Question I: What is a null hypothesis (H) and why is it important in hypothesis testing?

answer,

Provides a clear | Hypothesis testing begins by assuming the null hypothesis is true. This gives researchers a baseline against which evidence is evaluated.

Allows objective decision-making
Statistical tests calculate the probability (p-value) of observing the sample results if the null hypothesis were true. This helps determine whether the evidence is strong enough to reject H_0.

Question 2: What does the significance level (a) represent in hypothesis testing?

answer,

The significance level (α) in hypothesis testing represents the probability of rejecting the null hypothesis (H_0) when it is actually true. This is known as a Type I error.

Question. 3 : Diffrent between type I and type II errors.

Answer,

Type I and Type II errors are mistakes that can occur in hypothesis testing when making decisions about the null hypothesis.

Type I Error

Definition: Rejecting the null hypothesis when it is actually true.

Meaning: Concluding that there is an effect or difference when none exists (false positive).

Probability: Equal to the significance level (α).

Example: Saying a new drug works when it actually does not.

Type II Error

Definition: Failing to reject the null hypothesis when it is actually false.

Meaning: Missing a real effect or difference (false negative).

Probability: Denoted by β.

Example: Saying a new drug does not work when it actually does.

Question 4: Explain the difference between a one-tailed and two-tailed test. Give an example of each.

Answer,

The difference between one-tailed and two-tailed tests lies in the direction of the hypothesis and how the rejection region is defined.
A one-tailed test is used when the alternative hypothesis specifies a direction of the effect
A two-tailed test is used when the alternative hypothesis looks for any difference, without specifying a direction.

Question 5: A company claims that the average time to resolve a customer complaint is 10 minutes.
A random sample of 9 complaints gives an average time of I2 minutes and a standard deviation of 3 minutes.At a = 0.05, test the claim.

answer,

The data do not contradict the claim that the average complaint resolution time is 10 minutes.

question 6: When should you use aZ-test instead of a t-test?

answer,

Z-test: Known population variability, often large samples.
t-test: Unknown population variability, especially small samples.
The population standard deviation is unknown and must be estimated using the sample standard deviation.

The sample size is small (n < 30) and the population is approximately normal.

Question 7: The productivity of 6 employees was measured before and after a training program.

Answer,

Employee	before	after
1	50	55
2	60	65
3	58	59
4	55	58
5	62	63
6	56	59

Since 4.11 > 2.015, we reject the null hypothesis.
At the 5% significance level, there is strong statistical evidence that the training program improved employee productivity.

 The training program was effective.

Question 8: A company wants to test if product preference is independent of gender.

Answer,

Gender	Product A	Product B	Total
Male	30	20	50
female	10	40	50
Total	40	60	100

| | Since 16.66 > 3.841, we reject the null hypothesis.

Step 7: Conclusion

At the 5% significance level, there is strong evidence that product preference is not independent of gender.

Conclusion: Product preference depends on gender. | | | | |