Economics 250 Midterm Test 2: Answer Guide

1. (a) Three or more successes is the same thing as three or fewer failures. The probability of failing win a seat is 0.45. From table C, the probability of 3 or fewer losses is 0.7448 or 74.48%. So that is the probabi9lity of 3 or more wins.

And the probability of winning 6 is the probability of losing 0 which is 0.0277 or 2.77%.

(b) Using the normal approximation means that the number of successes,

$$X \sim N(27.5, \sqrt{12.375}).$$

Thus our z-statistic is

$$z = \frac{25 - 27.5}{3.5178} = -0.71067.$$

From table A there is probability 0.2389 below -0.71 or 76.11% above that point. So that is the probability of at least 25 wins.

2. (a) The confidence interval is

$$400 \pm 1.645\frac{20}{6} = 400 \pm 5.48 = (394.52, 405.48).$$

(b) The margin of error is:

$$4 = 1.645\frac{20}{\sqrt{n}},$$

so $\sqrt{n} = 8.225$ and so $n = 68$ is the smallest integer that gives a margin of error this small.

(b) Now

$$4 = z\frac{20}{6},$$

so $z = 1.2$ which has a cumulative probability of 0.8849. That leaves 1-0.8849 $= 0.1151$ in each tail so this is a 76.98% confidence interval.

3. (a) The one-sided critical value for $\alpha = 0.025$ is:

$$1.96\frac{3}{\sqrt{16}} = 1.47.$$

Because $2 > 1.47$, she rejects the null at this level of significance.

(b) Under this alternative the distribution is centred at 1 with standard deviation $\sigma/\sqrt{n} = 3/4 = 0.75$. The critical value is 1.47. Standardizing implies that critical value gives a z-value of 0.62666. From Table A I'll use the closest value which is 0.63 (you may be more precise with your calculator perhaps) giving a cumulative probability of 0.7357. That means there is a probability of type II error of 73.57% and a test power of 26.43%. (The alternative is quite close to the null, relative to the standard error, so it is difficult to distinguish them.)

4. (a) This is a paired difference with a mean of 2 and standard deviation of 2, as well as $n = 16$. With $df = 15$ from Table D the relevant t-statistic is 1.753. Thus the confidence interval is

$$2 \pm 1.753\frac{2}{4} = 2 \pm 0.8765 = (1.1235, 2.8765).$$

(b) The relevant t-statistic is:

$$t = \frac{2 - 3.301}{2/4} = -2.602.$$

From Table D, with $df = 15$ that leaves 1% probability in the lower tail. The P-value for a two-tailed test is the probability of finding a statistic this far from zero in absolute value, so the P-value is 0.02 or 2%.