

## Answer on Question #44513 - Math - Statistics and Probability

IQ of professional Pilots

The Wechsler IQ test is designed so that the mean is 100 and the standard deviation is 15 for the population of normal adults. Listed below are IQ scores of randomly selected professional pilots. It is claimed that because professional pilots are a more homogeneous group than the general population, they have IQ scores with a standard deviation less than 15. Test that claim using a 0.05 significance level.

Assume that a simple random sample is selected from a normally distributed population.

121 116 115 121 116 107 127 98 116 101 130 114

### Solution:

#### Identify the null hypothesis:

The null hypothesis contains "equal" sign ("=" or "≥" or "≤"), the alternative hypothesis is the complement to the null hypothesis. The claim is "professional pilots have IQ scores with a standard deviation less than 15". As the claim contains "<" sign, it is alternative hypothesis. Thus, the null hypothesis is the complement: "professional pilots have IQ scores with a standard deviation at least 15".

$$H_0: s \geq 15$$

#### Alternative hypothesis:

"Professional pilots have IQ scores with a standard deviation less than 15."

$$H_a: s < 15$$

#### Test statistic:

As the alternative hypothesis contains "<" sign, the test is left-tailed.  $\alpha = 0.05$

The sample standard deviation:

$$s = 9.5$$

The test statistic is:

$$\chi^2 = \frac{(n-1) * s^2}{\sigma^2} = \frac{(12-1) * 9.5^2}{15^2} = 4.412$$

#### P-Value or critical value(s):

For  $\alpha = 0.05$  and d.f. =  $(12 - 1) * (2 - 1) = 11$  the critical value is 4.575 (determined by the table for chi-squared distribution).

As  $4.412 < 4.575$ , we should reject the null hypothesis, and we have enough evidence to support the claim.