

Quiz 2 information and objectives

Quiz 2 will have a similar format to Quiz 1. The quiz 2 window is Saturday, Nov 2 - Tuesday, Nov 5 at 11:59pm. Material from weeks 6, 7, and 8 are covered. **Updated 10/29:** You will have 120 minutes (2 hours) to complete the quiz. Canvas, notes, textbooks, R, and internet resources may be used. You may not collaborate with classmates for the quiz. Corrections will be accepted for this quiz.

There will be some data analysis questions, which will typically ask you to find a confidence interval, test statistic, and/or p-value. You will need to be able to perform and draw appropriate conclusions from these three methods:

1. large-sample inference on π
2. Inference on μ (one sample t test)
3. Inference on $\pi_1 - \pi_2$

Week 6 (inference foundations):

Concepts such as

- Reject a null hypothesis when $p < \alpha$. When we reject, we say that there is evidence in support of the alternative (taking into account sample size and variability).
- Fail to reject a null hypothesis when $p > \alpha$. When we fail to reject, we say that the data do not provide sufficient evidence to conclude the alternative.
- A confidence interval contains a range of plausible values for a parameter
- standard errors reflect the variability of a statistic, accounting for population variance and sample size.
- A "statistically significant" result is a phrase that is used when the null hypothesis is rejected.
- Statistical models refer to probability distributions that are assumed to describe observed data.

Vocabulary such as

- standard error
- margin of error
- point estimate
- confidence level
- null and alternative hypothesis
- i.i.d. (independent and identically distributed)

Week 7 (inference on proportions)

Know how to calculate these using R as a calculator:

- sample proportion
- large sample confidence interval for the population proportion
- test statistic (z_0) for a hypothesis test for a population proportion
- p-value for a hypothesis test for a population proportion (under two-sided or one-sided alternative)
- margin of error for a confidence interval for the population proportion
- Find a $z_{\alpha/2}^*$ value given a confidence level.

Given a data set in spreadsheet format, know how to do these using R:

- find tables of counts or proportions for exploratory analysis
- use `prop.test` to find a confidence interval
- use `prop.test` to find a p-value and/or test statistic

Concepts:

- Interpret a confidence interval for π
- set up null and alternative hypotheses for π
- identify situation where the "magic number" 0.5 should be used.
- interpret results of a hypothesis test for π
- Check model assumptions for inference on π
- define type 1 and type 2 error

Week 8 (inference on the mean, inference on difference in proportions)

Know how to calculate these using R as a calculator:

(Stuff for inference on two proportions)

- two way (contingency) table
- proportion table with row proportions or column proportions
- z confidence interval for $\pi_1 - \pi_2$
- test statistic (z_0) for a hypothesis test for a population mean
- p-value for a hypothesis test for $\pi_1 - \pi_2$ (under two-sided or one-sided alternative)
- margin of error for a confidence interval for $\pi_1 - \pi_2$
- Find a $z_{\alpha/2}^*$ value given a confidence level.

(Stuff for inference on one mean)

- sample mean, sample standard deviation
- t confidence interval for the population mean
- test statistic (t_0) for a hypothesis test for a population mean
- p-value for a hypothesis test for a population mean (under two-sided or one-sided alternative)
- margin of error for a confidence interval for the population mean

- Find a $t_{n-1, \alpha/2}^*$ value given a confidence level.

Given a data set in spreadsheet format, know how to do these using R:

1. Inference on $\pi_1 - \pi_2$

- find tables of counts or proportions for exploratory analysis
- use prop.test to find a confidence interval
- use prop.test to find a test statistic and/or p-value (under two-sided or one-sided alternative)

2. Inference on μ

- use t.test to find a confidence interval
- use t.test to find a test statistic and/or p-value (under two-sided or one-sided alternative)

Concepts:

- Interpret a confidence interval for $\pi_1 - \pi_2$
- Identify outcome variable and grouping variable in a word problem.
- set up null and alternative hypotheses for $\pi_1 - \pi_2$
- identify situation where the "magic number" 0 should be used in a test for $\pi_1 - \pi_2$
- interpret results of a hypothesis test for $\pi_1 - \pi_2$
- interpret hypothesis test to determine if there is a significant association between the row and grouping variable
- interpret confidence interval to determine if there is a significant association between the row and grouping variable
- Check model assumptions for inference on $\pi_1 - \pi_2$ (sample size; number of successes/failures in each group)
- state how the width of a confidence interval changes when sample size changes
- state how the width of a confidence interval changes when confidence level changes
- Check model assumptions for inference on μ
- interpret confidence interval for μ
- interpret hypothesis test for μ
- in a word problem, identify when a certain μ_0 should be used in a null hypothesis
- interpret a normal quantile plot
- state how power changes when sample size changes