Statistical Package for the Social Sciences

Applied Assessment Workbook

Answer Key

For instructor's use with:

Statistics for the Behavioral Sciences, 2e

SPSS in Focus: Entering and Defining Variables
Exercise 1.1 Answer Key

Enter data by column:

With regard to the SPSS exercise,, answer the following questions:

State whether you used the **data view** or **variable view** to complete each of the following steps:

Naming variables	variable view
Entering the values for each variable	data view

State the following values for the data you entered in SPSS:

The number of values entered (overall)	20
The number of values entered in each group	10
The number of groups	2

Enter data by row:

With regard to the SPSS exercise, answer the following questions:

State whether you used the **data view** or **variable view** to complete each of the following steps:

Naming variables	variable view
Coding variables	variable view
Entering the values for each variable	data view

State the following values for the data you entered in SPSS:

The number of values entered (overall)	20
The number of values entered in each group	10
The number of groups	2

SPSS in Focus: Frequency Distributions for Quantitative Data
Exercise 2.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

State the dependent variable: Number of absences

State the following values (you can find these in the SPSS output table):

Total number of scores entered	100
The score at the 50th percentile	5
The frequency at or above the 80th percentile	22
The frequency at or below the 80th percentile	80

Explain why the frequencies at or above and at or below the 80th percentile do not sum to 100.

The frequencies at or above and at or below the 80th percentile do not sum to the total number of scores entered (N = 100), because the frequency at the 80th percentile (2) is counted in both percentile ranges.

Remember that a main goal for using frequency distributions is to simplify large data sets, which makes it easier to interpret research data. That being said, how would you characterize or interpret the data displayed in the SPSS output table you created?

The data indicate that half the students at this school were absent from school 5 or fewer times in a given school year, and one-fourth missed 0 or 1 day of school (25 out of 100 students missed only 0 or 1 day of school).

SPSS in Focus: Frequency Distributions for Categorical Data
Exercise 2.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Answer each of the following questions about coding data in SPSS.

Are categories displayed as numbers or words in data view? Numbers
Are categories displayed as numbers or words in the SPSS output table? Words

State the dependent variable: Texting efficiency (Always, Sometimes, Never)

State the following values (you can find these in the SPSS output table):

Total number of scores entered	45
The number of categories	3
The category in the 50th percentile	N

Remember that a main goal for using frequency distributions is to simplify large data sets, which makes it easier to interpret research data. That being said, how would you characterize or interpret the data displayed in the SPSS output table you created?

The largest frequency of texting in class was among those who never (N) looked at the keys. So those who efficiently text, were more often observed texting during class.

SPSS in Focus: Histograms, Bar Charts, and Pie Charts
Exercise 2.3 Answer Key

With regard to the SPSS exercise, answer the following questions:

For the histogram, state the:

Dependent variable	Amount of calories per meal
Scale of measurement of the dependent variable	Ratio

For the bar chart and pie chart, state the:

Dependent variable	Frequency in each health category
Scale of measurement of the dependent variable	Ratio

Remember that a main goal for using graphs is to simplify large data sets. This goal makes it easier to interpret research data. That being said, how would you characterize or interpret the data displayed in the SPSS output graphs you created?

Most meals (as measured by number of calories) were unhealthy. This is evident both in terms of the number of calories (shown in the histogram) and the frequency of meals in each health category (shown in the bar chart and pie chart).

For your own reference, state which display is easiest for you to read. Please pick only one. There is no right or wrong answer here. It is simply worth recognizing the type of graphical display that makes the most sense to you.

SUGGESTION FOR USING THIS QUESTION IN CLASS: You can record responses of students for this question and distribute it in a frequency distribution for categorical data, and then create a bar chart from it. When you show students the results in class, this often leads to rather interesting conversation and opinions with regards to the "best" way for displaying data. So this little exercise can reinforce previous lectures, as well as gauge student interest. This is something to consider for your classes if you find the time. This exercise typically requires about 10 to 15 minutes of class time; maybe more time when student participation is high.

SPSS in Focus: Mean, Median, and Mode
Exercise 3.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

State the dependent variable: The number of standard drinks consumed

State the following values (from the SPSS output table):

Mean	5.4
Median	5.4
Mode(s)	5.4

Is there more than one mode in this distribution? How does SPSS display or indicate that the distribution of scores has more than one mode?

No, there is only one mode. When more than one mode exists, SPSS lists the smallest value of the mode, and states below the table that "multiple modes exist."

Interpret the data displayed in the SPSS output table. Which measure of central tendency is the most appropriate statistic to summarize these data?

The distribution appears to be approximately normally distributed because the mean, median, and mode are all the same value; all values equal 5.4. Hence, the mean is an appropriate statistic to summarize these data.

SPSS in Focus: Range, Variance, and Standard Deviation
Exercise 4.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

State the dependent variable: The number of standard drinks consumed

State the following values (from the SPSS output table):

Sample size	30
Range	13.7
Variance	11.779
Standard Deviation	3.432

Interpret the data displayed in the SPSS output table. Also, compute the mean using SPSS (this was computed in the SPSS Exercise 3.1) and factor this in your interpretation.

Scores ranged from 0.5 to 14.2 with a standard deviation of 3.432 standard drinks. Because the mean, median, and mode are all the same value (5.4), this distribution appears to be approximately normally distributed with 5.4±3.432 (*M*±SD).

SPSS in Focus: Probability Tables
Exercise 5.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table(s) shown in SPSS, state the following values:

The probability of [**overweight**] $p = 0.55$
The probability of [**high fat diet**] $p = 0.50$
The probability of [**overweight**], and [**high fat diet**] $p = 0.40$
The probability of [**overweight**], given [**high fat diet**] $p = 0.80$
The probability of [**high fat diet**], given [**overweight**] $p = 0.73$

Are the two conditional probabilities the same or different? Explain why.

The probabilities are different, because the sample space was limited to two different groups of different size. In the first conditional probability, the sample size was limited only to those children consuming a high fat diet; in the second conditional probability, the sample size was limited to only those children who were overweight. Because these sample sizes differed, so also did the probabilities.

Based on your answers, provide an interpretation of these conditional probabilities.

Among children who eat a high fat diet, there is a very high probability that they are also overweight ($p = 0.80$). Similarly, among children who are overweight, there is a very high probability that they also eat a high fat diet ($p = 0.73$).

SPSS in Focus: Converting Raw Scores to Standard z-Scores
Exercise 6.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for the original data:

Sample size	40
Minimum score	5
Maximum score	25
Mean score	14
Standard deviation	5.154

Based on the *z*-scores listed in the *z*-scores column (data view), state the following values:

Minimum *z*-score	-1.74620
Maximum *z*-score	2.13425
Mean *z*-score	0.00000

How many scores were:

Above the mean	15
Below the mean	17
Equal to the mean	8

SPSS in Focus: Estimating the Standard Error of the Mean
Exercise 7.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

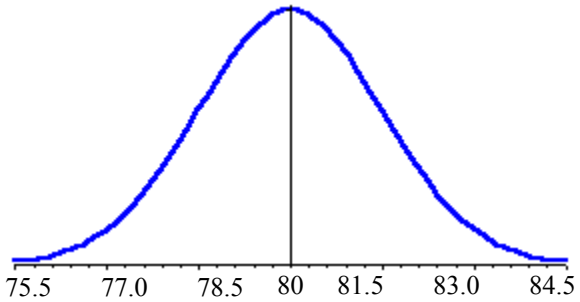
Based on the table shown in SPSS, state the following values for the original data (labeled as *statistic* in the SPSS output table):

Sample size	80
Minimum score	45
Maximum score	100
Mean score	80.000
Standard deviation	13.260

Based on the table shown in SPSS, state the following values for the sampling distribution:

Mean	80.000
Standard error	1.482

Draw the sampling distribution 3*SEM* above and below the mean for this example.



SPSS in Focus: One-Independent Sample *t*-Test
Exercise 9.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for the sample:

Sample size	36
Sample mean	0.778
Sample standard deviation	1.742
Estimated standard error	0.290 (labeled "Std. Error Mean")

Based on the table shown in SPSS, state the following values associated with the test statistic:

Mean difference	0.778
t-obtained (*t*)	2.679
Degrees of freedom (*df*)	35
Significance (2-tailed)	.011

Based on the value of the test statistic, what is the decision for a one-independent sample *t*-test? (Circle one)

Retain the null Reject the null

Compute Cohen's *d* and state the size of the effect as small, medium, or large. (Show your work). In a sentence, also state the number of standard deviations that scores have shifted in the population. Note: The tables in SPSS give you all the data you need to compute effect size.

Cohen's $d = \frac{M - \mu}{SD} = \frac{0.78 - 0}{1.742} = 0.45$ (medium effect size). The romantic movie clip shifted mood scores 0.45 standard deviations above the mean in the population.

Compute proportion of variance using eta-squared or omega-squared, and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the proportion of variance in the dependent variable that can be explained by the factor. Note: The tables in SPSS give you all the information you need to compute proportion of variance.

Using **eta-squared**: $\eta^2 = \frac{t^2}{t^2 + df} = \frac{(2.679)^2}{(2.679)^2 + 35} = 0.17$ (medium effect size). Hence, 17% of the variability in mood can be explained by the romantic movie clip.

Using **omega-squared**: $\omega^2 = \frac{t^2 - 1}{t^2 + df} = \frac{(2.679)^2 - 1}{(2.679)^2 + 35} = 0.15$ (medium effect size). Hence, 15% of the variability in mood can be explained by the romantic movie clip.

SPSS in Focus: Two-Independent Sample *t*-Test
Exercise 9.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for each group. Make sure you label a group name for each group in each column in the space provided:

	Group 1:	Group 2:
	Attractive Confederate	Unattractive Confederate
Sample size	18	18
Sample mean	4.017	5.956
Sample standard deviation	2.646	2.463
Estimated standard error	0.624	0.581

Based on the table shown in SPSS, state the following values associated with the test statistic (assume equal variances):

Mean difference	-1.939
t-obtained	-2.276
Degrees of freedom	34
Significance	.029
Estimated standard error for the difference	0.852

Based on the value of the test statistic, what is the decision for a two-independent sample *t*-test? (Circle one)

Retain the null Reject the null

Compute Cohen's *d* and state the size of the effect as small, medium, or large. (Show your work,) In a sentence, also state the number of standard deviations that scores have shifted in the population. Note: The tables in SPSS give you all the data you need to compute effect size.

Cohen's $d = \frac{M_1 - M_2}{\sqrt{s_p^2}} = \frac{4.017 - 5.956}{2.554} = -0.76$ (medium effect size). The attractiveness of a confederate shifted the distance from the confederate 0.76 standard deviations below the mean in the population.

Compute proportion of variance using eta-squared or omega-squared, and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the

proportion of variance in the dependent variable that can be explained by the levels of the factor. Note: The tables in SPSS give you all the information you need to compute proportion of variance.

Using **eta-squared**: $\eta^2 = \frac{t^2}{t^2 + df} = \frac{(-2.276)^2}{(-2.276)^2 + 34} = 0.13$ (medium effect size). Hence, 13% of the variability in distance from the confederate can be explained by the attractiveness of the confederate.

Using **omega-squared**: $\omega^2 = \frac{t^2 - 1}{t^2 + df} = \frac{(-2.276)^2 - 1}{(-2.276)^2 + 34} = 0.11$ (medium effect size). Hence, 11% of the variability in distance from the confederate can be explained by the attractiveness of the confederate.

SPSS in Focus: The Related Samples *t*-Test
Exercise 10.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for each group. Make sure you label a group name for each group in the space provided:

	Group 1:	Group 2:
Group Name:	Colored Words	Black Words
Sample size	22	22
Sample mean	6.05	4.27
Sample standard deviation	1.963	2.414
Estimated standard error	0.419	0.515

Based on the table shown in SPSS, state the following values associated with the difference scores:

Mean difference	1.773
Standard deviation	3.854
Estimated standard error for difference scores	0.822

Based on the values you have summarized thus far, what value is the numerator for the test statistic? What value is the denominator for the test statistic?

The numerator is 1.773 (the mean difference). The denominator is 0.822 (the standard error).

Based on the table shown in SPSS, state the following values associated with the test statistic (given in last three columns of the bottom table in output screen):

t-obtained (*t*)	2.158
Degrees of freedom (*df*)	21
Significance (2-tailed)	.043

Based on the value of the test statistic, what is the decision for a related samples *t*-test? (Circle one)

Retain the null Reject the null

Compute Cohen's *d* and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the number of standard deviations that scores have shifted in the population. Note: The tables in SPSS give you all the data you need to compute effect size.

Cohen's $d = \frac{M_D}{s_D} = \frac{1.773}{3.854} = 0.46$ (medium effect size). The color of the word shifted recall 0.46 standard deviations above the mean in the population.

Compute proportion of variance using eta-squared or omega-squared, and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the proportion of variance in the dependent variable that can be explained by the levels of the factor. Note: The tables in SPSS give you all the information you need to compute proportion of variance.

Using **eta-squared**: $\eta^2 = \frac{t^2}{t^2 + df} = \frac{(2.158)^2}{(2.158)^2 + 21} = 0.18$ (medium effect size). Hence, 18% of the variability in recall can be explained by the color of the word.

Using **omega-squared**: $\omega^2 = \frac{t^2 - 1}{t^2 + df} = \frac{(2.158)^2 - 1}{(2.158)^2 + 21} = 0.14$ (medium effect size). Hence, 14% of the variability in recall can be explained by the color of the word.

SPSS in Focus: Confidence Intervals for One-Sample *t*-Test Exercise 11.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for the sample:

Sample size	45
Sample mean	80.00
Sample standard deviation	11.097
Estimated standard error	1.654

Based on the table shown in SPSS, state the following values associated with the test statistic and confidence intervals:

Mean Difference	3.000
t-obtained (*t*)	1.814
Degrees of freedom (*df*)	44
Significance (2-tailed)	.077
95 % Lower confidence interval	-.33
95 % Upper confidence interval	6.33

Based on the value of the test statistic, what is the decision for a one-independent sample *t*-test? (Circle one)

(Retain the null) Reject the null

What is the point estimate for this example?

Two correct answers here. The point estimate is 80.000 (the actual sample mean) or 3.000 (the mean difference, because SPSS uses this to construct the CI).

State the confidence interval in APA format for the actual data (not the difference scores, which SPSS uses to construct the confidence interval [CI]). Based on the null hypothesis that $\mu = 77$, does the confidence interval confirm your decision? Explain.

The confidence interval is 95% CI 76.67 83.33. The CI confirms the decision to retain the null hypothesis because 77 is contained within the confidence intervals.

If the decision of the hypothesis test was to reject the null hypothesis, state (in words) the size of the effect in the population.

There is no effect in the population because the null hypothesis ($\mu = 77$) is contained within the confidence interval. Scores did not shift outside the CI.

SPSS in Focus: Confidence Intervals for Two-Sample *t*-Test Exercise 11.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for each group. Make sure you label a group name for each group in each column in the space provided:

	Group 1: Men	Group 2: Women
Sample size	15	15
Sample mean	86.00	49.00
Sample standard deviation	44.516	23.136
Estimated standard error	11.494	5.974

Based on the table shown in SPSS, state the following values associated with the test statistic and confidence intervals (assume equal variances):

Mean difference	37.00
t-obtained	2.856
Degrees of freedom	28
Significance	.008
Estimated standard error for the difference	12.954
95 % Lower confidence interval	10.465
95 % Upper confidence interval	63.535

Based on the value of the test statistic, what is the decision for a two-independent sample *t*-test? (Circle one)

Retain the null (Reject the null)

What is the point estimate for this example?

The point estimate is 37.00 (the mean difference between the two groups).

State the confidence interval in APA format. Based on the null hypothesis that $\mu_1 - \mu_2 = 0$, does the confidence interval confirm your decision? Explain.

The confidence interval is 95% CI 10.47 63.54. The CI confirms the decision to reject the null hypothesis because 0 is outside the confidence intervals.

If the decision of the hypothesis test was to reject the null hypothesis, state (in words) the size of the effect in the population.

Mean calories from fat shifted between 10.47 and 63.54 calories in the population. Specifically, mean calories from fat were 10.47 to 63.54 calories higher for men than women.

SPSS in Focus: Confidence Intervals for Related Samples *t*-Test Exercise 11.3 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the table shown in SPSS, state the following values for each group (given in the top table of the output screen). Make sure you label a group name for each group in the space provided:

	Group 1: Water Group	Group 2: Nonalcoholic Group
Sample size	18	18
Sample mean	0.83	1.17
Sample standard deviation	0.924	1.150
Estimated standard error	0.218	0.271

Based on the table shown in SPSS, state the following values associated with the difference scores:

Mean difference	-0.333
Standard deviation	1.372
Estimated standard error for difference scores	0.323

Based on the table shown in SPSS, state the following values associated with the test statistic and confidence intervals:

t-obtained (*t*)	-1.031
Degrees of freedom (*df*)	17
Significance (2-tailed)	0.317
95 % Lower confidence interval	-1.016
95 % Upper confidence interval	0.349

Based on the value of the test statistic, what is the decision for the related samples *t*-test? (Circle one)

Retain the null Reject the null

What is the point estimate for this example?

The point estimate is -0.333 (the mean difference between the two groups).

State the confidence interval in APA format. Based on the null hypothesis that $\mu_D = 0$, does the confidence interval confirm your decision? Explain.

The confidence interval is 95% CI -1.02 0.35. The CI confirms the decision to retain the null hypothesis because 0 is contained within the confidence intervals.

If the decision of the hypothesis test was to reject the null hypothesis, state (in words) the size of the effect in the population.

There is no effect in the population because the null hypothesis ($\mu_D = 0$) is contained within the confidence interval. Scores did not shift outside the CI.

SPSS in Focus: The One-Way Between-Subjects ANOVA
Exercise 12.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the output shown in SPSS, complete the following *F*-table:

Sources of variation	SS	*df*	MS	F-statistic	Sig.
Between groups	4469.926	2	2234.963	4.623	.014
Error	24653.111	51	483.394		
Total	29123.037	53			

Based on the value of the test statistic, what is the decision for the one-way between-subjects ANOVA? (Circle one)

Retain the null (Reject the null)

Based on the *F*-table you just completed, state the following values:

Total sample size	54
Sample size per group	18
Number of groups (k)	3
Degrees of freedom numerator	2
Degrees of freedom denominator	51
Significance	.014

Based on your decision, is it appropriate to conduct a post hoc test? Explain. Note: If it is not necessary to conduct a post hoc test, then stop here.

Yes, it is appropriate to conduct a post hoc test because the result was significant. At least one pair of group means significantly differ.

Based on the SPSS output table, state each pair of means that significantly differed using a Fisher's LSD post hoc test. Hint: SPSS places an asterisk in the "Mean Difference" column of the output table to indicate statistical significance.

Two pairs of means were significantly different:
Group > None
Individual > None

Compute proportion of variance using eta-squared or omega-squared, and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the

proportion of variance in the dependent variable that can be explained by the levels of the factor. Note: The tables in SPSS give you all the information you need to compute proportion of variance.

Using **eta-squared**: $\eta^2 = \frac{SS_{BG}}{SS_T} = \frac{4469.926}{29123.037} = 0.15$ (medium effect size). Hence, 15% of the variability in time spent on task can be accounted for by the type of reinforcement received.

Using **omega-squared**: $\omega^2 = \frac{SS_{BG} - df_{BG}(MS_E)}{SS_T + MS_E} = \frac{4469.926 - 2(483.394)}{29123.037 + 483.394} = 0.118$ (medium effect size). Hence, 12% of the variability in time spent on task can be accounted for by the type of reinforcement received.

State the conclusion for this test in APA format. Make sure you summarize the test statistic, effect size, and each significant post hoc comparison. Provide an interpretation for the statistics you report.

An effect of type of reinforcement was significant, $F(2, 51) = 4.623$, $p = .014$ ($\eta^2 = 0.15$). Post hoc tests showed that group and individual reinforcement significantly increased the time spent on task compared to no reinforcement (Fisher's LSD, $p < .05$). This supports the hypothesis that reinforcement will increase time spent on task at work.

SPSS in Focus: The One-Way Within-Subjects ANOVA
Exercise 13.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the output given in SPSS, complete the following *F*-table (assume sphericity):

Sources of variation	SS	*df*	MS	F-statistic	Sig.
Between Treatments	13.857	3	4.619	4.488	.008
Error	40.143	39	1.029		
Total					

Based on the value of the test statistic, what is the decision for the one-way within-subjects ANOVA? (Circle one)

Retain the null (Reject the null)

Based on the table, the sum of squares for error is 40.143. Is this the total error in this study? If not, then what additional source of error is omitted?

It is not the total error because the between-persons error variance is omitted.

Based on the *F*-table you just completed, state the following values:

Sample size (n)	14
Number of groups (k)	4
Degrees of freedom numerator	3
Degrees of freedom denominator	39
Significance	.008

Based on your decision, is it appropriate to conduct a post hoc test? Explain. Note: If it is not necessary to conduct a post hoc test, then stop here.

Yes, it is appropriate to conduct a post hoc test because the result was significant. At least one pair of group means significantly differ.

Based on the SPSS output table, state each pair of means that significantly differed using a Fisher's LSD post hoc test. Hint: SPSS places an asterisk in the "Mean Difference" column of the output table to indicate statistical significance.

Three pairs of means were significantly different:
Super Hero > None

Parent > None
Teacher > None

Compute proportion of variance using eta-squared or omega-squared, and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the proportion of variance in the dependent variable that can be explained by the levels of the factor. Note: SPSS does not give the value of the sum of squares between persons (SS_{BP}) in a one-way within-subjects ANOVA, To find this value you need to reanalyze the data as a one-way between-subjects ANOVA. The sum of squares total (SS_T) for that test (given in the output) is also the sum of squares total for the one-way within-subjects ANOVA. To find SS_{BP}, subtract SS_T (for the between-subjects test) from SS_E (for the within-subjects test).

Using **eta-squared**: $\eta_P^2 = \frac{SS_{BG}}{SS_{BG} + SS_E} = \frac{13.857}{13.857 + 40.143} = 0.26$ (large effect size).
Hence, 26% of the variability in liking can be accounted for by the type of sticker.
Using **omega-squared**: $\omega_P^2 = \frac{SS_{BG} - df_{BG}(MS_E)}{(SS_{BG} + SS_E) + MS_E} = \frac{13.857 - 3(1.029)}{(13.857 + 40.143) + 1.029} = 0.196$
(medium effect size). Hence, 20% of the variability in liking can be accounted for by the type of sticker.

State the conclusion for this test in APA format. Make sure you summarize the test statistic, effect size, and each significant post hoc comparison. Provide an interpretation for the statistics you report.

An effect of type of sticker was significant, $F(3, 39) = 4.488$, $p = .008$ ($\eta^2 = 0.26$). Post hoc tests showed that the stickers depicting a person (super hero, parent, or teacher) significantly increased liking for the block of wood compared to the sticker depicting no person at all (Fisher's LSD, $p < .05$).

SPSS in Focus: The Two-Way Between-Subjects ANOVA
Exercise 14.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the output shown in SPSS, complete the following *F*-table (label each factor in the space provided in the first column):

Sources of variation	SS	*df*	MS	F-statistic	Sig.
A (Gender)	260.100	1	260.100	4.167	.049
B (Relationship Status)	0.400	1	0.400	.006	.937
AB (Gender × Relationship Status	3.600	1	3.600	.058	.812
Error	2247.000	36	62.417		
Total	2511.100	39			

Based on the value of the test statistics, what is the decision for each factor in the two-way between-subjects ANOVA? (Circle one)

Factor A:	Retain the null	**Reject the null**
Factor B:	**Retain the null**	Reject the null
AXB Interaction:	**Retain the null**	Reject the null

Based on the *F*-table you just completed, state the following values:

Total sample size	40	
Sample size per cell	10	
Number of levels for Factor A (*p*)	2	
Number of levels for Factor B (*q*)	2	
Significance for each test:	Factor A	.049
	Factor B	.937
	AXB Interaction	.812

Based on your decision(s), what is the next appropriate step? Note: Simple main effect tests are necessary when the interaction is significant.

No further tests are necessary because the only significant effect (Gender) has only 2 levels. Group means show that women are more forgiving than men.

If the interaction is significant, then reorganize the data and compute simple main effect tests. Otherwise, compute post hoc tests on the main effects and state each pair of means that significantly differed.

N/A. The main effect of gender has only 2 levels. No further tests necessary.

Compute proportion of variance using eta-squared or omega-squared for each *significant* effect, and state the size of the effect as small, medium, or large. (Show your work.) In a sentence, also state the proportion of variance in the dependent variable that can be explained by the levels or combination of levels for each factor. Note: The table in SPSS gives you all the information you need to compute proportion of variance.

There is only one significant effect of GENDER:

Using **eta-squared**: $\eta_A^2 = \frac{SS_A}{SS_T} = \frac{260.10}{2511.10} = 0.10$ (medium effect size). Hence, 10% of the variability in forgiveness can be accounted for by gender.

Using **omega-squared**: $\omega_A^2 = \frac{SS_A - df_A(MS_E)}{SS_T + ME_E} = \frac{260.10 - 1(62.417)}{2511.10 + 62.417} = 0.077$ (small effect size). Hence, 8% of the variability in forgiveness can be accounted for by gender.

State the conclusion for this test in APA format. Make sure you summarize the test statistic, effect size, and each significant simple effect or post hoc comparison test. Provide an interpretation for the statistics you report.

A main effect of gender was significant, $F(1, 36) = 4.167$, $p = .049$ ($\eta^2 = 0.10$), with forgiveness scores being higher among women ($M = 24.7$) compared to men ($M = 19.6$). No additional significant effects were observed.

SPSS in Focus: Pearson Correlation Coefficient
Exercise 15.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the correlation coefficient, is there a significant relationship? (Circle one)

Yes, significant (No, insignificant)

Based on the F-table you just completed, state the following values:

Pearson correlation	-.140
Coefficient of determination	.0196
Sample size	24
Significance (2-tailed)	.513

State the conclusions for this test using APA format. First, describe the correlation coefficient in words and give the value of *r*. Then give the value of R^2 and describe (in words) the effect size using the coefficient of determination.

A correlation between notebook computer use in class and final class grades was not significant, $r = -0.140$, $p = .513$. In this study, only about 2% of the variability in final grades can be accounted for by notebook computer use in class ($R^2 = .0196$).

SPSS in Focus: Spearman Correlation Coefficient
Exercise 15.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the correlation coefficient, is there a significant relationship? (Circle one)

Yes, significant (No, insignificant)

Based on the F-table you just completed, state the following values:

Correlation coefficient	.421
Coefficient of determination	.177
Sample size	20
Significance (2-tailed)	.064

State the conclusions for this test using APA format. First, describe the correlation coefficient in words and give the value of *r*. Then give the value of R^2 and describe (in words) the effect size using the coefficient of determination.

The correlation between order of being picked and popularity rankings was not significant, $r = +0.421$, $p = .064$. In this study, about 18% of the variability in popularity rankings can be accounted for by the order that players were picked ($R^2 = .177$).

SPSS in Focus: Point-Biserial Correlation Coefficient
Exercise 15.3 Answer key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the correlation coefficient, is there a significant relationship? (Circle one)

(Yes, significant) No, insignificant

Based on the F-table you just completed, state the following values:

Correlation coefficient	.638
Coefficient of determination	.407
Sample size	22
Significance (2-tailed)	.001

State the conclusions for this test using APA format. First, describe the correlation coefficient in words and give the value of *r*. Then give the value of R^2 and describe (in words) the effect size using the coefficient of determination.

A significant positive correlation was evident between loneliness scores and whether or not the participant was physical activity, $r = +0.638$, $p = .001$. In this study, about 41% of the variability in loneliness scores can be accounted for by physical activity ($R^2 = .407$).

SPSS in Focus: Phi Correlation Coefficient
Exercise 15.4 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the correlation coefficient, is there a significant relationship? (Circle one)

(Yes, significant) No, insignificant

Based on the F-table you just completed, state the following values:

Correlation coefficient	.166
Coefficient of determination	.028
Sample size	150
Significance (2-tailed)	.042

State the conclusions for this test using APA format. First, describe the correlation coefficient in words and give the value of *r*. Then give the value of R^2 and describe (in words) the effect size using the coefficient of determination.

A significant positive correlation was evident between racial bias and choice of clip, $r = +0.166$, $p = .042$. Although, in this study only about 3% of the variability in choice of clip can be accounted for by racial bias ($R^2 = .028$).

SPSS in Focus: Analysis of Regression
Exercise 16.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the output shown in SPSS, complete the following F-table:

Sources of variation	SS	*df*	MS	F-statistic	Sig.
Regression	523.222	1	523.222	5.119	.036
Residual (Error)	1839.728	18	102.207		
Total	2362.950	19			

Based on the value of the test statistic, what is the decision for the analysis of regression? (Circle one)

Retain the null (Reject the null)

Based on the F-table you just completed, state the following values:

Sample size	20
Standard error of estimate	10.110
Proportion of variance	.221
Significance	.036

State the results of the analysis of regression using APA format. Then give the value of R^2 and describe (in words) the effect size using the coefficient of determination.

A significant linear regression was evident, F (1,18) = 5.119, p = .036. Hence, attitudes toward organic consumption significantly predict eco-friendly behaviors among college students. In this study, 22% of the variability in eco-friendly behaviors can be accounted for by attitudes toward organic consumption (R^2 = .221).

SPSS in Focus: Napping to Calm Children
Exercise 16.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Sample size	**15**
Standard error of estimate	**2.879**
Proportion of variance (R^2)	**.125**

Based on the output shown in SPSS, complete the following regression table:

Sources of Variation	***SS***	***df***	***MS***	***F*-Statistic**	**Sig.**
Regression	14.269	2	7.135	0.861	.447
Residual (error)	99.464	12	8.289		
Total	113.733	14			

Based on the value of the test statistic, what is the decision for the analysis of regression? (Circle one)

Retain the null hypothesis Reject the null hypothesis

To identify the standardized β coefficients, state the following values:

Standardized β for number of naps	**.511**
Standardized β for length of naps	**-.263**
Significance for test of number of naps	**.243**
Significance for test of length of naps	**.539**

State the results of the analysis of multiple regression using APA format. Refer to the standardized β coefficient to identify the relative significance of each factor.

An analysis of multiple regression showed no relationship between the number and length of naps on calmness (measured by crying time). When the relative contribution of each predictor variable was tested using the coefficients, no significance was evident, indicating that napping (number and length) did not predict calmness (crying time).

SPSS in Focus: The One-Way Chi-Square Goodness-of-Fit Test
Exercise 17.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the one-way chi-square goodness-of-fit test? (Circle one)

(Retain the null hypothesis) Reject the null hypothesis

Based on the data given in the SPSS output, state the frequency observed and frequency expected for each level of the categorical factor. Make sure you label a group name for each level of the categorical variable.

Level of Factor (k)	Frequency observed	Frequency Expected
1 deployment	22	32
2 deployments	36	32
3 deployments	34	32
4+ deployments	36	32

Based on the SPSS output, state the following values for the test statistic:

Total sample size	128
Chi-square test statistic	4.250
Degrees of freedom	3
Significance	.236

State the conclusions for this test using APA format. Provide an interpretation for your conclusion.

The discrepancy between observed and expected frequencies failed to reach significance, $\chi^2(3) = 4.250$, $p = 0.236$. The observed frequencies fit well with expected frequencies.

SPSS in Focus: The Two-Way Chi-Square Test for Independence Exercise 17.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the two-way chi-square test for independence? (Circle one)

Retain the null hypothesis (Reject the null hypothesis)

Based on the data given in the SPSS output, draw the frequency expected table and fill in the frequencies expected in each cell, row, column, and total.

		Type of Textbook		
		New	Used with MH	Used with SH
Outcome	Pass	71.50	73.16	67.34
	Fail	14.50	14.84	13.66

Based on the SPSS output, state the following values for the test statistic:

Total sample size	255
Chi-square test statistic	6.128
Degrees of freedom	2
Significance	.047

What is the effect size using Cramer's *V*? (Show your work.) Note: The value that you compute should match that given in the SPSS table.

Cramer's $V = \sqrt{\frac{6.128}{255}} = 0.155$ (This matches the value given in the SPSS output table).

State the conclusions for this test using APA format. Make sure you state the value of the test statistic, degrees of freedom, *p* value, and effect size. Provide an interpretation for your conclusion.

A test for independence showed that outcomes and type of textbook are related, χ^2 (2) = 6.128, p = .047 (V = 0.155). Hence, the type of textbook used (new, used with MH, used with SH) is related to student outcomes (pass, fail).

SPSS in Focus: The Related Samples Sign Test
Exercise 18.1 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the related samples sign test? (Circle one)

Retain the null hypothesis **Reject the null hypothesis**

Based on the data given in the SPSS output, state the following frequencies:

Negative differences	5
Positive differences	16
Ties	1
Total	22
Significance	.027

State the conclusions for this test using APA format. Provide an interpretation for your conclusion.

A related samples sign test was significant, $x = 16$, $p = .027$. This test showed that women who were pregnant for the first time drank significantly less caffeinated drinks 6 months following pregnancy compared to women who were pregnant for the second time.

SPSS in Focus: The Wilcoxon Signed-Ranks T Test
Exercise 18.2 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the Wilcoxon signed-ranks T test? (Circle one)

Retain the null hypothesis **Reject the null hypothesis**

Based on the data given in the SPSS output, state the following frequencies:

Negative differences	15
Positive differences	2
Ties	1
Total	18

Based on the SPSS output, state the following values for the test statistic:

Z	-3.480
Asymp. Sig. (2-tailed)	.001

State the conclusions for this test using APA format. Provide an interpretation for your conclusion.

A Wilcoxon signed-ranks T test was significant, $z = -3.480$, $p = .001$. This test showed that alcohol-dependent siblings expressed significantly greater delinquent traits during childhood compared with their non-substance dependent siblings.

SPSS in Focus: The Mann-Whitney *U* Test
Exercise 18.3 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the Mann-Whitney *U* test? (Circle one)

(Retain the null hypothesis) Reject the null hypothesis

Based on the data given in the SPSS output, state the following values for each group. Make sure you label a group name for each group in each column in the space provided.

	Group 1:	Group 2:
	General Education Teachers	Special Education Teachers
Sample size	14	14
Mean rank	12.39	16.61
Sum of ranks	173.50	232.50

Based on the SPSS output, state the following values for the test statistic:

Mann-Whitney *U*	68.500
Z	-1.358
Asymp. Sig. (2-tailed)	.174

State the conclusions for this test using APA format. Provide an interpretation for your conclusion.

A Mann-Whitney *U* test was not significant, $z = -1.358$, $p = .174$. Attitudes regarding the inclusion of students with disabilities into the regular classroom are the same between general and special education teachers.

SPSS in Focus: The Kruskal-Wallis *H* Test
Exercise 18.4 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the Kruskal-Wallis *H* test? (Circle one)

(Retain the null hypothesis) Reject the null hypothesis

Based on the data given in the SPSS output, state the sample size and mean rank for each group. Make sure you label a group name for each group in the first column.

Group Name	Sample size	Mean Rank
Yes-Yes	16	40.69
Yes-No	16	31.13
No-Yes	16	29.38
No-No	16	28.81

Based on the SPSS output, state the following values for the test statistic:

Chi-square	4.346
Degrees of freedom	3
Asymp. Sig.	.226

State the conclusions for this test using APA format. Provide an interpretation for your conclusion.

A Kruskal-Wallis *H* test was not significant, $\chi^2(3) = 4.346$, $p = .226$. The convenience and visibility of vegetables did not result in significant differences between groups.

SPSS in Focus: The Friedman Test
Exercise 18.5 Answer Key

With regard to the SPSS exercise, answer the following questions:

Based on the value of the test statistic, what is the decision for the Kruskal-Wallis *H* test? (Circle one)

Retain the null hypothesis **Reject the null hypothesis**

Based on the data given in the SPSS output, state the sample size and mean rank for each group. Make sure you label a group name for each group in the first column.

Group Name	Mean Rank
Stranger	1.75
Owner	1.71
Other Dogs	2.54

Based on the SPSS output, state the following values for the test statistic:

N	14
Chi-square	6.500
Degrees of freedom	2
Asymp. Sig.	.039

State the conclusions for this test using APA format. Provide an interpretation for your conclusion.

A Friedman test was significant, $\chi^2(2) = 6.500$, $p = .039$. Canine aggression was directed most strongly toward other dogs, followed by strangers, and owners. Hence, other dogs, not people, are at greatest risk of encountering canine aggression in this community.