SPSS for Windows Step by Step

A Simple Guide and Reference
Fourth Edition (11.0 update)

Answers to Selected Exercises

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Detailed Table of Contents

General Notes

- The following answers are in some cases fairly complete. In other cases, only portions of the answer are included.
- The data files used are available for download at http://www.abacon.com/george.
- Check with your instructor to find exactly what she or he wants you to turn in.
- We list the questions from each chapter first, followed by answers to selected exercises.

Chapter 3: Creating and Editing a Data File

1. Set up the variables described above for the **grades.sav** file, using appropriate variable names, variable labels, and variable values. Enter the data for the first five students into the data file.
2. Perhaps the instructor of the classes in the **grades.sav** dataset teaches these classes at two different schools. Create a new variable in this dataset named **school**, with values of 1 and 2. Create variable labels, where 1 is the name of a school you like, and 2 is the name of a school you don't like. Save your dataset with the name **gradesme.sav**.
3. Which of the following variable names will SPSS accept, and which will SPSS reject? For those that SPSS will reject, how could you change the variable name to make it "legal"?
   - ❒ **age**
   - ❒ **firstname**
   - ❒ **@edu**
   - ❒ **sex.**
   - ❒ **grade**
   - ❒ **not**
   - ❒ **anxeceu**
   - ❒ **date**
   - ❒ **iq**
4. Using the **grades.sav** file, make the **gpa** variable values (which currently have two digits after the decimal place) have no digits after the decimal point. You should be able to do this without retyping any numbers. *Note that this won't actually round the numbers, but it will change the way they are displayed and how many digits are displayed after the decimal point for statistical analyses you perform on the numbers.*
5. Using **grades.sav**, search for a student who got 121 on the final exam. What is his or her name?
6. Why is each of the following variables defined with the measure listed? Is it possible for any of these variables to be defined as a different type of measure?

ethnicity	Nominal
extrcred	Ordinal
quiz4	Scale
grade	Nominal

7. Ten people were given a test of balance while standing on level ground, and ten other people were given a test of balance while standing on a 30° slope. Their scores follow. Set up the appropriate variables, and enter the data into SPSS.
   - ❒ Scores of people standing on level ground: 56, 50, 41, 65, 47, 50, 64, 48, 47, 57
   - ❒ Scores of people standing on a slope: 30, 50, 51, 26, 37, 32, 37, 29, 52, 54

8. Ten people were given two tests of balance, first while standing on level ground and then while standing on a 30° slope. Their scores follow. Set up the appropriate variables, and enter the data into SPSS.

Participant:	1	2	3	4	5	6	7	8	9	10
Score standing on level ground:	56	50	41	65	47	50	64	48	47	57
Score standing on a slope:	38	50	46	46	42	41	49	38	49	55

3-2

The variable view screen might look something like this once the new variable is set up:

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
20	grade	String	8	0		None	None	8	Right	Nominal
21	passfail	String	1	0		None	None	1	Right	Ordinal
22	school	Numeric	2	0		{1, Good Scho	None	8	Right	Nominal
23										
24										

3-3

Variable Name	SPSS will…	What could be changed?
Age	Accept	
firstname	Reject	Variable names can only be up to 8 characters long…maybe use "firstnam"

3-5

Dawne Rathbun received a score of 121 for the course. No one received a score of 121 on the final exam.

3-6

Variable	Currently defined as	Could also be defined as
ethnicity	Nominal	Ethnicity will generally be defined as a nominal variable. The only exceptions might be if, for example, you were examining the relative size of different ethnicities in a certain population. In that case, where ethnicity has other theoretical meaning, ethnicity could be defined as an ordinal variable.

3-7

The variable view should look something like this, with one variable identifying whether the person was standing on level or sloped ground and a second variable identifying each person's balance score:

	Name	Type	Width	Decimals	Label	Values	Missing	Columns	Align	Measure
1	ground	Numeric	2	0		{1, Level}...	None	8	Right	Nominal
2	balance	Numeric	3	0	Balance score	None	None	8	Right	Scale

Once the data is entered, the data view should look something like this:

	ground	balance
1	Level	56
2	Level	50
3	Level	41
4	Level	65
5	Level	47
6	Level	50
7	Level	64
8	Level	48
9	Level	47
10	Level	57
11	Slope	30
12	Slope	50
13	Slope	51
14	Slope	26
15	Slope	37
16	Slope	32
17	Slope	37
18	Slope	29
19	Slope	52
20	Slope	54

3-8

Note that, because each person took the balance test both on level ground and on a slope, there are ten rows (one for each person) rather than twenty rows (one for each time the balance test was given).

Chapter 4: Managing Data

Some of the exercises that follow change the original data file. If you wish to leave the data in their original form, don't save your changes.

Case Summaries

1. Using the **grades.sav** file, list variables (in the original order) from **id** to **quiz5**, first 30 students consecutive, number cases, fit on one page by editing.
2. Using the **helping3.sav** file, list variables **hclose**, **hseveret**, **angert**, **controt**, **sympathi**, **worry**, **obligat**, **hcopet**, first 30 cases, number cases, fit on one page by editing.
3. List the first 20 students in the **grades.sav** file, with the lower division students listed first, followed by the upper division students.

Missing Values

4. Using the **grades.sav** file delete the **quiz1** scores for the cases selected in exercise 3, above. Replace the (now) missing scores with the average score for all other students in the class.

Computing Variables

5. Now that you have changed the **quiz1** scores (in exercise 4), recalculate **total** (the sum of all five quizzes and the final) and **percent** (100 times the total divided by the points possible, 125).
6. Using the **divorce.sav** file compute a variable named **spirit** (spirituality) that is the mean of **sp8** through **sp57** (there should be 18 of them). Print out **id, sex**, and the new variable **spirit**, first 30 cases, edit to fit on one page.
7. Using the **grades.sav** file, compute a variable named **quizsum** that is the sum of **quiz1** through **quiz5**. Print out variables **id**, **lastname**, **firstnam**, and the new variable **quizsum**, first 30, all on one page.

Recode Variables

8. Using the **grades.sav** file, compute a variable named **grade2** according to the instructions on page 47. Print out variables **id, lastname, firstnam, grade** and the new variable **grade2**, first 30, edit to fit all on one page. If done correctly, **grade** and **grade2** should be identical.
9. Recode the **passfail** variable so that D's and F's are failing, and A's, B's, and C's are passing.
10. Using the **helping3.sav** file, redo the coding of the ethnic variable so that **Black** = 1, **Hispanic** = 2, **Asian** = 3, **Caucasian** = 4, and **Other/DTS** = 5. Now change the value labels to be consistent with reality (that is the coding numbers are different but the labels are consistent with the original ethnicity). Print out the variables **id** and **ethnic**, first 30 cases.

Selecting Cases

11. Using the **divorce.sav** file select females (**sex** = 1); print out **id** and **sex**, first 40 subjects, numbered, fit on one page.

12. Select all of the students in the **grades.sav** file whose previous **GPA**'s are less than 2, and whose **percent**ages for the class is greater than 85.

13. Using the **helping3.sav** file, select females (**gender** = 1) who give more than the average amount of help (**thelplnz** > 0). Print out **id**, **gender**, **thelplnz**, first 40 subjects, numbered, fit on one page.

Sorting Cases

14. Alphabetize the **grades.sav** file by **lastname**, **firstnam**, first 40 cases.

15. Using the **grades.sav** file, sort by **id** (ascending order). Print out **id**, **total**, **percent**, and **grade**, first 40 subjects, fit on one page.

4-2

Case Summaries

	HCLOSE	HSEVERET	ANGERT	HCONTROT	SYMPATHI	WORRY	OBLIGAT	HCOPET
1	5	4.0	1.0	4.0	6.67	1	1	6.7
2	7	5.0	4.0	4.5	6.33	6	4	5.0
3	4	6.7	1.0	4.0	5.00	6	6	4.0
4	5	4.0	1.3	3.0	5.67	4	4	4.0
5	6	4.5	1.0	1.5	6.67	4	6	5.0

4-3

Case Summaries

				LASTNAME	FIRSTNAM
LOWUP	1 lower	1		VILLARRUZ	ALFRED
		2		OSBORNE	ANN
		3		LIAN	JENNY
		4		MISCHKE	ELAINE
		Total	N	4	4
	2 upper	1		VALAZQUEZ	SCOTT
		2		GALVEZ	JACKIE
		3		GUADIZ	VALERIE
		4		RANGIFO	TANIECE
		5		TOMOSAWA	DANIEL
		6		BAKKEN	KREG
		7		LANGFORD	DAWN
		8		VALENZUELA	NANCY
		9		SWARM	MARK
		10		KHOURY	DENNIS
		11		AUSTIN	DERRICK
		12		POTTER	MICKEY
		13		LEE	JONATHAN
		14		DAYES	ROBERT
		15		STOLL	GLENDON
		16	N	CUSTER	JAMES
		Total		16	16
	Total	N		20	20

a Limited to first 20 cases.

4-5

Follow sequence steps 5c and 5c′ to complete this calculation.

4-6

Case Summaries

	ID	SEX	SPIRIT
1	1	1 female	3.72
2	2	1 female	5.28
3	3	1 female	5.83
4	4	1 female	5.89
5	5	1 female	5.44
6	6	2 male	5.39
7	7	2 male	5.56
8	8	1 female	5.39
9	9	2 male	4.89
10	10	1 female	6.06
11	11	1 female	5.61
12	12	1 female	6.28
13	13	2 male	6.28
14	14	2 male	5.28
15	15	2 male	4.83
16	16	1 female	5.11
17	17	2 male	5.72
18	18	2 male	5.78
19	19	1 female	5.00
20	20	1 female	6.28
21	21	1 female	4.72
22	22	1 female	4.72
23	23	1 female	5.56
24	24	2 male	5.00
25	25	2 male	5.83
26	26	1 female	5.61
27	27	2 male	4.78
28	28	1 female	5.94
29	29	2 male	4.83
30	30	1 female	4.33
Total	30	30	30

a Limited to first 30 cases.

4-8

Case Summaries

	ID	LASTNAME	FIRSTNAM	GRADE	GRADE2
1	106484	VILLARRUZ	ALFRED	D	D
2	108642	VALAZQUEZ	SCOTT	C	C
3	127285	GALVEZ	JACKIE	C	C
4	132931	OSBORNE	ANN	B	B
5	140219	GUADIZ	VALERIE	B	B

a Limited to first 30 cases.

4-9

Follow sequence step 5d' but use a range of 70 to 100 for "P", and 0 to 69.9 for "F".

4-11

	ID	SEX
1	1	1 female
2	2	1 female
3	3	1 female
4	4	1 female
5	5	1 female

4-12

Case Summaries

		ID	LASTNAME	FIRSTNAM	GPA	PERCENT
1		140219	GUADIZ	VALERIE	1.84	86.4
2		417003	EVANGELIST	NIKKI	1.91	87.2
Total	N	2	2	2	2	2

a Limited to first 100 cases.

4-14

	ID	LASTNAME	FIRSTNAM
1	779481	AHGHEL	BRENDA
2	777683	ANDERSON	ERIC
3	211239	AUSTIN	DERRICK
4	420327	BADGER	SUZANNA
5	157147	BAKKEN	KREG

4-15

	ID	TOTAL	PERCENT	GRADE
1	988808	107	85.6	B
2	985700	109	87.2	B
3	983522	77	61.6	D
4	979028	70	56.0	F
5	978889	97	77.6	C
6	973427	107	85.6	B
7	972678	93	74.4	C
8	958384	106	84.8	B
9	944702	101	80.8	B
10	938881	115	92.0	A
11	938666	97	77.6	C
12	921297	107	85.6	B
13	920656	120	96.0	A
14	915457	99	79.2	C
15	911355	118	94.4	A
16	908754	90	72.0	C
17	905109	100	80.0	B
18	900485	109	87.2	B
19	899529	93	74.4	C
20	898766	118	94.4	A
21	897606	108	86.4	B
22	896972	95	76.0	C
23	870810	116	92.8	A
24	843472	113	90.4	A
25	822485	111	88.8	B
26	818528	98	78.4	C
27	807963	92	73.6	C
28	798931	109	87.2	B
29	781676	117	93.6	A
30	780028	122	97.6	A
31	779481	66	52.8	F
32	777683	70	56.0	F
33	768995	104	83.2	B
34	765360	106	84.8	B
35	762813	111	88.8	B
36	762308	99	79.2	C
37	756097	106	84.8	B
38	755724	105	84.0	B
39	737728	97	77.6	C
40	725987	92	73.6	C
Total N	40	40	40	40

a Limited to first 40 cases.

Chapter 5: Graphs

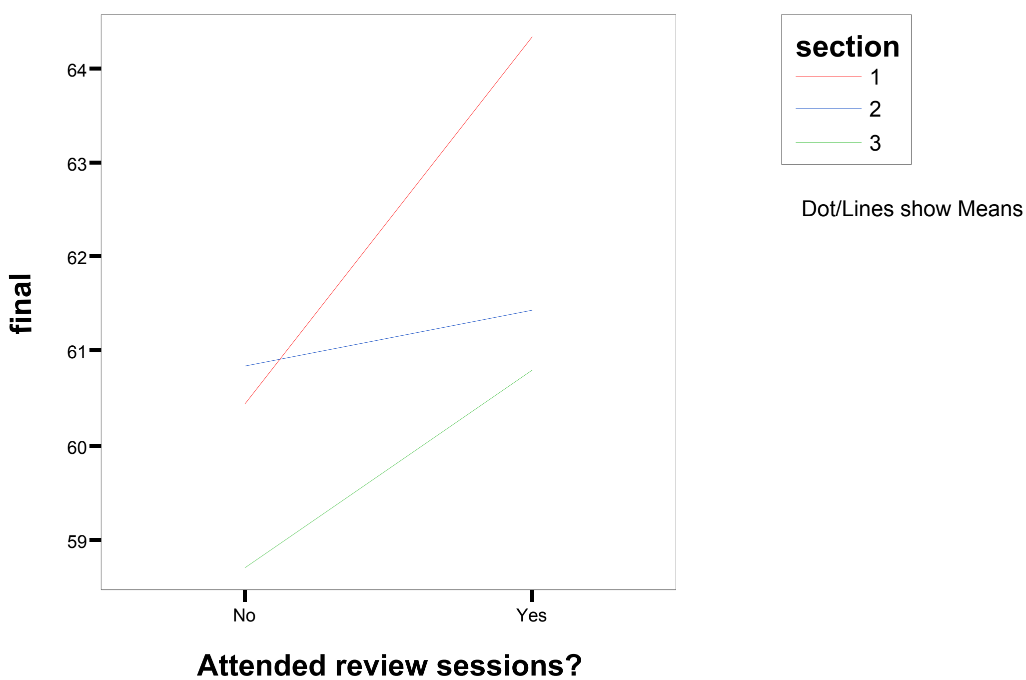
All of the following exercises use the **grades.sav** sample data file.

1. Using a bar chart, examine the number of students in each section of the class along with whether or not student attended the review session. Does there appear to be a relation between these variables?
2. Using a line graph, examine the relationship between attending the review session and section on the final exam score. What does this relationship look like?
3. Create a boxplot of quiz 1 scores. What does this tell you about the distribution of the quiz scores? Create a boxplot of quiz 2 scores. How does the distribution of this quiz differ from the distribution of quiz 1? Which case number is the outlier?
4. Create an error bar graph highlighting the 95% confidence interval of the mean for each of the three sections' final exam scores. What does this mean?
5. Based on the examination of a histogram, does it appear that students' previous GPA's are normally distributed?
6. Create the scatterplot described in Step 5g. What does the relationship appear to be between gender and academic performance? Add a regression line to this scatterplot. What does this regression line tell you?

5-1

There does appear to be a relationship (though we don't know if it's significant or not): People in Section 3 were somewhat more likely to skip the review session than in sections 1 or 2, and most people who attended the review sessions were from Section 2, for example. This relationship may be clearer with stacked rather than clustered bars, as there aren't the same number of people in each section:

5-2

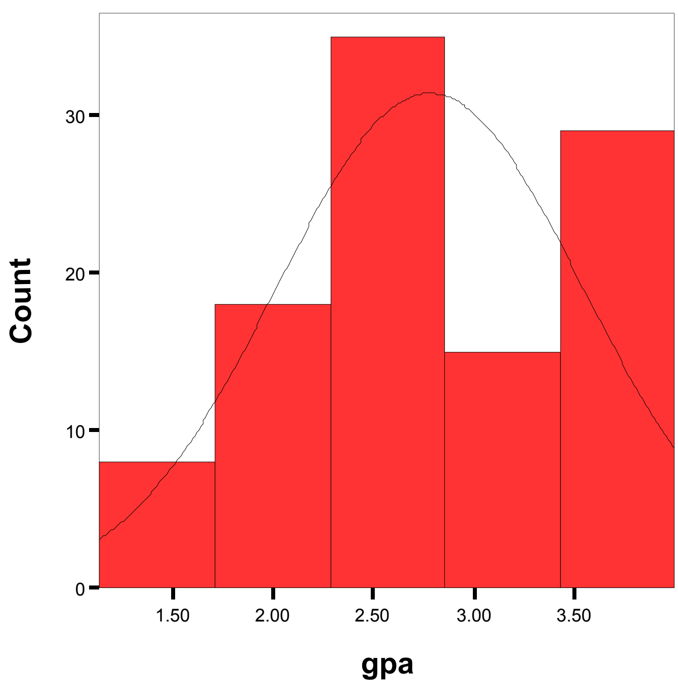


Though it looks like attending the review sessions was helpful for all students, it seems to have been particularly helpful for students in Section 1.

5-4

This is a good example of why we need to run statistical tests. The mean for section 1, for example, is outside of the 95% confidence interval for section 3 (and vice verse). So, the population mean for section 1 is probably higher than the mean for section 3. But, as the 95% confidence intervals for sections 1 and 3 overlap, we would have to run additional tests to see just how likely it is that the population means are really different.

5-5



Note that the GPA's below the median appear quite normal, but those above the median do not.

Chapter 6: Frequencies

Notice that data files other than the **grades.sav** file are being used here. Please refer to the **Data Files** section starting on page 365 to acquire all necessary information about these files and the meaning of the variables. As a reminder, all data files are downloadable from the web address shown above.

1. Using the **divorce.sav** file display frequencies for **sex**, **eth**, **status**. Print output to show frequencies for all three; edit output so it fits on one page. Include three bar graphs of these data and provide labels to clarify what each one means.

2. Using the **graduate.sav** file display frequencies for **motiv**, **stable**, **hostile**. Print output to show frequencies for all three; edit output so it fits on one page. Note: this type of procedure is typically done to check for accuracy of data. Motivation (**motiv**), emotional stability (**stable**), and hostility (**hostile**) are scored on 1 to 7 scales. You are checking to see if you have, by mistake, entered any 0s or 8s or 77s.

3. Using the **helping3.sav** file compute percentiles for **thelplnz** (time helping, measured in z scores), **tqualitz** (quality of help measured in z scores). Use percentile values 2, 16, 50, 84, 98. Print output and <u>circle</u> values associated with percentiles for **thelplnz**; <u>box</u> percentile values for **tqualitz**.

4. Using the **helping3.sav** file compute percentiles for **age**. Compute every 10th percentile (10, 20, 30, etc.). Edit (if necessary) to fit on one page.

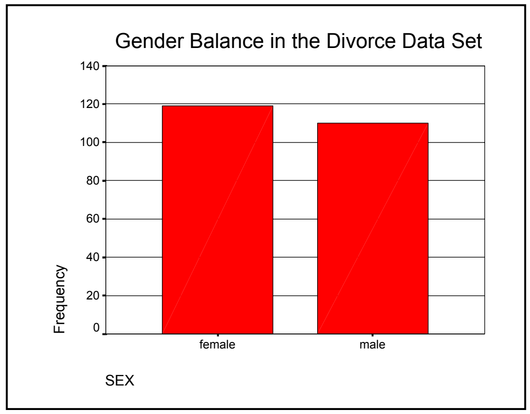
5. Using the **graduate.sav** file display frequencies for **gpa**, **areagpa**, **grequant**. Compute quartiles for these three variables. Edit (if necessary) to fit on one page.

6. Using the **grades.sav** file create a histogram for **final**. Create a title for the graph that makes clear what is being measured. The histogram provides midpoints for each bar; provide the values of the boundaries for each of the bars.

6-1

SEX

	Frequency	Percent	Valid Percent	Cumulative Percent
1 female	119	52.0	52.0	52.0
2 male	110	48.0	48.0	100.0
Total	229	100.0	100.0	



6-3

Statistics

		THELPLNZ	TQUALITZ
N	Valid	537	537
	Missing	0	0
Percentiles	2	-2.0966	-2.1701
	16	-.9894	-.8144
	50	.0730	.1351
	84	.9218	.9481
	98	1.7643	1.4766

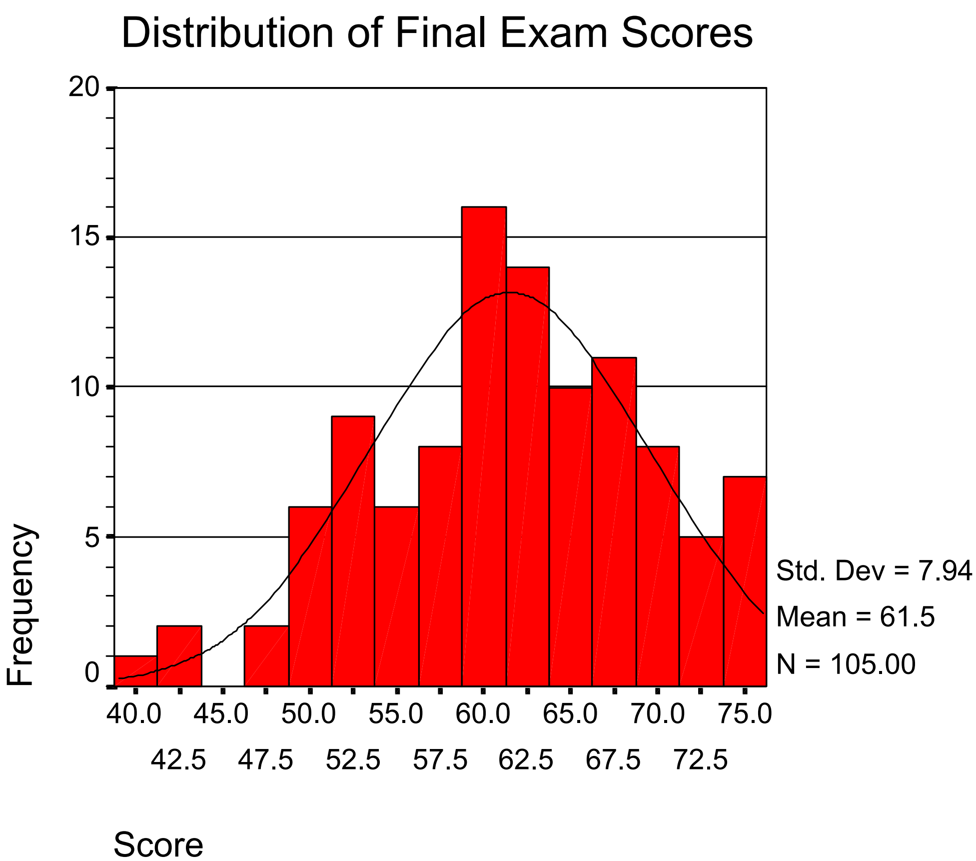
6-4

Statistics

AGE

N	Valid	537
	Missing	0
Percentiles	10	20.00

6-6



Boundaries of the 15 bars:

1. 38.75 to 41.25 (frequency = 1)
2. 41.25 to 43.75 (frequency = 2)
3. 43.75 to 46.25 (frequency = 0)
4. 46.25 to 48.75 (frequency = 2)
5. 48.75 to 51.25 (frequency = 6)
6. 51.25 to 53.75 (frequency = 9)
7. 53.75 to 56.25 (frequency = 6)
8. 56.25 to 58.75 (frequency = 8)
9. 58.75 to 61.25 (frequency = 16)
10. 61.25 to 63.75 (frequency = 14)
11. 63.75 to 66.25 (frequency = 10)
12. 66.25 to 68.75 (frequency = 11)
13. 68.75 to 71.25 (frequency = 8)
14. 71.25 to 73.75 (frequency = 5)
15. 73.75 to 76.25 (frequency = 7)

Chapter 7: Descriptive Statistics

1. Using the **grades.sav** file select all variables except **lastname**, **firstnam**, **grade**, **passfail**. Compute descriptive statistics including **mean**, **standard deviation**, **kurtosis**, **skewness**. Edit so that you eliminate "S.E. Kurt" and "S.E. Skew" and your chart is easier to interpret, and the output fits on one page.
   - ❒ Draw a line through any variable for which descriptives are meaningless (either they are categorical or they are known to not be normally distributed)
   - ❒ Place an "*" next to variables that are in the ideal range for both skewness and kurtosis
   - ❒ Place an × next to variables that are acceptable but not excellent
   - ❒ Place a ψ next to any variables that are not acceptable for further analysis

2. Using the **divorce.sav** file select **all** variables <u>except</u> the indicators (for spirituality, **sp8 – sp57**, for cognitive coping, **cc1 – cc11**, for behavioral coping, **bc1 – bc12**, for avoidant coping, **ac1 – ac7**, and for physical closeness, **pc1 – pc10**). Compute descriptive statistics including **mean**, **standard deviation**, **kurtosis**, **skewness**. Edit so that you eliminate "S.E. Kurt" and "S.E. Skew" and your chart is easier to interpret, and the output fits on two pages.
   - ❒ Draw a line through any variable for which descriptives are meaningless (either they are categorical or they are known to not be normally distributed)
   - ❒ Place an "*" next to variables that are in the ideal range for both skewness and kurtosis
   - ❒ Place an × next to variables that are acceptable but not excellent
   - ❒ Place a ψ next to any variables that are not acceptable for further analysis

3. Create a practice data file that contains the following variables and values:
   - ❒ VAR1: 3 5 7 6 2 1 4 5 9 5
   - ❒ VAR2: 9 8 7 6 2 3 3 4 3 2
   - ❒ VAR3: 10 4 3 5 6 5 4 5 2 9

   Compute: the mean, the standard deviation, and variance and print out on a single page.

7-1

Full answer provided for students.

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness	Kurtosis
~~ID~~	~~105~~	~~571366.67~~	~~277404.129~~	~~-.090~~	~~-1.299~~
~~SEX~~	~~105~~	~~1.39~~	~~.490~~	~~.456~~	~~-1.828~~
~~ETHNIC~~	~~105~~	~~3.35~~	~~1.056~~	~~-.451~~	~~-.554~~
✶ YEAR	105	2.94	.691	-.460	.553
~~LOWUP~~	~~105~~	~~1.79~~	~~.409~~	~~-1.448~~	~~.099~~
~~SECTION~~	~~105~~	~~2.00~~	~~.797~~	~~.000~~	~~-1.419~~
✶ GPA	105	2.7789	.76380	-.052	-.811
~~EXTRCRED~~	~~105~~	~~1.21~~	~~.409~~	~~1.448~~	~~.099~~
~~REVIEW~~	~~105~~	~~1.67~~	~~.474~~	~~-.717~~	~~-1.515~~
✶ QUIZ1	105	7.47	2.481	-.851	.162
✶ QUIZ2	105	7.98	1.623	-.656	-.253
X QUIZ3	105	7.98	2.308	-1.134	.750
✶ QUIZ4	105	7.80	2.280	-.919	.024
✶ QUIZ5	105	7.87	1.765	-.713	.290
✶ FINAL	105	61.48	7.943	-.335	-.332
✶ TOTAL	105	100.57	15.299	-.837	.943
✶ PERCENT	105	80.381	12.1767	-.844	.987
Valid N (listwise)	105				

7-2

Descriptive Statistics

	N	Mean	Std. Devia-	Skewness	Kurtosis
~~ID~~	~~229~~	~~116.32~~	~~66.903~~	~~-.007~~	~~-1.202~~
~~SEX~~	~~229~~	~~1.48~~	~~.501~~	~~.079~~	~~-2.011~~
✶ AGE	229	41.90	9.881	.679	.910

Chapter 8: Crosstabulation and χ^2 Analyses

For each of the chi-square analyses computed below:

1. Circle the observed (actual) values.
2. Box the expected values.
3. Put an * next to the unstandardized residuals.
4. Underline the significance value that shows whether observed and expected values differ significantly.
5. Make a statement about independence of the variables involved.
6. STATE THE NATURE OF THE RELATIONSHIP (in normal English, not statistical jargon).
7. Is there a significant linear association?
8. Does linear association make sense for these variables?
9. Is there a problem with low-count cells?
10. What would you do about it if there is a problem?

1. File: **grades.sav**. Variables: **sex** by **ethnic**. Select: **observed count**, **expected count**, **unstandarized residuals**; edit to fit on one page; print out; perform the 10 operations above.

2. File: **grades.sav**. Variables: **sex** by **ethnic**. Prior to analysis, complete the procedure shown in Step 5c (page 111) to eliminate the "Native" category (due to too many low-count cells). Select: **observed count**, **expected count**, **unstandarized residuals**; edit to fit on one page; print out; perform the 10 operations listed above.

3. File: **helping3.sav**. Variables: **gender** by **problem**. Select: **observed count**, **expected count**, **unstandarized residuals**; edit to fit on one page; print out; perform the 10 operations.

4. File: **helping3.sav**. Variables: **school** by **occupat**. Prior to analysis, select cases:

   "**school** > 1 & **occupat** < 6". Select: **observed count**, **expected count**, **unstandarized residuals**; edit to fit on one page; print out; perform the 10 operations above.

5. File: **helping3.sav**. Variables: **marital** by **problem**. Select: **observed count**, **expected count**, **unstandarized residuals**; edit to fit on one page; print out; perform the 10 operations listed above.

8-1

SEX * ETHNIC Crosstabulation

			ETHNIC					Total
			1 Native	2 Asian	3 Black	4 White	5 Hispanic	
SEX	1 female	Count	4	13	14	26	7	64
		Expected	3.0	12.2	14.6	27.4	6.7	64.0
		Residual	1.0*	.8*	-.6*	-1.4*	.3*	
	2 male	Count	1	7	10	19	4	41
		Expected	2.0	7.8	9.4	17.6	4.3	41.0
		Residual	-1.0*	-.8*	.6*	1.4*	-.3*	
Total		Count	5	20	24	45	11	105

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.193	4	.879
Likelihood Ratio	1.268	4	.867
Linear-by-Linear Association	.453	1	.501
N of Valid Cases	105		

a 3 cells (30.0%) have expected count less than 5. The minimum expected count is 1.95.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.107	.879
	Cramer's V	.107	.879
N of Valid Cases		105	

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

5. Ethnicity and gender are <u>independent</u> of each other.
6. There is no difference of gender balance across different ethnic groups.

or, Across different ethnic groups there is no difference in the balance of men and women.

7. No
8. No
9. Yes, there are 30% of cells with an expected value of less than 5. Acceptable is less than 25%.
10. Delete the category which most contributes to the low cell counts, the “Native” category in this case.

8-2

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.062	.942
	Cramer's V	.062	.942
N of Valid Cases		100	

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

5. Ethnicity and gender are <u>independent</u> of each other.

8-3

5. Gender and problem type are <u>dependent</u>, that is, which problems receive the most attention is <u>dependent</u> upon the gender of the helper.

6. While there are no significant gender differences in the likelihood of helping with illness or catastrophic problems, women are significantly more likely to help with relational problems whereas men are significantly more likely to help with goal-disruptive problems.

7. No

8. No

9. No, there are no cells with an expected value of less than 5. Acceptable is less than 25%.

10. Delete the category which most contributes to the low cell counts. There are none here.

Chapter 9: The Means Procedure

1. Using the **grades.sav** file use the Means procedure to explore the influence of **ethnic** and **section** on **total**. Print output, fit on one page, in general terms describe what the value in each cell means.

2. Using the **grades.sav** file use the Means procedure to explore the influence of **year** and **section** on **final**. Print output, fit on one page, in general terms describe what the value in each cell means.

3. Using the **divorce.sav** file use the Means procedure to explore the influence of gender (**sex**) and marital status (**status**) on **spiritua** (spirituality—high score is spiritual). Print output, in general terms describe what the value in each cell means.

9-1

Report

TOTAL

ETHNIC	SECTION	Mean	N	Std. Deviation
1 Native	1			
	2	90.25	4	15.042
	3	115.00	1	.
	Total	95.20	5	17.094
2 Asian	1	108.00	7	12.423
	2	97.78	9	14.394
	3	105.50	4	6.351
	Total	102.90	20	12.876
3 Black	1	105.14	7	12.185
	2	105.00	7	11.547
	3	93.10	10	16.509
	Total	100.08	24	14.714
4 White	1	105.75	16	17.628
	2	100.00	18	10.123
	3	100.91	11	16.736
	Total	102.27	45	14.702
5 Hispanic	1	94.67	3	27.154
	2	104.00	1	.
	3	90.57	7	21.816
	Total	92.91	11	21.215
Total	1	105.09	33	16.148
	2	99.49	39	12.013
	3	97.33	33	17.184
	Total	100.57	105	15.299

- The ETHNIC column identifies the ethnic group for which data are entered
- The SECTION column identifies which of the three sections individuals of a particular ethnic group are enrolled.
- The Mean column identifies the mean total points for the individuals in each cell of the table
- The N column identifies how many individuals are in each group
- The Std. Deviation column identifies the standard deviation for the values in each category.

9-3

Note: there is an error in the book on Problem 3. There is no "**religion**" variable in the divorce.sav file. To solve the problem replace "**religion**" with "**status**" (one's marital status). Further there is no "select cases" procedure that must be enacted for the **status** variable.

- The SEX column identifies the gender of the subjects
- The STATUS column identifies the marital status (4 levels) of women (first) then men.
- The Mean column identifies the mean total points for the individuals in each cell of the table
- The N column identifies how many individuals are in each group
- The Std. Deviation column identifies the standard deviation for the values in each category.

Chapter 10: Bivariate Correlation

1. Using the **grades.sav** file create a correlation matrix of the following variables; **id**, **ethnic**, **sex**, **year**, **section**, **gpa**, **quiz1**, **quiz2**, **quiz3**, **quiz4**, **quiz5**, **final**, **total**; select one-tailed significance; flag significant correlations.

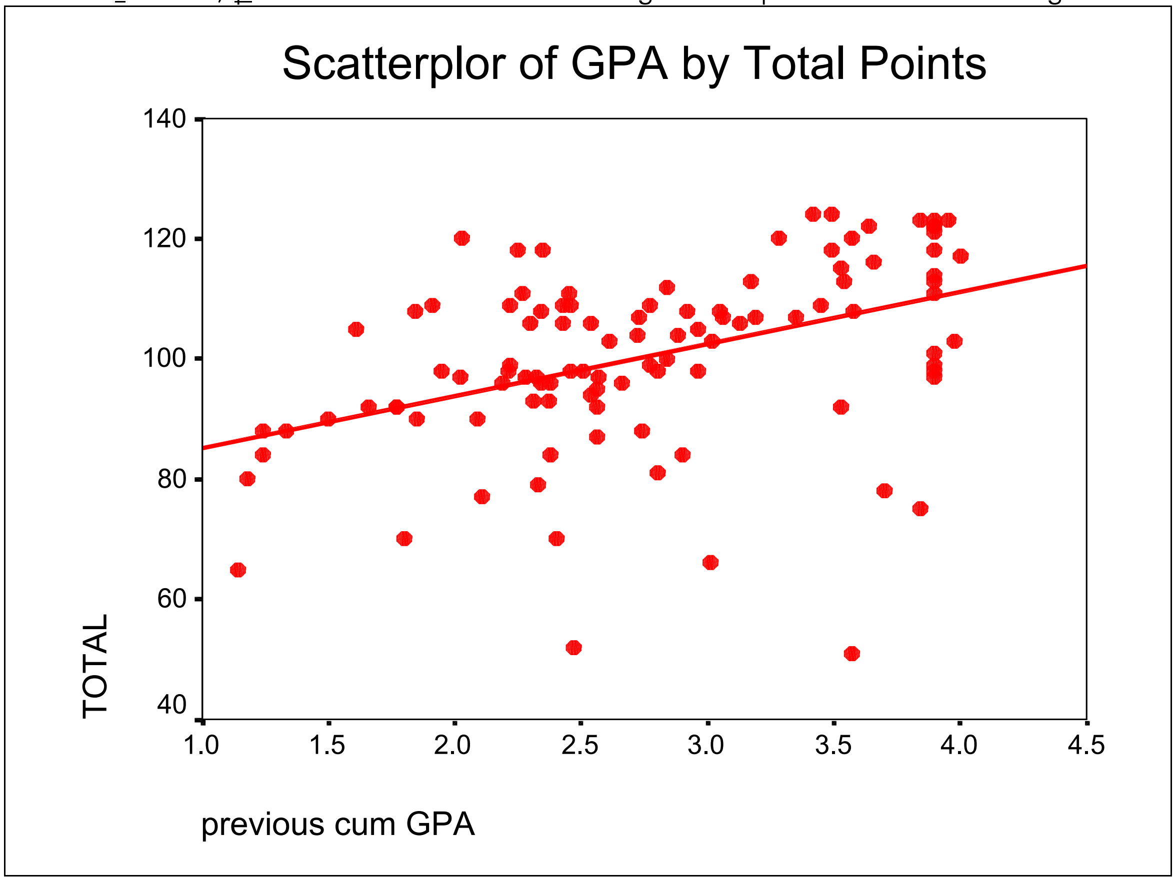
- ❐ Draw a single line through the columns and rows where the correlations are meaningless.
- ❐ Draw a double line through the correlations where there is linear dependency
- ❐ Circle 3 legitimate NEGATIVE correlations where the significance is $p < .05$ and explain what they mean.
- ❐ Box 3 legitimate POSITIVE correlations where the significance is $p < .05$ and explain what they mean.
- ❐ Create a scatterplot of **gpa** by **total** and include the regression line. (see Chapter 5 for instructions).

2. Using the **divorce.sav** file create a correlation matrix of the following variables; **sex**, **age**, **sep**, **mar**, **status**, **eth**, **school**, **income**, **avoicope**, **iq**, **close**, **locus**, **asq**, **socsupp**, **spiritua**, **trauma**, **lsatisfy**; select one-tailed significance; flag significant correlations. Note: Please make use of the **Data Files** descriptions starting on page 365 for meaning of all variables.

- ❐ Draw a single line through the columns and rows where the correlations are meaningless.
- ❐ Draw a double line through the correlations where there is linear dependency
- ❐ Circle 3 legitimate NEGATIVE correlations where the significance is $p < .05$ and explain what they mean.
- ❐ Box 3 legitimate POSITIVE correlations where the significance is $p < .05$ and explain what they mean.
- ❐ Create a scatterplot of **close** by **lsatisfy** and include the regression line. (see Chapter 5 for instructions).
- ❐ Create a scatterplot of **avoicope** by **trauma** and include the regression line.

10-1

- $r = -.19$, $p = .024$: Women tend to have higher GPA's than men
- $r = -.21$, $p = .014$: students in lower numbered sections (e.g. sections 1 and 2) tend to score higher on quiz 1.
- $r = -.20$, $p = .019$: students in lower numbered sections (e.g. sections 1 and 2) tend to score higher on the final exam.
- $r = .26$, $p = .004$: Those who have higher GPAs tend to score higher on quiz 4.
- $r = .69$, $p < .001$: Those who score higher on quiz 2 tend to score higher on quiz 3
- $r = .56$, $p < .001$: Those who score higher on quiz 3 tend to score higher on the final exam



Chapter 11: The T Test Procedure

For questions 1- 7, perform the following operations:

a) Circle the two mean values that are being compared

b) Circle the appropriate significance value (be sure to consider equal or unequal variance)

c) If the results are statistically significant, describe what the results mean.

1. Using the **grades.sav** file, compare men with women (**sex**) for **quiz1**, **quiz2**, **quiz3**, **quiz4**, **quiz5**, **final**, **total**.

2. Using the **grades.sav** file, determine whether the following pairings produce significant differences: **quiz1** with **quiz2**, **quiz1** with **quiz3**, **quiz1** with **quiz4**, **quiz1** with **quiz5**.

3. Using the **grades.sav** file, compare the GPA variable (**gpa**) with the mean GPA of the university of 2.89.

4. Using the **divorce.sav** file, compare men with women (**sex**) for **lsatisfy**, **trauma**, **age**, **school**, **cogcope**, **behcope**, **avoicope**, **iq**, **close**, **locus**, **asq**, **socsupp**, **spiritua**.

5. Using the **helping3.sav** file, compare men with women (**gender**) for **age**, **school**, **income**, **tclose**, **hcontrot**, **sympathi**, **angert**, **hcopet**, **hseveret**, **empathyt**, **effict**, **thelplnz**, **tqualitz**, **tothelp**. Please see the **Data Files** section (page 365) for meaning of each variable.

6. Using the **helping3.sav** file, determine whether the following pairings produce significant differences: **sympathi** with **angert**, **sympathi** with **empathy**, **empahelp** with **insthelp**, **empahelp** with **infhelp**, **insthelp** with **infthelp**.

7. Using the **helping3.sav** file, compare the age variable (**age**) with the mean age for North Americans (33.0).

8. In an experiment, 10 participants were given a test of mental performance in stressful situations. Their scores were 2, 2, 4, 1, 4, 3, 0, 2, 7, and 5. Ten other participants were given the same test after they had been trained in stress-reducing techniques. Their scores were 4, 4, 6, 0, 6, 5, 2, 3, 6, and 4. Do the appropriate t test to determine if the group that had been trained had different mental performance scores than the group that had not been trained in stress reduction techniques. What do these results mean?

9. In a similar experiment, ten participants were given a test of mental performance in stressful situations at the start of the study, were then trained in stress reduction techniques, and were finally given the same test again at the end of the study. In an amazing coincidence, the participants received the same scores as the participants in question 8: The first two people in the study received a score of 2 on the pretest, and a score of 4 on the posttest; the third person received a score of 4 on the pretest and 6 on the post-test; and so on. Do the appropriate t test to determine if there was a significant difference between the

pretest and posttest scores. What do these results mean? How was this similar and how was this different than the results in question 1? Why?

10. You happen to know that the population mean for the test of mental performance in stressful situations is exactly three. Do a t test to determine whether the post test scores in #9 above (the same numbers as the training group scores in #8 above) is significantly different than three. What do these results mean? How was this similar and how was this different than the results in question 2? Why?

11-1

Independent Samples Test

				Levene's Test for Equality of Variances		t-test for Equality of Means					
	SEX	N	Mean	F	Sig.		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
QUIZ1	1 female	64	7.72	2.180	.143	Equal var.	1.305	103	.195	.65	.495
	2 male	41	7.07			Unequal var.	1.259	75.304	.212	.65	.513
QUIZ2	1 female	64	7.98	1.899	.171	Equal var.	.027	103	.979	.01	.326
	2 male	41	7.98			Unequal var.	.026	77.634	.979	.01	.335
QUIZ3	1 female	64	8.19	3.436	.067	Equal var.	1.147	103	.254	.53	.461
	2 male	41	7.66			Unequal var.	1.103	74.189	.274	.53	.480
QUIZ4	1 female	64	8.06	.894	.347	Equal var.	1.482	103	.141	.67	.454
	2 male	41	7.39			Unequal var.	1.452	79.502	.151	.67	.463
QUIZ5	1 female	64	7.88	4.103	.045	Equal var.	.060	103	.952	.02	.355
	2 male	41	7.85			Unequal var.	.058	74.071	.954	.02	.369
FINAL	1 female	64	62.36	.093	.761	Equal var.	1.431	103	.156	2.26	1.581
	2 male	41	60.10			Unequal var.	1.391	77.417	.168	2.26	1.626
TOTAL	1 female	64	102.03	2.019	.158	Equal var.	1.224	103	.224	3.74	3.053
	2 male	41	98.29			Unequal var.	1.169	72.421	.246	3.74	3.198

No results are statistically significant

11-2

Paired Samples Statistics

		Mean	Paired Differences	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
						Lower	Upper			
Pair 1	QUIZ1	7.47	-.51	1.835	.179	-.87	-.16	-2.872	104	.005
	QUIZ2	7.98								
Pair 2	QUIZ1	7.47	-.51	1.287	.126	-.76	-.27	-4.095	104	.000
	QUIZ3	7.98								
Pair 3	QUIZ1	7.47	-.33	1.405	.137	-.61	-.06	-2.431	104	.017
	QUIZ4	7.80								
Pair 4	QUIZ1	7.47	-.40	2.204	.215	-.83	.03	-1.860	104	.066
	QUIZ5	7.87								

1. Students scored significantly higher on quiz 2 (M = 7.98) than on quiz 1 (M = 7.47), t(104) = -2.87, p = .005.

2. Students scored significantly higher on quiz 3 (M = 7.98) than on quiz 1 (M = 7.47), t(104) = -4.10, p < .001.

[Notice that the mean values are identical with the first comparison but quiz 1 with quiz 3 pairing produces a much stronger result. This is due to a much narrower standard deviation for the second comparison (1.287) than for the first (1.835)]

3. Students scored significantly higher on quiz 4 (M = 7.80) than on quiz 1 (M = 7.47), t(104) = -2.43, p = .017.

11-3

The values do not differ significantly.

11-4

1. Women (M = 4.54) are significantly more likely to practice cognitive coping than men (M = 4.28), t(227) = 2.08, p = .038.
2. Men (M = 2.92) are significantly more likely to practice avoidant coping than women (M = 2.55), t(227) = -3.13, p = .002.
3. Women (M = 3.51) are significantly more likely to experience non-sexual physical closeness than men (M = 3.23), t(227) = 2.26, p = .025.
4. Women (M = 3.44) are significantly more likely to have a positive attributional style than men (M = 2.62), t(227) = 2.24, p = .023.
5. Women (M = 3.67) are significantly more likely to receive social support than men (M = 3.37), t(227) = 2.36, p = .009.
6. Women (M = 4.80) have significantly higher personal spirituality than men (M = 4.14), t(227) = 4.20, p < .001.

11-8

Group Statistics

	CONDITIO	N	Mean	Std. Deviation	Std. Error Mean
PERFORMA	Control	10	3.00	2.055	.650
	Treatment (training)	10	4.00	1.944	.615

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
PERFORMA	Equal variances assumed	.134	.718	-1.118	18	.278	-1.00	.894	-2.879	.879
	Equal variances not assumed			-1.118	17.945	.278	-1.00	.894	-2.880	.880

Although the mean for the treatment group (M = 4.00, SD = 1.94) appeared to be higher than the mean for the control group (M = 3.00, SD = 2.06), this difference was not statistically significant ($t(18) = 1.12$, $p > .05$).

11-9

Although the mean for the treatment condition (M = 4.00, SD = 1.94) appeared to be higher than the mean for the control condition (M = 3.00, SD = 2.06), this difference was not statistically significant ($t(9) = 2.24$, $p > .05$).

Chapter 12: The One-Way ANOVA Procedure

Perform one-way ANOVAs with the specifications listed below. If there are significant findings write them up in APA format (or in the professional format associated with your discipline). Examples of correct APA format are shown on the web site. Further, notice that the final five problems make use of the **helping3.sav** data file. This data set (and all data files used in this book) is also available for download at the website listed above. To assist in understanding the meaning and specification of each of the variables, make generous use of **Data Files** section of this book beginning on page 365.

1. File: **grades.sav**; dependent variable: **quiz4**; factor: **ethnic** (2,5); use **LSD** procedure for post hoc comparisons, compute two planned comparisons. This problem asks you to reproduce the output on pages 150-152. Note that you will need to perform a select-cases procedure (see page 146) to delete the "1 = Native" category.

2. File: **helping3.sav**; dependent variable: **tothelp**; factor: **ethnic** (1,4); use **LSD** procedure for post hoc comparisons, compute two planned comparisons.

3. File: **helping3.sav**; dependent variable: **tothelp**; factor: **problem** (1,4); use **LSD** procedure for post hoc comparisons, compute two planned comparisons.

4. File: **helping3.sav**; dependent variable: **angert**; factor: **occupat** (1,6); use **LSD** procedure for post hoc comparisons, compute two planned comparisons.

5. File: **helping3.sav**; dependent variable: **sympathi**; factor: **occupat** (1,6); use **LSD** procedure for post hoc comparisons, compute two planned comparisons.

6. File: **helping3.sav**; dependent variable: **effict**; factor: **ethnic** (1,4); use **LSD** procedure for post hoc comparisons, compute two planned comparisons.

12-1

Descriptives: Dependent Variable: **QUIZ4**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower	Upper		
2 Asian	20	8.35	1.531	.342	7.63	9.07	6	10
3 Black	24	7.75	2.132	.435	6.85	8.65	4	10
4 White	45	8.04	2.256	.336	7.37	8.72	2	10
5 Hispanic	11	6.27	3.319	1.001	4.04	8.50	2	10
Total	100	7.84	2.286	.229	7.39	8.29	2	10

ANOVA: Dependent variable: **QUIZ4**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	34.297	**3**	11.432	**2.272**	**.085**
Within Groups	483.143	**96**	5.033		
Total	517.440	99			

Contrast Coefficients

	ETHNIC			
Contrast	2 Asian	3 Black	4 White	5 Hispanic
1	1	1	-1	-1
2	1	1	1	-3

Contrast Tests

		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
QUIZ4	equal variances	1	1.78	1.015	1.756	96	.082
		2	5.33	2.166	2.459	96	.016
	Unequal variances	1	1.78	1.192	1.495	19.631	.151
		2	5.33	3.072	1.734	10.949	.111

Multiple Comparisons, Dependent Variable: **QUIZ4** Method: **LSD**

(I) ETHNIC	(J) ETHNIC	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
2 Asian	3 Black	.60	.679	.379	-.75	1.95
	4 White	.31	.603	.613	-.89	1.50
	5 Hispanic	**2.08***	.842	**.015**	.41	3.75
3 Black	4 White	-.29	.567	.605	-1.42	.83
	5 Hispanic	1.48	.817	.074	-.14	3.10
4 White	5 Hispanic	**1.77***	.755	**.021**	.27	3.27

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

A one-way ANOVA revealed marginally significant ethnic differences for scores on Quiz 4, $F(3, 96) = 2.27$, $p = .085$. Post hoc comparisons using the LSD procedure with an alpha value of .05 found that Whites ($M = 8.04$) and Asians ($M = 8.35$) scored significantly higher than Hispanics ($M = 6.27$).

12-2

Descriptives: Dependent Variable: **TOTHELP**

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower	95% Confidence Interval for Mean Upper	Minimum	Maximum
1 CAUCASIAN	293	-.0006	.75658	.04420	-.0876	.0864	-2.88	1.58
2 BLACK	50	.1611	.67714	.09576	-.0314	.3535	-1.72	1.69
3 HISPANIC	80	.0339	.70614	.07895	-.1233	.1910	-2.02	1.39
4 ASIAN	70	-.1821	.76336	.09124	-.3642	-.0001	-1.85	1.31
Total	493	-.0044	.74478	.03354	-.0703	.0615	-2.88	1.69

ANOVA: Dependent Variable: **TOTHELP**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.702	**3**	1.234	**2.241**	**.083**
Within Groups	269.212	**489**	.551		
Total	272.913	492			

Contrast Coefficients

	ETHNIC			
Contrast	1 Caucasian	2 Black	3 Hispanic	4 Asian
1	3	-1	-1	-1
2	1	-1	-1	1

Contrast Tests

		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
TOTHELP	Equal variances	1	-.0146	.20656	-.071	489	.944
		2	-.3777	.16624	-2.272	489	.024
	Unequal variances	1	-.0146	.20325	-.072	399.562	.943
		2	-.3777	.16025	-2.357	204.483	.019

Multiple Comparisons; Dependent Variable: **TOTHELP**; Post Hoc procedure: **LSD**

(I) ETHNIC	(J) ETHNIC	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower	95% Confidence Interval Upper
1 CAUCASIAN	2 BLACK	-.1617	.11353	.155	-.3848	.0614
	3 HISPANIC	-.0345	.09360	.713	-.2184	.1495
	4 ASIAN	.1815	.09871	.067	-.0124	.3755
2 BLACK	3 HISPANIC	.1272	.13376	.342	-.1356	.3900
	4 ASIAN	**.3432***	.13739	**.013**	.0733	.6132
3 HISPANIC	4 ASIAN	.2160	.12144	.076	-.0226	.4546

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

A one-way ANOVA revealed marginally significant ethnic differences for the total amount of help given, $F(3, 489) = 2.24$, $p = .083$. Post hoc comparisons using the LSD procedure with an alpha value of .05 found that Blacks ($M = .16$) provide significantly more total help than Asians ($M = -.18$).

12-3

A one-way ANOVA revealed significant differences for the amount of total help given based on problem type, $F(3, 533) = 4.34$, $p = .005$. Post hoc comparisons using the LSD procedure with an alpha value of .05 found that less help was given for goal disruptive problems ($M = -.12$) than for either relational problems ($M = .07$) or illness problems ($M = .13$).

12-4

A one-way ANOVA revealed marginally significant differences for the amount of anger experienced based on the occupation of the helper, $F(5, 531) = 1.982$, $p = .080$. Post hoc comparisons using the LSD procedure with an alpha value of .05 found greater anger was experienced by those who chose not to state their occupation ($M = 2.75$) than for either unemployed/retired persons ($M = 1.80$) or professional persons ($M = 2.06$). It was also found that service/support workers ($M = 2.37$) experienced more anger than those who were unemployed.

Chapter 14: Three-Way ANOVA

For the first five problems below, perform the following:

- Print out the cell means portion of the output.
- Print out the ANOVA results (main effects, interactions, and so forth.
- Interpret and write up correctly (APA format) all main effects and interactions.
- Create multiple-line graphs (or clustered bar charts) for all significant interactions (see pp. 174-175).

1. File: **helping3.sav**; dependent variable: **tothelp**; independent variables: **gender**, **problem.**

2. File: **helping3.sav**; dependent variable: **tothelp**; independent variables: **gender**, **income.**

3. File: **helping3.sav**; dependent variable: **hseveret**; independent variables: **ethnic**, **problem.**

4. File: **helping3.sav**; dependent variable: **thelplnz**; independent variables: **gender**, **problem**; covariate: **tqualitz**.

5. File: **helping3.sav**; dependent variable: **thelplnz**; independent variables: **gender**, **income**, **marital.**

6. In an experiment, participants were given a test of mental performance in stressful situations. Some participants were given no stress-reduction training, some were given a short stress-reduction training session, and some were given a long stress-reduction training section. In addition, some participants who were tested had a low level of stress in their lives, and others had a high level of stress in their lives. Perform an ANOVA on these data (listed below). What do these results mean?

Training:	**None**										**Short**				
Life Stress:	**High**					**Low**					**High**				
Performance Score:	5	4	2	5	4	4	4	6	6	2	6	4	5	4	3

Training:	**Short**					**Long**									
Life Stress:	**Low**					**High**					**Low**				
Performance Score:	7	6	6	5	7	5	5	5	3	5	7	7	9	9	8

7. In an experiment, participants were given a test of mental performance in stressful situations. Some participants were given no stress-reduction training, and some were given a stress-reduction training session. In addition, some participants who were tested had a low level of stress in their lives, and others had a high level of stress in their lives. Finally, some participants were tested after a full night's sleep, and some were tested after an all-night study session on three-way ANOVA. Perform an ANOVA on these data (listed below question 8; ignore the "caffeine" column for now). What do these results mean?

8. In the experiment described in problem 7, data were also collected for caffeine levels. Perform an ANOVA on these data (listed below). What do these results mean? What is similar to and different than the results in question 6?

Training?	Stress Level	Sleep/Study	Performance	Caffeine
No	Low	Sleep	8	12
No	Low	Sleep	9	13
No	Low	Sleep	8	15
No	Low	Study	15	10
No	Low	Study	14	10
No	Low	Study	15	11
No	High	Sleep	10	14
No	High	Sleep	11	15
No	High	Sleep	11	16
No	High	Study	18	11
No	High	Study	19	10
No	High	Study	19	11
Yes	Low	Sleep	18	11
Yes	Low	Sleep	17	10
Yes	Low	Sleep	18	11
Yes	Low	Study	10	4
Yes	Low	Study	10	4
Yes	Low	Study	11	4
Yes	High	Sleep	22	14
Yes	High	Sleep	22	14
Yes	High	Sleep	23	14
Yes	High	Study	13	5
Yes	High	Study	13	5
Yes	High	Study	12	4

14-1

Estimated Marginal Means

Dependent Variable: **TOTHELP** (total amount of help provided)

GENDER	N	Mean
1 female	325	.194
2 male	212	-.073

PROBLEM TYPE	N	Mean
1 Goal Disruptive	229	-.129
2 Relational	209	.019
3 Illness	86	.088
4 Catastrophic	13	.263

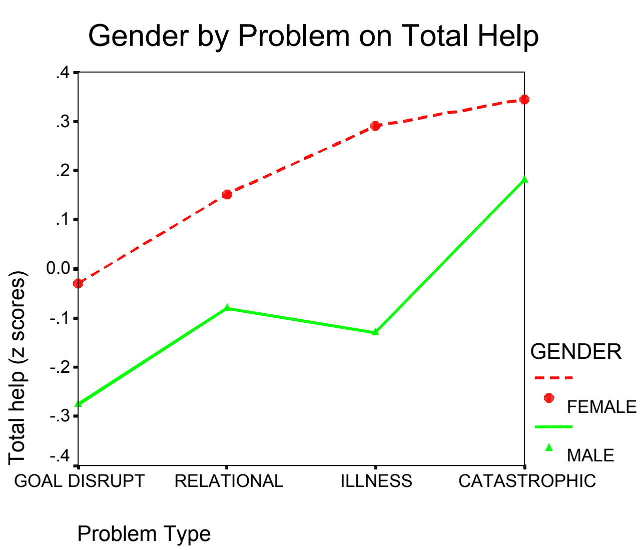
GENDER	PROBLEM TYPE	N	Mean
1 Female	1 Goal Disruptive	105	-.002
	2 Relational	132	.145
	3 Illness	50	.288
	4 Catastrophic	7	.345
2 Male	1 Goal Disruptive	102	-.257
	2 Relational	57	-.106
	3 Illness	34	-.112
	4 Catastrophic	6	.182

Tests of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16.732	7	2.389	4.624	.000
Intercept	.586	1	.586	1.134	.287
GENDER	2.861	1	2.861	5.538	.019
PROBLEM	4.956	3	1.652	3.198	.023
GENDER*PROBLEM	.417	3	.139	.269	.848
Error	273.285	529	.517		
Total	290.009	237			
Corrected Total	290.008	536			

Multiple Comparisons (note: only significant results are shown)

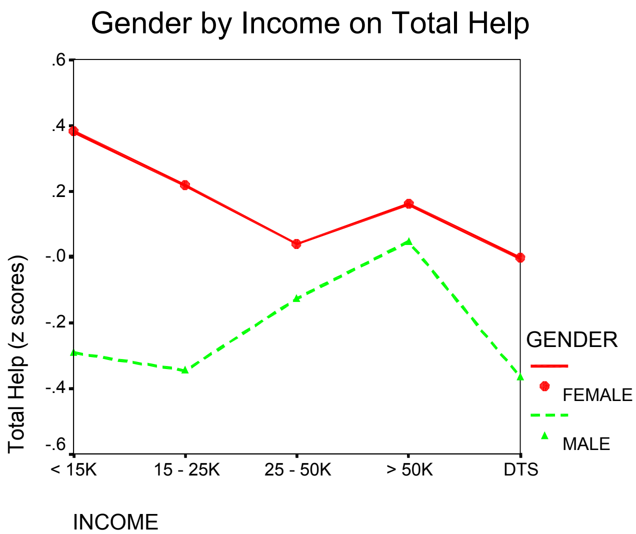
(I)Problem Type	(J) Problem Type	Mean Difference (I - J)	Std. Error	Sig.
1 Goal Disruptive	2 Relational	-.1960*	.0688	.005
	3 Illness	-.2499*	.0909	.006



(The chart (left) is included for demonstration only. There is no significant interaction in the present results.)

A 2-way ANOVA was conducted to determine the influence of gender and type of problem on the total amount of help given. Results showed a significant main effect for gender in which women (M = .12) gave more help than men (M = -.18), F(1, 529) = 5.54, p = .019. There was also a significant main effect for problem type, F(3, 529) = 1.65, p = .023. Post hoc comparisons using the least significant differences procedure with an alpha value of .05 revealed that subjects helping with a goal disruptive problem spent less time helping (M = -.12) than subjects helping with relational problems (M = .07) or illness problems (M = -.13). There was no significant gender by problem type interaction.

14-2



A 2-way ANOVA was conducted to determine the influence of gender and level of income on the total amount of help given. Results showed a significant main effect for gender in which women (M = .12) gave more help than men (M = -.18), F(1, 527) = 30.14, p < .001. There was also a significant main effect for level of income, F(4, 527) = 3.15, p = .014. Post hoc comparisons using the LSD procedure with an alpha value of .05 revealed that subjects unwilling to state their income gave less total help (M = -.12) than subjects making less than 15,000 per year (M = .09) or subjects making more than 50,000 per year (M = .11). There was also a significant gender by income interaction. F(4, 527) = 2.60, p = .035. While for all income levels, women helped more than men, for subjects making less than 25,000, the gender discrepancy was much greater, while for subjects making more than 25,000, the gender discrepancy was small.

14-3

A 2-way ANOVA was conducted to determine the influence of ethnicity and problem type on the severity rating of problems. Results showed a significant main effect for problem type, F(3, 518) = 11.64, p = .002. Post hoc comparisons using the least significant differences procedure with an alpha value of .05 revealed that the severity rating for goal-disruptive problems (M = 4.58) was significantly less than for relational problems (M = 5.15), illness problems (M = 5.70), or catastrophic problems (M = 6.00). Also illness problems were rated more severe than relational problems. There was no significant ethnic by problem type interaction.

14-6

Descriptive Statistics

Dependent Variable: PERFORMA

TRAINING	LIFESTRE	Mean	Std. Deviation	N
None	High	4.00	1.225	5
	Low	4.40	1.673	5
	Total	4.20	1.398	10
Short	High	4.40	1.140	5
	Low	6.20	.837	5
	Total	5.30	1.337	10
Long	High	4.60	.894	5
	Low	8.00	1.000	5
	Total	6.30	2.003	10
Total	High	4.33	1.047	15
	Low	6.20	1.897	15
	Total	5.27	1.780	30

Tests of Between-Subjects Effects

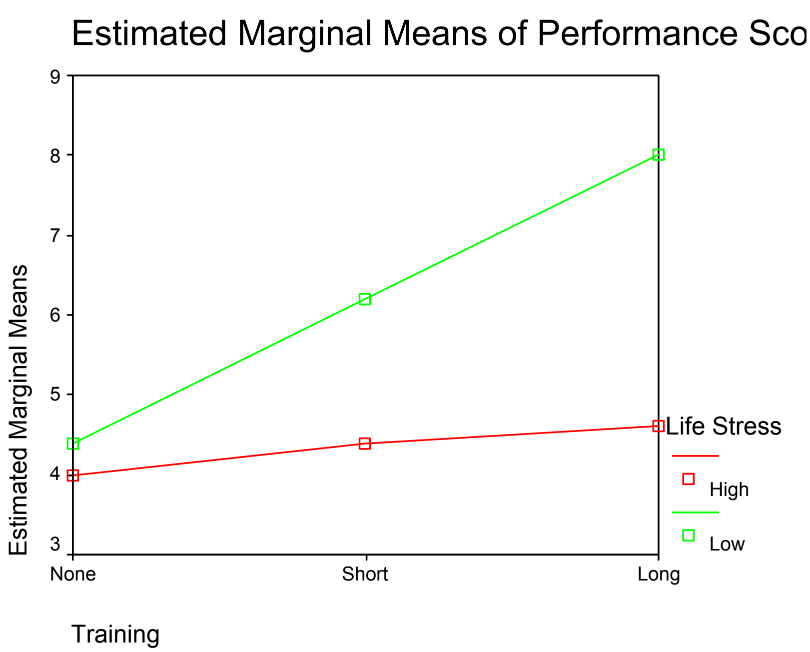
Dependent Variable: PERFORMA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
Corrected Model	59.467[b]	5	11.893	8.810	.000	.647	44.049	.999
Intercept	832.133	1	832.133	616.395	.000	.963	616.395	1.000
TRAINING	22.067	2	11.033	8.173	.002	.405	16.346	.934
LIFESTRE	26.133	1	26.133	19.358	.000	.446	19.358	.988
TRAINING * LIFESTRE	11.267	2	5.633	4.173	.028	.258	8.346	.678
Error	32.400	24	1.350					
Total	924.000	30						
Corrected Total	91.867	29						

a. Computed using alpha = .05

b. R Squared = .647 (Adjusted R Squared = .574)

- There was a main effect of training: People who had a long training session (M = 6.30, SD = 2.00) performed better than people who had a short training session (M = 5.30, SD = 1.34), who in turn did better than those who had no training session (M = 4.20, SD = 1.40; $F(2,24) = 8.17$, $p = .002$).
- There was a main effect of level of life stress: People with low levels of life stress (M = 6.20, SD = 1.90) performed better than people with high levels of life stress (M = 4.33, SD = 1.05; $F(1,24) = 19.36$, $p < .001$).
- There was an interaction between training and level of life stress, as displayed in this graph ($F(2,24) = 4.17$, $p = .028$):



Note that for those with low life stress, the amount of training seems to make a big difference. For those with high life stress, the impact of training is minimal.

14-7

- There was a main effect for training: Participants who received training performed better (M = 15.75, SD = 4.86) than participants who did not receive training (M = 13.08, SD = 4.14; F(1,16) = 128.00, p < .001).
- There was a main effect of stress level: Participants with high stress levels performed better (M = 16.08, SD = 4.89) than those with low stress levels (M = 12.75, SD = 3.85; F(1,16) = 200.00, p < .001).
- There was main effect on sleeping versus studying all night: People who slept performed somewhat better (M = 14.75, SD = 5.83) than those who didn't sleep (M = 14.08, SD = 3.23; F(1,16) = 8.00, p = .012).
- There was no significant interaction effect between training and stress level (F(1,16) = .50, p > .05).
- There was a significant interaction between training and sleeping versus studying (F(1,16) = 1104.50, p < .001): For those with no training, people who slept performed worse (M = 9.50, SD = 1.38) than those who studied (M = 16.67, SD = 2.25). For those with training, however, people who slept performed better (M = 20.00, SD = 2.61) than people who studied (M = 11.50, SD = 1.38).
- There was no significant interaction between stress level and sleeping versus studying (F(1,16) = .50, p > .05).
- There was a significant three-way interaction between training, stress level, and sleeping versus studying (F(1,16) = 18.00, p = .001).
- For those who slept, they performed better with high stress levels, and better with training. A post hoc test could determine whether the difference between high and low stress levels was greater in the training condition than in the no training condition.
- For those who didn't sleep, they performed better with high stress levels and better without training. A post hoc test could determine whether the performance gain for the high stress level participants was greater in the no training condition than in the training condition.

Chapter 15: Simple Linear Regression

1. Use the **anxiety.sav** file exercises that follow (downloadable at the address shown above).

Perform the 4a - 5a sequences on pages 184 and 185.

- ❒ Include output in as compact a form as is reasonable
- ❒ Write the linear equation for the predicted exam score
- ❒ Write the quadratic equation for the predicted exam score

For subjects numbered 5, 13, 42, and 45

- ❒ Substitute values into the two equations and solve. Show work on a separate page.
- ❒ Then compare in a small table (similar to that on page 182)
  - → Linear equation results
  - → Quadratic equation results
  - → Actual scores for sake of comparison

subject #	anxiety score	predicted linear score	predicted quadratic score	actual score
5				
13				
42				
45				

2. Now using the **divorce.sav** file, test for linear and curvilinear relations between:

- ❒ physical closeness (**close**) and life satisfaction (**lsatisfy**)
- ❒ attributional style (**ASQ**) and life satisfaction (**lsatisfy**)

Print graphs and write linear and quadratic equations for both.

3. Now perform step 5b (p. 186) for the relationship between exam score, anxiety and anxiety squared (from the **anxiety.sav** file) and similar procedures for the two relationships shown in problem 2 (from the **divorce.sav** file).

For each of the three analyses:

- ❒ Box the Multiple R
- ❒ Circle the R Square
- ❒ Underline the two (2) B values
- ❒ Double underline the two (2) Sig of T values.

In a single sentence (just once, not for each of the 3 problems) identify the meaning of each of the four (4) bulleted items above.

4. A researcher is examining the relationship between stress levels and performance on a test of cognitive performance. She hypothesizes that stress levels lead to an increase in performance to a point, and then increased stress decreases performance. She tests ten participants, who have the following levels of stress: 10.94, 12.76, 7.62, 8.17, 7.83, 12.22, 9.23, 11.17, 11.88, and 8.18. When she tests their levels of mental performance, she finds the following cognitive performance scores (listed in the same participant order as above): 5.24, 4.64, 4.68, 5.04, 4.17, 6.20, 4.54, 6.55, 5.79, and 3.17. Perform a linear regression to examine the relationship between these variables. What do these results mean?

5. The same researcher tests ten more participants, who have the following levels of stress: 16, 20, 14, 21, 23, 19, 14, 20, 17, and 10. Their cognitive performance scores are (listed in the same participant order): 5.24, 4.64, 4.68, 5.04, 4.17, 6.20, 4.54, 6.55, 5.79, and 3.17. (Note that in an amazing coincidence, these participants have the same cognitive performance scores as the participants in question 4; this coincidence may save you some typing.) Perform a linear regression to examine the relationship between these variables. What do these results mean?

6. Create a scatterplot (see Chapter 5) of the variables in question 5. What about this suggests that linear regression might not be the best analysis to perform?

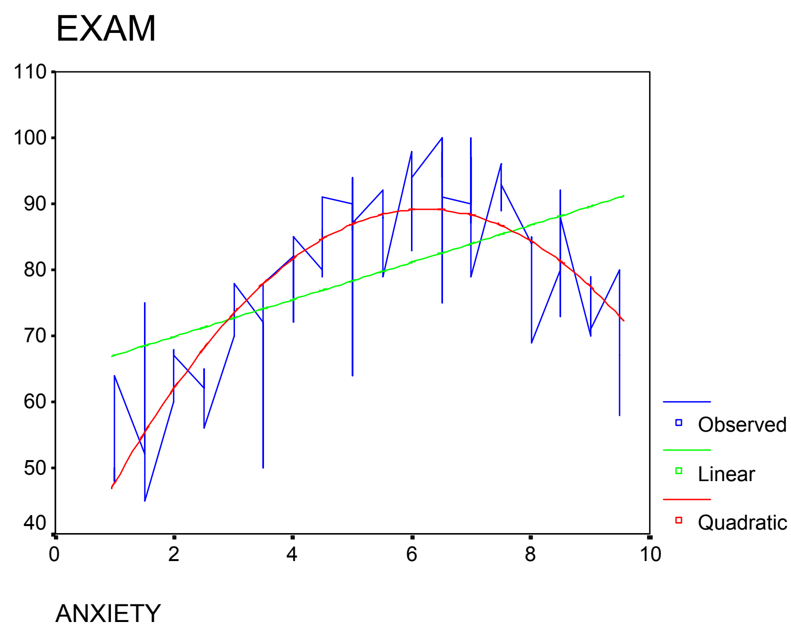
7. Perform curve estimation on the data from Question 5. What does this tell you about the data that you could not determine from the analysis in Question 5?

8. What is different about the data in Questions 4 and 5 that leads to different results?

15-1

Independent: ANXIETY

Dependent	Method	R Sq	Df	F	Sig.	b0	b1	b2
EXAM	Linear	.238	71	22.19	.000	64.247	2.818	
EXAM	Quad-ratic	.641	70	62.52	.000	30.377	18.926	-1.521



Linear: $EXAM_{(pred)} = 64.247 + 2.818(ANXIETY)$

Quadratic: $EXAM_{(pred)} = 30.377 + 18.926(ANXIETY) - 1.521(ANXIETY)^2$

subject #	Anxiety score	predicted linear score	predicted quadratic score	actual score
5	3.0	72.7	73.5	70
13	4.0	75.5	81.7	82
42	6.5	82.6	89.1	98
45	9.0	89.6	77.6	79

15-2

Linear: $LSATISFY_{(pred)} = 4.571 + .08(ASQ)$

Quadratic: $LSATISFY_{(pred)} = 4.587 + .051(ASQ) + .004(ASQ)^2$

15-4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.632[a]	.399	.324	.82256

a. Predictors: (Constant), STRESS

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.594	1	3.594	5.312	.050[a]
	Residual	5.413	8	.677		
	Total	9.007	9			

a. Predictors: (Constant), STRESS

b. Dependent Variable: PERFORMA

These results suggest that there is a significant relationship between stress and performance ($R^2 = .399$, $F(1,8) = 5.31$, $p = .05$). Note, though, that we have tested for a linear relationship—which is **not** what the research hypothesized.

15-7

Notice that the linear regression information (the "LIN" row) has (within rounding error) the same information as calculated by the linear regression procedure in exercise 5, above. That model doesn't fit the data well. The quadratic equation, however (the "QUA" row) fits the data much better ($\underline{R}^2 = .69$, $\underline{F}(1,7) = 7.68$, $\underline{p} = .017$). This tells us that the data is predicted much better from a quadratic equation (which will form an upside-down "U" shape) than a linear one.

15-8

The data in question 4 is (roughly) linear; the data in question 5 is curvilinear.

Chapter 16: Multiple Regression Analysis

Use the **helping3.sav** file for the exercises that follow (downloadable at the address shown above).

Conduct the following THREE regression analysis:

Criterion variables:

1. **thelplnz**: Time spent helping
2. **tqualitz**: Quality of the help given
3. **tothelp**: A composite help measure that includes both time and quality

Predictors: (use the same predictors for each of the three dependent variables)

- **age**: range from 17 to 89
- **angert**: Amount of anger felt by the helper toward the needy friend
- **effict**: Helper's feeling of self-efficacy (competence) in relation to the friend's problem
- **empathyt**: Helper's empathic tendency as rated by a personality test
- **gender**: 1 = female, 2 = male
- **hclose**: Helper's rating of how close the relationship was
- **hcontrot**: helper's rating of how controllable the cause of the problem was
- **hcopet**: helper's rating of how well the friend was coping with his or her problem
- **hseveret**: helper's rating of the severity of the problem
- **obligat**: the feeling of obligation the helper felt toward the friend in need
- **school**: coded from 1 to 7 with 1 being the lowest education, and 7 being the highest (> 19 years)
- **sympathi**: The extent to which the helper felt sympathy toward the friend
- **worry**: amount the helper worried about the friend in need

Use **entry value** of .06 and **removal value** of .11.

Use **stepwise** method of entry.

Create a table (example below) showing for each of the three analyses Multiple R, R^2, then each of the variables that significantly influence the dependent variables. Following the R^2, List the name of each variable and then (in parentheses) list its β value. Rank order them from the most influential to least influential from left to right. Include only significant predictors.

Dependent Variable	Multiple R	R^2	1st var (β)	2nd var (β)	3rd var (β)	4th var (β)	5th var (β)	6th var (β)
Time helping								
Help quality								
Total help								

4. A researcher is examining the relationship between **stress** levels, **self-esteem**, **coping skills**, and **performance** on a test of cognitive performance (the dependent measure). His data are shown below. Perform multiple regression on these data, entering variables using the stepwise procedure. Interpret the results.

Stress	Self-esteem	Coping skills	Performance
6	10	19	21
5	10	14	21
5	8	14	22
3	7	13	15
7	14	16	22
4	9	11	17
6	9	15	28
5	9	10	19
5	11	20	16
5	10	17	18

16-1

Dependent Variable	Multiple R	R^2	1st var (β)	2nd var (β)	3rd var (β)	4th var (β)	5th var (β)	6th var (β)
1. Time help-ing	.576	.332	Efficacy (.330)	Severity (.214)	Worry (.153)	Closeness (.113)	Anger (.110)	Gender (-.096)

16-4

Two different models were examined. The first model, Performance = 7.688 + 2.394 x Stress + Residual, fit the data fairly well (R^2 = .49, $F(1,8)$ = 7.53, p = .025). Adding self-esteem significantly improved the model, so the second model, Performance = 12.999 + 4.710 x Stress – 1.765 x Self-Esteem + Residual, fit the data even better (R^2 = .90, $F(2,7)$ = 14.65, p = .003). So, when stress goes up, performance goes up; but when self-esteem goes up, performance goes down. Coping skills didn't contribute to make the model better.

Chapter 18: Reliability Analysis

Use the **helping3.sav** file for the exercises that follow (downloadable at the address shown above). Measure the internal consistency (coefficient alpha) of the following sets of variables. An "h" in front of a variable name, refers to assessment by the help giver; an "r" in front of a variable name refers to assessment by the help recipient.

Compute Coefficient alpha for the following sets of variables, then delete variables until you achieve the highest possible alpha value. Print out relevant results.

1. **hsevere1, hsevere2, rsevere1, rsevere2** measure of problem severity
2. **sympath1, sympath2, sympath3, sympath4** measure of helper's sympathy
3. **anger1, anger2, anger3, anger4** measure of helper's anger
4. **hcompe1, hcompe2, hcope3, rcope1, rcope2, rcope3** how well the recipient is coping
5. **hhelp1-hhelp15** helper's rating of time spent helping
6. **rhelp1-rhelp15** recipient's rating of time helping
7. **empathy1-empathy14** helper's rating of empathy
8. **hqualit1, hqualit2, hqualit3, rqualit1, rqualit2, rqualit3** quality of help
9. **effic1-effic15** helper's belief of self efficacy
10. **hcontro1, hcontro2, rcontro1, rcontro2** controllability of the cause of the problem

From the **divorce.sav** file:

11. **drelat-dadjust** (16 items) factors disruptive to divorce recovery
12. **arelat-amain2** (13 items) factors assisting recovery from divorce
13. **sp8-sp57** (18 items) spirituality measures

18-1

R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)

		Mean	Std Dev	Cases
1.	HSEVERE1	4.8864	1.7159	537.0
2.	HSEVERE2	5.1434	1.6242	537.0
3.	RSEVERE1	5.0987	1.6705	537.0
4.	RSEVERE2	5.1993	1.6604	537.0

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
HSEVERE1	15.4413	19.1575	.7544	.6553	.8591
HSEVERE2	15.1844	19.7178	.7680	.6685	.8540
RSEVERE1	15.2291	19.6620	.7412	.6310	.8638
RSEVERE2	15.1285	19.4592	.7658	.6549	.8546

Reliability Coefficients   4 items

Alpha =   .8895   Standardized item alpha =   .8897

18-2

```
R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)



                              Mean        Std Dev       Cases

  1.     SYMPATH1           5.4581         1.3627       537.0
  2.     SYMPATH2           5.2253         1.5221       537.0
  3.     SYMPATH3           4.7318         1.6703       537.0

Item-total Statistics

               Scale          Scale      Corrected
               Mean          Variance      Item-         Squared          Alpha
              if Item        if Item       Total         Multiple        if Item
              Deleted        Deleted    Correlation    Correlation       Deleted

SYMPATH1       9.9572         8.2911        .6545          .4286           .7682
SYMPATH2      10.1899         7.3333        .6835          .4672           .7327
SYMPATH3      10.6834         6.6235        .6829          .4668           .7398



Reliability Coefficients     3 items

Alpha =   .8166           Standardized item alpha =   .8196
```

18-3

```
R E L I A B I L I T Y   A N A L Y S I S   -   S C A L E   (A L P H A)



Reliability Coefficients     4 items

Alpha =   .9376           Standardized item alpha =   .9376
```

Chapter 23: MANOVA and MANCOVA

1. Using the **grade.sav** file, compute and interpret a MANOVA examining the effect of whether or not students completed the extra credit project on the total points for the class and the previous GPA.
2. Using the **grades.sav** file, compute and interpret a MANOVA examining the effects of **section** and **lowup** on **total** and **GPA**.
3. Why would it be a bad idea to compute a MANOVA examining the effects of **section** and **lowup** on **total** and **percent**?
4. A researcher wishes to examine the effects of high- or low-stress situations on a test of cognitive performance and self-esteem levels. Participants are also divided into those with high- or low-coping skills. The data is shown after question 5 (ignore the last column for now). Perform and interpret a MANOVA examining the effects of stress level and coping skills on both cognitive performance and self-esteem level.
5. Coping skills may be correlated with immune response. Include immune response levels (listed below) in the MANOVA performed for Question 4. What do these results mean? In what way are they different than the results in Question 4? Why?

Stress Level	Coping Skills	Cognitive Performance	Self-Esteem	Immune Response
High	High	6	19	21
Low	High	5	18	21
High	High	5	14	22
High	Low	3	8	15
Low	High	7	20	22
High	Low	4	8	17
High	High	6	15	28
High	Low	5	7	19
Low	Low	5	20	16
Low	Low	5	17	18

23-1

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
Intercept	Pillai's Trace	.971	1733.479[b]	2.000	102.000	.000	.971	3466.959	1.000
	Wilks' Lambda	.029	1733.479[b]	2.000	102.000	.000	.971	3466.959	1.000
	Hotelling's Trace	33.990	1733.479[b]	2.000	102.000	.000	.971	3466.959	1.000
	Roy's Largest Root	33.990	1733.479[b]	2.000	102.000	.000	.971	3466.959	1.000
EXTRCRED	Pillai's Trace	.100	5.686[b]	2.000	102.000	.005	.100	11.372	.854
	Wilks' Lambda	.900	5.686[b]	2.000	102.000	.005	.100	11.372	.854
	Hotelling's Trace	.111	5.686[b]	2.000	102.000	.005	.100	11.372	.854
	Roy's Largest Root	.111	5.686[b]	2.000	102.000	.005	.100	11.372	.854

a. Computed using alpha = .05

b. Exact statistic

c. Design: Intercept+EXTRCRED

There is a significant effect of whether or not students did the extra credit project and their previous GPA's/class points ($\underline{F}(2,102) = 5.69$, $\underline{p} = .005$).

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
Corrected Model	GPA	.055[b]	1	.055	.093	.761	.001	.093	.061
	TOTAL	2151.443[c]	1	2151.443	9.985	.002	.088	9.985	.879
Intercept	GPA	543.476	1	543.476	923.452	.000	.900	923.452	1.000
	TOTAL	749523.786	1	749523.786	3478.731	.000	.971	3478.731	1.000
EXTRCRED	GPA	.055	1	.055	.093	.761	.001	.093	.061
	TOTAL	2151.443	1	2151.443	9.985	.002	.088	9.985	.879
Error	GPA	60.618	103	.589					
	TOTAL	22192.272	103	215.459					
Total	GPA	871.488	105						
	TOTAL	1086378.000	105						
Corrected Total	GPA	60.673	104						
	TOTAL	24343.714	104						

a. Computed using alpha = .05

b. R Squared = .001 (Adjusted R Squared = -.009)

c. R Squared = .088 (Adjusted R Squared = .080)

One-way ANOVA suggest that this effect seems to primarily be related to the total class points ($\underline{F}(1,103) = 9.99$, $\underline{p} = .002$) rather than the previous GPA ($\underline{F}(1,103) = .093$, $\underline{p} > .05$).

Descriptive Statistics

	EXTRCRED	Mean	Std. Deviation	N
GPA	No	2.7671	.78466	83
	Yes	2.8232	.69460	22
	Total	2.7789	.76380	105
TOTAL	No	98.24	15.414	83
	Yes	109.36	11.358	22
	Total	100.57	15.299	105

Students who completed the extra credit project had more points ($\underline{M} = 109.36$, $\underline{SD} = 11.36$) than those who did not complete the extra credit project ($\underline{M} = 98.24$, $\underline{SD} = 15.41$).

23-2

- There is not a significant main effect of lower/upper division status on total class points and previous gpa ($F(2,98) = 1.14$, $p > .05$).
- There is not a significant main effect of class section on total class points and previous GPA ($F(4,198) = 1.98$, $p > .05$).
- There is a significant interaction between class section and lower/upper division status, on total class points and previous GPA ($F(4,198) = 4.23$, $p = .003$).
- One-way ANOVA suggest that this interaction takes place primarily in the total class points ($F(2,99) = 4.60$, $p = .012$), though the interaction nearly reached significance ($F(2,99) = 3.00$, $p = .055$).

Descriptive Statistics

	LOWUP	SECTION	Mean	Std. Deviation	N
GPA	Lower	1	2.7229	.71642	7
		2	2.8445	.99018	11
		3	3.5325	.50049	4
		Total	2.9309	.85824	22
	Upper	1	3.0042	.71130	26
		2	2.6711	.68360	28
		3	2.5655	.76682	29
		Total	2.7386	.73718	83
	Total	1	2.9445	.71074	33
		2	2.7200	.77220	39
		3	2.6827	.80044	33
		Total	2.7789	.76380	105
TOTAL	Lower	1	109.86	9.512	7
		2	90.09	13.126	11
		3	107.50	9.469	4
		Total	99.55	14.664	22
	Upper	1	103.81	17.436	26
		2	103.18	9.444	28
		3	95.93	17.637	29
		Total	100.84	15.539	83
	Total	1	105.09	16.148	33
		2	99.49	12.013	39
		3	97.33	17.184	33
		Total	100.57	15.299	105

23-4

- MANOVA suggests that there is a main effect of stress on cognitive performance and self-esteem ($F(2,5) = 13.70$, $p = .009$). One-way ANOVA suggest that this effect is primarily centered on the relation between stress and self-esteem ($F(1,6) = 32.55$, $p = .001$) rather than stress and cognitive performance ($F(1,6) = 1.37$, $p > .05$). Those in the low-stress condition had higher self-esteem ($M = 18.75$, $SD = 1.50$) than those in the high-stress condition ($M = 11.83$, $SD = 4.88$).
- MANOVA also revealed a significant main effect of coping on cognitive performance and self-esteem ($F(2,5) = 6.24$, $p = .044$). One-way ANOVA suggest that this effect is clearly present in the relation between coping and self-esteem ($F(1,6) = 13.27$, $p = .011$), though the relation between coping and cognitive performance was marginally significant as well ($F(1,6) = 5.49$, $p = .058$). Those with high coping skills had higher self-esteem ($M = 17.20$, $SD = 2.59$) than those with low coping skills ($M = 12.00$, $SD = 6.04$). Those high coping skills may have also had higher cognitive performance ($M = 5.80$, $SD = .84$) than those with low coping skills ($M = 4.40$, $SD = .89$).
- The interaction effect between coping and stress levels was not significant ($F(2,5) = 4.42$, $p = .079$).

Chapter 24: Repeated-Measures MANOVA

1. Imagine that in the **grades.sav** file, the five quiz scores are actually the same quiz taken under different circumstances. Perform repeated-measures ANOVA on the five quiz scores. What do these results mean?
2. To the analysis in exercise 1, add whether or not students completed the extra credit project (**extrcred**) as a between-subjects variable. What do these results mean?
3. A researcher puts participants in a highly stressful situation (say, performing repeated-measures MANCOVA) and measures their cognitive performance. He then puts them in a low-stress situation (say, lying on the beach on a pleasant day). Participant scores on the test of cognitive performance are reported below. Perform and interpret a within-subjects ANOVA on these data.

Case Number:	1	2	3	4	5	5	6	7	8	10
High Stress:	76	89	86	85	62	63	85	115	87	85
Low Stress:	91	92	127	92	75	56	82	150	118	114

4. The researcher also collects data from the same participants on their coping ability. They scored (in case number order) 25, 9, 59, 16, 23, 10, 6, 43, 44, and 34. Perform and interpret a within-subjects ANCOVA on these data.

5. The researcher just discovered some more data…in this case, physical dexterity performance in the high-stress and low-stress situations (listed below, in the same case number order as in the previous two exercises). Perform and interpret a 2 (stress level: high, low) by 2 (kind of performance: cognitive, dexterity) ANCOVA on these data.

Case Number:	1	2	3	4	5	5	6	7	8	10
High Stress:	91	109	94	99	73	76	94	136	109	94
Low Stress:	79	68	135	103	79	46	77	173	111	109

24-1

Descriptive Statistics

	Mean	Std. Deviation	N
QUIZ1	7.47	2.481	105
QUIZ2	7.98	1.623	105
QUIZ3	7.98	2.308	105
QUIZ4	7.80	2.280	105
QUIZ5	7.87	1.765	105

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[a]
CONDITIO	Pillai's Trace	.152	4.539[b]	4.000	101.000	.002	.152	18.156	.934
	Wilks' Lambda	.848	4.539[b]	4.000	101.000	.002	.152	18.156	.934
	Hotelling's Trace	.180	4.539[b]	4.000	101.000	.002	.152	18.156	.934
	Roy's Largest Root	.180	4.539[b]	4.000	101.000	.002	.152	18.156	.934

a. Computed using alpha = .05

b. Exact statistic

c.
Design: Intercept
Within Subjects Design: CONDITIO

These results suggest that there is a significant difference between the five conditions under which the quiz was taken ($F(4,101) = 4.54$, $p = .002$). We can examine the means to determine what that pattern of quiz scores looks like.

24-2

When the condition in which the quiz was taken is examined at the same time that extra credit participation is examined, there is no difference between the conditions on their own ($F(4,412) = .74$, $p > .05$). There is, however, an interaction effect between the quiz condition and extra credit participation ($F(4,412) = 7.60$, $p < .001$).

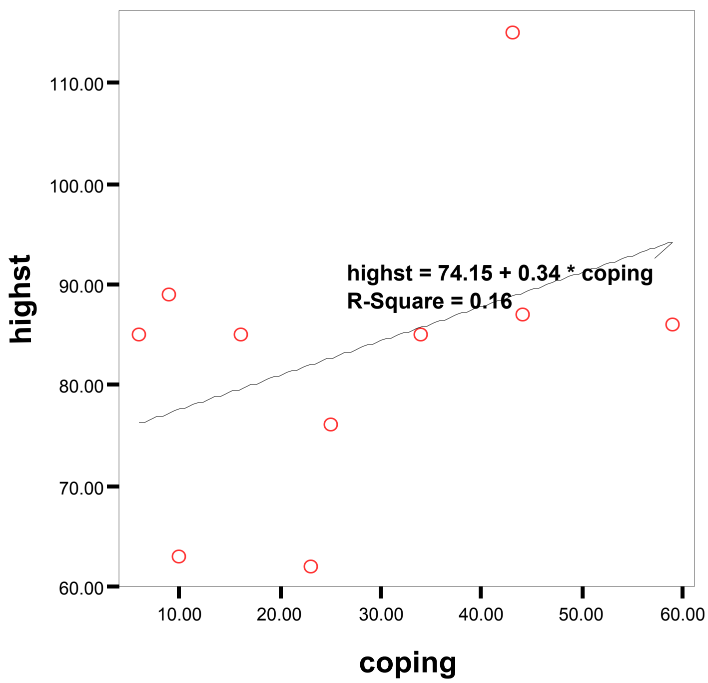
An examination of the means suggests that doing the extra credit helped more for the quiz in conditions 1 and 4 (or, not doing the extra credit hurt more in conditions 1 and 4) than in the other conditions, with the extra credit affecting the quiz score least in conditions 2 and 5.

There was also a significant main effect of doing the extra credit ($F(1,103) = 10.16$, $p = .002$) such that people who did the extra credit assignment had higher scores overall ($M = 8.86$) that those who didn't do the extra credit assignment ($M = 7.54$).

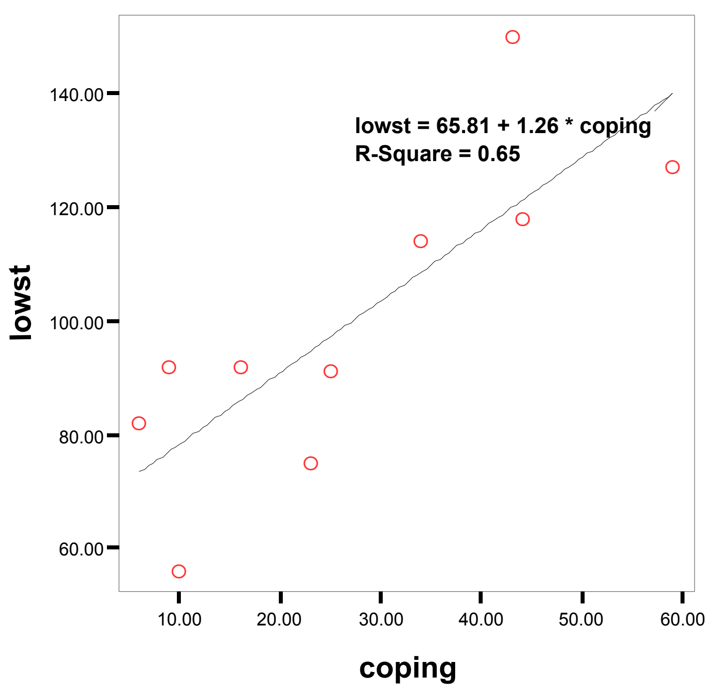
24-4

There is a significant difference in cognitive performance between individuals in the high stress ($M = 83.30$, $SD = 14.86$) and low stress ($M = 99.70$, $SD = 27.57$) conditions, $F(1,8) = 10.50$, $p = .012$.

There is also a significant interaction between stress and coping skills in their effect on cognitive performance, $F(1,8) = 128.28$, $p < .001$. Note that to interpret this interaction, we would need to examine scatterplots and/or regressions for the relation between coping and cognitive performance for the high and low stress conditions. An example of this graph is shown here:



Linear Regression



Linear Regression

There is also a significant relationship between coping and cognitive performance overall ($F(1,8) = 7.26$, $p = .027$). From the graphs above, it is clear that as coping skills increase, so does performance on the cognitive task.