

Section 8-4

Testing a Claim About a Mean: σ Known

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Notation

n = sample size

\bar{x} = sample mean

μ = claimed population mean (from H_0)

σ = known value of the population
standard deviation

Requirements for Testing Claims About a Population Mean (with σ Known)

- 1) The sample is a simple random sample.
- 2) The value of the population standard deviation σ is known.
- 3) Either or both of these conditions is satisfied: The population is normally distributed or $n > 30$.

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Test Statistic for Testing a Claim About a Mean (with σ Known)

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

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Example:

People have died in boat accidents because an obsolete estimate of the mean weight of men (166.3 lb) was used.

A random sample of $n = 40$ men yielded the mean $\bar{x} = 172.55$ lb. Research from other sources suggests that the population of weights of men has a standard deviation given by $\sigma = 26$ lb.

Test the claim that men have a mean weight greater than 166.3 lb.

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Example:

Requirements are satisfied: σ is known (26 lb), sample size is 40 ($n > 30$)

We can express claim as $\mu > 166.3$ lb

It does not contain equality, so it is the alternative hypothesis.

$H_0: \mu = 166.3$ lb null hypothesis

$H_1: \mu > 166.3$ lb alternative hypothesis
(and original claim)

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Example:

For a significance level to $\alpha = 0.05$

Next we calculate z

$$z = \frac{\bar{x} - \mu_{\bar{x}}}{\frac{\sigma}{\sqrt{n}}} = \frac{172.55 - 166.3}{\frac{26}{\sqrt{40}}} = 1.52$$

It is a right-tailed test, so *the critical region* is the area to the right of $z = 1.52$;

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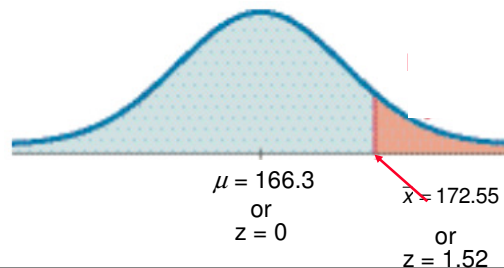
Example:

The critical value $z = 1.645$ And
Test statistic $z = 1.52$

i.e. the test statistic is to the left of
the critical value

For the significance level of $\alpha = 0.05$, we fail
to reject the null hypothesis.

i.e. we reject H_1 ; alternative hypothesis
(and original claim)



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