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

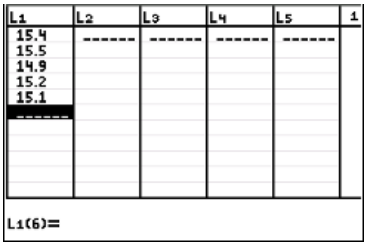
a Use the *p*-value to perform a test at the 5% significance level to see if his average time to complete the circuit has changed.

b Find the critical region for the test.

Press [STAT] 1:Edit and press [ENTER]

Type the times in the first column.

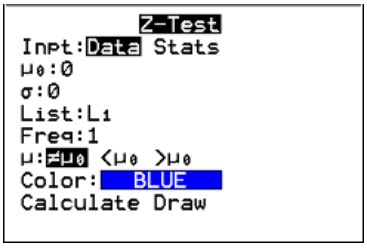
Press [ENTER] or † after each number to move to the next cell.



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

To calculate the *p*-value Press [STAT] and [▶] [▶] to access the TESTS menu.

Select 1:Z-Test… and press [ENTER].



Choose Input: Data

$\mu_0 = 15.4$

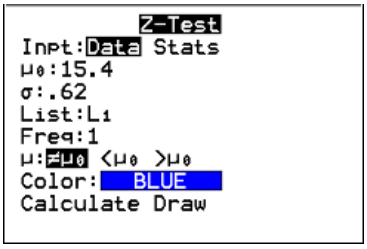
$\sigma = 0.62$

List: L_1

Freq: 1

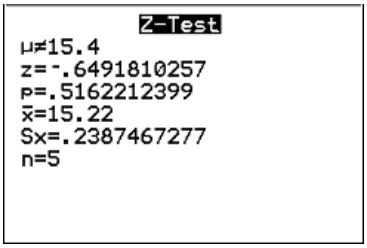
$\mu \neq \mu_0$

Navigate down to Calculate and 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, $\bar{X} \sim N\left(15.4, \frac{0.62^2}{5}\right)$

$P(X < a) = 0.025$

Press 2nd [MODE] [QUIT]

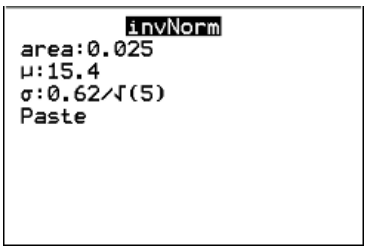
Press 2nd [VARS] [DISTR] 3:invNorm(

area = 0.025

$\mu = 15.4$

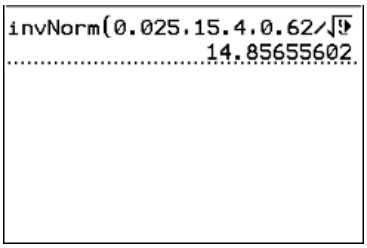
$\sigma = 0.62 \div \sqrt{5}$

Press [ENTER].



Press [ENTER].

$\bar{X} = 14.86$



$P(X < a) = 0.975$

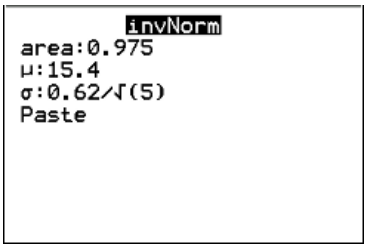
Press 2nd [VARS] [DISTR] 3:invNorm(

area = 0.975

$\mu = 15.4$

$\sigma = 0.62 \div \sqrt{5}$

Press [ENTER].



Press [ENTER].

$\bar{X} = 15.94$

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