Topic: The p-value and rejecting the null

Question: Which p-value would lead you to reject the null hypothesis at the given significance level?

Answer choices:

A A lower-tail test with $p = 0.002$ and $\alpha = 0.001$

B An upper-tail test with $p = 0.925$ and $\alpha = 0.95$

C A two-tail test with $p = 0.07$ and $\alpha = 0.05$

D A lower-tail test with $p = 0.085$ and $\alpha = 0.05$

Solution: B

The type of test doesn't matter. You reject, or fail to reject, a null hypothesis based on the relationship between the p-value and the α level.

If $p \leq \alpha$, reject the null hypothesis

If $p > \alpha$, do not reject the null hypothesis

Let's look at the tests we were given.

In answer choice A with $p = 0.002$ and $\alpha = 0.001$, $0.002 > 0.001$ so $p > \alpha$, which means we fail to reject the null hypothesis.

In answer choice B with $p = 0.925$ and $\alpha = 0.95$, $0.925 > 0.95$ so $p \leq \alpha$, which means we reject the null hypothesis.

In answer choice C with $p = 0.07$ and $\alpha = 0.05$, $0.07 > 0.05$ so $p > \alpha$, which means we fail to reject the null hypothesis.

In answer choice D with $p = 0.085$ and $\alpha = 0.05$, $0.085 > 0.05$ so $p > \alpha$, which means we fail to reject the null hypothesis.

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Question: The smaller the p-value...

Answer choices:

A the less likely we are to reject the null hypothesis

B the lower the Type I error rate

C the smaller the region of rejection

D All of these

Solution: D

The smaller the p-value is in a statistical significance test, the less likely we are to reject the null hypothesis and make a claim that the alternative hypothesis is true.

Therefore, when the p-value is smaller, the Type I error rate is lower, and the region of rejection is smaller.

Topic: The p-value and rejecting the null

Question: If you're running an upper-tail test and find $p = 0.0643$, what is the z-value that gives the boundary between the region of acceptance and the region of rejection?

Answer choices:

A $z = -1.85$

B $z = -1.52$

C $z = 1.52$

D $z = 1.85$

Solution: C

In an upper-tail test, the entire region of rejection will lie in the upper tail, with the region of acceptance (non-rejection region) to the left of the region of acceptance.

Which means the full $p = 0.0643$ will lie in the upper tail. If we subtract this value from 1, we'll get the value that we'll be looking for in the body of the z-table.

$$1 - 0.0643$$

$$0.9357$$

If we look for 0.9357 in the body of the z-table, we get $z = 1.52$.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	**.9357**	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545