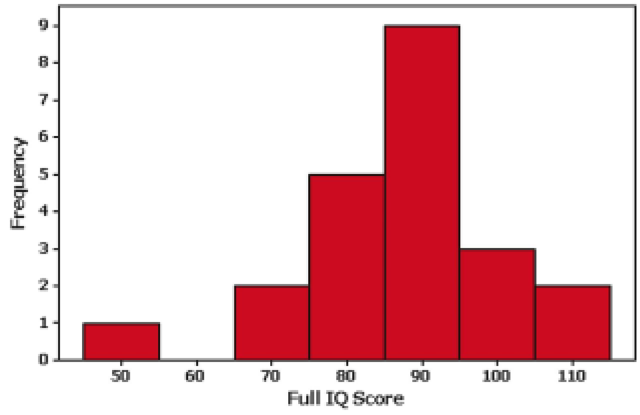
satisfied. (It would be wise to find the confidence interval with the low score excluded so we can see its effect.) This check of requirements is Step 1 in the process of finding a confidence interval of σ, so we proceed with Step 2.

MINITAB



Step 2: The confidence interval can be found using technology. If using Table A-4, we first use the sample size of $n = 22$ to determine that the number of degrees of freedom is given by df $= n - 1 = 21$. If we use Table A-4, we refer to the row corresponding to 21 degrees of freedom, and we refer to the columns with areas of 0.975 and 0.025. (For a 95% confidence level, we divide $\alpha = 0.05$ equally between the two tails of the chi-square distribution, and we refer to the values of 0.975 and 0.025 across the top row of Table A-4.) The critical values are $\chi_L^2 = 10.283$ and $\chi_R^2 = 35.479$ (as shown in Example 1).

Step 3: Using the critical values of 10.283 and 35.479, the sample standard deviation of $s = 14.3$, and the sample size of $n = 22$, we construct the 95% confidence interval by evaluating the following:

$$\frac{(n-1)s^2}{\chi_R^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_L^2}$$

$$\frac{(22-1)(14.3)^2}{35.479} < \sigma^2 < \frac{(22-1)(14.3)^2}{10.283}$$

Step 4: Evaluating the expression above results in $121.0 < \sigma^2 < 417.6$. Finding the square root of each part (before rounding), then rounding to one decimal place, yields this 95% confidence interval estimate of the population standard deviation: $11.0 < \sigma < 20.4$.

Interpretation

Based on this result, we have 95% confidence that the limits of 11.0 and 20.4 contain the true value of σ. The confidence interval can also be expressed as (11.0, 20.4).

The IQ test was designed so that the population of IQ scores would have a standard deviation of 16, and the value of 16 is contained within the confidence interval, so the variation of the IQ scores does not appear to be unusual.