

Alternative to the Two Mean Test

The conditions for the two mean test are:

- $20n \leq N$
- The sample differences have no outliers (Boxplot)
- The sample differences come from a population that is normally distributed (QQ Plot)

If the conditions are not all satisfied we can turn to the nonparametric test known as the **Mann-Whitney Test**.

The two samples are combined together and then the values are ranked from smallest to largest in terms of absolute value. The ranks for each sample are totaled.

If the ranks for each sample are close that indicates that there is no difference but if they are far apart that could indicate that the two median are different.

Differences for This Test

Step 1: This test involves the difference between the two population medians.

$$H_0: M_1 = M_2$$

The sign for H_1 depends on which population is Population #1 and the wording of the claim.

Step 3: Mann-Whitney Test

Step 4: Stat > Nonparametrics > Mann-Whitney

Select the columns for sample 1 and sample 2.

Leave the value in the null hypothesis as 0.

Select the correct sign for the alternative hypothesis and click Compute.

On the back of this page are 3 two mean hypothesis tests. If the conditions for the two mean test are met, then perform the standard two mean test. Otherwise switch to its alternative test – the Mann-Whitney test. Write each hypothesis test using our standard 5-step procedure.

Math 21 Two Mean or Mann-Whitney

1) A high school instructor is curious to see the effect that an open-notes policy would have on tests. He allows one of his classes to use their notes on their test, while his other class takes the test without them. Here are the scores.

With Notes

86	95	97	98	53	84	91	64
97	97	97	84	64	94	73	

Without Notes

70	92	97	50	81	97	84	61
98	98	58	16	69	84	91	78

At the 0.05 level, test the claim that the use of notes produces a higher mean test score.

2) Here are the serum cholesterol levels, in mg/dL, of 12 men and 26 women aged 60 – 69.

Men

176	196	189	184	230	169	173
159	180	284	221	196		

Women

168	239	213	197	170	226	200
205	237	219	246	247	268	273
213	151	188	196	273	202	236
214	295	221	255	260		

At the 0.01 level of significance, test the claim that men and women aged 60 – 69 have the same mean serum cholesterol level.

3) Here are the ages that a random sample of 7 male smokers began smoking.

20	17	18	19	17	18	23
----	----	----	----	----	----	----

Here are the ages that a random sample of 10 female smokers began smoking.

22	25	23	22	20	24	18	21	26	30
----	----	----	----	----	----	----	----	----	----

At the 0.05 level of significance, test the claim that the mean age that men begin smoking is the same as the mean age that women begin smoking.