

**Topic:** Inferential statistics and hypotheses

**Question:** What is the null hypothesis in a test procedure?

**Answer choices:**

- A      The competing claim that you are trying to prove.
- B      The statement you're trying to disprove to make a claim.
- C      A step that you can skip because it's empty.
- D      The claim that the test characteristic is greater than the hypothesized value.



**Solution: B**

The null hypothesis in a statistical hypotheses test or test procedure is the claim that is assumed to be true. In order to prove something statistically you want to prove that the data is outside of the null hypothesis. This means the point of the statistical test is to disprove the null hypothesis to make a claim.

A. The competing claim that you are trying to prove. This is the alternative hypothesis.

B. The statement you are trying to disprove to make a claim. This is a correct statement about the null hypothesis.

C. A step that you can skip because it is empty. This is not a true statement, you must have a null hypothesis in a significance test to make sure you have something to disprove.

D. The claim that the tested characteristic is greater than the hypothesized value. This is an example of a possible alternative hypothesis.



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**Question:** Which statement is not a possible alternative hypothesis?

**Answer choices:**

- A      population parameter  $>$  hypothesized value
- B      population parameter  $<$  hypothesized value
- C      population parameter  $\neq$  hypothesized value
- D      population parameter  $=$  hypothesized value



**Solution: D**

Null hypotheses always take one of the following forms,

$H_0$ : population parameter = hypothesized value

$H_0$ : population parameter  $\geq$  hypothesized value

$H_0$ : population parameter  $\leq$  hypothesized value

and the associated alternative hypotheses are

$H_a$ : population characteristic  $\neq$  hypothesized value

$H_a$ : population characteristic  $<$  hypothesized value

$H_a$ : population characteristic  $>$  hypothesized value

respectively. Answer choices A, B, and C are all possible alternative hypotheses, which means D is the only answer choice that couldn't represent an alternative hypothesis.



**Topic:** Inferential statistics and hypotheses

**Question:** Which statement pair shows a correct way of setting up a statistical hypothesis test?

**Answer choices:**

- A  $H_0 : \mu = 21$  and  $H_a : \mu \neq 21$
- B  $H_0 : \mu \neq 3.6$  and  $H_a : \mu = 3.6$
- C  $H_0 : \mu = 0.2$  and  $H_a : \mu < 0.3$
- D  $H_0 : \mu = 256$  and  $H_a : \mu = 256$



**Solution: A**

$H_0 : \mu = 21$  and  $H_a : \mu \neq 21$  is correct because both are set to the same value, the null hypothesis uses an equals sign, and the alternative hypothesis uses a  $\neq$  sign, which is the matching sign when the null hypothesis includes an equals sign.

$H_0 : \mu \neq 3.6$  and  $H_a : \mu = 3.6$  is incorrect because, even though both are set to the same value, the null hypothesis and the alternative hypothesis have their signs switched. The null hypothesis should always use the equals sign. The alternative hypothesis should always use  $<$ ,  $>$ , or  $\neq$ .

$H_0 : \mu = 0.2$  and  $H_a : \mu < 0.3$  is incorrect because the null hypothesis value and the alternative hypothesis value are not the same (they're 0.2 and 0.3). To be a correct statistical hypothesis test, both the null and alternative hypotheses need to use the same values.

$H_0 : \mu = 256$  and  $H_a : \mu = 256$  is incorrect because, even though both are set to the same value, only the null hypothesis should use an equals sign. The alternative hypothesis shouldn't use an equals sign, it should use  $<$ ,  $>$ , or  $\neq$ .

