Hypothesis Test Worksheet for One Population Standard Deviation

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On this page we will see a number of situations with related questions. In each case, this page will give the answers to those questions. Your task is to find those same answers by inspecting the given information and/or by using a calculator or computer to produce those desired values.

Case 1:

We have a population that we know to be approximately normally distributed. We want to test the hypothesis that the standard deviation in the population is 14.160 against the alternative that the population standard deviation is less than 14.160. We will perform this test at the 0.0025 level of significance. We take a sample of size 35 of that population. That sample has a sample standard deviation of 9.90.

(1) State the null hypothesis. **(Answer: H_0: $\sigma = 14.16$)**
(2) State the alternative hypothesis. **(Answer: H_1: $\sigma < 14.16$)**
(3) Give the number of degrees of freedom to use in this case. **(Answer: df = 34)**
(4) For this style of test, what χ^2 value will have 0.0025 as the area to the left of that value? **(Answer: $\chi^2 = 15.368$)**
(5) Give the computed χ^2 value. **(Answer: computed $\chi^2 = 16.62$)**
(6) Based on the critical value and the computed value should we reject or not reject H_0? **(Answer: based on critical value: do not reject)**
(7) Give the attained (achieved) significance for phat. **(Answer: attained = 0.0054)**
(8) Based on that attained significance do we reject or not reject H_0 in favor of H_1? **(Answer: Based on attained significance: do not reject)**

Case 2:

We have a population that we know to be approximately normally distributed. We want to test the hypothesis that the standard deviation in the population is 42.920 against the alternative that the population standard deviation is less than 42.920. We will perform this test at the 0.0150 level of significance. We take a sample of size 45 of that population. That sample has a sample standard deviation of 31.44.

(9) State the null hypothesis. **(Answer: H_0: $\sigma = 42.92$)**
(10) State the alternative hypothesis. **(Answer: H_1: $\sigma < 42.92$)**
(11) Give the number of degrees of freedom to use in this case. **(Answer: df = 44)**
(12) For this style of test, what χ^2 value will have 0.0150 as the area to the left of that value? **(Answer: $\chi^2 = 26.164$)**
(13) Give the computed χ^2 value. **(Answer: computed $\chi^2 = 23.61$)**
(14) Based on the critical value and the computed value should we reject or not reject H_0? **(Answer: based on critical value: reject)**
(15) Give the attained (achieved) significance for phat. **(Answer: attained = 0.0051)**
(16) Based on that attained significance do we reject or not reject H_0 in favor of H_1? **(Answer: Based on attained significance: reject)**

Case 3:

We have a population that we know to be approximately normally distributed. We want to test the hypothesis that the standard deviation in the population is 40.400 against the alternative that the population standard deviation is greater than 40.400. We will perform this test at the 0.0675 level of significance. We take a sample of size 63 of that population. That sample has a sample standard deviation of 47.09.

(17) State the null hypothesis. **(Answer: H_0: $\sigma = 40.40$)**
(18) State the alternative hypothesis. **(Answer: H_1: $\sigma > 40.40$)**
(19) Give the number of degrees of freedom to use in this case. **(Answer: df = 62)**

(20) For this style of test, what χ^2 value will have 0.0675 as the area to the right of that value? **(Answer: $\chi^2 = 79.394$)**
(21) Give the computed χ^2 value. **(Answer: computed $\chi^2 = 84.23$)**
(22) Based on the critical value and the computed value should we reject or not reject H_0? **(Answer: based on critical value: reject)**
(23) Give the attained (achieved) significance for phat. **(Answer: attained = 0.0317)**
(24) Based on that attained significance do we reject or not reject H_0 in favor of H_1? **(Answer: Based on attained significance: reject)**

Case 4:

We have a population that we know to be approximately normally distributed. We want to test the hypothesis that the standard deviation in the population is 3.650 against the alternative that the population standard deviation is greater than 3.650. We will perform this test at the 0.0625 level of significance. We take a sample of size 14 of that population. That sample has a sample standard deviation of 4.47.

(25) State the null hypothesis. **(Answer: $H_0: \sigma = 3.65$)**
(26) State the alternative hypothesis. **(Answer: $H_1: \sigma > 3.65$)**
(27) Give the number of degrees of freedom to use in this case. **(Answer: df = 13)**
(28) For this style of test, what χ^2 value will have 0.0625 as the area to the right of that value? **(Answer: $\chi^2 = 21.564$)**
(29) Give the computed χ^2 value. **(Answer: computed $\chi^2 = 19.50$)**
(30) Based on the critical value and the computed value should we reject or not reject H_0? **(Answer: based on critical value: do not reject)**
(31) Give the attained (achieved) significance for phat. **(Answer: attained = 0.1085)**
(32) Based on that attained significance do we reject or not reject H_0 in favor of H_1? **(Answer: Based on attained significance: do not reject)**

Case 5:

We have a population that we know to be approximately normally distributed. We want to test the hypothesis that the standard deviation in the population is 22.000 against the alternative that the population standard deviation is not equal to 22.000. We will perform this test at the 0.0875 level of significance. We take a sample of size 21 of that population. That sample has a sample standard deviation of 16.97.

(33) State the null hypothesis. **(Answer: $H_0: \sigma = 22.00$)**
(34) State the alternative hypothesis. **(Answer: $H_1: \sigma \neq 22.00$)**
(35) Give the number of degrees of freedom to use in this case. **(Answer: df = 20)**
(36) For this style of test, what χ^2 values will have 0.0875 as the total, two-tailed, area not between those values? **(Answer: $\chi^2 = 10.586$ and 31.958)**
(37) Give the computed χ^2 value. **(Answer: computed $\chi^2 = 11.90$)**
(38) Based on the critical value and the computed value should we reject or not reject H_0? **(Answer: based on critical value: do not reject)**
(39) Give the attained (achieved) significance for phat. **(Answer: attained = 0.1611)**
(40) Based on that attained significance do we reject or not reject H_0 in favor of H_1? **(Answer: Based on attained significance: do not reject)**

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