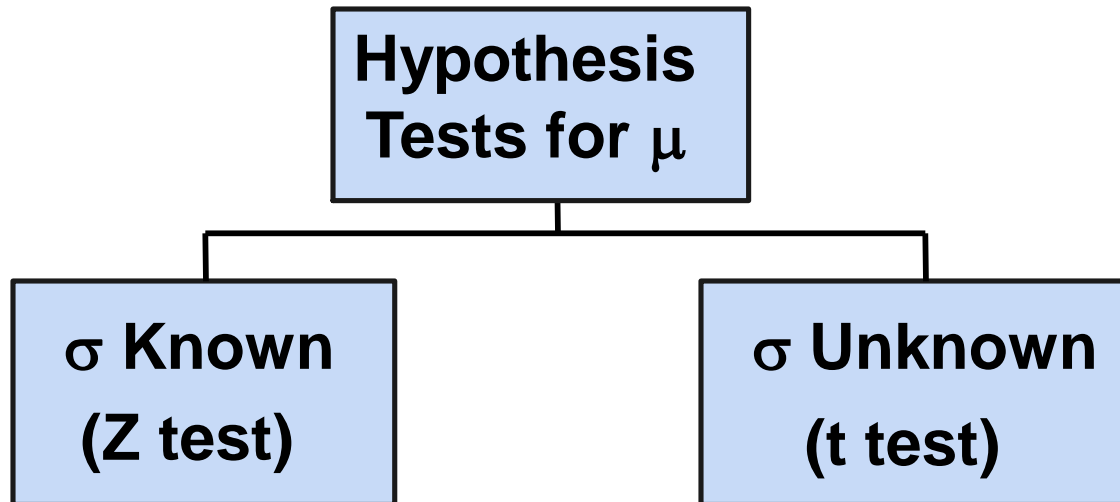
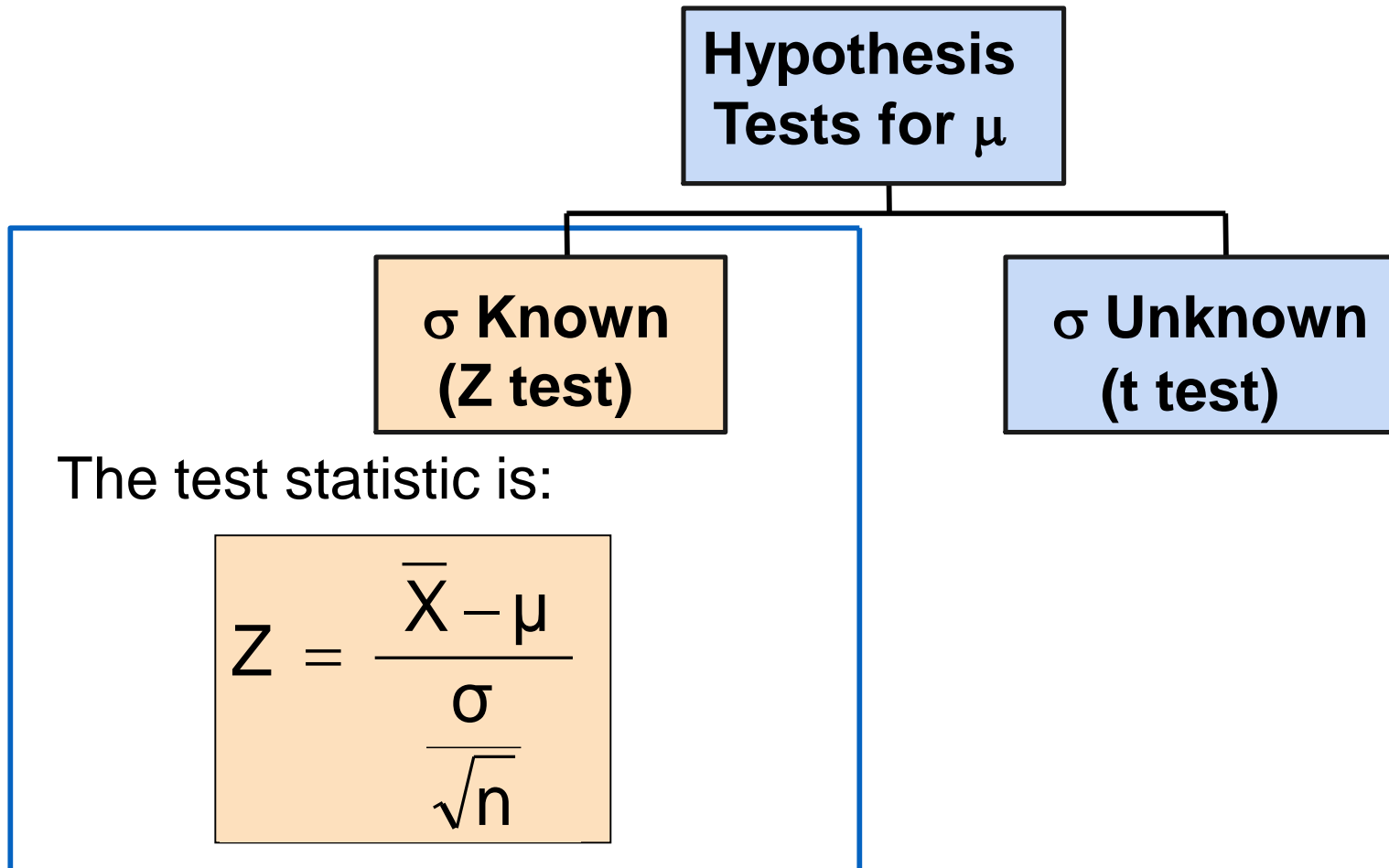


Hypothesis Tests for the Mean



Z Test of Hypothesis for the Mean (σ Known)

- Convert sample statistic () to a \bar{X} test statistic



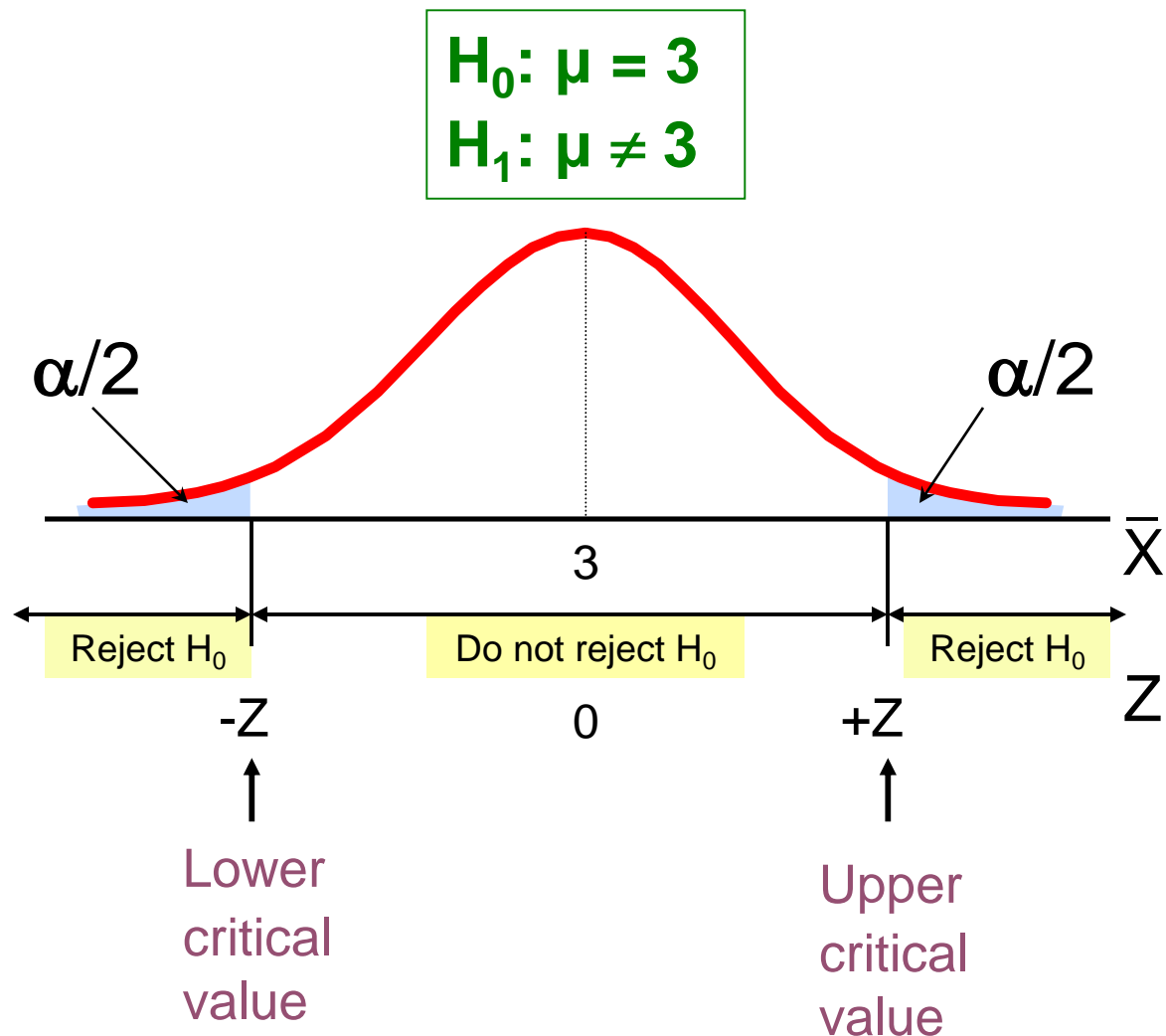
Critical Value Approach to Testing

- For a two-tail test for the mean, σ known:
- Convert sample statistic (\bar{x}) to test statistic (Z statistic)
- Determine the critical Z values for a specified level of significance α from a table or computer
- **Decision Rule:** If the test statistic falls in the rejection region, reject H_0 ; otherwise do not reject H_0



Two-Tail Tests

- There are two cutoff values (critical values), defining the regions of rejection





One-Tail Tests

- In many cases, the alternative hypothesis focuses on a particular direction

$$H_0: \mu \geq 3$$

$$H_1: \mu < 3$$



This is a **lower**-tail test since the alternative hypothesis is focused on the lower tail below the mean of 3

$$H_0: \mu \leq 3$$

$$H_1: \mu > 3$$

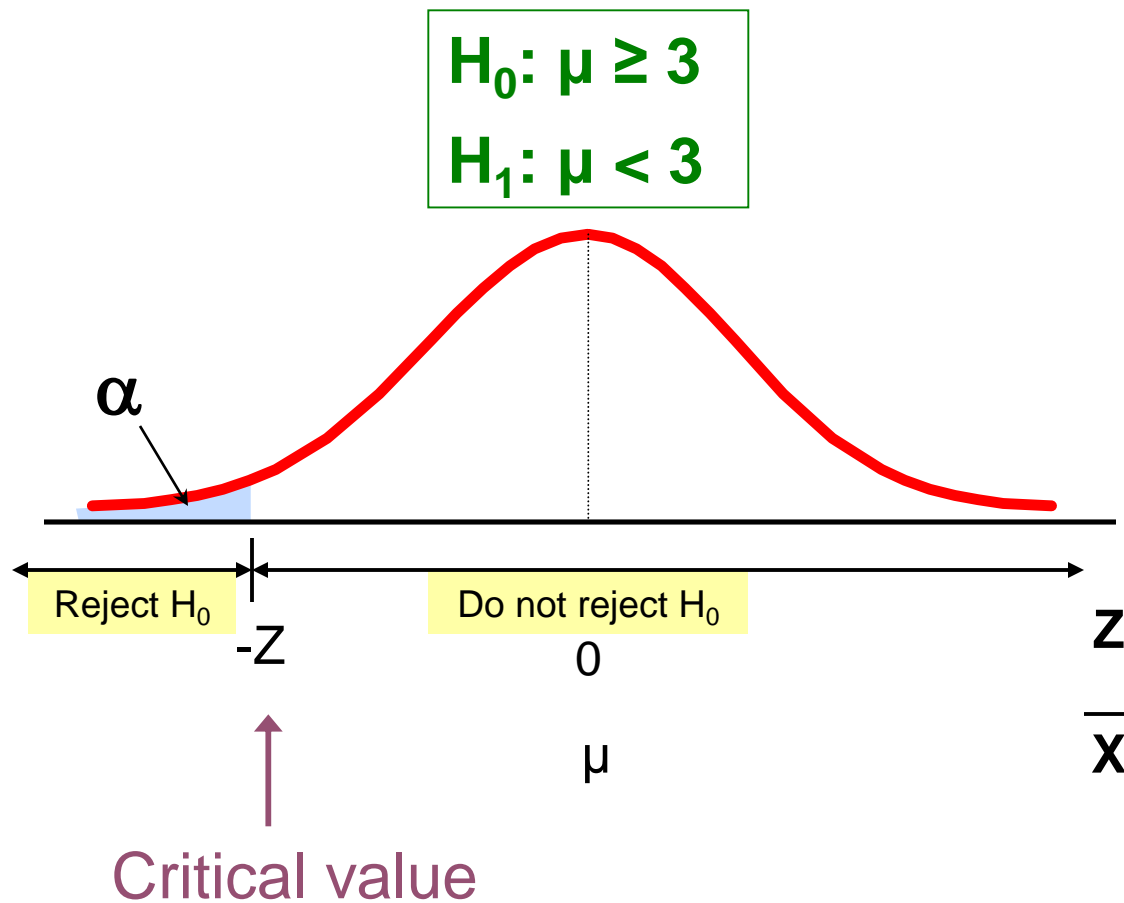


This is an **upper**-tail test since the alternative hypothesis is focused on the upper tail above the mean of 3



Lower-Tail Tests

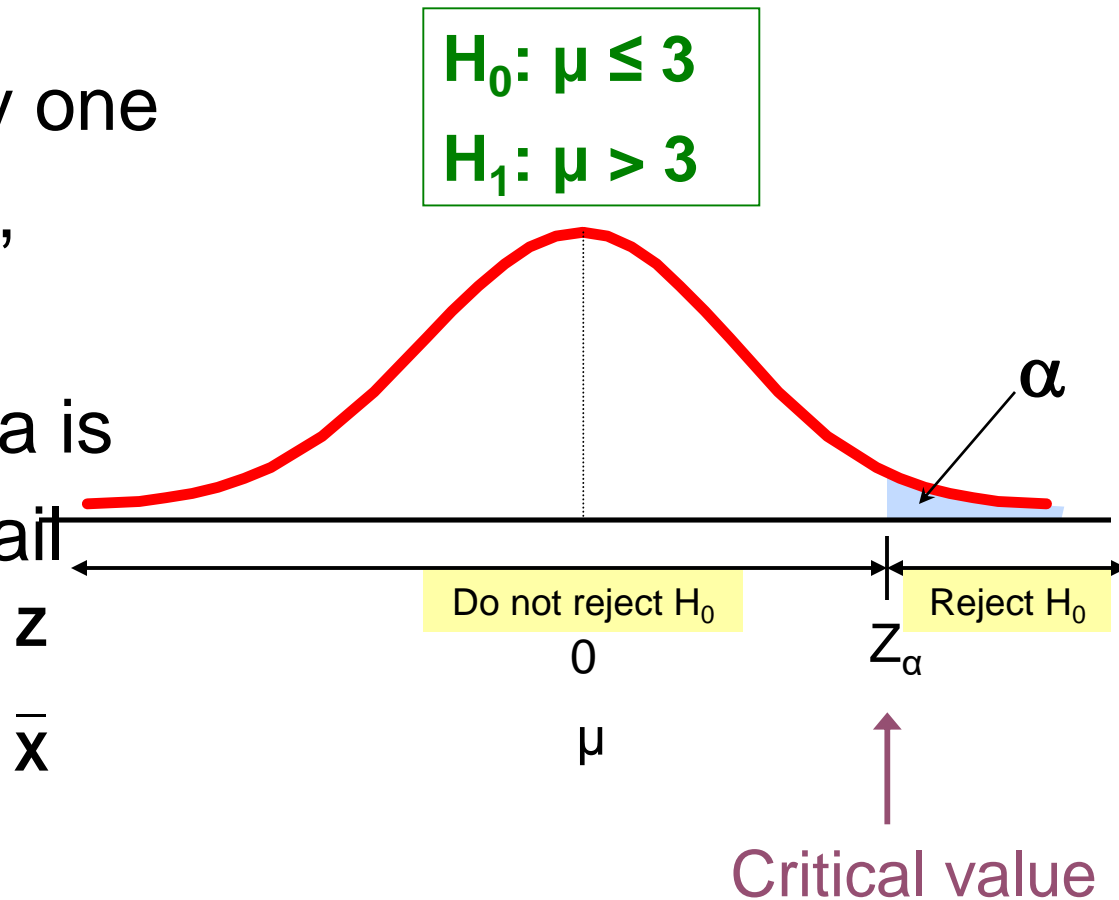
- There is only one critical value, since the rejection area is in only one tail





Upper-Tail Tests

- There is only one critical value, since the rejection area is in only one tail



Example: Upper-Tail Z Test for Mean (σ Known)

A phone industry manager thinks that customer monthly cell phone bills have increased, and now average over \$52 per month. The company wishes to test this claim. (Assume $\sigma = 10$ is known)

Form hypothesis test:

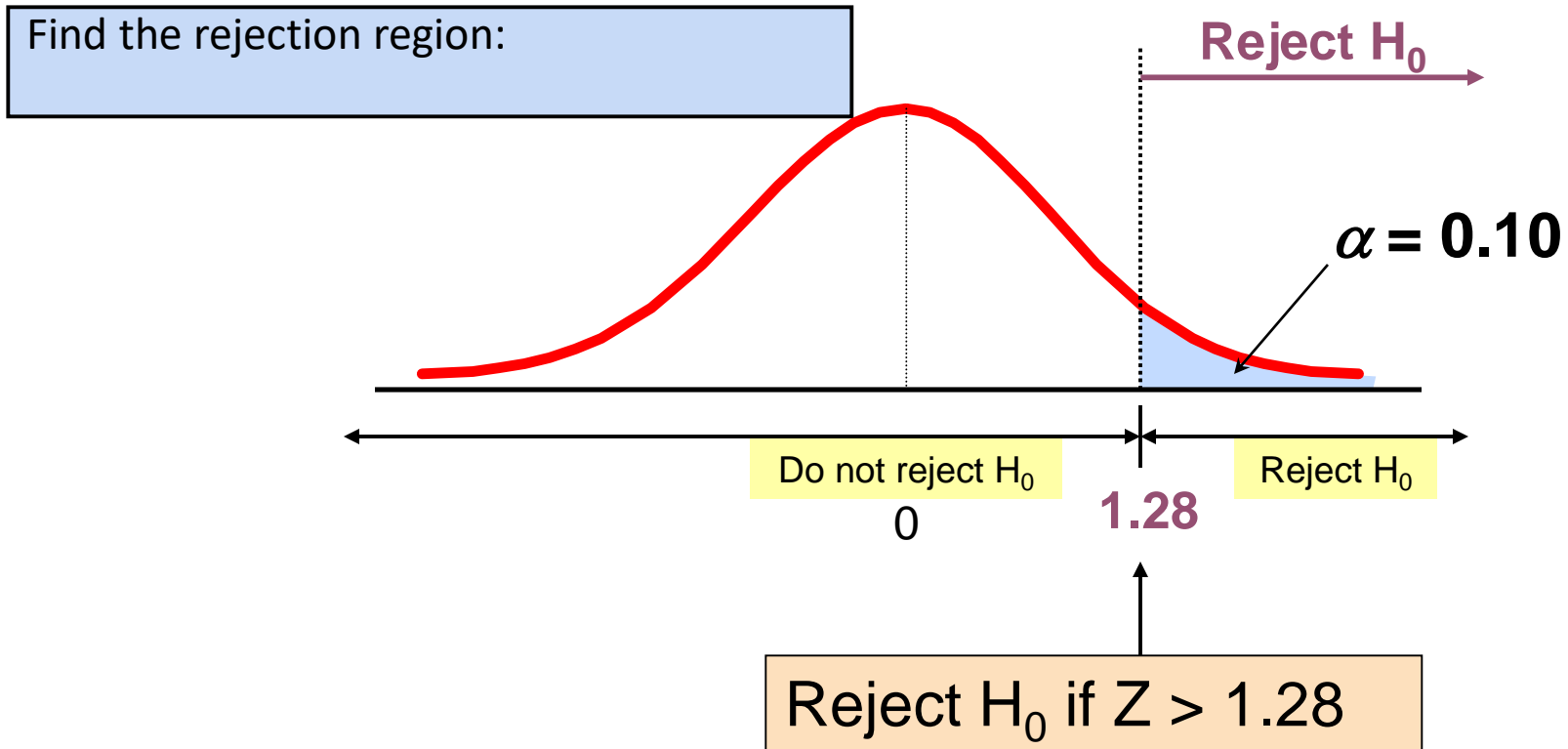
$H_0: \mu \leq 52$ the average is not over \$52 per month

$H_1: \mu > 52$ the average **is** greater than \$52 per month
(i.e., sufficient evidence exists to support the manager's claim)

Example: Find Rejection Region

(continued)

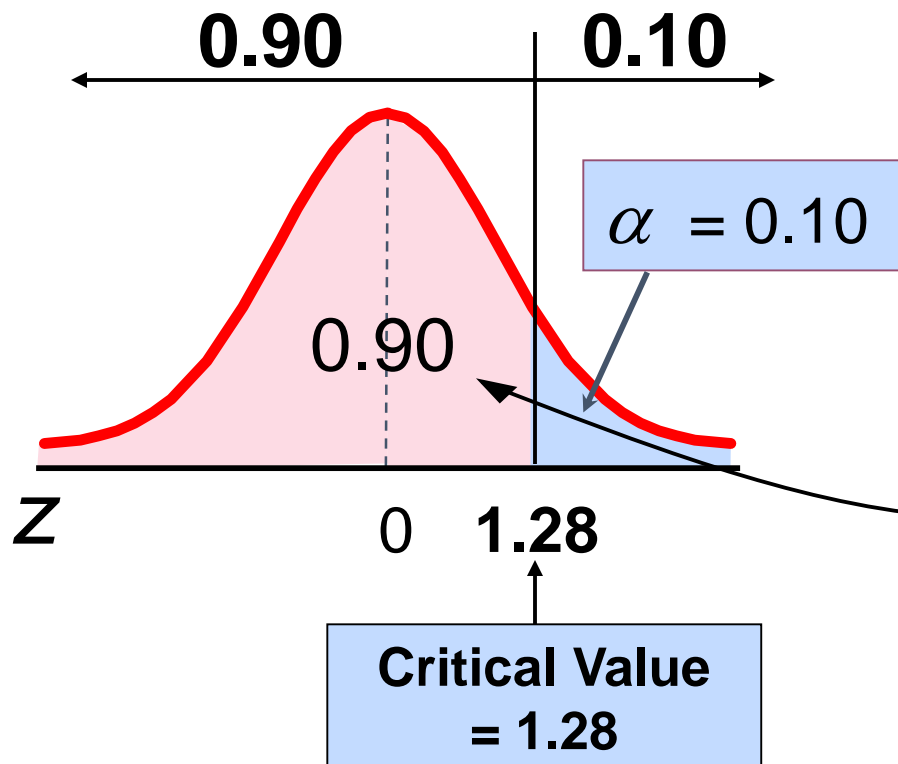
- Suppose that $\alpha = 0.10$ is chosen for this test





Review: One-Tail Critical Value

What is Z given $\alpha = 0.10$?



Standardized Normal
Distribution Table (Portion)

Z	.07	.08	.09
1.1	.8790	.8810	.8830
1.2	.8980	.8997	.9015
1.3	.9147	.9162	.9177



Example: Test Statistic

(continued)

Obtain sample and compute the test statistic

Suppose a sample is taken with the following results: $n = 64$,
 $\bar{X} = 53.1$ ($\sigma = 10$ was assumed known)

- Then the test statistic is:

$$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{53.1 - 52}{\frac{10}{\sqrt{64}}} = 0.88$$