Terms, topics, or concepts you should be familiar with:

p-value
frequentist vs Bayesian approaches
Bayes theorem
reproducibility crisis
statistic
parameter
continuous variable
discrete variable
nominal variable
ordinal variable
experimental vs observational studies
μ
σ
$\bar{Y}$
s
blinding
pseudoreplication
biological vs technical replicates
confounding variables
common faults in plots
sample
population
transformation
parametric
non-parametric

R skills you should have

Create matrices and vectors
Subset a dataframe or matrix to select only specific rows or columns
Subset a vector to select only specific elements
Read a csv file to import data
Make a basic plot of 1, 2, or 3 variables that have a mix of continuous and discrete values
Perform the statistical tests mentioned below

Tests you should be able to run

Binomial
Chi-square
T-test (single sample, two sample, paired)
Anova
Permutation

Example Problems

You flip a coin 235 times you get heads 269 times you get tails.
Does this dataset provide support for this being a fair coin? _____
What test did you use? _____
What p-value was associated with this test? _____

You measure height of students at the MSC and the gym. Are the heights you measured significantly different
MSC: 126, 164, 148, 120, 178, 183
Gym: 151, 109, 151, 174, 118, 136
What test did you use for this question? _____
What p-value was associated with this test? _____
What do you infer from your test? _____

You grow plants with three different potting soils and measure height at 21 days does your data support any difference in the growth with these soils.
Soil1: 23, 12, 45, 23, 21, 45, 21
Soil2: 35, 45, 21, 34, 67, 23, 16
Soil3: 16, 21, 18, 33, 16, 21, 19

Stickleback fish occur in deep water and shallow water populations. These populations rarely interbreed. It has been hypothesized that these fish have genetic adaptations to their habitat. To test this you grow fish from both strains in both deep and shallow water. Does the data below support the hypothesis that these fish are adapted to their natural habitat? The values in the table are fitnesses for fish in your experiment

	Deep water habitat	Shallow water habitat
Deep water fish	.97, .78, .99, .87, .91, .89	.61, .87,.88, .78, .80, .37
Shallow water fish	.56, .95,.73, .81, .89, .64	.77, .95,.93, .95, .89, .94