Math 110

Quiz 4 Sample Solutions

March 22, 2010

Be sure to show the calculations that lead to your answers.

1. Betting on a pair of adjacent numbers in roulette pays 17 to 1 (a winning bet of \$10 wins \$170, otherwise it loses the \$10). Refer to the accompanying roulette table as needed.

   (a) Construct a box model for this bet. (How many tickets are in the box and what numbers are on the tickets?)

   The box consists of 2 tickets marked \$170 and 36 tickets marked -\$10.

   (b) If the bet is made 20 times, what is the EV for the total amount won/lost?

   The box average is $\frac{1}{38}(2\times 170 - 36\times 10) = -\frac{10}{19} \approx -.53$. The EV is $20\times(-.53) = -10.53$.

   (c) What is the SE for this EV?

   The SD of the box is $(170-(-10))\sqrt{\frac{2}{38}\frac{36}{38}} \approx 40.2$. The SE of the box is $\sqrt{20}\times 40.2 \approx 179.8$.

   (d) What are the chances that a person playing this bet 20 times will wind up with winnings of more than a \$100?

   Convert \$100 to standard units: $z = \frac{100-(-10.53)}{179.8} \approx .615$. The corresponding symmetric area is approximately 46%. The answer is $\frac{1}{2}(100-46) = 27\%$.

2. When constructing a probability histogram for flipping a fair coin 50, times:

   (a) What is the width of a class interval?

   All class intervals are one unit wide and are centered on a whole number.

   (b) How do we determine the area of a block?

   The area of the block centered at the number k is the binomial formula times 100%:

   $$\frac{50!}{k!(50-k)!}(\frac{1}{2})^k(\frac{1}{2})^{n-k}\times 100\%$$

   .

3. (Hypothetical) A simple random sample of 50 first-year students finds that 62% approve of trayless dining in Kimball while 38% would prefer to use trays. Find the 95% confidence interval for this poll. (Assume there are 730 students in the first-year class.)

   The 95% confidence interval is centered on 62%. The SE for the box model is $(1-0)\sqrt{.62\times .38} \approx .485$. The SE for percentage $\frac{.485}{\sqrt{50}}\times 100\% \approx 7\%$. Adjusting for drawing without replacement, multiply the SE by $\sqrt{\frac{730-50}{730-1}} \approx .97$ Therefore the 95% confidence interval is $62 \pm 2\cdot .97\cdot 7\% = 62 \pm 13.6\%$.