T-test Exercises: UDP 520
TA: Lin Lin
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Five steps for hypothesis testing
Step 1: Making assumptions and meeting test requirements
Step 2: stating the null hypothesis
Step 3: selecting the sampling distribution and establishing the critical region
Step 4: computing the test statistic
Step 5: making a decision and interpreting the results of the test

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Exercises are taken from
Statistics, a tool for social research by Joseph F. Healey, Wadsworth Publishing, 7TH edition 2005. P 220

8.4

Nationally, the average score on the college entrance exams (verbal test) is 452 with a standard deviation of 95. A random sample of 152 freshmen entering St. Algebra College shows a mean score of 502. Is there a significance difference?

National	St. Algebra College
$u = 452$	$\bar{X} = 502$
$\sigma = 95$	$n = 152$

Step 1: Making assumptions and meeting test requirements

Random sampling

Level of measurement is interval-ratio

Sampling distribution is normal

Step 2: stating the null hypothesis

H_0: $\bar{X} = 452$

$H_{a:}$ $\bar{X} \neq 452$

Step 3: selecting the sampling distribution and establishing the critical region

Sampling distribution = Z distribution

$a = 0.05$

Z (critical)= ± 1.96

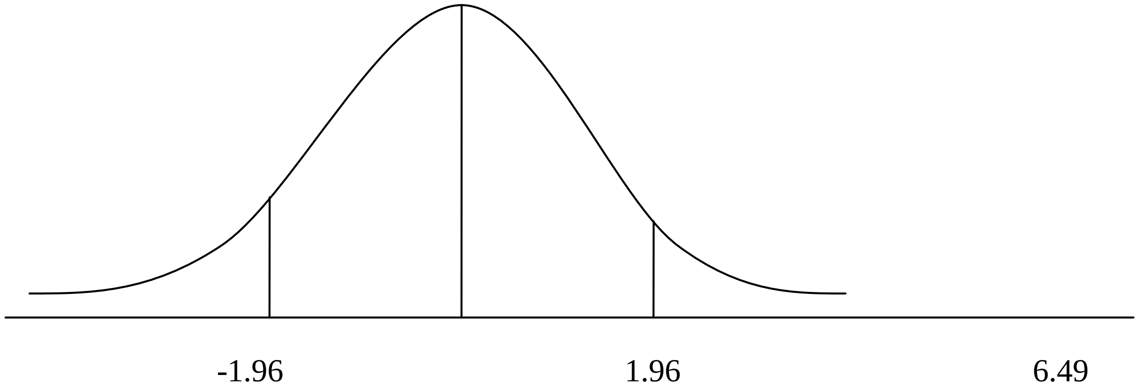
Step 4: computing the test statistic

$$Z(obtained) = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} = \frac{502 - 452}{95 / \sqrt{152}} = \frac{50 * 12.33}{95} = 6.49$$

Step 5: making a decision and interpreting the results of the test

Z (critical)= ± 1.96

Z(obtained)=6.49



8.5

A random sample of 423 Chinese Americans has finished an average of 12.7 years of formal education with a standard deviation of 1.7. Is this significantly different from the national average of 12.2 years?

National	Chinese Americans
	$\bar{X} = 12.7$
$u = 12.2$	$s = 1.7$
	$n = 423$

Step 1: Making assumptions and meeting test requirements

Random sampling
Level of measurement is interval-ratio
Sampling distribution is normal

Step 2: stating the null hypothesis

H_0: $\bar{X} = 12.2$
$H_{a:}$ $\bar{X} \neq 12.2$

Step 3: selecting the sampling distribution and establishing the critical region

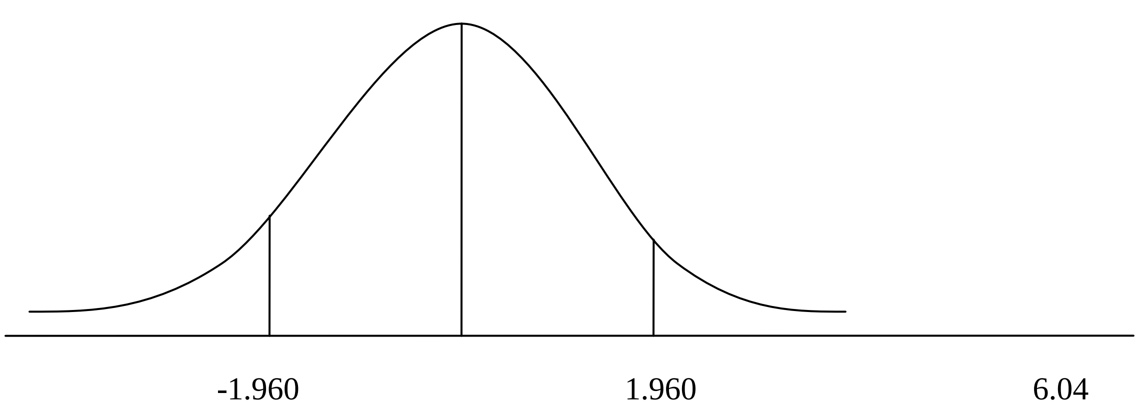
Sampling distribution = t distribution
a = 0.05, two-tailed test
Df=(n-1)=422
t (critical)=$\pm$1.960

Step 4: computing the test statistic

$$Z(obtained) = \frac{\bar{X} - \mu}{s/\sqrt{n-1}} = \frac{12.7 - 12.2}{1.7/\sqrt{422}} = \frac{0.5 * 20.54}{1.7} = 6.04$$

Step 5: making a decision and interpreting the results of the test

Z (critical)=$\pm$1.960
Z(obtained)=6.04



8.6

A sample of 105 workers in the Overkill Division of the Machismo Toy Factory earns an average of $24,375 per year. The average salary for all workers is $24,230 with a standard deviation of $523. Are workers in the Overkill Division overpaid? Conduct both one- and two-tail tests.

All workers	The Overkill Division
$u = 24230$	$\overline{X} = 24375$
$\sigma = 523$	$n = 105$

Step 1: Making assumptions and meeting test requirements

Random sampling
Level of measurement is interval-ratio
Sampling distribution is normal

Step 2: stating the null hypothesis

$H_{0\text{-}1}$: $\overline{X} = 24230$ $H_{0\text{-}2}$: $\overline{X} = 24230$

$H_{a\text{-}1}$: $\overline{X} \neq 24230$ $H_{a\text{-}2}$: $\overline{X} > 24230$

Step 3: selecting the sampling distribution and establishing the critical region

Sampling distribution = Z distribution
$a = 0.05$
Z $(\text{critical})_1 = \pm 1.96$
Z $(\text{critical})_2 = +1.65$

Step 4: computing the test statistic

$$Z(obtained) = \frac{\overline{X} - \mu}{\sigma / \sqrt{n}} = \frac{24375 - 24230}{523 / \sqrt{105}} = \frac{145 * 10.25}{523} = 2.84$$

Step 5: making a decision and interpreting the results of the test

Z (critical)= + 1.65
Z(obtained)=2.84