

7.2] Binomial Distributions

Fluitt's

1. While Tree Planting, my quality would be checked every day by a manager that walked through my land. He would place a shovel down somewhere and then check the quality of the trees within a 3m distance. He would check 3 different plots each with about 12 trees. If I plant at a 97% quality level, what is the probability that he will find

i) no bad trees,

$$(.97)^{12} = .69 = 69\% \quad 3\% \text{ bad.}$$

ii) 1 bad tree,

iii) 3 bad trees?

$$ii) \begin{array}{l} 11 \text{ Good} \\ 1 \text{ Bad} \end{array} \quad (.97)^{11} \cdot .03 > .02 = 2\% \Rightarrow 24\%$$

$$12C_1 (11 \text{ Good}) (1 \text{ Bad})$$

$$12 C_3 (96)(38)$$

$$= 220 (.97)^9 (.03)^3$$

$$= 0.005 = 0.5\%$$

Probability in a Binomial Distribution

$P(x) = {}_nC_x p^x q^{n-x}$ where p is the probability of success on any individual trial and $q = 1 - p$ is the probability of failure.

Expectation for a Binomial Distribution

$$E(x) = np$$

2. A chocolate company manufactures 40% white chocolates and the 60% brown. Chocolates are chosen at random and placed into a box of 10.

- a) What is the expected number of white chocolates in a box?
- b) What is the probability that two or less candies in a given box are white?
- c) What is the probability that less than two candies in a given box are white?

a) $E(x) = 10(0.4) = 4$

b) 0 white: ${}_{10}C_0 (0.4)^0 (0.6)^{10} = 0.006$
1 white: ${}_{10}C_1 (0.4)^1 (0.6)^9 = 0.04$
2 whites: ${}_{10}C_2 (0.4)^2 (0.6)^8 = 0.12$

} $\approx 17\%$

5. You forgot to study for your history quiz. The quiz consists of 10 multiple choice questions with 4 options for each question. You randomly guess the answer to each question. Show a probability distribution for the number of correct answers.

$$p = 0.25 \quad q = 0.75$$

$$0 \text{ correct: } {}_{10}C_0 (0.25)^0 (0.75)^{10} = 5.6\%$$

$$1 \text{ correct: } {}_{10}C_1 (0.25)^1 (0.75)^9 = 18.8\%$$

$$2 \text{ correct: } {}_{10}C_2 (0.25)^2 (0.75)^8 = 28\%$$

$$52.4\%$$