

- 10.2** An experimenter has prepared a drug dosage level that she claims will induce sleep for 80% of people suffering from insomnia. After examining the dosage, we feel that her claims regarding the effectiveness of the dosage are inflated. In an attempt to disprove her claim, we administer her prescribed dosage to 20 insomniacs and we observe Y , the number for whom the drug dose induces sleep. We wish to test the hypothesis $H_0 : p = .8$ versus the alternative, $H_a : p < .8$. Assume that the rejection region $\{y \leq 12\}$ is used.
- In terms of this problem, what is a type I error?
 - Find α .
 - In terms of this problem, what is a type II error?
 - Find β when $p = .6$.
 - Find β when $p = .4$.

a. conclude $p < .8$ but actually $p = .8$

$$\begin{aligned}
 \text{b. } \alpha &= P(\text{reject } H_0 \mid H_0 \text{ is true}) \\
 &= P(Y \leq 12 \mid p = 0.8) \\
 &= 0.032
 \end{aligned}$$

$Y \sim \text{Bin}(20, 0.8)$
 α significance of the test

c. conclude $p = .8$ but $p < .8$

$$\begin{aligned}
 \text{d. } \beta &= P(\text{fail to reject } H_0 \mid p = 0.6) \\
 &= P(Y > 12 \mid p = 0.6) \\
 &= 0.416
 \end{aligned}$$

$1 - \beta$ power of the test