Hypothesis Test Worksheet for One Populations, sigma known

Return to Hypothesis Test; One population; sigma known

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 sample of size 51 from a population that we know has a standard deviation of 8.18. We want to test the null hypothesis that the mean of the population is equal to 76.70 against the alternative hypothesis that the mean is less than 76.70. We want to run the test at the 0.060 level of significance. Our sample has a mean equal to 75.33 and a sample standard deviation of 6.32

(1) State the null hypothesis. **(Answer: $H_0 = 76.70$)**
(2) State the alternative hypothesis. **(Answer: $H_1 < 76.70$)**
(3) State the standard deviation of the population. **(Answer: $\sigma = 8.18$)**
(4) State the standard deviation of the means of samples of this size. **(Answer: 1.15)**
(5) State the level of significance at which we are going to run this test. **(Answer: 0.060)**
(6) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z) = 0.060$. **(Answer: 1.5548)**
(7) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 74.92)**
(8) Give the value of the sample mean. **(Answer: 75.33)**
(9) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**
(10) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.1158)**
(11) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**

Case 2:

We have a sample of size 49 from a population that we know has a standard deviation of 17.91. We want to test the null hypothesis that the mean of the population is equal to 171.02 against the alternative hypothesis that the mean is greater than 171.02. We want to run the test at the 0.035 level of significance. Our sample has a mean equal to 177.00 and a sample standard deviation of 21.78

(12) State the null hypothesis. **(Answer: $H_0 = 171.02$)**
(13) State the alternative hypothesis. **(Answer: $H_1 > 171.02$)**
(14) State the standard deviation of the population. **(Answer: $\sigma = 17.91$)**
(15) State the standard deviation of the means of samples of this size. **(Answer: 2.56)**
(16) State the level of significance at which we are going to run this test. **(Answer: 0.035)**
(17) For a **standard normal** distribution give the **z** value that has $P(X \geq z) = 0.035$. **(Answer: 1.8119)**
(18) Give the critical value or values for this test. **(Answer: Reject if sample mean is greater than 175.66)**

(19) Give the value of the sample mean. **(Answer: 177.00)**
(20) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**
(21) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.0097)**
(22) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**

Case 3:

We have a sample of size 14 from a normally distributed population that we know has a standard deviation of 9.02. We want to test the null hypothesis that the mean of the population is equal to 13.27 against the alternative hypothesis that the mean is less than 13.27. We want to run the test at the 0.015 level of significance. Our sample has a mean equal to 7.62 and a sample standard deviation of 10.44

(23) State the null hypothesis. **(Answer: $H_0 = 13.27$)**
(24) State the alternative hypothesis. **(Answer: $H_1 < 13.27$)**
(25) State the standard deviation of the population. **(Answer: $\sigma = 9.02$)**
(26) State the standard deviation of the means of samples of this size. **(Answer: 2.41)**
(27) State the level of significance at which we are going to run this test. **(Answer: 0.015)**
(28) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z) = 0.015$. **(Answer: 2.1701)**
(29) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 8.04)**
(30) Give the value of the sample mean. **(Answer: 7.62)**
(31) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**
(32) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.0095)**
(33) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**

Case 4:

We have a sample of size 27 from a normally distributed population that we know has a standard deviation of 7.84. We want to test the null hypothesis that the mean of the population is equal to -23.95 against the alternative hypothesis that the mean is not equal to -23.95. We want to run the test at the 0.060 level of significance. Our sample has a mean equal to -20.80 and a sample standard deviation of 9.58

(34) State the null hypothesis. **(Answer: $H_0 = -23.95$)**
(35) State the alternative hypothesis. **(Answer: $H_1 \neq -23.95$)**
(36) State the standard deviation of the population. **(Answer: $\sigma = 7.84$)**
(37) State the standard deviation of the means of samples of this size. **(Answer: 1.51)**
(38) State the level of significance at which we are going to run this test. **(Answer: 0.060)**
(39) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z \text{ or } X \geq z) = 0.060$. **(Answer: 1.8808)**
(40) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than -26.79 or greater than -21.11)**
(41) Give the value of the sample mean. **(Answer: -20.80)**
(42) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**
(43) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.0368)**

(44) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**

Case 5:

We have a sample of size 32 from a normally distributed population that we know has a standard deviation of 21.33. We want to test the null hypothesis that the mean of the population is equal to 56.58 against the alternative hypothesis that the mean is not equal to 56.58. We want to run the test at the 0.055 level of significance. Our sample has a mean equal to 62.73 and a sample standard deviation of 15.91

(45) State the null hypothesis. **(Answer: $H_0 = 56.58$)**
(46) State the alternative hypothesis. **(Answer: $H_1 \neq 56.58$)**
(47) State the standard deviation of the population. **(Answer: $\sigma = 21.33$)**
(48) State the standard deviation of the means of samples of this size. **(Answer: 3.77)**
(49) State the level of significance at which we are going to run this test. **(Answer: 0.055)**
(50) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z \text{ or } X \geq z) = 0.055$. **(Answer: 1.9189)**
(51) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 49.34 or greater than 63.82)**
(52) Give the value of the sample mean. **(Answer: 62.73)**
(53) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**
(54) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.1029)**
(55) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**

Case 6:

We have a population with a known standard deviation σ_1=45.40. We also know that the population is has an approimate normal distribution. We draw a random sample from that population. Here is that sample:

Table 1: Sample from Population 6.1

22.76	9.81	110.91	82.61	129.02	56.68	96.18	145.11	134.04	136.96	122.97	36.33	44.93	49.77
158.05	-74.85	-8.05	72.13	-1.97	-30.93	-2.71	86.08	62.00	72.59				

You can generate this set of data using the command **gnrnd4(2887612304,503105466).**
We want to test the null hypothesis that the mean of the population is equal to 37.06 against the alternative hypothesis that the mean is not equal to 37.06. We want to run the test at the 0.020 level of significance.
(56) What is the sample size of the sample? **(Answer= 24)**
(58) State the null hypothesis. **(Answer: $H_0 = 37.06$)**
(59) State the alternative hypothesis. **(Answer: $H_1 \neq 37.06$)**
(60) State the standard deviation of the population. **(Answer: $\sigma = 45.40$)**
(61) State the standard deviation of the means of samples of this size. **(Answer: 9.27)**
(62) State the level of significance at which we are going to run this test. **(Answer: 0.020)**
(63) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z \text{ or } X \geq z) = 0.020$. **(Answer: 2.3263)**
(64) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 15.50 or greater than 58.62)**

(65) Give the value of the sample mean. **(Answer: 62.9342)**
(66) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**
(67) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.0052)**
(68) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**

Case 7:

We have a population with a known standard deviation σ_1=13.53. We draw a random sample from that population. Here is that sample:

Table 1: Sample from Population 6.1													
185.62	172.19	161.02	151.48	176.18	194.98	172.25	139.17	136.09	139.26	188.85	164.80	157.27	147.04
174.55	156.42	194.08	169.68	184.75	172.19	170.25	151.73	169.08	167.14	170.56	157.30	172.46	193.07
143.47	171.86	185.75	165.80	143.91	184.63	168.46							

You can generate this set of data using the command **gnrnd4(2605763404,170916566).**
We want to test the null hypothesis that the mean of the population is equal to 170.48 against the alternative hypothesis that the mean is less than 170.48. We want to run the test at the 0.070 level of significance.
(69) What is the sample size of the sample? **(Answer= 35)**
(71) State the null hypothesis. **(Answer: $H_0 = 170.48$)**
(72) State the alternative hypothesis. **(Answer: $H_1 < 170.48$)**
(73) State the standard deviation of the population. **(Answer: σ =13.53)**
(74) State the standard deviation of the means of samples of this size. **(Answer: 2.29)**
(75) State the level of significance at which we are going to run this test. **(Answer: 0.070)**
(76) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z) = 0.070$. **(Answer: 1.4758)**
(77) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 167.10)**
(78) Give the value of the sample mean. **(Answer: 167.2383)**
(79) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**
(80) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.0782)**
(81) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**

Case 8:

We have a population with a known standard deviation σ_1=19.46. We draw a random sample from that population. Here is that sample:

Table 1: Sample from Population 6.1													
-4.81	0.23	11.40	-8.46	9.30	5.14	2.59	24.52	-6.12	-1.87	10.31	20.24	8.04	30.00
17.66	2.20	-6.34	-0.28	2.78	-14.94	20.20	-8.08	5.07	13.03	2.92	-6.59	5.65	-6.46
-5.37	20.26	-12.92	12.87	-0.26	32.58	20.97	-17.93	3.28	-15.13	3.89	24.99	3.72	24.26
15.62	16.82	9.69	0.17	-12.75	12.66	11.34	7.66	6.66	-13.61	-0.17	7.36	-5.19	20.62
8.99	3.43	12.50	27.73	13.10	24.20	-13.60	-14.01	-9.63	10.98	26.96	-4.03	12.34	

You can generate this set of data using the command **gnrnd4(2698936804,135700556).**
We want to test the null hypothesis that the mean of the population is equal to 9.02 against the alternative

hypothesis that the mean is less than 9.02. We want to run the test at the 0.070 level of significance.

(82) What is the sample size of the sample? **(Answer= 69)**

(84) State the null hypothesis. **(Answer: $H_0 = 9.02$)**

(85) State the alternative hypothesis. **(Answer: $H_1 < 9.02$)**

(86) State the standard deviation of the population. **(Answer: $\sigma = 19.46$)**

(87) State the standard deviation of the means of samples of this size. **(Answer: 2.34)**

(88) State the level of significance at which we are going to run this test. **(Answer: 0.070)**

(89) For a **standard normal** distribution give the **z** value that has $P(X \leq {}^{-}z) = 0.070$. **(Answer: 1.4758)**

(90) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 5.56)**

(91) Give the value of the sample mean. **(Answer: 5.7736)**

(92) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**

(93) If H_0 is true, and considering H_1 as the alternative, then what is the attained (achieved) significance of having the sample mean that we found? **(Answer: 0.0829)**

(94) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**

Return to Hypothesis Test; One population; sigma known

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