

Test 3 Checklist

1. sampling:
 - (a) population vs sample
 - (b) sample space Ω is the set of possible outcomes
 - (c) observational study vs designed experiment
 - (d) with / without replacement
 - (e) simple random sample, stratified sample, voluntary response sample
 - (f) sampling issues/dangers

2. inference - generalizing from a sample to a population

	sample/empirical/estimated statistic	population/theoretical/true parameter
proportion	\hat{p}	p
mean	\bar{x}	μ
standard deviation	s	σ
correlation	r	ρ

3. Basic inference by equating sample and population ratios or averages.
4. Confidence interval - a window around the point estimate that is likely to contain the true population parameter
 - (a) confidence level $1 - \alpha$, e.g. if $\alpha = .05$ then 95% confident
 - (b) margin of error
 - (c) CI can be written as point estimate \pm MOE
 - (d) one sample proportion: $\hat{p} = \frac{x}{n}$ is the point estimate for p ; use 1-propZint for CI
 - (e) one sample mean \bar{x} is the point estimate for μ ; use tInterval for CI
5. Hypothesis Test outline:
 - (a) null hypothesis H_0
The presumption that you want to discredit/reject.
 - (b) alternative hypothesis H_1
what the “prosecutor” thinks the evidence may point to
 - (c) sample statistics and effect sizes
calculated from the observed data
 - (d) p-value
plausibility of H_0 ; measures how consistent the sample evidence is with the null hypothesis (the probability that such an extreme observation would occur by chance if H_0 were true)
 - (e) conclusion
The lower the p-value, the more “significant” the results are against H_0 in favor of H_1 .
 - If $p\text{-value} \leq \alpha$ then the data are inconsistent with H_0 ;
the difference is statistically significant, so reject H_0
 - If $p\text{-value} > \alpha$, then the data are reasonably consistent with H_0 ;
the difference is not statistically significant, so fail to reject H_0 .
6. significance level α (think “reasonable doubt” threshold), $\alpha = .05$ is common
7. left-tailed ($<$), right-tailed ($>$), two-tailed (\neq)

8. one-sample hypothesis test:
 - one sample mean
 $H_0 : \mu = \mu_0$, use t-test
 - one sample proportion
 $H_0 : p = p_0$, use 1-propZtest
9. You may do a hypothesis test of $H_0 : \rho = 0$ using linRegTtest
10. two sample inference on the calculator
 - (a) two sample proportion HT
 $H_0 : p_1 = p_2$, use 2-propZtest
 - (b) two sample proportion CI
 $p_1 - p_2$, use 2-propZint
 - (c) two sample mean HT
 $H_0 : \mu_1 = \mu_2$, use 2-sampTtest
 - (d) two sample mean CI
 $\mu_1 - \mu_2$, use 2-sampTint
 - (e) two sample standard deviation HT
 $H_0 : \sigma_1 = \sigma_2$, use 2-sampFtest
11. Understand the hypothesis test framework, notation, and terminology.
 - (a) What does statistically “significant” really mean? Interpret the p-value and effect size together.
 - (b) Have intuition about how changes in the problem setup and/or data will affect the p-value or confidence interval.
 - (c) Type I error: reject a true H_0 (convict the innocent)
 - (d) Type II error: fail to reject a false H_0 (acquit the guilty)
12. Confidence interval (CI) and hypothesis testing (HT) decision guide:
 - (a) Decide if you have 1 or 2 samples.
 - (b) If you are interested in the differences between matched pairs, subtract and treat the differences as one sample.
 - (c) Decide which distribution applies:
 - proportions p (normal - Z)
 - means μ (T distribution)
 - standard deviations σ (F distribution)
 - (d) Confidence interval or hypothesis test ?
 - (e) If you are doing a HT, is it left, right, or two-tailed? State H_0 and H_1 . Find the p-value. Reject H_0 (the results are statistically significant) if the p-value $< \alpha$.
 - (f) If you are doing a CI, be able to identify the point estimate, CI, and margin of error.