Hypothesis Test Worksheet for One Populations, sigma unknown

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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 sample of size 41 from a population. We do not know standard deviation of that population. We want to test the null hypothesis that the mean of the population is equal to 79.29 against the alternative hypothesis that the mean is not equal to 79.29. We want to run the test at the 0.025 level of significance. Our sample has a mean equal to 75.59 and a sample standard deviation of 9.08

(1) State the null hypothesis. **(Answer: H_0 = 79.29)**
(2) State the alternative hypothesis. **(Answer: $H_1 \neq$ 79.29)**
(3) State the standard deviation of the sample. **(Answer: σ =9.08)**
(4) State the standard deviation of the means of samples of this size. **(Answer: 1.42)**
(5) State the level of significance at which we are going to run this test. **(Answer: 0.025)**
(6) State the number of degrees of freedom that we will use for this test. **(Answer: 40)**
(7) For a **Student's t** distribution give the **t** value that has P(X ≤ ¬t or X ≥ t) = 0.025. **(Answer: 2.3289)**
(8) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 75.99 or greater than 82.59)**
(9) Give the value of the sample mean. **(Answer: 75.59)**
(10) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**
(11) 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: 0.0127)**
(12) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: reject)**

Case 2:

We have a sample of size 38 from a population. We do not know standard deviation of that population. We want to test the null hypothesis that the mean of the population is equal to 187.86 against the alternative hypothesis that the mean is less than 187.86. We want to run the test at the 0.040 level of significance. Our sample has a mean equal to 186.44 and a sample standard deviation of 6.86

(13) State the null hypothesis. **(Answer: H_0 = 187.86)**
(14) State the alternative hypothesis. **(Answer: $H_1 <$ 187.86)**
(15) State the standard deviation of the sample. **(Answer: σ =6.86)**
(16) State the standard deviation of the means of samples of this size. **(Answer: 1.11)**
(17) State the level of significance at which we are going to run this test. **(Answer: 0.040)**
(18) State the number of degrees of freedom that we will use for this test. **(Answer: 37)**
(19) For a **Student's t** distribution give the **t** value that has P(X ≤ ¬t) = 0.040. **(Answer: 1.8001)**
(20) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 185.86)**
(21) Give the value of the sample mean. **(Answer: 186.44)**
(22) Based on the 'critical value test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**
(23) 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: 0.1050)**
(24) Based on the 'attained significance test' do we reject or not reject H_0 in favor of H_1? **(Answer: do not reject)**

Case 3:

We have a sample of size 16 from a population that has an approximately normal distribution of the parameter that we are examining. We do not know standard deviation of that population. We want to test the null hypothesis that the mean of the population is equal to 16.46 against the alternative hypothesis that the mean is less than 16.46. We want to run the test at the 0.025 level of significance. Our sample has a mean equal to 13.36 and a sample standard deviation of 5.49

(25) State the null hypothesis. **(Answer: H_0 = 16.46)**

(26) State the alternative hypothesis. **(Answer: H_1 < 16.46)**

(27) State the standard deviation of the sample. **(Answer: σ =5.49)**

(28) State the standard deviation of the means of samples of this size. **(Answer: 1.37)**

(29) State the level of significance at which we are going to run this test. **(Answer: 0.025)**

(30) State the number of degrees of freedom that we will use for this test. **(Answer: 15)**

(31) For a **Student's t** distribution give the **t** value that has P($X \le {}^-t$) = 0.025. **(Answer: 2.1314)**

(32) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 13.53)**

(33) Give the value of the sample mean. **(Answer: 13.36)**

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

(35) 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: 0.0196)**

(36) 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 26 from a population. We do not know standard deviation of that population. We want to test the null hypothesis that the mean of the population is equal to -15.92 against the alternative hypothesis that the mean is greater than -15.92. We want to run the test at the 0.035 level of significance. Our sample has a mean equal to -13.45 and a sample standard deviation of 7.39

(37) State the null hypothesis. **(Answer: H_0 = -15.92)**

(38) State the alternative hypothesis. **(Answer: H_1 > -15.92)**

(39) State the standard deviation of the sample. **(Answer: σ =7.39)**

(40) State the standard deviation of the means of samples of this size. **(Answer: 1.45)**

(41) State the level of significance at which we are going to run this test. **(Answer: 0.035)**

(42) State the number of degrees of freedom that we will use for this test. **(Answer: 25)**

(43) For a **Student's t** distribution give the **t** value that has P($X \ge t$) = 0.035. **(Answer: 1.8929)**

(44) Give the critical value or values for this test. **(Answer: Reject if sample mean is greater than -13.18)**

(45) Give the value of the sample mean. **(Answer: -13.45)**

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

(47) 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: 0.0504)**

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

Case 5:

We have a sample of size 18 from a population. We do not know standard deviation of that population. We want to test the null hypothesis that the mean of the population is equal to -91.13 against the alternative hypothesis that the mean is greater than -91.13. We want to run the test at the 0.060 level of significance. Our sample has a mean equal to -88.98 and a sample standard deviation of 7.64

(49) State the null hypothesis. **(Answer: H_0 = -91.13)**

(50) State the alternative hypothesis. **(Answer: H_1 > -91.13)**

(51) State the standard deviation of the sample. **(Answer: σ =7.64)**

(52) State the standard deviation of the means of samples of this size. **(Answer: 1.80)**

(53) State the level of significance at which we are going to run this test. **(Answer: 0.060)**

(54) State the number of degrees of freedom that we will use for this test. **(Answer: 17)**

(55) For a **Student's t** distribution give the **t** value that has P($X \ge t$) = 0.060. **(Answer: 1.6370)**

(56) Give the critical value or values for this test. **(Answer: Reject if sample mean is greater than -88.18)**

(57) Give the value of the sample mean. **(Answer: -88.98)**

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

(59) 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: 0.1244)**

(60) 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 an unknown standard deviation. 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													
53.85	30.86	53.82	66.00	60.28	66.66	35.98	65.15	35.98	53.88	42.03	46.30	13.96	62.03
75.85	11.01	65.50	53.10	33.39	57.36	72.67	47.43	51.61	45.17	72.69	55.11	22.52	

You can generate this set of data using the command **gnrnd4(2729832604,204904541).**

We want to test the null hypothesis that the mean of the population is equal to 55.84 against the alternative hypothesis that the mean is less than 55.84. We want to run the test at the 0.070 level of significance.

(61) What is the sample size of the sample? **(Answer= 27)**

(63) State the null hypothesis. **(Answer: $H_0 = 55.84$)**

(64) State the alternative hypothesis. **(Answer: $H_1 < 55.84$)**

(65) State the standard deviation of the sample. **(Answer: $s_x = 17.33$)**

(66) State the standard deviation of the means of samples of this size. **(Answer: 3.33)**

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

(68) State the number of degrees of freedom for this test. **(Answer: 26)**

(69) For a **Student's t** distribution give the **t** value that has $P(X \leq {}^-t) = 0.070$. **(Answer: -1.5223)**

(70) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 50.76)**

(71) Give the value of the sample mean. **(Answer: 50.0070)**

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

(73) 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: 0.0460)**

(74) 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 an unknown standard deviation. 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													
180.82	204.80	208.41	216.37	206.42	208.64	176.49	235.06	212.82	207.00	223.01	177.81	219.14	220.21
215.02	212.06	219.03	190.12	192.77	228.78	180.81	187.63	208.05	196.50	199.98	215.03	207.72	185.88
218.95	174.35	220.30	197.69										

You can generate this set of data using the command **gnrnd4(2519983104,165320226).**

We want to test the null hypothesis that the mean of the population is equal to 212.22 against the alternative hypothesis that the mean is less than 212.22. We want to run the test at the 0.010 level of significance.

(75) What is the sample size of the sample? **(Answer= 32)**

(77) State the null hypothesis. **(Answer: $H_0 = 212.22$)**

(78) State the alternative hypothesis. **(Answer: $H_1 < 212.22$)**

(79) State the standard deviation of the sample. **(Answer: $s_x = 16.25$)**

(80) State the standard deviation of the means of samples of this size. **(Answer: 2.87)**

(81) State the level of significance at which we are going to run this test. **(Answer: 0.010)**

(82) State the number of degrees of freedom for this test. **(Answer: 31)**

(83) For a **Student's t** distribution give the **t** value that has $P(X \leq {}^-t) = 0.010$. **(Answer: -2.4528)**

(84) Give the critical value or values for this test. **(Answer: Reject if sample mean is less than 205.17)**

(85) Give the value of the sample mean. **(Answer: 204.6147)**

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

(87) 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: 0.0063)**

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

Case 8:

We have a population with an unknown standard deviation. 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													
-15.74	-41.31	14.84	8.51	-22.41	-28.35	19.19	-26.01	0.54	0.63	-1.43	-22.65	18.33	21.32
-17.38	7.24	-7.49	10.73	35.76	-1.09	-5.24	-11.06	-2.47	21.09	-1.66	-15.89	-4.61	-20.51
10.93	16.09	48.00	35.78	23.23	24.37	-0.42	-21.04	31.07	9.74	-9.74	3.73	-15.65	-28.63
24.90	35.71	21.60	-0.29	22.44	28.32	-2.76	-24.89	12.44	19.82	10.64	-39.96	24.55	4.68
-5.72	6.77	-6.58	2.45	-6.79	-7.06	-9.97	-11.98	-5.19	18.77	-9.64	4.65	25.82	

You can generate this set of data using the command **gnrnd4(2248946804,186400530).**

We want to test the null hypothesis that the mean of the population is equal to -0.19 against the alternative hypothesis that the mean is greater than -0.19. We want to run the test at the 0.010 level of significance.

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

(91) State the null hypothesis. **(Answer: H_0 = -0.19)**

(92) State the alternative hypothesis. **(Answer: H_1 > -0.19)**

(93) State the standard deviation of the sample. **(Answer: s_x =19.23)**

(94) State the standard deviation of the means of samples of this size. **(Answer: 2.32)**

(95) State the level of significance at which we are going to run this test. **(Answer: 0.010)**

(96) State the number of degrees of freedom for this test. **(Answer: 68)**

(97) For a **Student's t** distribution give the **t** value that has P($X \geq z$) = 0.010. **(Answer: 2.3824)**

(98) Give the critical value or values for this test. **(Answer: Reject if sample mean is greater than 5.33)**

(99) Give the value of the sample mean. **(Answer: 2.5083)**

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

(101) 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: 0.1240)**

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

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