### Quiz: Advanced Statistics

1. What is the main difference between t-tests and z-tests?

- A) T-tests require a larger sample size than z-tests

- B) T-tests assume a known population variance while z-tests assume an unknown population variance

- C) Z-tests require a smaller sample size than t-tests

- D) Z-tests are used for testing two population means while t-tests are used for testing one population mean

2. In hypothesis testing, what is a Type 1 error?

- A) Rejecting a true null hypothesis

- B) Failing to reject a false null hypothesis

- C) Rejecting a false alternative hypothesis

- D) Failing to reject a true alternative hypothesis

3. What is the margin of error in a confidence interval?

- A) The width of the confidence interval

- B) The maximum amount a point estimate can be off from the true population parameter

- C) The probability of making a Type 1 error

- D) The probability of making a Type 2 error

4. A researcher wants to compare the mean weight of two different groups of mice. One group has a sample size of 25 and the other group has a sample size of 50. Which test should the researcher use to compare the means?

- A) T-test

- B) Z-test

- C) Both tests can be used

- D) Neither test can be used

5. A researcher wants to estimate the probability of a hypothesis based on new evidence. Which statistical tool should they use?

- A) T-test

- B) Z-test

- C) Bayes theorem

- D) Confidence interval

6. A confidence interval is calculated for a sample mean with a sample size of 100 and a standard deviation of 10. The 95% confidence interval is found to be between 25 and 30. What is the margin of error?

- A) 2.5

- B) 5

- C) 7.5

- D) 10

7. A researcher wants to compare the mean height of two different groups of plants. One group has a sample size of 15 and the other group has a sample size of 20. The population variance is known to be 9. Which test should the researcher use to compare the means?

- A) T-test

- B) Z-test

- C) Both tests can be used

- D) Neither test can be used

### Answers

1. \*\*C) Z-tests require a smaller sample size than t-tests\*\*

- T-tests are typically used when the sample size is small and/or the population variance is unknown. Z-tests are used when the sample size is large and the population variance is known.

2. \*\*A) Rejecting a true null hypothesis\*\*

- A Type 1 error occurs when the null hypothesis, which is actually true, is incorrectly rejected.

3. \*\*B) The maximum amount a point estimate can be off from the true population parameter\*\*

- The margin of error represents the maximum expected difference between the point estimate and the true population parameter.

4. \*\*A) T-test\*\*

- With the given sample sizes, especially since one is less than 30, a t-test is appropriate. Z-tests are generally used for larger sample sizes and when the population variance is known.

5. \*\*C) Bayes theorem\*\*

- Bayes theorem is used to update the probability of a hypothesis based on new evidence.

6. \*\*B) 5\*\*

- The margin of error is half the width of the confidence interval. The width of the interval is 30 - 25 = 5, so the margin of error is 5 / 2 = 2.5.

7. \*\*B) Z-test\*\*

- Since the population variance is known and the sample sizes are not large, a Z-test can be used.