

Exercises in R: Set 1

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R reference: Lam - An Introduction to R.
https://cran.r-project.org/doc/contrib/Lam-IntroductionToR_LHL.pdf

1 R as a calculator

Use R to do the following.

1. Find $\sqrt{3}$
2. Find the 10th, 25th, 75th and 95th quantiles of the standard normal distribution.
3. Generate 100 random fair coin tosses, and display a table of heads and tails.

2 Basic vectors and arrays

Use R to do the following.

1. Generate a vector consists of all integers between 1 and 100
2. Generate a vector consists of all odd numbers between 1 and 100
3. Generate a vector consists of all numbers divisible by 7 between 1 and 100
4. Find the mean and standard deviation of the list of odd number divisible by 7 between 1 and 100.

5. Compute $\sum_{i=1}^{100} \sqrt{i} \log(i)$ (hint: create two appropriate vectors of length 100, then take their dot products).
6. Find the singular value decomposition of the 100×100 matrix A , where $A_{ij} = i + j$ for $i, j = 1, \dots, n$.

3 Vectors and arrays: typical statistical applications

- Create a random 70×5 matrix with 70 rows, 5 columns, with **integer** entries between 0 and 100. Call it M . We shall interpret M as the scoresheet of a math class: the rows correspond to student, and the columns of M are the scores of 5 different assignments in this class.
- Turn M into a dataframe. Give the columns names: "homework1", "homework2", "homework3", "midterm", "final".
- The total score in this fictitious class is: 20% midterm + 60% final + 20% from the best two homework. Compute the score, and store it as a new column **score** in M .
- Compute means and standard deviations of the rows and columns of M .
- Plot the distribution of **score**. Is **score** approximately normal?
- Compute the letter grades for your students based on these rules: the top 5% of the class receive A, the next 15% receive B, the next 30% receive C, the next 20% receive D, and the rest fails.