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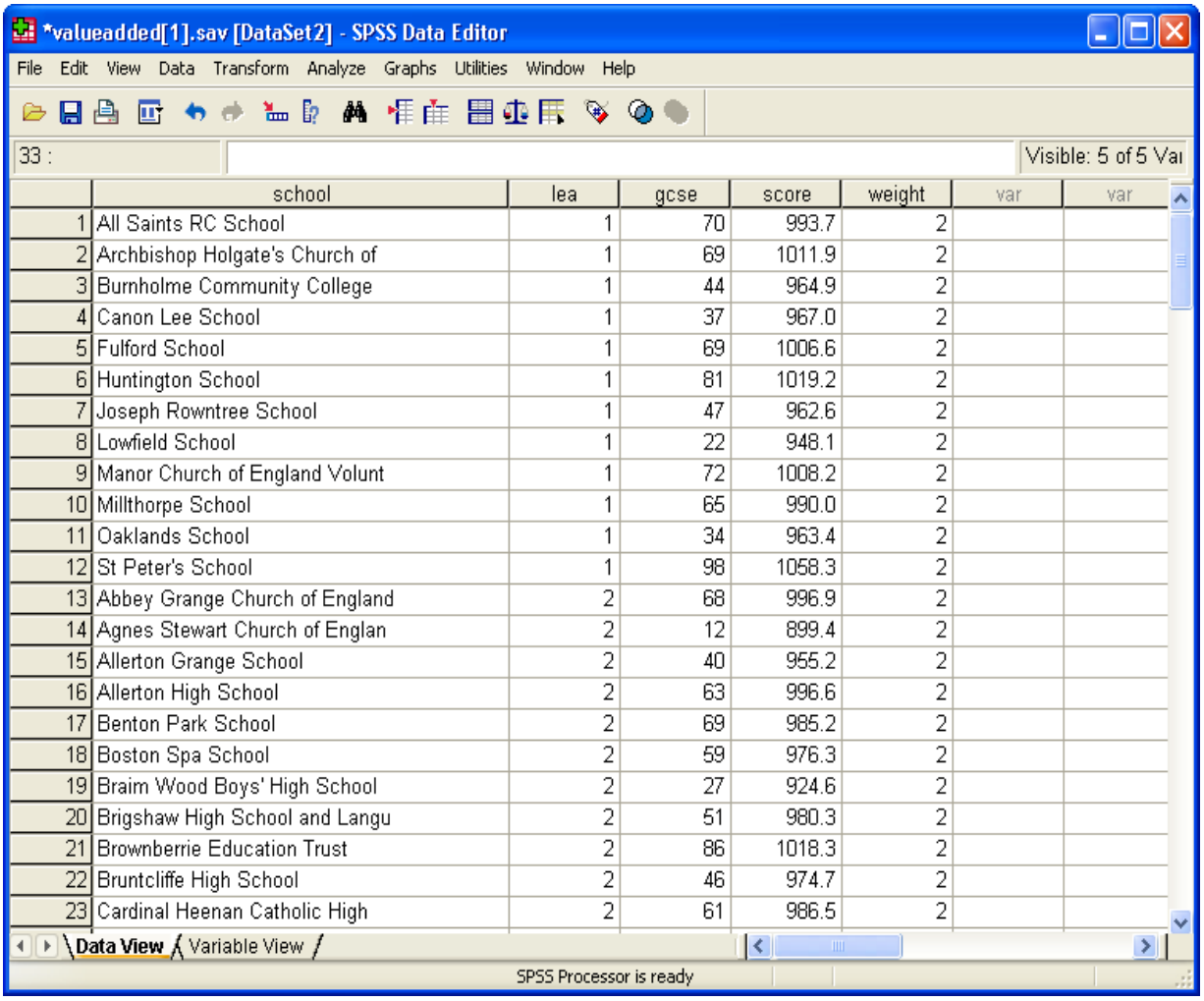
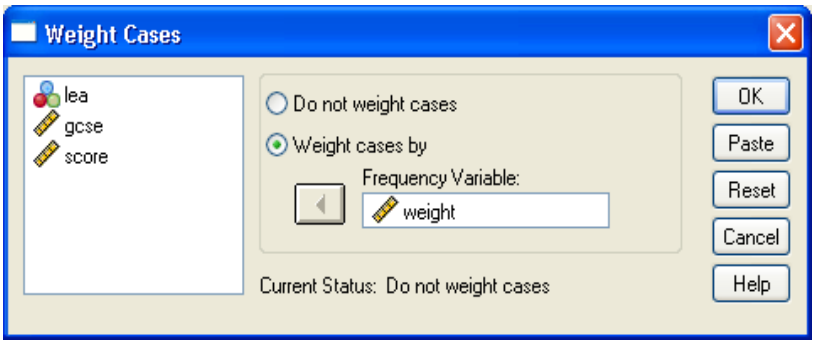
Answers to Exercise 6.5 (p. 214)

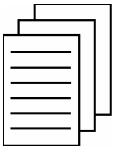
Having created the new variable 'weight' as suggested, the **valueadded.sav** dataset should look like this:



	school	lea	gcse	score	weight	var	var
1	All Saints RC School	1	70	993.7	2		
2	Archbishop Holgate's Church of	1	69	1011.9	2		
3	Burnholme Community College	1	44	964.9	2		
4	Canon Lee School	1	37	967.0	2		
5	Fulford School	1	69	1006.6	2		
6	Huntington School	1	81	1019.2	2		
7	Joseph Rowntree School	1	47	962.6	2		
8	Lowfield School	1	22	948.1	2		
9	Manor Church of England Volunt	1	72	1008.2	2		
10	Millthorpe School	1	65	990.0	2		
11	Oaklands School	1	34	963.4	2		
12	St Peter's School	1	98	1058.3	2		
13	Abbey Grange Church of England	2	68	996.9	2		
14	Agnes Stewart Church of Englan	2	12	899.4	2		
15	Allerton Grange School	2	40	955.2	2		
16	Allerton High School	2	63	996.6	2		
17	Benton Park School	2	69	985.2	2		
18	Boston Spa School	2	59	976.3	2		
19	Braim Wood Boys' High School	2	27	924.6	2		
20	Brigshaw High School and Langu	2	51	980.3	2		
21	Brownberrie Education Trust	2	86	1018.3	2		
22	Bruntcliffe High School	2	46	974.7	2		
23	Cardinal Heenan Catholic High	2	61	986.5	2		

Use the **Data → Weight Cases…** procedure to weight the dataset by this new variable 'weight' as shown below:





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Now, as the variable 'weight' consists of a column of 2's then this will have the effect of doubling the sample size of the **valueadded.sav** dataset. To see this, repeat the exact **Analyze → Compare Means → One-Way ANOVA…** procedure covered in the book (see Figure 6.9 on p. 209). The output you should not get is as below:

Descriptives

Percentage of Pupils at the School Gaining 5 or More GCSEs Grades A*-C

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
City of York	24	59.00	21.625	4.414	49.87	68.13	22	98
City of Leeds	88	48.20	20.262	2.160	43.91	52.50	12	98
East Riding of Yorkshire	38	58.74	14.612	2.370	53.93	63.54	30	91
North Yorkshire	98	63.51	17.802	1.798	59.94	67.08	21	99
Total	248	56.91	19.744	1.254	54.44	59.38	12	99

ANOVA

Percentage of Pupils at the School Gaining 5 or More GCSEs Grades A*-C

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11169.872	3	3723.291	10.674	.000
Within Groups	85114.176	244	348.829		
Total	96284.048	247			

Multiple Comparisons

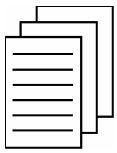
Dependent Variable: Percentage of Pupils at the School Gaining 5 or More GCSEs Grades A*-C

Hochberg

(I) Local Education Authority	(J) Local Education Authority	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
City of York	City of Leeds	10.795	4.301	.074	-.61	22.20
	East Riding of Yorkshire	.263	4.870	1.000	-12.65	13.18
	North Yorkshire	-4.510	4.254	.870	-15.79	6.77
City of Leeds	City of York	-10.795	4.301	.074	-22.20	.61
	East Riding of Yorkshire	-10.532*	3.625	.024	-20.15	-.92
	North Yorkshire	-15.306*	2.743	.000	-22.58	-8.03
East Riding of Yorkshire	City of York	-.263	4.870	1.000	-13.18	12.65
	City of Leeds	10.532*	3.625	.024	.92	20.15
	North Yorkshire	-4.773	3.569	.699	-14.24	4.69
North Yorkshire	City of York	4.510	4.254	.870	-6.77	15.79
	City of Leeds	15.306*	2.743	.000	8.03	22.58
	East Riding of Yorkshire	4.773	3.569	.699	-4.69	14.24

*. The mean difference is significant at the .05 level.

Notice how the number of schools in the first Descriptives table has now doubled as expected compared to the original Output 6.12 (p. 211). Also, notice how doubling the size of the sample has now reduced the significance levels of the contrasts reported in the Multiple Comparisons table. Thus, it will be noted from the original Output 6.12 that the significance of the difference between the City of York and the City of Leeds was p=0.393. In other words there was no evidence of a difference in school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performance between the two local education authorities. However, what we can now see from the above is that simply by doubling the sample size we now have a difference that we can report as approaching statistical significance (p=0.074).

The simplest way to change the 'weight' variable is to use the **Transform → Recode into Same Variables…** procedure and to set the old and new values for 'weight' as '2 → 3' (i.e. increasing the original sample now by a factor of 3). Re-run the test again with this amended weighting variable and see what happens to the significance levels reported in the Multiple Comparisons table.

Doing this a number of times and increasing the size of the weighting variable by one on each occasion you should find that you need to increase the original sample size by a factor of 13 (i.e. from a total sample of 124 to one of 1,612) before all of the multiple comparisons become statistically significant as shown below:

Descriptives

Percentage of Pupils at the School Gaining 5 or More GCSEs Grades A*-C

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
City of York	156	59.00	21.238	1.700	55.64	62.36	22	98
City of Leeds	572	48.20	20.164	.843	46.55	49.86	12	98
East Riding of Yorkshire	247	58.74	14.447	.919	56.93	60.55	30	91
North Yorkshire	637	63.51	17.725	.702	62.13	64.89	21	99
Total	1612	56.91	19.710	.491	55.95	57.87	12	99

Multiple Comparisons

Dependent Variable: Percentage of Pupils at the School Gaining 5 or More GCSEs Grades A*-C

Hochberg

(I) Local Education Authority	(J) Local Education Authority	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
City of York	City of Leeds	10.795*	1.675	.000	6.38	15.21
	East Riding of Yorkshire	.263	1.897	1.000	-4.73	5.26
	North Yorkshire	-4.510*	1.657	.039	-8.87	-.15
City of Leeds	City of York	-10.795*	1.675	.000	-15.21	-6.38
	East Riding of Yorkshire	-10.532*	1.412	.000	-14.25	-6.81
	North Yorkshire	-15.306*	1.068	.000	-18.12	-12.49
East Riding of Yorkshire	City of York	-.263	1.897	1.000	-5.26	4.73
	City of Leeds	10.532*	1.412	.000	6.81	14.25
	North Yorkshire	-4.773*	1.390	.004	-8.44	-1.11
North Yorkshire	City of York	4.510*	1.657	.039	.15	8.87
	City of Leeds	15.306*	1.068	.000	12.49	18.12
	East Riding of Yorkshire	4.773*	1.390	.004	1.11	8.44

*. The mean difference is significant at the .05 level.