

ISI 11.4 Problem Set B partial solutions

Tuesday, April 4, 2023

- What is the experimental unit?
- From how many populations were the experimental units drawn? Identify the population(s). How many units were drawn from each population? Is this a 1- or a 2-sample problem?
- How many measurements were taken on each experimental unit? Identify them.
- Define the parameter(s) of interest for this problem. For 1-sample problems, this should be μ ; for 2-sample problems, this should be Δ .
- State appropriate null and alternative hypotheses.

ISI 11.4 Problem Set B Q7

a) A block of wood.

b) 2-populations $\left\{ \begin{array}{l} \text{wood treated with IGR} \quad (1) \\ \text{only with solvent.} \quad (2) \end{array} \right.$

60 units drawn from each pop.

2-sample problem.

c) 2 measurements per experimental unit.

d) $X_i = \overbrace{A_i - B_i}^{(1)} \quad i = 1, \dots, 60$

\uparrow \uparrow \uparrow
 after before

$Y_j = \overbrace{A_j - B_j}^{(2)} \quad j = 1, \dots, 60$

$X_1, \dots, X_{60} \sim P_1$

$Y_1, \dots, Y_{60} \sim P_2$

\bar{X}_{60}
 \bar{Y}_{60}

$\bar{X}_{60} \sim N\left(\mu_1, \frac{\sigma_1^2}{60}\right)$

$\Delta = \underbrace{\mu_1}_{\text{small negative}} - \underbrace{\mu_2}_{\text{large negative}} > 0$

negative negative > 0
 -1 -10

e) $H_0: \Delta \leq 0$
 $H_1: \Delta > 0$

Q7

a) E.V.: A runner.

b) 1-population (of runners)

120 units drawn

1-sample problem.

c) 2-measurements. (times on both races)

d) $\mu \rightarrow$ Average time difference
 $X_i = \underbrace{F_i}_{\substack{\uparrow \\ \text{First race} \\ \text{time}}} - \underbrace{S_i}_{\substack{\uparrow \\ \text{2nd race} \\ \text{time}}}$ $X_1, \dots, X_{120} \sim IP$

e) $H_0: \mu \geq 30$
 $H_1: \mu < 30$ } To show company's statement is incorrect.