
1: The binomial coefficient

(a) **Solve:** Formally show that $\binom{n}{k} \equiv \binom{n}{n-k}$

(b) **Reason:** Logically explain why $\binom{n}{k} \equiv \binom{n}{n-k}$

2: The binomial distribution

Disks produced by a certain company will be defective with probability 0.01 independently of each other. The company sells the disks in packages of 10 and offers a money-back guarantee that at most 1 of the 10 disks is defective.

Solve:

(a) What proportion of packages is returned?

(b) If a client buys 30 packages, what is the expected of packages that will be returned?

(c) If a client buys 3 packages, what is the probability that exactly one of them will be returned?

R commands:

With reference to question (c), write the R-commands for:

- computing the probability distribution of the corresponding random variable
 - plotting the probability distribution of the corresponding random variable
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3: The multinomial distribution

In a certain town, 40% of the eligible voters prefer candidate A, 10% prefer candidate B, and the remaining 50% have no preference. You randomly sample 10 eligible voters.

Solve:

(a) What is the probability that 4 will prefer candidate A, 1 will prefer candidate B, and the remaining 5 will have no preference?

(b) What is the probability that 3 will prefer candidate A, 5 will prefer candidate B, and the remaining 2 will have no preference?

R commands: (Suggestion: Google search for “Multinomial distribution in R”)

With reference to previous problem, write the R-commands for:

- computing the probability distribution of the corresponding random variable
- plotting the probability distribution of the corresponding random variable