

Exercise walk-through

7.10

Skills Focus: Selecting, Implementing, and Communicating Inference Procedures

AP Statistics

Two-mean test and paired data

A **two-sample t-test** of
 $H_0 : \mu_1 = \mu_2$ – **do not pool** (unlike proportions):

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}}$$

Same subjects measured twice? Use a **paired t-test** : reduce each pair to a difference d , then a one-sample t .

Brands

$\bar{x}_1 = 85, \bar{x}_2 = 78; SE = \sqrt{2}$:

$$t = \frac{7}{1.414} \approx 4.95$$

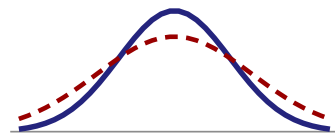
$df = 8, p \approx 0.001$: reject.

Exam tips

- Use **t-procedures** for means (population σ unknown) – the t-distribution has heavier tails than normal.
- Check conditions: random, independent, and roughly normal (or large n).
- Interpret an interval and a test in context, always tied to the parameter (the true mean).
- Match the right procedure: one-sample, two-sample, or paired (look for a natural pairing).
- State the degrees of freedom; for a two-sample t -test use technology's value (or, by hand, the conservative smaller $n - 1$).

Check yourself

- 1 Why use t instead of z for a mean?
- 2 What are the degrees of freedom for a one-sample t ?
- 3 Do you pool for a two-sample t -test of means?
- 4 Before-and-after on the same subjects calls for which test?



Answers 1. σ is unknown (use s_x) 2. $n - 1$ 3. no 4. a paired t -test

Exercises 2.1-2.3

2.1 State how to decide between a proportion and a mean procedure. [1]

2.2 State how to decide between a one-sample and a two-sample procedure. [1]

2.3 State the difference between a confidence interval and a hypothesis test. [2]

Exercises 2.1-2.3

2.1 State how to decide between a proportion and a mean procedure. [1]

2.1

- categorical data uses a proportion procedure; quantitative data uses a mean procedure
-

2.2 State how to decide between a one-sample and a two-sample procedure. [1]

2.2

- comparing to a fixed value is one-sample; comparing two groups is two-sample
-

2.3 State the difference between a confidence interval and a hypothesis test. [2]

2.3

- a confidence interval estimates a parameter; a hypothesis test evaluates a specific claim

Exercises 3.1-3.2

3.1 To estimate a categorical variable's population value, use a procedure for a [1]

☐

A mean

B proportion

C slope

D variance

3.2 Comparing the average heights of two groups uses a [1]

☐

A one-proportion test

B two-sample t procedure

C chi-square test

D one-mean interval only

Exercises 3.1-3.2

3.1 To estimate a categorical variable's population value, use a procedure for a [1]

- ☐ A mean
☐ B proportion
☐ C slope
☐ D variance

3.1 B

- proportion.

3.2 Comparing the average heights of two groups uses a [1]

- ☐ A one-proportion test
☐ B two-sample t procedure
☐ C chi-square test
☐ D one-mean interval only

3.2 B

- two-sample t procedure.

Exercise 3.3 (a)

3.3 A study compares the proportion of defective items from two factories.

(a) Name the type of data.

[1]

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(a) Name the type of data.

[1]

(a)

- categorical (proportions)

Exercise 3.3 (b)

3.3 A study compares the proportion of defective items from two factories.

(b) State whether it is a one- or two-sample situation.

[1]

Exercise 3.3 (b)

3.3 A study compares the proportion of defective items from two factories.

(b) State whether it is a one- or two-sample situation. [1]

(b)

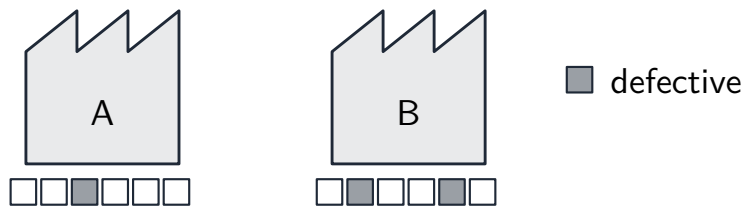
- two-sample

Exercise 3.3 (c)

3.3 A study compares the proportion of defective items from two factories.

(c) Name a suitable procedure.

[1]

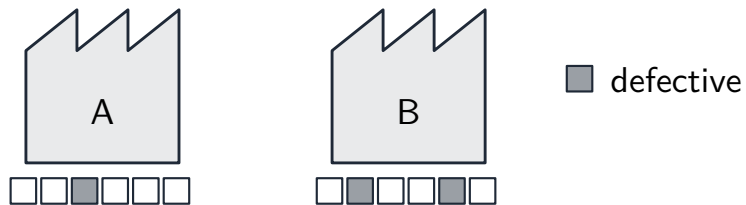


Exercise 3.3 (c)

3.3 A study compares the proportion of defective items from two factories.

(c) Name a suitable procedure.

[1]



(c)

- a two-proportion test (or confidence interval)