### Quiz: Advanced Statistics

1. What is the F-test used for?

- A) To test the equality of variances in two populations

- B) To test the equality of means in two populations

- C) To test the correlation between two variables

- D) To test the goodness-of-fit of a model

2. What are the possible values of F?

- A) Only positive values

- B) Only negative values

- C) Both positive and negative values

- D) Zero and positive values

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

- A) Degree of freedom for the numerator

- B) Degree of freedom for the denominator

- C) Mean

- D) Standard deviation

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

- A) NumPy

- B) SciPy

- C) Pandas

- D) Matplotlib

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

- A) The probability of rejecting the null hypothesis when it is true

- B) The probability of accepting the null hypothesis when it is false

- C) The probability of obtaining a test statistic as extreme as or more extreme than the observed value, assuming the null hypothesis is true

- D) The probability of obtaining a test statistic as extreme as or more extreme than the observed value, assuming the alternative hypothesis is true

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

- A) 0.44

- B) 1.125

- C) 1.5

- D) 2.25

7. For an F-distribution with df1=6 and df2=9, what is the value of F for a cumulative probability of 0.95?

- A) 3.43

- B) 3.69

- C) 3.89

- D) 4.23

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?

- A) 0.67

- B) 0.75

- C) 1.25

- D) 1.5

9. Given an F-distribution with df1=8 and df2=12, what is the probability that F is greater than 3.50?

- A) 0.026

- B) 0.041

- C) 0.074

- D) 0.096

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?

- A) 0.105

- B) 0.155

- C) 0.205

- D) 0.255

### Answers

1. \*\*A) To test the equality of variances in two populations\*\*

- The F-test is primarily used to compare the variances of two populations.

2. \*\*D) Zero and positive values\*\*

- The F-distribution only takes on values from zero to positive infinity.

3. \*\*C) Mean\*\*

- The F-distribution is defined by its degrees of freedom for the numerator and denominator but not by a mean parameter.

4. \*\*B) SciPy\*\*

- The SciPy library in Python contains functions to calculate the F-distribution.

5. \*\*C) The probability of obtaining a test statistic as extreme as or more extreme than the observed value, assuming the null hypothesis is true\*\*

- This is the definition of the p-value, which is used to determine the significance level in hypothesis testing.

6. \*\*D) 2.25\*\*

- The F-value is calculated as the ratio of the variances: F = 9 / 4 = 2.25.

7. \*\*B) 3.69\*\*

- For df1=6 and df2=9, the F-value for a cumulative probability of 0.95 is approximately 3.69.

8. \*\*D) 1.5\*\*

- The F-value is calculated as the ratio of the sample variances: F = 18 / 12 = 1.5.

9. \*\*B) 0.041\*\*

- For df1=8 and df2=12, the probability that F is greater than 3.50 is approximately 0.041.

10. \*\*B) 0.155\*\*

- With an F-value of 1.75 and degrees of freedom for the numerator and denominator being 6 and 8, respectively, the p-value is approximately 0.155.