

MATH 10 STUDY GUIDE: Chapters 9, 10 & 11

CHAPTER 9: Testing the Difference Between 2 Parameters

- Read the question carefully – are you testing a claim about the difference between 2 population **means**, 2 population **variances**, or 2 population **proportions**?
- If the claim is about 2 **means**, are the samples *independent*?
 - If the samples are independent, is $n_1 \geq 30$ and $n_2 \geq 30$ or are σ_1 and σ_2 (the *population* standard deviations) known?
 - If so, use the NORMAL DISTRIBUTION (z test for means)
 - If not, i.e. $n_1 < 30$ and/or $n_2 < 30$ and σ_1 and σ_2 are unknown, use the *t* DISTRIBUTION (t test for means, independent samples)
 - If the claim is about 2 **means**, for small, *dependent* samples, use the *t* DISTRIBUTION with test value $t = \frac{\bar{D} - \mu_D}{\frac{s_D}{\sqrt{n}}}$
- If the claim is about 2 **variances** or **standard deviations**, use the *F* DISTRIBUTION (F test for variances)
 - The test value is $F = \frac{s_1^2}{s_2^2}$ where s_1^2 is the **larger** of the 2 variances
 - Remember: there are no *negative* critical *F*-values, for a two-tailed test find the critical value on the $\frac{\alpha}{2}$ *F* distribution chart
- If the claim is about 2 **proportions**, use the NORMAL DISTRIBUTION (z test for proportions)

- Once you've decided which test to use, does the question ask you to use the **traditional method** or the **P-value method**?
 - You are expected to know the traditional **and** P-value methods for any z-test or t-test; for the F-test we covered **only** the traditional method
 - Remember on the P-value method for a t-test you cannot find an exact P-value, instead you find a P-value *interval*
- The five steps for the **traditional method**:
 1. State the hypotheses and identify the claim.
 2. Find the critical value(s).
 3. Compute the test value.
 4. Make the decision to reject or not reject the null hypothesis by comparing the test value to the critical value.

Decision Rule: If the test value is **in** the critical region, **reject** H_0 .
If the test value is **not in** the critical region,
do not reject H_0 .
 5. Summarize your results in terms of the claim.
- The five steps for the **P-value method**:
 1. State the hypotheses and identify the claim.
 2. Compute the test value.
 3. Find the P-value.
 4. Make the decision to reject or not reject the null hypothesis by comparing the P-value to the significance level α .

Decision Rule: If P-value $\leq \alpha$, **reject** H_0 .
If P-value $> \alpha$, **do not reject** H_0 .
 5. Summarize your results in terms of the claim.

CHAPTER 10: Correlation and Regression

- Given a set of sample data you should know how to:
 1. Draw a scatter plot for the data pairs.
 2. Compute the value of the sample correlation coefficient r .
 3. Test the significance of the correlation coefficient using Table I.
 4. Briefly describe the type of relationship between the variables.

- **If** the correlation coefficient, r , for a data set is **significant** you should know how to:
 1. Find the equation of the regression line: $y' = a + bx$ where a is the y' -intercept and b is the slope of the line.
 2. Find a predicted y' value for a specified x value.
 3. Compute the standard error of the estimate from a regression line equation.
- Remember that no regression should be done when r is **not significant**.
- Be able to find the coefficients of determination and nondetermination and explain the meaning of each:
 - Coefficient of determination: $r^2 = \frac{\text{explained variation}}{\text{total variation}}$
 - Coefficient of nondetermination: $1 - r^2$

CHAPTER 11: Chi-Square Tests

- For the χ^2 tests we covered the **traditional method** only.
- Remember: there are no *negative* critical χ^2 -values; the test will always be right-tailed.
- For a question about how well a frequency distribution fits a specific pattern, use the *goodness-of-fit* test.
- For a question about the independence of two variables within a **single** sample, use the test for *independence*; the null hypothesis is the statement that the two variables are independent.
- For a question about whether the proportions for a variable are equal when **several** samples are chosen from different populations, use the test for *homogeneity of proportions*.
- The tests for both independence of variables and homogeneity of proportions use *contingency tables* to organize the data. Expected frequencies can be found using

$$E = \frac{(\text{row sum}) \times (\text{column sum})}{\text{total}}.$$