

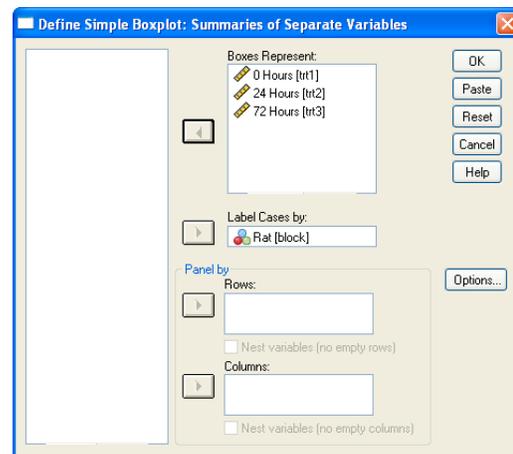
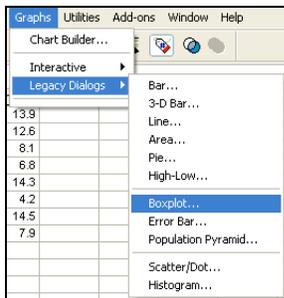
The following data on amount of food consumed (g) by eight rats after 0, 24, and 72 hours of food deprivation appeared in the paper “The Relation Between Differences in Level of Food Deprivation and Dominance in Food Getting in the Rat” (*Psych. Sci.* (1972):297-298). Does the data indicate a difference in the true mean food consumption for the three experimental conditions? Test for a difference in the true mean food consumptions using Friedman's Test. Use  $\alpha = 0.01$ .

<i>Hours</i>	<i>Rat</i>							
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
<i>0</i>	3.5	3.7	1.6	2.5	2.8	2.0	5.9	2.5
<i>24</i>	5.9	8.1	8.1	8.6	8.1	5.9	9.5	7.9
<i>72</i>	13.9	12.6	8.1	6.8	14.3	4.2	14.5	7.9

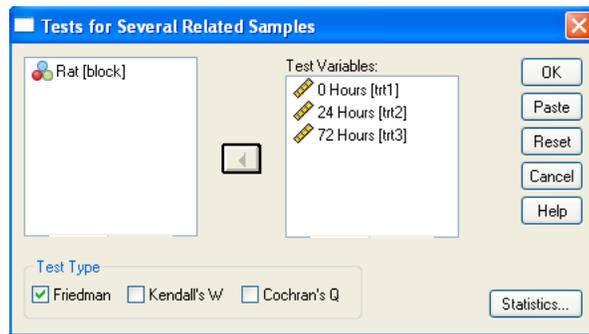
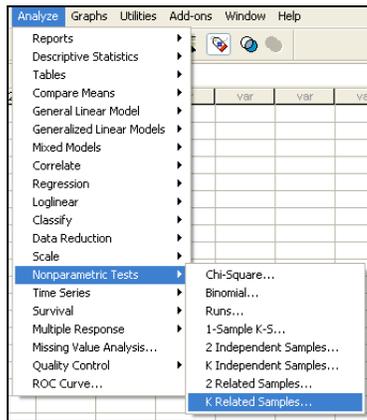
- Enter the block values (Rat 1, Rat 2, etc.) into one variable and the corresponding responses for each of the  $k$  treatment levels into  $k$  columns (a separate variable column for each of 0 Hours, 24 Hours, and 72 Hours) (*see figure, below*). Be sure to code your variables appropriately.

	block	trt1	trt2	trt3
1	Rat 1	3.5	5.9	13.9
2	Rat 2	3.7	8.1	12.6
3	Rat 3	1.6	8.1	8.1
4	Rat 4	2.5	8.6	6.8
5	Rat 5	2.8	8.1	14.3
6	Rat 6	2.0	5.9	4.2
7	Rat 7	5.9	9.5	14.5
8	Rat 8	2.5	7.9	7.9

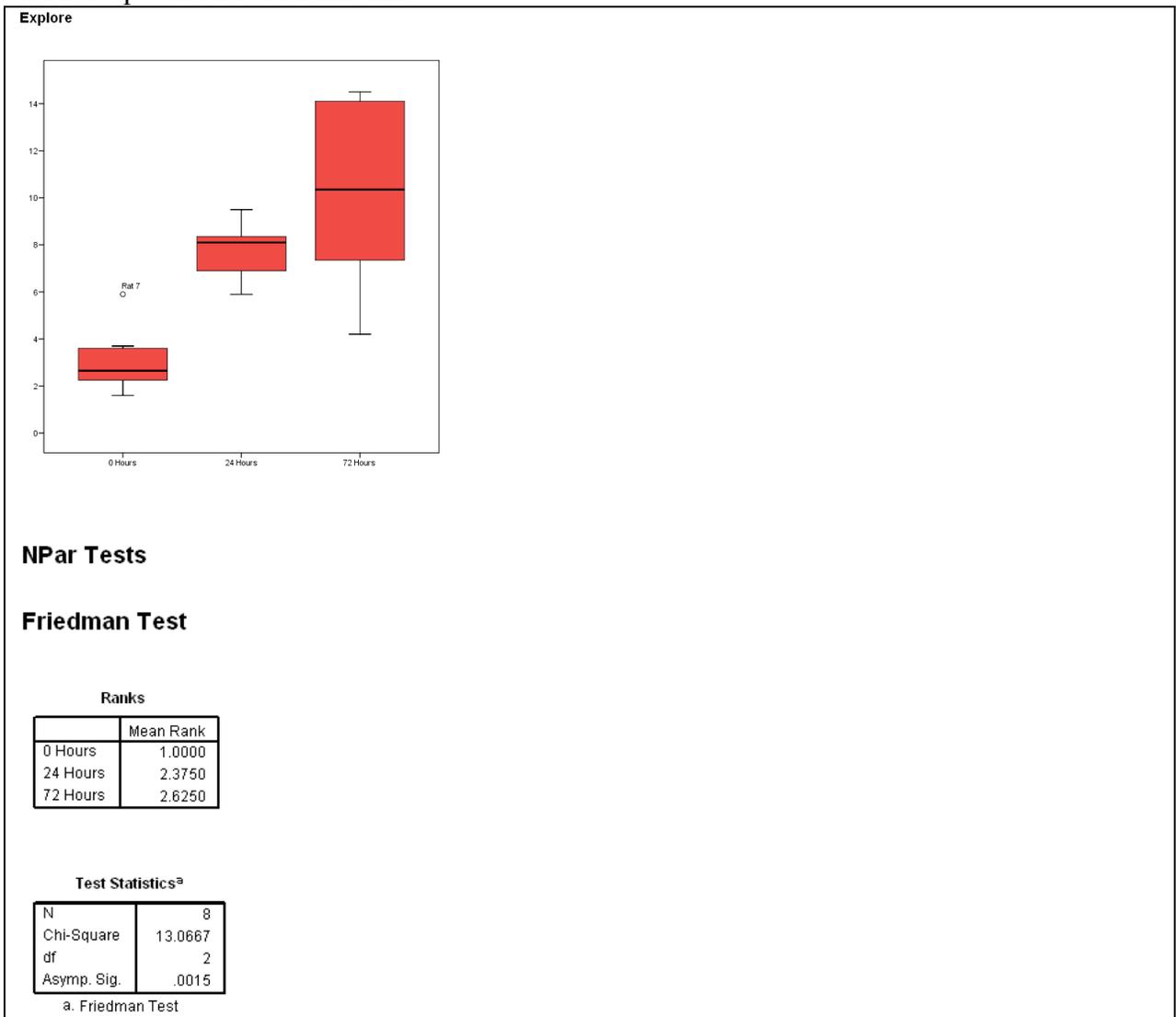
- Now it is time to check the assumption of same shape for the treatment distributions. Select Graphs → Legacy Dialogs → Boxplot... (be sure the type is “Simple” and the data in the chart are “Summaries for separate variables”) with the boxes representing the treatments (0 Hours, 24 Hours, 72 Hours) and cases labeled by the blocking variable (Rat) entered (*see figures, below*). Click “OK”. You may double-click the resulting boxplot to access the chart editor and adjust any display settings as desired (background color, bar width, bar color, etc.). As long as the boxes have approximately the same shape, you may continue with the Friedman's Test analysis.



- Select Analyze → Nonparametric Tests → K Related Samples... (see left figure, below). Select the treatment variable columns (0 Hours, 24 Hours, 72 Hours) as the test variables and select “Friedman” as the test type (see right figure, below). Click “OK”.



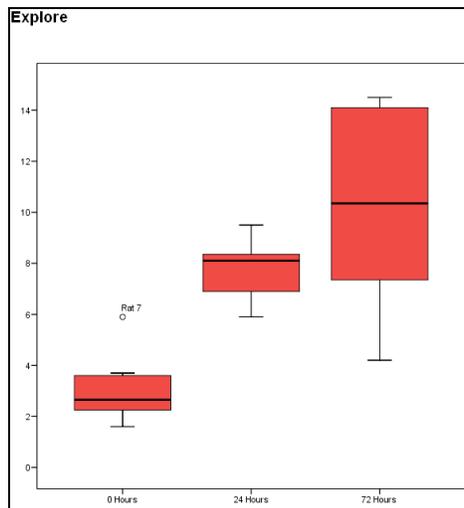
- Your output should look like this.



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

**Step 0: Check Assumptions**

The samples were taken randomly and independently of each other.  
 The populations have approximately the same shapes since the boxplots are all about the same shape.



*The three boxplots each have approximately the same shape. Any differences in variation/spread are probably explained by the blocking variable (differences in the rats).*

**Step 1: Hypotheses**

$$H_0 : \mu_0 = \mu_{24} = \mu_{72}$$

$H_a$  : Not all of the means are equal.

**Step 2: Significance Level**

$$\alpha = 0.01$$

**Step 3: Critical Value and Rejection Region**

Reject the null hypothesis  $p\text{-value} \leq 0.01$ .

**Step 4: Test Statistic**

Ranks	
	Mean Rank
0 Hours	1.0000
24 Hours	2.3750
72 Hours	2.6250

Test Statistics <sup>a</sup>	
N	8
Chi-Square	13.0667
df	2
Asymp. Sig.	.0015

a. Friedman Test

*Note that the test statistic ( $F_r = \text{Chi-Square} = 13.0667$ ) is corrected for the existence of ties in the ranks of the data.*

**Step 5: Decision**

Since  $p\text{-value} = 0.0015 \leq 0.01 = \alpha$ , we reject the null hypothesis.

**Step 6: State conclusion in words**

At the  $\alpha = 0.01$  level of significance, there exists enough evidence to conclude that there is a difference in the true mean food consumption in rats for the three experimental conditions (time periods of food deprivation).