6.2 Continued

- empirical rule derive the empirical rule using symmetry and the standard normal table.

6.3 The Binomial Distribution

- binomial distribution represents the number of observations matching a particular type.
- put another way, it represents the count of independent binary random variables.
- binary random variable a random variable that is binary has the following density function

$$X_i = \begin{cases} 1 & \text{w/ probability } p \\ 0 & \text{w/ probability } 1-p \end{cases}$$

consider n cases, or trials, then

$$Y = \sum_{i=1}^{n} X_i$$

is said to be binomial with parameters n and p.

then Y can take values $0, 1, 2, \ldots, n$ and the density function of the binomial distribution will tell us the probabilities for each value that Y takes.

- ex find the probabilities for flipping a coin three times using the equation for the binomial distribution and using the sample space. in this case use $p = 0.4$ and $p = 0.5$.
- ex : quiz we will revisit the quiz question, only make it a little more difficult. an instructor is giving a multiple choice quiz today. there are five questions, with five options each (only one option is correct out of each set). a student must answer at least 3 correct to pass. calculate the probability of passing the quiz.
- ex 12 a few years ago a lawsuit was brought against Wal-Mart. the prosocution claims that women were passed over for managerial training. suppose a large group of employees is going to be pooled for training. ten will be chosen to go to the training. half of the large group are women and half are men. since the program began, none of the 10 chosen have been women. calculate the probability of no women being chosen.

  always check binomial conditions

  - data are binary.
  - probability of selecting a female (or any condition) on any trial is 0.5 (or some specified value of p).

  - the outcome for one trial is separate and independent from the outcome of another.

- ex 13 suppose the population of potential trainees is only 4 people (two men and two women). we will chose two people to go to training. do the binomial conditions apply?

- for a binomial distribution $\mu = np$ and $\sigma = \sqrt{np(1-p)}$.

- since the binomial distribution is symmetric and bell shaped, it is approximated nicely with the normal distribution so that $bin(n,p) \approx N(np, \sqrt{np(1-p)})$.

- guideline : the binomial distribution can be approximated well with the normal distribution if np and $n(1-p)$ are both at least 15.