

Binomial Distribution

Exercise 1.

A factory produces screws and 1% of them are defective. A company buys boxes with 100 screws in them and rejects the box if there is any defective screw.

- a) Calculate the probability of rejecting a box. *Answer: 0.6339*
- b) If the company buys 16 boxes, calculate the probability of rejecting 5 of them. *Answer: 0.00617*
- c) If the company buys 20 boxes, how many of them do we expect to reject? *Answer: $E(X) = 12.8$*

Exercise 2.

The potato harvest of a country was evenly distributed in 6 regions, and the estimation is that 90% of the potato bags are in good condition. If we receive 20 bags from certain region, what is the probability to receive at least 15 of them in good condition? *Answer: 0.9888*

Exercise 3.

An insurance company sells the health care service to 5 people of the same age. According to previous studies, $\frac{2}{3}$ of the people are alive after 30 years from that point. Calculate the probability after 30 years of being alive:

- a) 5 of them. *Answer: 0.1350*
- b) Only 2 of them. *Answer: 0.1613*
- c) At least 3 of them. *Answer: 0.7950*
- d) At most one of them. *Answer: 0.0436*

Exercise 4.

A data entry makes a spelling mistake in 9% of the words he enters. How many mistakes he expects to have in 84 words? *Answer: 7.56 mistakes*

Exercise 5.

In a production process, 10% of the products shows a defect. If we pick 7 products:

- a) Calculate the probability to find 3 of them with defects. *Answer: 0.0229*
- b) Calculate the probability that none of them have defects. *Answer: 0.4783*

- c) Calculate the probability to find defects in at most 4 of them. *Answer: 0.9998*
- d) How many products do we expect to find with defects within these 7? *Answer: 0.70*
- e) Calculate the variance and the standard deviation. *Answer: $VAR(X) = 0.63 \text{ products}^2$ $SD(x) = 0.793 \text{ products}$.*

Exercise 6.

A “true/false” test has 5 questions. If a student answers each of them randomly. He passes the exam with at least 3 correct answers.

- a) What is his probability to answer 2 questions correctly? *Answer: 0.3125*
- b) What is his probability to pass the test? *Answer: 0.50*
- c) What is the probability to fail the test? *Answer: 0.50*
- d) What is his probability to answer all the questions correctly? *Answer: 0.0313*
- e) How many questions does he expect to answer wrong? *Answer: 2.5*