8.3 Significance tests about the mean

- summarize the 5 steps

  1. Assumptions
     - variable is quantatative
     - data production used randomization
     - population distribution is appoximately normal
  2. Hypothesis

     $H_0 : \mu = \mu_0$ $\qquad\qquad$ $H_a : \mu \neq \mu_0$

     $\qquad\qquad\qquad\qquad\qquad\quad \mu < \mu_0$

     $\qquad\qquad\qquad\qquad\qquad\quad \mu > \mu_0$
  3. Test statistic
     - $t_0 = (\bar{x} - \mu_0)/se$ where $se = s/\sqrt{n}$
     - use t distribution because st dev (σ) is estimated and is good to use for small sample sizes. use $df = n - 1$.
  4. p-value (remember describes how unusual the data would be given H_0 true)
     - single-tail or double-tail depending on H_a.
  5. conclusion
     - report p-value
     - make judgement on H_0 based on significance level (α).

- <u>Example : Anorexia study</u>
  - 29 girls recieved a new type of therapy
  - want to determine if these therapies had an effect on wieght
  - go through 5 steps

- how do we approximate p-values using the table?

- results from two-sided test agree w/ results from confidence intervals.

- what happens if normality assumption fails?

- what effect does the sample size have on p-values?

8.4 Types of error

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	Do not reject H_0	Reject H_0
H_0 true	correct decision	type I error
H_0 not true	type II error	correct decision

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	Acquit	Convict
Innocent (H_0)	correct decision	type I error
Guilty (H_a)	type II error	correct decision

8.5 Limitations of hypothesis tests

- Example : Politics
  - survey asks people to rate themselves on a 7 points scale (1 being extremely liberal and 7 being extremely conservative)
  - would like to determine if, in general, Americans lean one way or the other.
- some problems with significance tests
  - statistical significance $\neq$ practical significance
  - do not reject $H_0 \neq$ accept H_0
  - p-value is not the probability that H_0 is true
  - should not report only results which are statistically significant
  - some tests may be significant by chance