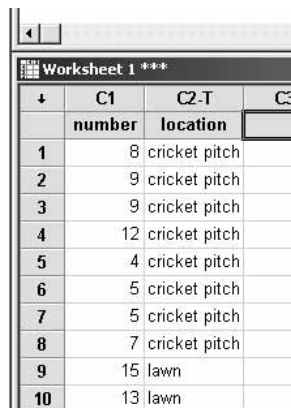


### 8.3. One-way non-parametric analysis of variance (ANOVA) (Kruskal–Wallis test): General hypotheses

**EXAMPLE 8.2.** The density of *Bellis perennis* (daisy) at four different locations on the University of Worcester campus, 2002

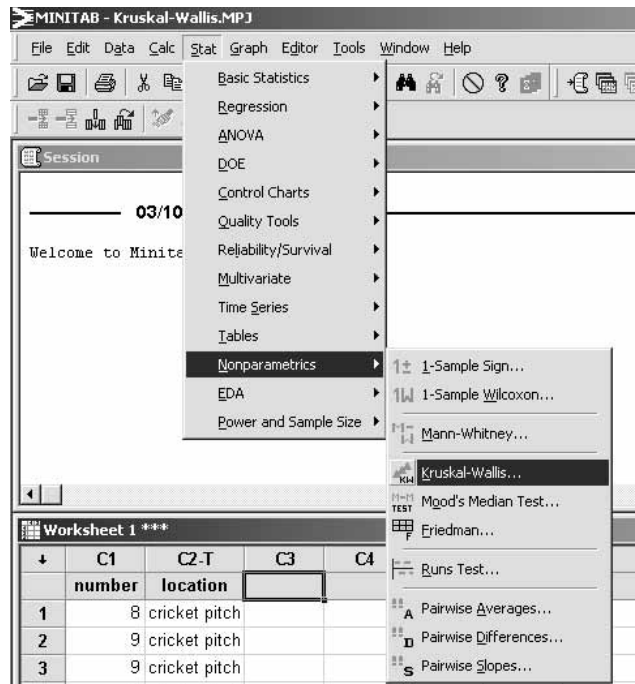
**BOX 8.3.** How to carry out a one-way non-parametric ANOVA (Kruskal–Wallis test): general hypotheses

Step 1. Put your data into the worksheet window of the Minitab display, using sensible headings for the columns.

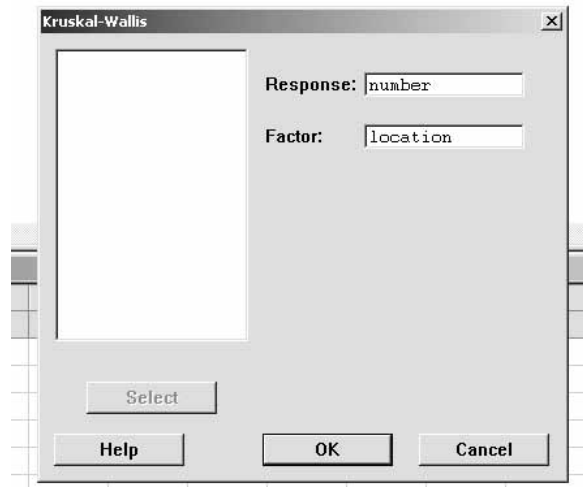


	C1	C2-T	C3
	number	location	
1	8	cricket pitch	
2	9	cricket pitch	
3	9	cricket pitch	
4	12	cricket pitch	
5	4	cricket pitch	
6	5	cricket pitch	
7	5	cricket pitch	
8	7	cricket pitch	
9	15	lawn	
10	13	lawn	

Step 2. Perform the test. Go to ‘Stat’, ‘Nonparametrics’, ‘Kruskal–Wallis’.



The response is the number of plants. Highlight this in the left-hand window, and click on 'Select' to transfer it to the 'Response' window. Click in the 'Factor' window, highlight 'location' in the left-hand window, and click on 'Select' to transfer it to the factor window.



Click on 'OK'. The output will appear in the 'Session' window.

**Kruskal–Wallis Test: number versus location**

Kruskal–Wallis Test on number

location	N	Median	Ave Rank	Z
cricket pitch	8	7.500	7.0	−3.31
lawn	8	13.000	23.1	2.31
quadrangle	8	12.500	21.1	1.59
rugby pitch	8	10.000	14.8	−0.59
Overall	32		16.5	

H=14.35 DF=3 P=0.002

H=14.51 DF=3 P=0.002 (adjusted for ties)

**Step 3.** Decide what the result means. (The test statistic here is called  $H$ , while we call it  $K$ .) The  $p$  value is 0.002, whether it is adjusted for ties or not. This means that we can reject the null hypothesis at  $p = 0.01$ , but not at  $p = 0.001$ . This means that there is a highly significant difference between the median densities of *Bellis perennis* at the four locations.