SAT PREP
Procedure for Hypothesis Testing

(1) **Hypotheses:** State the null and alternative hypotheses. (Specify whether it is a one- or two-tailed test.)

(2) **Null distribution:** State the null distribution of the test statistic.

(3) **Test statistic**: Calculate the test statistic from the sample evidence.

(4) **Decision rule:** State the decision rule based on the significance level.

(5) **Evidence:** Find the p-value using your graphics calculator or find the critical values and the critical region.

(6) **Decision**: Make your decision to reject or not reject H_0, based on the significance level.

(7) **Conclusion**: Write a brief conclusion giving your decision some contextual meaning.

Example

Owner of the restaurant goes to a food wholesaler and inspects a large catch of over 50 000 fish. It is known that the population standard deviation is 4.2 grams. She will buy the catch if the mean weight exceeds 55 grams per fish. A random sample of 60 fish is taken, and the mean weight is 56.2 grams. Is there sufficient evidence at a 5% level to reject the catch?

Solution

Suppose the weight of prawns has distribution X with mean μ and $\sigma = 4.2$ g.

$$\overline{X} \sim N\left(\mu, \frac{4.2^2}{\sqrt{60}}\right)$$

(1) Hypotheses: H_0: $\mu = 55$ H_1: $\mu > 55$ (one-tailed test)

(2) Null distribution: Z-distribution ($\sigma = 4.2$ g is known)

(3) Test statistic:

$$z = \frac{56.2 - 55}{\frac{4.2}{\sqrt{60}}} \approx 2.213$$

(4) Decision rule: Reject H_0 if the p-value is less than 0.05   or Reject H0 if z lies in the critical region of Z.

(5) Evidence: p-value = P(Z > 2.213)
                  ≈ 0.0134

(6) Decision: Since the p-value is less than 0.05, we reject H_0 or Since z lies in the critical region, We reject H_0.

(7) Conclusion: Sufficient evidence exists at the 5% level to accept H_1, that the mean weight exceeds 55 grams. So, on this evidence, the owner should purchase the catch.