

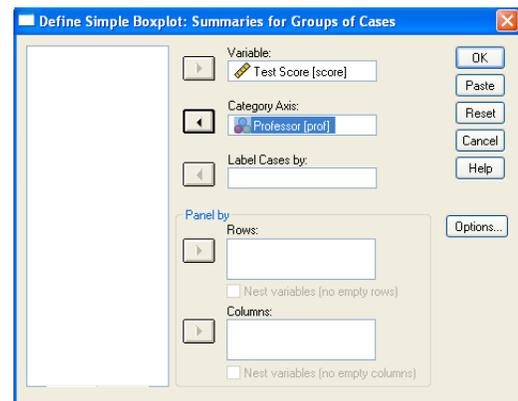
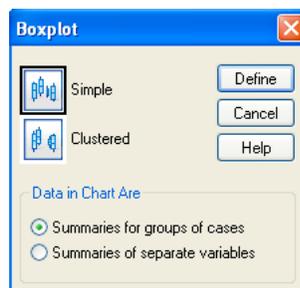
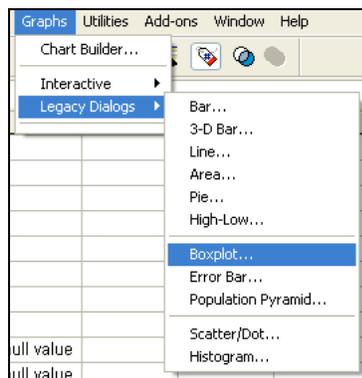
The test scores shown in the table below were recorded by two different professors for two sections of the same course. Using the Mann-Whitney Rank Sum Test and a significance level of  $\alpha = 0.05$ , determine if the locations of the two distributions are equal (*i.e.*, if the medians are equal).

Professor A	74	78	68	72	76	69	71	74
Professor B	75	80	87	81	72	73	80	76

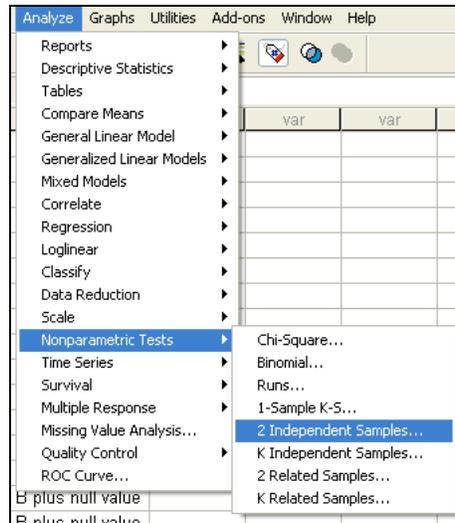
- Enter the values into one variable and the corresponding sample number (1 for Professor A, 2 for Professor B plus null value) into another variable (*see figure, below*). Be sure to code your variables appropriately.

	score	prof
1	74	Professor A
2	78	Professor A
3	68	Professor A
4	72	Professor A
5	76	Professor A
6	69	Professor A
7	71	Professor A
8	74	Professor A
9	75	Professor B plus null value
10	80	Professor B plus null value
11	87	Professor B plus null value
12	81	Professor B plus null value
13	72	Professor B plus null value
14	73	Professor B plus null value
15	80	Professor B plus null value
16	76	Professor B plus null value

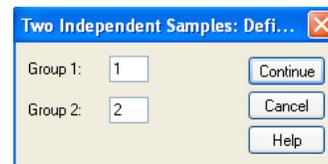
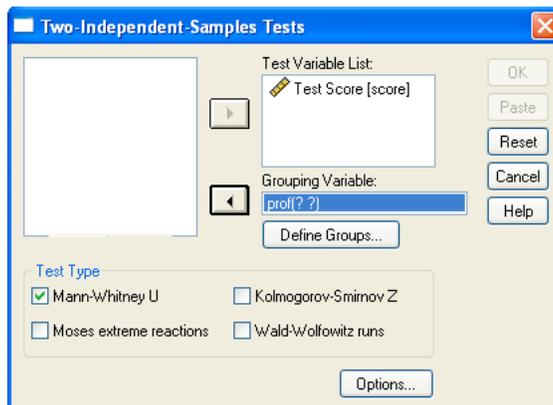
- Next you need to check the similar distribution assumption by checking boxplots of the data. Select “Boxplot...” under the “Legacy Dialogs” section of the “Graphs” menu (*see right figure, below*). Select “Simple” and “Summaries for groups of cases” before clicking “Define” (*see middle figure, below*). The variable to be graphed should be “Test Score,” and the category axis should be based upon “Professor” (*see right figure, below*).



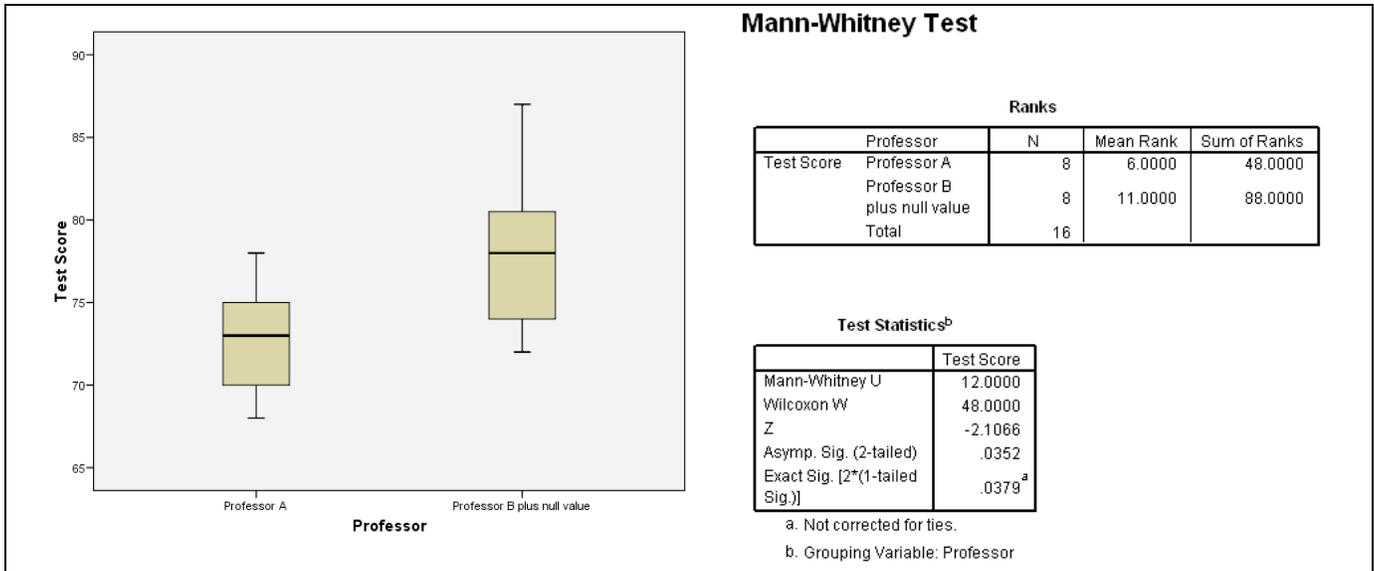
3. Select Analyze → Nonparametric Tests → 2 Independent Samples ... (see figure, below).



4. Select “Test Score” as the test variable and click “Define Groups...”. For Group 1, enter 1 (Professor A), and for Group 2, enter 2 (Professor B plus null value). Click “Continue” to close the “Define Groups” window. Be sure the “Test Type” selected is Mann-Whitney U, and then click “OK” (see the two figures, below).



5. Your output should look like this.



6. You should use the output information in the following manner to answer the question.

**Step 0: Check Assumptions**

The boxplots appear roughly the same shape, so the same shape assumption appears to be satisfied.

**Step 1: Hypotheses**

$$H_0: Median_A = Median_B \quad H_0: Median_A - Median_B = 0$$

$$H_a: Median_A \neq Median_B \quad \text{or} \quad H_a: Median_A - Median_B \neq 0$$

**Step 2: Significance Level**

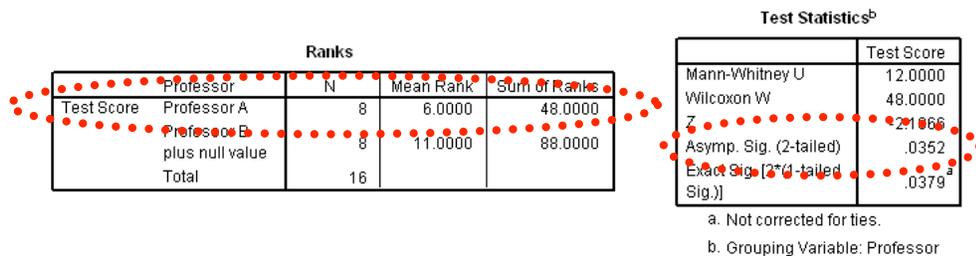
$$\alpha = 0.05$$

**Step 3: Rejection Region**

This is a two-tailed test with  $n_1 = 8$  and  $n_2 = 8$ .

Reject the null hypothesis if  $p\text{-value} \leq 0.05$ .

**Step 4: Test Statistic**



$RS$  = sum of the Sample 1 (Professor A) ranks = "Wilcoxon W" in SPSS = 48

$p\text{-value} = \text{Asymp. Sig. (2-tailed)} = 0.0352$

[If the test were one-tailed, the  $p\text{-value}$  would be  $\frac{1}{2}(\text{Asymp. Sig. (2-tailed)})$ .]

**Step 5: Decision**

Since  $p\text{-value} = 0.0352 \leq 0.05 = \alpha$ , we shall reject the null hypothesis.

**Step 6: State conclusion in words**

At the  $\alpha = 0.05$  level of significance, there is enough evidence to conclude that there is a difference in the median grades of the two professor's classes.