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

p-value
reproducibility crisis
statistic
parameter
continuous variable
discrete variable
experimental vs observational studies
μ
σ
$\bar{Y}$
s
blinding
pseudoreplication
confounding variables
common faults in plots
sample
population
transformation
parametric
non-parametric

R skills you should have

Create matrices and vectors
Subset a vector, dataframe, or matrix to select only specific elements
Read a csv file to import data
Make a publication quality 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)
Permutation

Example Problems

You administer a vaccine candidate for covid-19 and a placebo each to 1000 individuals. You find that after 2 months there have been covid-19 cases in 32 placebo group and 6 vaccine group participants.
Does this vaccine work? _____
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 two different potting soils and measure height at 21 days. Use a non-parameteric test evaluate the results of your study.
Soil1: 23, 12, 45, 23, 21, 45, 21
Soil2: 35, 45, 21, 34, 67, 23, 16

You measure the reproductive success of fish in your study and record the sex and number of offspring that survive to adulthood for each fish in the study. Use a permutation test to determine whether males and females have equal variance in reproductive success.

Sex	f	m	f	f	m	f	f	f	m	m	m	m	m	f	m	m	f	m	f	f
Total reproduction	10	16	9	8	0	9	9	9	8	3	17	14	17	8	9	18	8	7	7	8

Determine which species don't have a 50:50 sex ratio
Species 1 6 males / 1 female
Species 2 345 males / 302 females
Species 3 127 males / 94 females

Use the iris data in R - `data(iris)` - to make a plot showing what you think is the most striking differences in the species