

## Errors In Hypothesis Testing

1. **Binomial:**  $H_0 : p = \frac{3}{4}$ .  $H_1 : p < \frac{3}{4}$ .  $\alpha = 10\%$ .  $n = 25$ .
  - (a) Find the true significance level of the test. 7.13%
  - (b) Find the probability of a Type I error. 7.13%
  - (c) Find the critical region for the test. {0, 1, ..., 15}
  - (d) Given that  $p$  is actually 0.65 find the probability of a Type II error. 0.6303
  
2. **Poisson:**  $H_0 : \lambda = 4.2$ .  $H_1 : \lambda < 4.2$ .  $\alpha = 5\%$ .
  - (a) Find the true significance level of the test. 1.50%
  - (b) Find the probability of a Type I error. 1.50%
  - (c) Find the critical region for the test. {0}
  - (d) Given that  $\lambda$  is actually 1 find the probability of a Type II error. 0.6321
  
3. **Binomial:**  $H_0 : p = 0.4$ .  $H_1 : p > 0.4$ .  $\alpha = 2\frac{1}{2}\%$ .  $n = 20$ .
  - (a) Find the true significance level of the test. 2.10%
  - (b) Find the probability of a Type I error. 2.10%
  - (c) Find the critical region for the test. {13, ..., 20}
  - (d) Given that  $p$  is actually 0.6 find the probability of a Type II error. 0.5841
  
4. **Poisson:**  $H_0 : \lambda = 8$ .  $H_1 : \lambda \neq 8$ .  $\alpha = 10\%$ .
  - (a) Find the true significance level of the test. 7.66%
  - (b) Find the probability of a Type I error. 7.66%
  - (c) Find the critical region for the test. {0, 1, 2, 3, 14, 15, ...}
  - (d) Given that  $\lambda$  is actually 9.5 find the probability of a Type II error. 0.8832
  
5. **Continuous:**  $H_0 : \mu = 10$ .  $H_1 : \mu > 10$ .  $\alpha = 5\%$ . Sample of 15 drawn from a population distributed  $X \sim N(\mu, 2^2)$ .
  - (a) Find the true significance level of the test. 5%
  - (b) Find the probability of a Type I error. 5%
  - (c) Find the critical value for  $\bar{X}$ . (i.e.  $\bar{X}_{\text{crit}}$ .) 10.849
  - (d) Given that  $\mu$  is actually 11 find the probability of a Type II error. 0.3851
  
6. **Binomial:**  $H_0 : p = \frac{1}{2}$ .  $H_1 : p \neq \frac{1}{2}$ .  $\alpha = 5\%$ .  $n = 18$ .
  - (a) Find the true significance level of the test. 3.08%
  - (b) Find the probability of a Type I error. 3.08%
  - (c) Find the critical region for the test. {0, 1, 2, 3, 4, 14, 15, ..., 18}
  - (d) Given that  $p$  is actually 0.75 find the probability of a Type II error. 0.4813
  
7. **Continuous:**  $H_0 : \mu = 6$ .  $H_1 : \mu < 6$ .  $\alpha = 10\%$ . Sample of 30 drawn from a population distributed  $X \sim N(\mu, 1^2)$ .
  - (a) Find the true significance level of the test. 10%
  - (b) Find the probability of a Type I error. 10%
  - (c) Find the critical value for  $\bar{X}$ . (i.e.  $\bar{X}_{\text{crit}}$ .) 5.766

- (d) Given that  $\mu$  is actually 5.5 find the probability of a Type II error. 0.0735
8. **Continuous:**  $H_0 : \mu = 200$ .  $H_1 : \mu \neq 200$ .  $\alpha = 1\%$ . Sample of 10 drawn from a population distributed  $X \sim N(\mu, 16)$ .
- (a) Find the true significance level of the test. 1%
- (b) Find the probability of a Type I error. 1%
- (c) Find the critical values for  $\bar{X}$ . (i.e.  $\bar{X}_{\text{crit}}$ .) 196.7 and 203.3
- (d) Given that  $\mu$  is actually 205 find the probability of a Type II error. 0.0849
- (e) Calculate the probability of a Type III error. (Only kidding...)