

Worksheet for Two Populations, sigma known

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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 38 from a population that we know has a standard deviation of 7.06. The mean of that sample is 76.95. And, we have a second population, with a known standard deviation, namely, 8.82. Finally, we have a sample of size 51 that has a sample mean equal to 71.24.

- (1) What is the point estimate for the difference of the means, $\mu_1 - \mu_2$? (**Answer= 5.71**)
- (2) Considering the size of our two samples and the known standard deviations of the two populations, what is the standard deviation of the difference of sample means? (**Answer= 1.6843**)
- (3) We want a 92% confidence interval. We know that the difference of sample means is normally distributed. What is the z value that we will use so that in a standard normal distribution there is 92% of the area between $-z$ and z ? (**Answer= 1.7507 or -1.7507**)
- (4) Using all of those results, what is the 92% confidence interval for the difference of the means? (**Answer= (2.7612, 8.6588)**)
- (5) What is the value of the margin of error for that confidence interval? (**Answer= 2.9488**)

Case 2:

We have a sample of size 44 from a population that we know has a standard deviation of 5.47. The mean of that sample is 80.66. And, we have a second population, with a known standard deviation, namely, 8.67. Finally, we have a sample of size 45 that has a sample mean equal to 86.18.

- (6) What is the point estimate for the difference of the means, $\mu_1 - \mu_2$? (**Answer= -5.52**)
- (7) Considering the size of our two samples and the known standard deviations of the two populations, what is the standard deviation of the difference of sample means? (**Answer= 1.5331**)
- (8) We want a 99% confidence interval. We know that the difference of sample means is normally distributed. What is the z value that we will use so that in a standard normal distribution there is 99% of the area between $-z$ and z ? (**Answer= 2.5758 or -2.5758**)
- (9) Using all of those results, what is the 99% confidence interval for the difference of the means? (**Answer= (-9.4690, -1.5710)**)
- (10) What is the value of the margin of error for that confidence interval? (**Answer= 3.9490**)

Case 3:

We have a sample of size 72 from a population that we know has a standard deviation of 8.86. The mean of that sample is 77.35. And, we have a second population, with a known standard deviation, namely, 11.18. Finally, we have a sample of size 47 that has a sample mean equal to 82.57.

- (11) What is the point estimate for the difference of the means, $\mu_1 - \mu_2$? (**Answer= -5.22**)

(12) Considering the size of our two samples and the known standard deviations of the two populations, what is the standard deviation of the difference of sample means? (**Answer= 1.9364**)

(13) We want a 99.5% confidence interval. We know that the difference of sample means is normally distributed. What is the z value that we will use so that in a standard normal distribution there is 99.5% of the area between $-z$ and z ? (**Answer= 2.8070 or -2.8070**)

(14) Using all of those results, what is the 99.5% confidence interval for the difference of the means? (**Answer= (-10.6556, 0.2156)**)

(15) What is the value of the margin of error for that confidence interval? (**Answer= 5.4356**)

Case 4:

We have two populations. The first has a known standard deviation $\sigma_1=5.1$, while the second has a known standard deviation $\sigma_2=6.5$. We draw a random sample from each population. Here is the first:

79.5	70.1	72.3	68.0	78.3	75.4	69.6	80.3	73.2	77.3	77.6	68.3	64.8	80.1	72.0	67.2	73.6	78.4	70.0	78.8
75.4	83.3	76.0	78.1	79.9	76.2	75.7	74.2	69.0	68.1	85.9	83.3	71.6	72.0	71.1	75.5	76.7	82.3	65.9	65.8
80.8	84.5	78.2	72.8	73.9	72.6	66.4	73.9	79.2	73.4	73.8	70.2	87.9	84.1	73.3	77.8				

You can generate this set of data using the command **gnrnd4(1895785504,5100746)**.

Then we draw a random sample from the second population. Here is that sample:

60.6	65.8	72.6	59.4	75.3	68.9	60.0	66.4	72.8	69.6	70.3	77.4	73.5	72.1	74.0	73.7	65.2	64.8	63.8	57.4
64.5	64.0	77.1	61.1	74.3	61.8	77.9	63.4	79.3	62.8	73.1	68.7	61.8	68.2	70.2	76.1	61.0	84.5	71.3	68.0
53.8	64.4	78.4	86.4	70.0	59.2	72.1	61.7	71.5	60.1	62.0	63.8	77.2	76.0	71.0	68.0	56.5	77.1	60.5	74.1
53.1	78.9	66.9	70.7	76.5	64.1	62.5	68.6	63.0	62.0	62.3	76.8	62.2	76.8	72.3	67.7	68.1			

You can generate this set of data using the command **gnrnd4(1943827604,6500689)**.

(16) What is the sample size of the first sample? (**Answer= 56**)

(17) What is the sample size of the second sample? (**Answer= 77**)

(18) What is the sample mean of the first sample? (**Answer= 75.0643**)

(19) What is the sample mean of the second sample? (**Answer= 68.4286**)

(20) What is the point estimate for the difference of the means, $\mu_1 - \mu_2$? (**Answer=6.6357**)

(21) Considering the size of our two samples and the known standard deviations of the two populations, what is the standard deviation of the difference of sample means? (**Answer= 1.0066**)

(22) We want a 89.5% confidence interval. We know that the difference of sample means is normally distributed. What is the z value that we will use so that in a standard normal distribution there is 89.5% of the area between $-z$ and z ? (**Answer= 1.6211 or -1.6211**)

(23) Using all of those results, what is the 89.5% confidence interval for the difference of the means? (**Answer= (5.0040, 8.2674)**)

(24) What is the value of the margin of error for that confidence interval? (**Answer= 1.6317**)

Case 5:

We have two populations. The first has a known standard deviation $\sigma_1=6.4$, while the second has a known standard deviation $\sigma_2=9.3$. We draw a random sample from each population. Here is the first:

-57.0	-42.0	-42.9	-46.8	-48.3	-30.7	-40.4	-39.7	-44.2	-33.1	-43.8	-43.0	-44.3	-41.4	-52.4	-41.3	-45.3	-51.4
-42.3	-48.3	-31.7	-35.5	-41.3	-47.8	-43.9	-46.3	-42.2	-45.4	-46.2	-45.2	-55.3	-45.6	-39.8	-42.2	-42.8	-48.8
-54.7	-44.1	-33.3	-40.8	-36.8	-53.8	-28.7	-37.3	-41.9	-43.3	-41.6	-45.5	-59.7	-36.4	-49.2	-40.6	-54.8	-51.1
-44.6	-48.8	-43.0	-47.7	-60.9	-43.5	-40.9	-49.4	-38.0	-45.4	-45.2	-43.3	-52.3	-37.5	-40.2	-55.4	-32.1	-43.6
-48.8																	

You can generate this set of data using the command **gnrnd4(6128867204,6400432)**.

Then we draw a random sample from the second population. Here is that sample:

-39.3	-42.4	-56.9	-51.3	-51.5	-45.5	-32.8	-45.0	-55.8	-44.3	-57.0	-28.0	-45.6	-60.3	-58.7	-58.1	-62.0	-42.6
-32.7	-57.6	-48.9	-52.3	-59.6	-57.8	-48.8	-47.2	-63.8	-49.4	-68.4	-48.2	-52.8	-57.5	-54.3	-60.6	-58.7	-55.1
-60.7	-52.1	-59.6	-34.4	-44.3	-48.4	-56.3	-54.3	-44.0	-59.7	-55.1	-52.5	-53.7	-55.5	-57.8	-67.4	-59.8	-67.1
-38.1	-41.9	-55.1	-47.1	-70.7	-41.1	-46.4	-37.5	-44.4	-45.2	-57.5	-52.5	-50.3	-61.9	-69.8	-53.8	-40.1	-61.1

You can generate this set of data using the command **gnrnd4(6179647104,9300514)**.

- (25) What is the sample size of the first sample? (**Answer= 73**)
- (26) What is the sample size of the second sample? (**Answer= 72**)
- (27) What is the sample mean of the first sample? (**Answer= -44.2849**)
- (28) What is the sample mean of the second sample? (**Answer= -52.0556**)
- (29) What is the point estimate for the difference of the means, $\mu_1 - \mu_2$? (**Answer=7.7706**)
- (30) Considering the size of our two samples and the known standard deviations of the two populations, what is the standard deviation of the difference of sample means? (**Answer= 1.3275**)
- (31) We want a 81.5% confidence interval. We know that the difference of sample means is normally distributed. What is the z value that we will use so that in a standard normal distribution there is 81.5% of the area between $-z$ and z ? (**Answer= 1.3255 or -1.3255**)
- (32) Using all of those results, what is the 81.5% confidence interval for the difference of the means? (**Answer= (6.0110, 9.5303)**)
- (33) What is the value of the margin of error for that confidence interval? (**Answer= 1.7597**)

Case 6:

We have a population that we know has a standard deviation of 5.70. We have a second populations with a known standard deviation of 8.34. We want test the null hypothesis that the two means are equal against the alternative hypothesis that mean of the first population is less than the mean of the second population. We will do this test at the 0.03 level of significance. We draw samples from each population. The sample from the first population has size 58 and sample mean equal to 79.16. The sample from the second population has size 65 and sample mean equal to 81.73.

- (34) State the null hypothesis. (**Answer= $H_0: \mu_1 = \mu_2$**)
- (35) State the alternative hypothesis. (**Answer= $H_1: \mu_1 < \mu_2$**)
- (36) Give the value of the difference of the two means $(\bar{x}_1 - \bar{x}_2)$. (**Answer= -2.5700**)

- (37) Give the value of the standard deviation of the difference of the two means. **(Answer= 1.2768)**
- (38) Give the z-value associated with the specified level of significance for this type of alternative hypothesis. **(Answer= 1.8808)**
- (39) Give the critical value (or values) computed from the two previous answers. **(Answer= low is -2.401)**
- (40) Give the attained (achieved) significance for the difference of the two means. **(Answer= 0.0221)**
- (41) Therefore, do we reject or not reject H_0 ? **(Answer= Reject)**

Case 7:

We have a population that we know has a standard deviation of 12.04. We have a second populations with a known standard deviation of 15.15. We want test the null hypothesis that the two means are equal against the alternative hypothesis that mean of the first population is greater than the mean of the second population. We will do this test at the 0.020 level of significance. We draw samples from each population. The sample from the first population has size 43 and sample mean equal to 87.86. The sample from the second population has size 42 and sample mean equal to 81.27.

- (42) State the null hypothesis. **(Answer= $H_0: \mu_1 = \mu_2$)**
- (43) State the alternative hypothesis. **(Answer= $H_1: \mu_1 > \mu_2$)**
- (44) Give the value of the difference of the two means $(\bar{x}_1 - \bar{x}_2)$. **(Answer= 6.5900)**
- (45) Give the value of the standard deviation of the difference of the two means. **(Answer= 2.9725)**
- (46) Give the z-value associated with the specified level of significance for this type of alternative hypothesis. **(Answer= 2.0537)**
- (47) Give the critical value (or values) computed from the two previous answers. **(Answer= high is 6.105)**
- (48) Give the attained (achieved) significance for the difference of the two means. **(Answer= 0.0133)**
- (49) Therefore, do we reject or not reject H_0 ? **(Answer= Reject)**

Case 8:

We have a population that we know has a standard deviation of 8.80. We have a second populations with a known standard deviation of 10.60. We want test the null hypothesis that the two means are equal against the alternative hypothesis that mean of the first population is less than the mean of the second population. We will do this test at the 0.035 level of significance. We draw samples from each population. The sample from the first population is:

139.4	120.0	123.0	123.4	115.9	121.6	116.8	140.8	124.6	134.2	135.0	121.3	121.4	137.2	129.5	138.4	124.2	136.2	129.0	136.9
104.9	129.5	116.6	117.1	138.3	123.1	124.1	128.7	128.7	123.2	121.9	130.3	117.1	129.8	134.3	132.2	126.4	134.7	133.3	129.5
130.2	138.0	128.0																	

You can generate this set of data using the command **gnrnd4(1177104204,8801266)**.

Here is the sample from the second population.

135.6	132.6	118.9	155.9	109.9	133.0	143.6	110.6	130.6	121.7	129.0	133.9	123.5	135.4	128.8	137.7	136.8	133.6	141.0	133.2
138.4	130.2	130.5	128.5	127.1	136.6	117.4	127.4	127.8	130.1	149.5	125.4	118.7	129.1	135.0	142.9	143.3	131.8	146.8	125.5
131.0	139.0	130.3	127.3	119.9															

You can generate this set of data using the command **gnrnd4(1903894404,10601312)**.

- (50) State the null hypothesis. **(Answer= $H_0: \mu_1 = \mu_2$)**

- (51) State the alternative hypothesis. **(Answer= $H_1: \mu_1 < \mu_2$)**
- (52) Give the value of the mean of the first sample. **(Answer= 127.6442)**
- (53) Give the value of the mean of the second sample. **(Answer= 131.4400)**
- (54) Give the value of the difference of the two means $(\bar{x}_1 - \bar{x}_2)$. **(Answer= -3.7958)**
- (55) Give the value of the standard deviation of the difference of the two means. **(Answer= 2.0731)**
- (56) Give the z-value associated with the specified level of significance for this type of alternative hypothesis. **(Answer= 1.8119)**
- (57) Give the critical value (or values) computed from the two previous answers. **(Answer= low is -3.756)**
- (58) Give the attained (achieved) significance for the difference of the two means. **(Answer= 0.0336)**
- (59) Therefore, do we reject or not reject H_0 ? **(Answer= Reject)**

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