MTH 23.5 LECTURE NOTES (Ojakian)

Topic 17: Binomial Distribution

OUTLINE

References (**Algebra Book**: None; **Statistics Book**: 4.3)

1. Binomial Distributions

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1. Binomial Distribution

   (a) Binomial Experiment Example

      i. Flip the same coin 3 times and count the number of heads (biased so probability of heads is 0.2). What is the probability of all heads? What is the probability of 2 heads? Etc? Draw a probability tree diagram. Draw a histogram of the distribution.

      ii. Parameters/Terminology
      n = number of trails
      p = probability of "success"
      q = probability of "failure"
      r = number of successes
      $P(r)$ = probability of r successes
      $P(r < x)$ = probabillity of less than x successes (ETC.)

      iii. Using Excel

         A. BINOM.DIST(r, n, p,FALSE): For probability of **exactly r successes**.

         B. BINOM.DIST(r, n, p,TRUE): For probability of **r or fewer successes**.

         PROBLEM 1. *Use Excel to verify the above calculations.*

      iv.

         PROBLEM 2. *Use Excel for this question. From Section 6.2 (5th edition), do problem 14. Also answer these questions:*

         A. *What is the probability that* **exactly** *3/4 of the men are wearing their ties too tight?*

         B. *What is the probability that* **at least** *3/4 of the men are wearing their ties too tight?*

   (b) Key formula

   $P(r \text{ successes }) = C_{n,r}p^r q^{n-r}$

   Along with the rest of probability theory! (complements, multiplication rule, addition rule, etc)

   PROBLEM 3. *Use the formula to calculate some of the above probabilities by hand.*

   PROBLEM 4. *From Section 6.2, do problem 15. Do it by hand, and using Excel.*

   (c) Expectation of binomial distribution

   Expectation = np

PROBLEM 5. *Steve Nash has the highest career foul shooting percentage of* 90.4% *(stats based on the last time I checked ...).*

i. If he shoots 100 foul shots, how many do we expect to go in?

ii. If he shoots 25 foul shots, how many do we expect to go in?

iii. Do a simulation of 25 foul shots in Excel using RAND, to see how many go in. How close is the simulation to the expected value?

(d) Standard Deviation, $\sigma = \sqrt{npq}$