

- (c) Using a sample size of $n = 10$, find with the applet the power of the test against the alternatives $\mu = 0.5$, $\mu = 1.0$, and $\mu = 1.5$. How does effect size affect power?

15.54 Power of a two-sided test. Power calculations for two-sided tests follow the same outline as for one-sided tests. Example 14.9 (page 352) presents a test of

$$H_0: \mu = 128 \quad \text{versus} \quad H_a: \mu \neq 128$$

at the 5% level of significance. The company medical director failed to find significant evidence that the mean blood pressure of a population of executives differed from the national mean $\mu = 128$. The data used were an SRS of size 72 from a population with standard deviation $\sigma = 15$. The medical director now wonders if the test used would detect an important difference if one were present. What would be the power of this test against the alternative $\mu = 134$?

- (a) The test in Example 14.9 rejects H_0 when $|z| \geq 1.96$. The test statistic z is

$$z = \frac{\bar{x} - 128}{15/\sqrt{72}}$$

Write the rule for rejecting H_0 in terms of the values of \bar{x} . (Because the test is two-sided, it rejects H_0 when \bar{x} is either too large or too small.)

- (b) Now find the probability that \bar{x} takes values that lead to rejecting H_0 if the true mean is $\mu = 134$. This probability is the power.
 (c) What is the probability that this test makes a Type II error when $\mu = 134$?

15.55 Power of a two-sided test, continued. Let's now use technology to perform the power calculations for the two-sided test of the previous exercise.



- (a) Use the *Power of a Test* applet to find the power of the two-sided test against the alternative $\mu = 134$. Make sure that it is similar to what you calculated in the previous exercise.
 (b) Use the applet to calculate the power of the test against the alternative $\mu = 122$. Can the test be relied on to detect a mean that differs from 128 by 6?
 (c) If the alternative were farther from H_0 , say, $\mu = 136$, would the power be higher or lower than the values calculated in (a) and (b)?