Wednesday, April 25, 2018 1:11 PM

Find the probability that the student guess at least 2 questions correctly.

$$P(X \geq 2) = 1 - [P(X=0) + P(X=1)]$$

$$= 1 - [C(10,0)\cdot(0.2)^0\cdot(0.8)^{10} + C(10,1)\cdot(0.2)^1\cdot(0.8)^9]$$

$$\simeq 0.624$$

E.g. A test for a certain drug produces a false positive 22% of the time.

An athlete who does not use the drug takes the test 6 times. Find the probability that the athlete tests positive at least 4 times?

(a) $n = 6$ trials.

(b) Each trial has 2 outcomes: positive (success), negative (failure)

(c) $p = 0.22$; $q = 0.78$

(d) Independent trials

0.0239

$$P(X \geq 4) = P(X=4) + P(X=5) + P(X=6)$$

$$= C(6,4)\cdot(0.22)^4\cdot(0.78)^2$$
$$+ C(6,5)\cdot(0.22)^5\cdot(0.78)^1$$
$$+ C(6,6)\cdot(0.22)^6$$

$$\approx 0.0239$$

E.g. Suppose 15% of major league baseball players are left-handed. In a sample of 12 players, find the probability that at most 10 of them are left-handed. 0.99

$n = 12$ trials. outcomes $\begin{cases} \text{left-handed (success)} \\ \text{righ-handed (failure)} \end{cases}$

$p = 0.15$

$$P(X \leq 10) = 1 - [P(X=11) + P(X=12)]$$

$$= 1 - [C(12,11)\cdot(0.15)^{11}\cdot(0.85)^{1} + C(12,12)\cdot(0.15)^{12}.]$$

$$\approx 0.99$$

Mean, Variance, Standard Deviation of Binomial Distribution

X is a binomial random variable with n trials and $P(S) = p$.

Then the expected value of X is:

$$\boxed{E(X) = np.}$$

The variance of X is

$$V(X) = np(1-p) = npq$$

Standard Deviation:

$$\sigma_X = \sqrt{npq}.$$

E.g. X = # of correct guesses for a student guessing on a 10 question exam. $(n=10)$ with 5 choices per question. $(p=0.2)$

$$E(X) = np = 10 \cdot (0.2) = 2.$$

$$V(X) = npq = 10 \cdot (0.2) \cdot (0.8) = 1.6$$

$$\sigma_X = \sqrt{1.6} = 1.26$$