Chapter 14 / **Example 6**

Two-tailed tests

The times taken by an athlete to run a circuit near his home can be modelled by a normal distribution with a mean of 15.4 minutes and a standard deviation of 0.62 minutes. The athlete's work takes him away from home for six months and on his return he is interested to see whether his average times have changed. He records his times over the first five days after his return and obtains the following times in minutes:
15.4, 15.5, 14.9, 15.2, 15.1

a Use the *p*-value to perform a test at the 5% significance level to see if his average time to complete the circuit has changed.

b Find the critical region for the test.

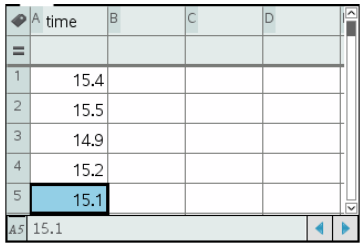
Open a new document and add a Lists & Spreadsheet page.

Type 'time' in the first cell.

Type the times in the first column.

Press enter or ▼ after each number to move to the next cell.

Note: *'time' is a label that will be used to calculate the p-value. You can use any letter or name to label the list.*

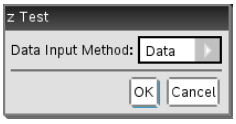


H_0: $\mu = 15.4$, H_1: $\mu \neq 15.4$

To calculate the *p*-value press menu 4:Statistics | 4:Stat Tests | 1:z Test…

Choose Input Method: Data

Press enter.



$\mu_0 = 15.4$

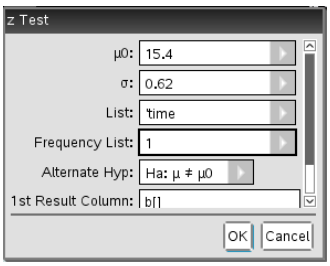
$\sigma = 0.62$

List: time

Frequency List: 1

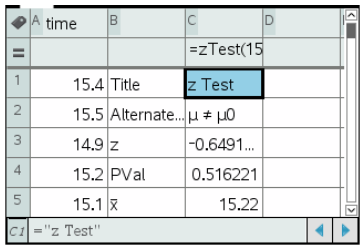
$\mu \neq \mu_0$

Press enter.



p-value = 0.516

0.516 > 0.05, not significant so no reason to reject H_0 that his average time is still 15.4 minutes.



Chapter 14 / **Example 6**

Two-tailed tests

To find the critical region, $\bar{X} \sim \mathrm{N}\left(15.4, \frac{0.62^2}{5}\right)$

$\mathrm{P}\ X < a\ = 0.025$

Press ▶ to move to an empty cell.

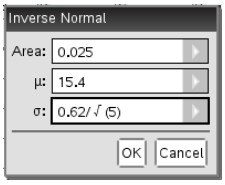
Press menu 4:Statistics | 2:Distributions | 3:Inverse Normal…

area = 0.025

μ = 15.4

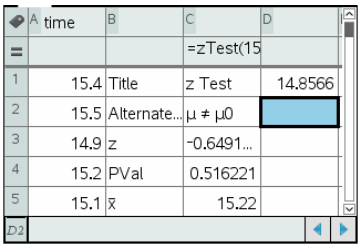
σ = $0.62 \div \sqrt{5}$

Press enter.



Press enter.

$\bar{X} = 14.86$



	A time	B	C	D
=			=zTest(15	
1	15.4	Title	z Test	14.8566
2	15.5	Alternate...	μ ≠ μ0	
3	14.9	z	-0.6491...	
4	15.2	PVal	0.516221	
5	15.1	x̄	15.22	
D2				

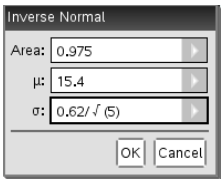
Press menu 4:Statistics | 2:Distributions | 3:Inverse Normal…

area = 0.975

μ = 15.4

σ = $0.62 \div \sqrt{5}$

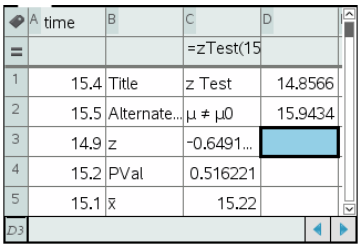
Press enter.



Press enter.

$\bar{X} = 15.94$

The critical region is $\bar{X} < 14.86$, $\bar{X} > 15.94$



	A time	B	C	D
=			=zTest(15	
1	15.4	Title	z Test	14.8566
2	15.5	Alternate...	μ ≠ μ0	15.9434
3	14.9	z	-0.6491...	
4	15.2	PVal	0.516221	
5	15.1	x̄	15.22	
D3				