

A-Level Mathematics

Name: _____ Score: _____

1. For $X \sim \text{Po}(3)$, what is the mean of X ?

2. X has mean 5. What is $E(3X - 1)$?

3. A probability density function must satisfy $\int f(x)dx$ over all x equals what value?

4. A population has $\sigma = 8$. For a sample of $n = 64$, what is $\text{Var}(\bar{X}) = \sigma^2/n$?

5. Population mean claimed 50, $\sigma = 8$, sample $n = 64$, $\bar{x} = 52$. What is $z = (\bar{x} - \mu)/(\sigma/\sqrt{n})$?

6. A Type I error is:
 - ☐ rejecting H_0 when it is actually true
 - ☐ accepting H_0 when it is actually false
 - ☐ choosing the wrong significance level
 - ☐ using the wrong sample
7. In $\text{Var}(aX + b)$, the constant b :
 - ☐ has no effect on the variance
 - ☐ is added to the variance
 - ☐ is squared
 - ☐ doubles the variance
8. For a continuous variable, $P(a < X < b)$ is the area under $f(x)$ between a and b .
 - ☐ True ☐ False
9. By the Central Limit Theorem, the sample mean is approximately normal for a large sample, whatever the population shape.
 - ☐ True ☐ False
10. The null hypothesis H_0 usually states that:
 - ☐ there is no change

- ☐ the mean has increased
- ☐ the test failed
- ☐ the sample is biased

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1. **3**

For a Poisson variable, the mean equals $\lambda = 3$ (and so does the variance).

2. **14**

$$E(3X - 1) = 3E(X) - 1 = 3 \times 5 - 1 = 14.$$

3. **1**

The total area under a pdf is always 1.

4. **1**

$$\text{Var}(X) = \sigma^2/n = 64/64 = 1.$$

5. **2**

$$z = (52 - 50)/(8/\sqrt{64}) = 2/(8/8) = 2/1 = 2.$$

6. **rejecting H_0 when it is actually true**

Type I = reject a true H_0 ; Type II = accept a false H_0 .

7. **has no effect on the variance**

Adding a constant shifts the data but does not change its spread, so b drops out.

8. **True**

Probabilities for a continuous variable are areas under the density function.

9. **True**

The CLT makes X approximately normal as the sample size grows.

10. **there is no change**

H_0 is the claim being tested, usually "no change"; H_1 is the suspected alternative.