Task:

What is the probability to get rain exactly 4 days during a week if probability to get rain in a randomly selected day p 0.4

Solution:

Chance of precipitation on any day of the week is always constant. Therefore, we deal with the binomial experiment. Binomial Formula:

$$P_n^k = C_n^k p^k q^{n-k}$$

Where n – the number of trials in the binomial experiment,

k – the number of successes that result from the binomial experiment,

p – the probability of success on an individual trial,

q – the probability of failure on an individual trial($q = 1 - p$),

C_n^k – the number of combinations of n things, taken k at a time.

$$n = 7$$

$$k = 4$$

$$p = 0.4$$

$$q = 1 - p = 1 - 0.4 = 0.6$$

$$C_n^k = \frac{n!}{k!\,(n-k)!}$$

$$P_7^4 = C_7^4 \cdot 0.4^4 \cdot 0.6^{7-4} = \frac{7!}{4!\,(7-4)!} \cdot 0.4^4 \cdot 0.6^3 = \frac{7 \cdot 6 \cdot 5}{3!} 0.0055296$$
$$= 7 \cdot 5 \cdot 0.0055296 = 0.193536$$

Answer: probability to get rain exactly 4 days during a week is 0.193536.