Learning Goals

- State null and alternative hypotheses in terms of population parameters and identify whether a test is one-sided or two-sided.
- Calculate and interpret test statistics and p-values for one-sample tests about a population mean or population proportion.
- Choose the appropriate hypothesis test procedure based on whether the population standard deviation is known or unknown and whether the response variable is quantitative or categorical.
- Use `pnorm()`, `pt()`, `t.test()`, and `prop.test()` in R to carry out hypothesis tests and write conclusions in context.

- `paired sample / independent sample:`

- `difference in means:`

- `pooled variance:`

- `equal variance / unequal variance:`

- `paired t-test / two-sample t-test:`

- `ANOVA:`

Practice Problems

For each task below, write the R code you would use and briefly describe what you expect the output to look like.

1. Use the `sleep` dataset in base R. This dataset records the increase in hours of sleep for the same subjects under two different drugs. Explain why this setting uses a paired t-test rather than an independent samples t-test. Then write the R code you would use to test whether the mean increase in sleep differs between the two drugs.

2. Use the `ToothGrowth` dataset in base R. We want to determine whether the mean tooth length differs between the two supplement types (`OJ` and `VC`). Explain why this setting uses an independent samples t-test, and write the R code you would use to check whether the variances appear equal and then carry out the appropriate test.

3. The `PlantGrowth` dataset contains plant weights for three different treatment groups. Write the R code you would use to test whether the mean plant weight is the same across all three groups using ANOVA. Briefly describe what the output would tell you.