



Statistics Advance quiz

10 out of 10 correct

1. What is the F-test used for?

- ☒ To test the equality of variances in two populations
- ☐ To test the equality of means in two populations
- ☐ To test the correlation between two variables
- ☐ To test the goodness-of-fit of a model

Explanation: The F-test (variance ratio test) is used to determine if the variances of two populations are equal or not. It is a statistical test that compares the ratio of variances of two samples to a known F-distribution.

2. What are the possible values of F?

- ☐ Only positive values
- ☐ Only negative values
- ☐ Both positive and negative values
- ☒ Zero and positive values

Explanation: F is always a positive number or zero. It is the ratio of two variances, which cannot be negative.

3. Which of the following is NOT a parameter for the F-distribution?

- ☐ Degree of freedom for the numerator
- ☐ Degree of freedom for the denominator



- ☒ Mean
- ☐ Standard deviation

Explanation: The F-distribution is a probability distribution that depends on two degrees of freedom: the degree of freedom for the numerator (df1) and the degree of freedom for the denominator (df2). The F-distribution does not depend on the mean, but it is affected by the sample size and the variances of the samples.

4. Which library in Python can be used to calculate the F-distribution?

- ☐ NumPy
- ☒ SciPy
- ☐ Pandas
- ☐ Matplotlib

Explanation: The SciPy library in Python provides the f-distribution module to calculate the F-distribution. This module includes functions for calculating the cumulative distribution function (CDF) and the probability density function (PDF) of the F-distribution.

5. What is the significance level for the F-test?

- ☐ The probability of rejecting the null hypothesis when it is true
- ☐ The probability of accepting the null hypothesis when it is false
- ☒ The probability of obtaining a test statistic as extreme as or more extreme than the observed value, assuming the null hypothesis is true
- ☐ The probability of obtaining a test statistic as extreme as or more extreme than the observed value, assuming the alternative hypothesis is true

Explanation: The significance level for the F-test is the probability of obtaining a test statistic as extreme as or more extreme than the observed value, assuming the null hypothesis is true. It is usually set at 0.05 or 0.01, and it determines the threshold for rejecting the null hypothesis. If the p-value is less than the significance level, we reject the null hypothesis.

6. Two samples have variances 4 and 9. What is the value of F?

- ☐ 0.44
- ☐ 1.125
- ☐ 1.5
- ☒ 2.25

Explanation: F is the ratio of variances, so $F = 9/4 = 2.25$

7. For an F-distribution with $df_1=6$ and $df_2=9$, what is the value of F for a cumulative probability of 0.95?

- ☐ 3.43
- ☒ 3.69
- ☐ 3.89
- ☐ 4.23

Explanation: Using the `f.ppf()` function from SciPy library in Python, we get $f.ppf(0.95, 6, 9) = 3.69$.

8. A researcher wants to test if the variances of two samples are equal. She collects two samples of sizes 20 and 30 with sample variances 12 and 18, respectively. What is the calculated value of F?

- ☐ 0.67
- ☐ 0.75
- ☐ 1.25
- ☒ 1.5

Explanation: $F = s_1^2/s_2^2$, where s_1^2 and s_2^2 are the sample variances. So, $F = 12/18 = 1.5$.

9. Given an F-distribution with $df_1=8$ and $df_2=12$, what is the probability that F is greater than 3.50?

- ☐ 0.026
- ☐ 0.041
- ☒ 0.074
- ☐ 0.096

Explanation: Using the `f.sf()` function from SciPy library in Python, we get `f.sf(3.50, 8, 12) = 0.074`.

10. An experiment is conducted to compare the variances of two groups of data. The F-value is calculated to be 1.75, with degrees of freedom for the numerator and denominator being 6 and 8, respectively. What is the p-value for this F-value?

- ☐ 0.105
- ☒ 0.155
- ☐ 0.205
- ☐ 0.255

Explanation: Using the `f.cdf()` function from SciPy library in Python, we get `f.cdf(1.75, 6, 8) = 0.845`. The p-value is the complement of the cumulative probability, so $p = 1 - 0.845 = 0.155$.

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