Homework 1

Hao Zhang

True or False questions

Please write T (for true) or F (for false) in the parenthesis. A correct answer is worth 1 point and a wrong answer is 0 points.

For problems 1-8, assume $Y_1, Y_2, \ldots, Y_n$ are a random sample from $N(\mu, \sigma^2)$ with the sample mean $\bar{Y} = (1/n)\sum_{i=1}^{n} Y_i$ and sample variance S^2.

1. $\bar{Y} = (1/n)\sum_{i=1}^{n} Y_i$ is $N(\mu, \sigma^2)$. ( )
2. $\bar{Y} = (1/n)\sum_{i=1}^{n} Y_i$ is $N(\mu, \sigma^2/n)$. ( )
3. $\frac{\bar{Y}-\mu}{\sigma/\sqrt{n}} \sim N(0,1)$. ( )
4. $\frac{\bar{Y}-\mu}{S/\sqrt{n}} \sim N(0,1)$. ( )
5. $\frac{\bar{Y}-\mu}{S/\sqrt{n}} \sim t_{n-1}$. ( )
6. $\bar{Y}$ and S are independent. ( )
7. S^2 has a χ^2 distribution. ( )
8. $\left(\frac{\bar{Y}-\mu}{S/\sqrt{n}}\right)^2$ has an F distribution. ( )

Short answer questions

Each problem is worth 3 points.

9. Explain the difference or differences between a treatment factor and a treatment.
10. Explain some differences between a completely randomized design and a randomized complete block design.
11. What are some potential negative consequences if the treatments are assigned to experimental units without randomization?