STAT 511 Midterm Exam Fall 2011
Answer

MULTIPLE CHOICE

1. ANS: B PTS: 1
2. ANS: A PTS: 1
3. ANS: C PTS: 1
4. ANS: A PTS: 1
5. ANS: A PTS: 1
6. ANS: A PTS: 1
7. ANS: C PTS: 1

NUMERIC RESPONSE

8. ANS: 500

   PTS: 1
9. ANS: 73

   PTS: 1
10. ANS: 0.5, 0.5, 5/8, 0.25

    PTS: 4
11. ANS: 9, 2, 2.

    PTS: 3
12. ANS: Hypergeometric distribution, 0.114.

    PTS: 2
13. ANS: 5, 0.16

    PTS: 2
14. ANS: normal , μ , $\sigma/\sqrt{n}$ PTS: 3
15. ANS: type I

    PTS: 1
16. ANS: t, n-1.

    PTS: 2

PROBLEM

17. ANS:
    (a) 1000/200= 5.

$p = 1/200;\ \ n = 1000;\ \ \lambda = np = 5$

(b) $P(6 \le X \le 9) = \sum_{x=6}^{9} \frac{e^{-\lambda}\lambda^x}{x!} = 0.352$

(c) Here one could use the Poisson approximation which will yield an answer 0.032, or use the normal approximation.

Let $\mu = 5$ and $\sigma^2 = np(1-p) = 1000 \times 0.005 \times 0.995 = 4.975$. Then

$$P(X \ge 10) = 1 - \Phi\left(\frac{9.5 - 5}{4.975}\right) = 0.022.$$

PTS: 8

18. ANS:
a. 0.328
b. 0.0086.

PTS: 6

19. ANS:
(a) 0.125 (b) 3/4

PTS: 6

20. ANS:
(a) d.f. = $n - 1 = 7$, so the critical value for a 95% C.I. is $t_{.025,7} = 2.365$ = 2.365. The interval is then

$30.5 \pm (2.365)\left(\frac{3.0}{\sqrt{8}}\right) = 30.5 \pm 2.51 (27.99, 33.01)$.

(b). Use the formula $\left(\frac{(n-1)s^2}{\chi^2_{\frac{\alpha}{2}}}, \frac{(n-1)s^2}{\chi^2_{1-\frac{\alpha}{2}}}\right)$ where for $\alpha = 0.05$, $\chi^2_{0.025} = 16.012,\ \chi^2_{0.975} = 1.69$. The 95% CI for $\sigma^2\ is\ (3.37, 31.95)$.

PTS: 6

21. ANS:
a. $H_0 : \mu = 5.5$ vs. $H_a : \mu \ne 5.5$; for a level .01 test, reject H_0 if either $z \ge 2.58$ or $z \le -2.58$. Since

$$z = \frac{\bar{x} - 5.5}{\frac{\sigma}{\sqrt{n}}} = -0.33,$$

we fail to reject H_0.
b.

$$\beta(5.6) = \Phi\left(z_\alpha + \frac{5.5 - 5.6}{\frac{3}{4}}\right) - \Phi\left(-z_\alpha + \frac{5.5 - 5.6}{\frac{3}{4}}\right) = \Phi(2.45) - \Phi(-2.71) = 0.98.$$

PTS: 6