the proportion of the total population represented by the stratum (not done in this case because equal size samples were picked from each age group). In cluster sampling, the population is divided into heterogeneous groups called clusters, and we then take a random sample of clusters from among all the clusters.


Which Inference Method Do We Use?
Inference About?
Means
One Sample
Estimate
t-interval
Test
t-test
Paired data
Estimate differences
t-interval
Test differences
t-test
Two samples
Estimate
2 sample t-interval
Test
2 sample t-test
Proportions
One sample/ Paired Data
Estimate
z-interval
Test
z-test
Two samples
Estimate
2 proportion z-interval
Test
2 proportion z-test
Several Samples
Chi-square test (χ^2)
Relationships between two categorical variables OR Distribution of a single categorical variable
Chi-square test (χ^2)
Relationships between two quantitative variables
Regression Inference


Which Inference Method Do We Use?
Means
One Sample
Estimate
t-interval
Test
t-test
Paired data
Estimate differences
t-interval
Test differences
t-test
Two samples
Estimate
2 sample t-interval
Test
2 sample t-test
Proportions
One sample/ Paired Data
Estimate
z-interval
Test
z-test
Two samples
Estimate
2 proportion z-interval
Test
2 proportion z-test

Paired Data or Two Samples?

our Goal today

Paired Data or Two Samples?

$\boxed{\mu_1 - \mu_2}$

Two-sample *t* procedures require data that come from *independent random samples* from the two populations of interest or from *two groups in a randomized experiment*.

Paired Data or Two Samples?

$\boxed{\mu_1 - \mu_2}$

Two-sample *t* procedures require data that come from *independent random samples* from the two populations of interest or from *two groups in a randomized experiment*.

10.1
10.2

$\boxed{\mu_{diff}}$

Paired *t* procedures require *paired data* that come from *a random sample* from the population of interest or from *a randomized experiment*.

10.3

handout
:)

handout

Caution! The proper ______________ method depends on how the data were _______________.

40%

handout

Caution! The proper Inference method depends on how the data were Produced.

1. **How many samples do I have?**

   One:

   Two:

2. **Can any piece of data in the first group be compared to any piece of data in the second?**

   If yes:

   If no:

3. **Do they represent pairing the data?**

   Yes:

   No:

1. **How many samples do I have?**

   One: μ_{diff}

   Two: $\mu_1 - \mu_2$ (usually Watch out for 2 samples that pair individuals

2. **Can any piece of data in the first group be compared to any piece of data in the second?**

   If yes:

   If no:

3. **Do they represent pairing the data?**

   Yes:

   No:

1. How many samples do I have?

One: μ_{diff}

Two: $\mu_1 - \mu_2$ (Usually) Watch out for 2 samples that pair individuals

2. Can any piece of data in the first group be compared to any piece of data in the second?

If yes: $\mu_1 - \mu_2$

If no: if they must stay pairs μ_{diff}

3. Do they represent pairing the data?

Yes:

No:

1. How many samples do I have?

One: μ_{diff}

Two: $\mu_1 - \mu_2$ (Usually) Watch out for 2 samples that pair individuals

2. Can any piece of data in the first group be compared to any piece of data in the second?

If yes: $\mu_1 - \mu_2$

If no: if they must stay pairs μ_{diff}

3. Do they reference pairing the data?

Yes: μ_{diff}

No: $\mu_1 - \mu_2$

Other things to look for:

Paired
- Can't scramble a list
- Same # of values in each
- "Mean difference"

Unpaired
- Can scramble a list
- Can have different # of values
- "difference of means"

Luke's Taco Shop

- look at the first situation
- Get a consensus

Luke's taco shop

Two samples or paired data?

In each of the following settings, decide whether you should use two-sample *t* procedures to perform inference about a difference in means **OR** paired *t* procedures to perform inference about a mean difference. Explain your choice.

(a) Luke's taco shop is considering a switch to a new tortilla that supposedly has a larger diameter. To test this claim, Luke takes a random sample of 50 of the old tortillas and 50 of the new tortillas and records the diameter of each.

μ_{diff}

(a) **Two-sample *t* procedures**; *the data come from independent random samples of the old and new tortillas.*

(b) Luke's taco shop wants to be sure that the new tortillas taste better than the old tortillas. Luke selects a random sample of 20 regular customers. Each customer is asked to try both tortillas and then record a "taste" score for each. The order in which the customers try the two tortillas is randomized.

(b) **Paired *t* procedures**; *the data come from two measurements of the same variable ("taste" score) for each regular customer.*

(c) Luke's taco shop is not sure whether to cook the tortillas in the oven or on the grill. The chefs want tortillas to cook as quickly as possible. Luke sets up an experiment taking a batch of 50 tortillas and randomly assigning half of them to be cooked one at a time in the oven and half of them to be cooked one at a time on the grill. The time it takes until ready to serve is recorded for each tortilla.

(c) **Two-sample *t* procedures**; *the data come from two groups in a randomized experiment,* ~~with each group~~

When designing an experiment to compare two means, a completely randomized design may not be the best option.

A matched pairs design might be a better choice.......

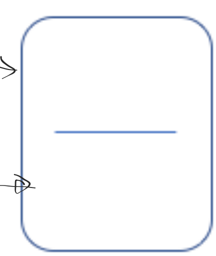
Activity page 684

"Get your Heart Beating"

Standardizing the Way We measure

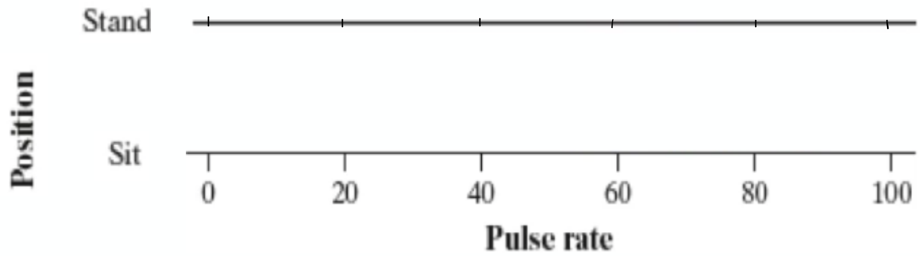
(will reduce variability in the results

Standing Pulser rates get recorded on top



Sitting

write your value and put a dot.



Is there some evidence that the standing pulse rates are higher, on average?

Do a 2-sample t test (if conditions are met) to determine if there is convincing evidence that standing pulse rates are higher on average.

Standing - 65 81 75 79 83
72 70 ~~78~~ 78 96

$\bar{x}_1 = 77.67$
$s_1 = 8.92$

Can do informally

Sit 85 70 67 62 60 70 67
59 90

$\bar{x}_2 = 68.89$
$s_2 = 11.27$

$H_0: \mu_1 - \mu_2 = 0$
$H_a: \mu_1 - \mu_2 > 0$

Do a 2-sample t test (if conditions are met) to determine if there is convincing evidence that standing pulse rates are higher on average.

State H_0:

H_a

Plan Two-sample t test for $\mu_1 - \mu_2$

Random :

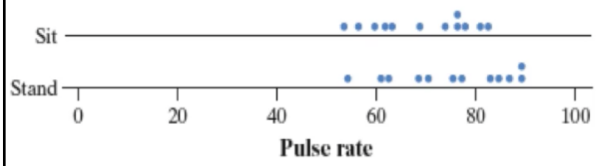
10% :

Normal :

Do 2SampTTest gives $t = 1.83$ and P-Value $= 0.043$ using $df = 15.19$

Conclude

example from another class



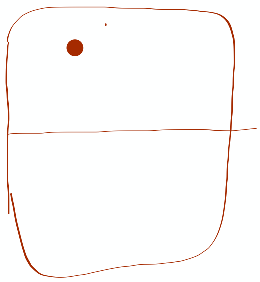
$\bar{x}_{sit} = 63.33$

$\bar{x}_{stand} = 74.83$

$\bar{x}_{stand} - \bar{x}_{sit} = 6.5$

A two-sample t test of H_o: $\mu_{stand} - \mu_{sit} = 0$ versus H_a: $\mu_{stand} - \mu_{sit} > 0$ yields t = 1.42 and a P-value of 0.09. These data do not provide convincing evidence that standing pulse rates are higher, on average, than sitting pulse rates for people like the students in this class

Experiment #2 Matched Pairs Design



$\bar{x}_1 - \bar{x}_2 =$

μ_{diff}

16 11 5 30 -2 10 5 11 12

-5 3 8 5 13 -35 -12 1 4

μ_{diff}

$H_0: \mu_{diff} = 0$

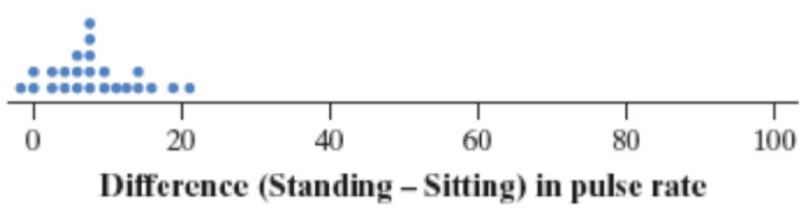
$H_a: \mu_{diff} > 0$

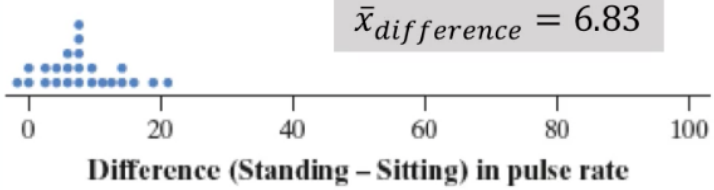
$\bar{x}_{diff} = 4.44$

$S_{diff} = 13.32$

Is there some evidence that standing pulse rates are higher, on average ?

Sample class





$\bar{x}_{difference} = 6.83$

One sample t-test

$H_0: \mu_{diff} = 0$

$H_a: \mu_{diff} > 0$

t = 6.483

P-value ≈ 0

Conduct a one-Sample t Test for μ_{diff}

$t = 1.415$

~~P = .175~~ P = .088

df = ~~18~~ 17

5. Which design provides more convincing evidence that standing pulse rates are higher, on average, than sitting pulse rates? Justify your answer.

Matched pairs design reduced variability in the response variable

- ...by accounting for a big source of variability – the difference between individuals.

Matched pairs design reduced variability in the response variable

... by accounting for a big source of variability – the difference between individuals.

and that makes it easier to detect the fact that standing causes an increase in pulse rate.

avg.

Moral of the Story

Using a paired design resulted in more Power.

- with the large amount of variability in the completely randomized design we would not draw such a conclusion.

It can be difficult to decide when to use a two-sample t test or a paired t test.

especially when mixed in with all of the others.

Choosing the correct inference procedure

handout

A food scientist wants to estimate the difference between the weights of eggs classified as jumbo and large. They plan on taking a sample of eggs of each type and comparing the average weight between the samples.

Which of these inference procedures is most appropriate?

Choose 1 answer:

- (A) A t-interval for slope
- (B) A two-sample t-interval for the difference of means
- (C) A two-sample z-interval for the difference of proportions
- (D) A paired t-interval for a mean difference
- (E) A z-interval for a proportion

Proportions or means ?
z t

Estimate or a Test ?
CI Signif. Test

one sample or two ?

Unpaired ?

Paired ?

CORRECT (SELECTED)

A two-sample t-interval for the difference of means

They are interested in the *average* weights, so they should use t procedures for a *mean*. They are comparing the means between two independent samples, so two-sample procedures are appropriate.

Finn blogs about video games. In a particular game, a certain enemy occasionally drops a rare item when they are defeated. Finn wants to estimate the likelihood that this enemy drops the rare item, so he defeats the enemy 1000 times and tallies how many times the rare item is dropped.

Which of these inference procedures is most appropriate?

2

(A) ~~A paired t-interval for the mean difference~~

(B) ~~A t-test for a mean~~

(C) ~~A t-interval for a mean~~

(D) A z-interval for a proportion

(E) A z-test for a proportion

CORRECT (SELECTED)

A z-interval for a proportion

Finn wants to *estimate*, so he should use an *interval*. He's tallying a *categorical* variable, so looking at a *proportion* is appropriate.

A test prep course takes a random sample of 50 its customers. Researchers score each customer on a diagnostic test before taking the course and again on a similar test after taking the course. They want to use these results to estimate the average difference between the before and after scores.

Which of these inference procedures is most appropriate?

(A) A t-interval for slope

(B) A paired t-interval for the mean difference

(C) A two-sample z-interval for the difference of proportions

(D) A z-interval for a proportion

(E) A two-sample t-interval for the difference of means

Lylah created an app, and she recently updated the app. She randomly samples a group of users to estimate what percentage of all users are using the updated version.

Which of these inference procedures is most appropriate?

Choose 1 answer:

(A) A t-test for a mean

(B) A z-interval for a proportion

(C) A paired t-test for the mean difference

(D) A z-test for a proportion

(E) A t-interval for a mean

INCORRECT

A t-test for a mean

Lylah wants to *estimate*, so she should use an *interval*, not a test. She's tallying a *categorical* variable, so looking at a *proportion* is more appropriate than a mean.

CORRECT (SELECTED)

A z-interval for a proportion

Lylah wants to *estimate*, so she should use an *interval*. She's tallying a *categorical* variable, so looking at a *proportion* is appropriate.

INCORRECT

A paired t-test for the mean difference

Lylah collected one data point (whether or not they have the updated version) for each user, so she doesn't have paired data. Also, this data is *categorical*, so looking at a *proportion* is more appropriate than a mean.

INCORRECT

A z-test for a proportion

Lylah wants to *estimate*, so she should use an *interval*, not a test.

INCORRECT

A t-interval for a mean

Lylah is tallying a *categorical* variable, so looking at a *proportion* is more appropriate than a mean.

See your LCQ's

10.3.....91, 93, 95-97

and study.... pp.683 - 685

Test on Wednesday

Researchers were studying how playing a dancing video game impacts heart rate. They measured the heart rates (in beats per minute) of 15 subjects before they danced a song and again after they finished dancing the song. They want to use these results to estimate the average difference between before and after heart rates.

Which of these inference procedures is most appropriate?

Choose 1 answer:

- (A) A z-interval for a proportion
- (B) A two-sample t-interval for the difference of means
- (C) A paired t-interval for the mean difference
- (D) A two-sample z-interval for the difference of proportions
- (E) A t-interval for slope

INCORRECT

A z-interval for a proportion

The researchers aren't categorizing the heart rates, so proportions wouldn't be appropriate.

INCORRECT

A two-sample t-interval for the difference of means

The before heart rates are **not** independent of the after heart rates, so we shouldn't treat them as two separate samples.

CORRECT (SELECTED)

A paired t-interval for the mean difference

The researchers recorded two measurements on each subject. They should calculate the difference between the two heart rates for each subject, and do a test on the mean of those differences.

A website streams movies and television shows to millions of users. Employees know that the average time a user spends per session on their website is 2 hours. The website changed its design, and they wanted to know if the average session length was longer than 2 hours. They randomly sampled 100 users and recorded their session lengths.

Which of these inference procedures is most appropriate?

Choose 1 answer:

(A) A paired t-test for the mean difference

(B) A two-sample t-test for the difference of means

(C) A t-test for a mean

(D) A z-test for a proportion

(E) A two-sample z-test for the difference of proportions

INCORRECT

A paired t-test for the mean difference

The employees collected one data point (the session length) for each user in the sample, so they don't have paired data.

INCORRECT

A two-sample t-test for the difference of means

The employees are looking at one sample of data, not two.

CORRECT (SELECTED)

A t-test for a mean

The employees are interested in the *average* session length, so t procedures for a *mean* are appropriate. They are comparing the mean of a single sample to a hypothesized value, so two-sample procedures aren't appropriate.

Felipe is curious if there is a relationship between a runner's age and their finishing time in a recent marathon. He takes a random sample of finishers and records the age (in years) and the finishing time (in minutes) for each of those sampled.

Which of these inference procedures is most appropriate?

Choose 1 answer:

(A) A two-sample z-test for the difference of proportions

(B) A z-test for a proportion

(C) A paired t-test for the mean difference

(D) A t-test for slope

(E) A two-sample t-test for the difference of means

A t-interval for slope

150 people in the 30-39 age group about
e the difference between the percentage of

A two-sample z-interval for the difference of proportions

A z-interval for a proportion

A two-sample t-interval for the difference of means

A t-interval for a mean

INCORRECT

A t-interval for slope

This type of interval is useful for estimating the slope of a regression line, but Angelica isn't looking at the relationship between two quantitative variables.

CORRECT (SELECTED)

A two-sample z-interval for the difference of proportions

Angelica has two groups (150 people from each age group) and she's comparing a *categorical* variable (vegetarian or not) between the two groups, so *proportions* are appropriate.

INCORRECT

A z-interval for a proportion

Angelica's data came from two groups (150 people from each age group), so two-sample procedures are appropriate.

A two-sample t-interval for the difference of means

Angelica is looking at a *categorical* variable, so using *proportions* is more appropriate than means.

INCORRECT

A t-interval for a mean

Angelica is looking at a *categorical* variable, so using *proportions* is more appropriate than means. Also, she has two groups, so two-sample procedures are appropriate.

INCORRECT

A z-test for a proportion

The employees are interested in the *average* session length, so they should use t procedure for a *mean*. They aren't categorizing the lengths, so proportions wouldn't be appropriate.

INCORRECT

A two-sample z-test for the difference of proportions

The employees are looking at one sample of data, not two. Also, they are interested in the *average* session length, so they should use t procedures for a *mean*. They aren't categorizin the lengths, so proportions wouldn't be appropriate.

INCORRECT

A two-sample z-interval for the difference of proportions

The researchers aren't categorizing the heart rates, so proportions wouldn't be appropriate.

INCORRECT

A t-interval for slope

This would be useful if the researchers were interested in the relationship between before and after heart rates in a scatter plot, but it wouldn't be the best way to estimate the average difference.

CORRECT (SELECTED)

A paired t-interval for the mean difference

The researchers recorded two measurements on each customer. They should calculate the difference between the two scores for each customer, and do a test on the mean of those differences.

INCORRECT

A two-sample z-interval for the difference of proportions

The researchers aren't categorizing the scores, so proportions wouldn't be appropriate.

INCORRECT

A z-interval for a proportion

The researchers aren't categorizing the scores, so proportions wouldn't be appropriate.

INCORRECT

A two-sample t-interval for the difference of means

The before scores are **not** independent of the after scores, so we shouldn't treat them as two separate samples.

A school counselor suspects that, on average, students at their school are sleeping less than 8 hours per night. They survey a random sample of students about how many hours they slept the previous night to see if their average sleep amount is significantly less than 8 hours.

Which of these inference procedures is most appropriate?

Choose 1 answer:

(A) A two-sample z-test for the difference of proportions

(B) A paired t-test for the mean difference

(C) A z-test for a proportion

(D) A t-test for a mean

(E) A two-sample t-test for the difference of means

CORRECT (SELECTED)

A t-test for a mean

The counselor is interested in the *average* sleep amount, so t procedures for a *mean* are appropriate. They are comparing the mean of a single sample to a hypothesized value, so two-sample procedures aren't appropriate.

INCORRECT

A two-sample z-test for the difference of proportions

The counselor is looking at one sample of data, not two. Also, they are interested in the *average* sleep amount, so they should use t procedures for a *mean*. They aren't categorizing the sleep amounts, so proportions wouldn't be appropriate.

INCORRECT

A paired t-test for the mean difference

The counselor collected one data point (the sleep amount) for each student in the sample, so they don't have paired data.

INCORRECT

A z-test for a proportion

The counselor is interested in the *average* sleep amount, so they should use t procedures for a *mean*. They aren't categorizing the sleep amounts, so proportions wouldn't be appropriate.

INCORRECT

A two-sample t-test for the difference of means

The counselor is looking at one sample of data, not two.