

Part A. Research Concepts

1. What is the mean of a sample containing the following values: 20, 5, 10, 15, 100
 - a. 20
 - b. 30
 - c. 80
 - d. 95

2. Using the same numbers from the previous question, what is the range?
 - a. 20
 - b. 30
 - c. 80
 - d. 95

3. Alternative explanations in science are also known as:
 - a. null hypotheses
 - b. rival hypotheses
 - c. research hypotheses
 - d. extraneous variables

4. The statistical test used most commonly with nominal data is the:
 - a. Pearson's product moment correlation
 - b. ANOVA
 - c. chi-square
 - d. t-test

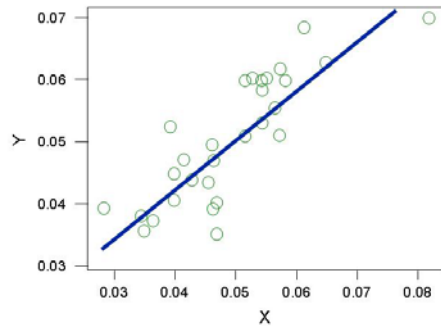
5. A good starting question in a survey would be:
 - a. demographic question (e.g., your age)
 - b. open-ended question (e.g., what do you think about global warming?)
 - c. sensitive question (e.g., how often do you have sex with a horse?)
 - d. easy question (e.g., how often do you visit the park?)

6. Which level or constraint allows us to draw causal inferences with confidence?
 - a. differential
 - b. naturalistic
 - c. case-study
 - d. experimental

7. Low-constrain research enables us to obtain useful information about
 - a. techniques for manipulating variables
 - b. causality
 - c. relationships among variables
 - d. making and testing predictions

8. Case-study research:
 - a. is generally applicable to the wider society
 - b. is similar to high constraint research
 - c. can be used to predict future results with a high degree of accuracy
 - d. may not predict behavior in the wider society

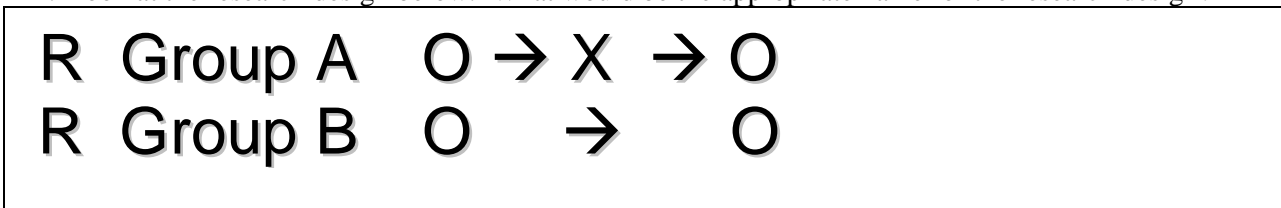
9. What statistic is calculated from the graphic below?
- r value
 - t statistic
 - F statistic
 - X^2 statistic



10. One function of correlational research is to:
- provide data that are consistent with a theory
 - provide data negating a theory
 - prove a theory correct
 - both A and B
11. "As the sea level gets higher, the pregnancy rate increases." This statement best describes:
- A spurious correlation
 - Cause and effect
 - An inferred relationship
 - A negative correlation
12. Correlating one variable with another after statistically removing the effects of a third variable is called:
- a multiple correlation
 - a simple correlation
 - a partial correlation
 - a canonical correlation
13. In differential research, assignment of subjects is:
- random
 - pre-destined
 - on the basis of preexisting variable
 - by subject choice
14. Which type of design is typically used to examine interaction effects?
- factorial
 - covariate
 - blocking
 - nonequivalent
15. The experimenter hopes to find:
- high error variance
 - low experimental variance
 - high experimental variance
 - high within-groups variance

16. The F-test compares _____ variation to _____ variation.
- unsystematic between-groups; systematic within-groups
 - between groups; within groups
 - systematic within-groups error; nonsystematic within-groups
 - nonsystematic between-groups; systematic between-groups
17. Which of the following is a true experimental design?
- randomized, posttest-only design
 - single-group, pretest-posttest design
 - single-group, posttest only design
 - pretest-posttest, natural control-group design
18. Within-subjects designs reduce error variance by:
- controlling conditions of measurement
 - randomization
 - eliminating individual differences
 - adding more subjects
19. If there are no systematic between-group differences in an experiment, the F-ratio should have a value of:
- 9.00
 - 1.00
 - 1.00
 - 0
20. How many factors are there in a 4 x 4 x 5 factorial design?
- three
 - four
 - thirteen
 - eighty

21. Look at the research design below. What would be the appropriate name for the research design?



- experimental—randomized two group post-test design
 - experimental—randomized two group pre-test, post-test design
 - correlational—randomized two group design
 - differential—randomized two group design
22. If a researcher measured stress level of moose, relocated them to a place with more snows for two months, then measured their stress level again after two month, the research would be employing:
- a single-group, posttest-only design
 - ad hoc design
 - single-group, posttest-only design
 - single-group, pretest-posttest design

23. Examine the random number table below. In a systematic random sample, with a random start of 3, a sampling interval of 5, and a target sample size of 20, what would be the 2nd element sampled from the population if the population size is 100?

39634	62349	74088	65564	16379	19713	39153	69459	17986	24537
14595	35050	40469	27478	44526	67331	93365	54526	22356	93208
30734	71571	83722	79712	25775	65178	07763	82928	31131	30196
64628	89126	91254	24090	25752	03091	39411	73146	06089	15630
42831	95113	43511	42082	15140	34733	68076	18292	69486	80468
80583	70361	41047	26792	78466	03395	17635	09697	82447	31405
00209	90404	99457	72570	42194	49043	24330	14939	09865	45906
05409	20830	01911	60767	55248	79253	12317	84120	77772	50103
95836	22530	91785	80210	34361	52228	33869	94332	83868	61672
65358	70469	87149	89509	72176	18103	55169	79954	72002	20582
72249	04037	36192	40221	14918	53437	60571	40995	55006	10694
41692	40581	93050	48734	34652	41577	04631	49184	39295	81776

- a. 83rd element
- b. 9th element
- c. 50th element
- d. 69th element

24. Again, consulting the same random table above, in a systematic random sample, with a random start of 2, a sampling interval of 10, and a target sample size of 70, what would be the 2nd element sampled from the population if the population size is 700?

- a. 409th element
- b. 254th element
- c. 9th element
- d. 692st element

25. To do a systemic random sample with a population of 2000 and a target sample size of 50, what sampling interval would you use?

- a. 10
- b. 20
- c. 40
- d. 50

26. Choose the best answer to fill the gap.

- | |
|--|
| <ul style="list-style-type: none">• _____ sampling selects every nth element from a list.• _____ sampling usually requires a random number table. |
|--|

- a. simple random; systematic
- b. stratified; systematic
- c. systematic; simple random
- d. cluster; simple random

27. Ideally, strata in a stratified sample should be as _____ as possible.

28. The clusters in “cluster sampling” are assumed to be _____.

29. Choose the best answer to fill the gap.

- If we divide the population into similar groups and then randomly sample from each group we are using _____.
- If we divide the population into groups by geographic areas, randomly sample a subset of areas, and then measure every unit of each sample group, we are using _____.

- a. Simple random sampling; Stratified random sampling
- b. Stratified random sampling; Cluster sampling
- c. Cluster sampling; Stratified sampling
- d. Simple random sampling; Cluster random sampling

30. Choose the best answer to fill the gap.

- _____ describes a sampling procedure where the sampling fraction is equal for each stratum (subpopulation).
- An ecological sampling technique that involves randomly selected square areas to be observed is called _____.

- a. proportionate sampling; transect sampling
- b. disproportionate sampling; transect sampling
- c. proportionate sampling; square sampling
- d. disproportionate sampling; square sampling

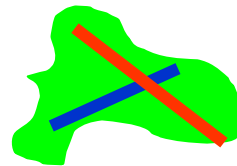
31. Choose the best answer to fill the gap.

- The non-probability sampling procedure where one person recommends another, who recommends another, who recommends another, is called _____.
- The non-probability sampling procedure where available, accessible, or volunteer subjects are sampled, is called _____.

- a. purposive sampling; convenience sampling
- b. snowball sampling; purposive sampling
- c. convenience sampling; purposive sampling
- d. snowball sampling; convenience sampling

32. The picture to the right shows what type of ecological sampling?

- a. transect sampling
- b. grid sampling
- c. point sampling
- d. square sampling



33. If a sample mean is calculated to be 15.25 and the sampling error is 0.5, what percentage of observations would be expected to fall between 14.75 and 15.75?

- a. 50%
- b. 64%
- c. 95%
- d. 99%

34. A sample has a mean of 25 and standard deviation of 5. What is the probability that a sample value will be found between 15 and 35?

- a. 50%
- b. 65%
- c. 95%
- d. 99%
- e. 100%

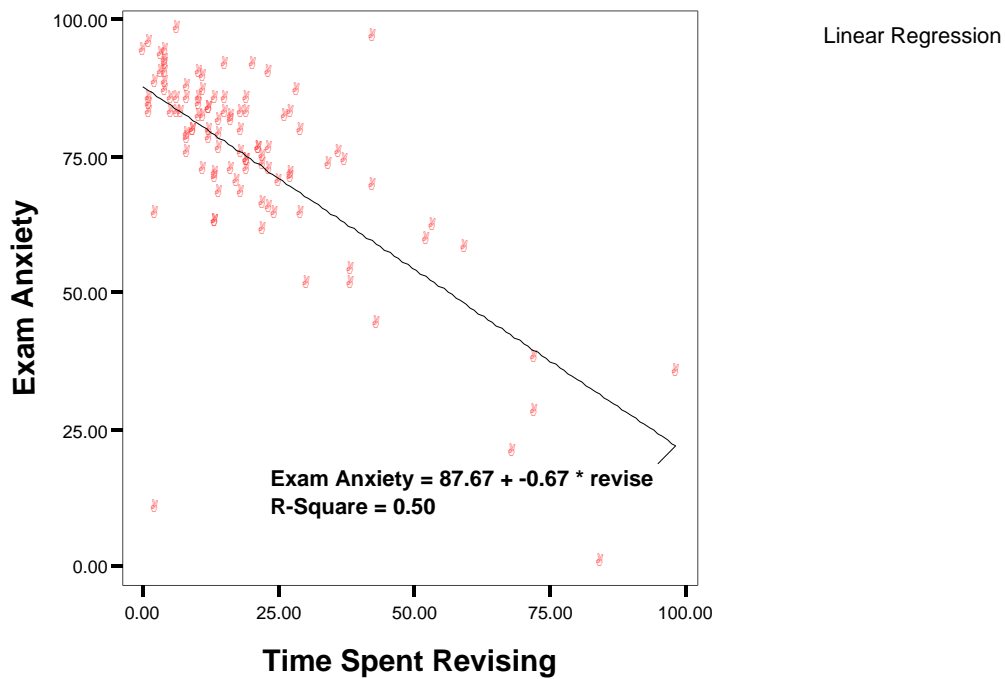
35. Statistical power increases linearly with increased sample size.
- TRUE
 - FALSE
36. The statistical test(s) most often used in differential research are:
- Kolmogorov-Smirnov
 - t-test and ANOVA
 - Mann-Whitney U-test
 - chi-square
37. In a t-test, the sum of the persons in both groups minus two is called:
- The t-value
 - The alpha level
 - The degrees of freedom
 - The mean
38. Using the table below, which one of the following is correct?

Descriptives

			Statistic	Std. Error
Exam Performance (%)	Mean		56.5728	2.55600
	95% Confidence Interval for Mean	Lower Bound	51.5030	
		Upper Bound	61.6426	
	5% Trimmed Mean		57.0901	
	Median		60.0000	
	Variance		672.914	
	Std. Deviation		25.94058	
	Minimum		2.00	
	Maximum		100.00	
	Range		98.00	
	Interquartile Range		40.00	
	Skewness		-.373	.238
	Kurtosis		-.852	.472

- negatively skewed
- positively skewed
- flat
- spiky
- none of the above

39. Using the graphic below, which one of the following is wrong?



- a. intercept is 87.67
- b. slope is -0.67
- c. negatively correlated
- d. correlation between the exam anxiety and time spent revising is -0.67

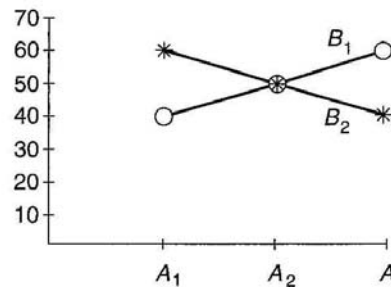
40. If a correlation coefficient is -0.35, the coefficient of determination would be:

- a. -0.35
- b. 0.35
- c. -0.1225
- d. 0.1225

41. Examine the results of the factorial analysis below. What “effect” is shown in the diagram?

- a. main
- b. constant
- c. interaction
- d. ANOVA

	A ₁	A ₂	A ₃	Mean
B ₁	40	50	60	50
B ₂	60	50	40	50
Mean	50	50	50	



42. Which statistic expresses a ratio of the difference between group means divided by within group variance?
- Chi-square
 - Kolmogorov-Smirnov
 - F
 - R^2
43. Qualitative research is generally considered to be:
- inductive
 - deductive
44. Which of the following would not be considered qualitative research?
- having participants keep a journal during the research study
 - conducting an interview and transcribing the interview
 - researching whether park visitation increases with lower entrance fees
 - gathering observational notes by observing as a participant
 - doing content analysis on newspaper articles
45. Which of the following emphasizes the observation of details of everyday life as they naturally unfold in the real world?
- hypothesis testing
 - grounded theory
 - phenomenology
 - ethnography
46. Qualitative research tends to be weakest on?
- internal validity
 - external validity
47. Which type of research approach is most useful to validate a theory?
- qualitative
 - quantitative
48. Which type of research approach is more generalizable?
- qualitative
 - quantitative
49. Which type of research approach generates more detail?
- qualitative
 - quantitative
50. In qualitative research, what would you call the following?
- traffic blockage → anxiety → anger
- construct
 - flow chart
 - concept map
 - coding

Part B. Applied Research Concepts and Statistics

**Use the following research description to answer Questions 51-59 following it.
[15 marks in total: 1 mark for each question unless otherwise stated.]**

A researcher wants to know if patients with depression show significantly more frequent and more serious symptoms of the depression if they watch TV. The researcher also wants to know if patients' age is a factor. The following research is set up.

All patients were interviewed every night before bedtime and checked for number of depression symptoms they showed, the seriousness of each depression symptom is judged later by doctors using a 25 point (interval) of seriousness.

The subjects are patients with depression with age ranging from 15 to 50 years old. The subjects are randomly assigned to two conditions (TV vs no TV), and the age range is the same for both groups.

All patients had the same timetable, but the experimental group had TV time for three hours, while the control group did not have TV time. If a patient's symptom is too serious, he/she is pulled out from this experiment.

51. Draw a diagram of the research design. [4 marks]

52. What is the level of constraint in the study? (Circle one response)

- a. naturalistic
- b. experimental
- c. correlational
- d. differential

53. What is the independent variable in the study? (Circle one response)
- age
 - number of patients
 - number of depression symptoms
 - seriousness of depression symptoms
54. How many levels of the manipulated independent variable are there in the study?
- one
 - two
 - three
 - there is no manipulated independent variable
55. What type of design is represented in the research?
- correlated-groups (within-groups) design
 - independent-groups design
 - nonparametric design
 - both 2 and 3
56. What are the dependent measures in the study?
- age of patients and number of depression symptoms
 - number of days stayed in the experiment and number of depression symptoms
 - number of days stayed in the experiment, number and seriousness of depression symptoms
 - number and seriousness of depression symptoms
57. What is the level of measurement of the dependent measures in the study?
- ratio; interval
 - nominal; ratio; interval
 - interval; ordinal
 - interval; ordinal; ratio
58. What type(s) of data is(are) generated for the dependent measure(s) in the study?
- nominal; score; ordered
 - score; interval
 - nominal; score
 - score; score
59. Given the four hypotheses below, what statistical procedures (analyses) are appropriate to test each hypothesis? [4 marks]

Hypothesis 1: TV will cause more depression symptoms.

Hypothesis 2: Seriousness will be greater if depressed patients watch TV.

Hypothesis 3: If they watched TV, there will be an inverse relationship between age and the number of depression symptoms.

Hypothesis 4: If they watched TV, there will be inverse relationship between age and seriousness of depression symptoms.

Statistical Procedure

Hypothesis 1→

Hypothesis 2→

Hypothesis 3→

Hypothesis 4→

**Use the following research description to answer Questions 60-65 following it.
[12 marks in total: 1 mark for each question unless otherwise stated.]**

The head of bio-security officers wants to determine if a video program containing extra detailed information about which food items they can bring into the country to change their habits of declaring unnecessary items (such as chocolates). Three airports where most tourists visit are chosen. The prime tourist season is in the summer months for 90 days.

For sampling, the head officer decided to randomly select 20 percent of the days (18 days) throughout the season. A systematically chosen airport was then matched with each day. On the sampled day at the selected airport, the head officer asked all passengers of every fifth flight arriving into the airport to answer 10 questions whether they can bring in the food item stated in each question or not. A maximum of 5 flights per day were contacted. Once the test forms were collected, a randomly selected passenger of the flight was asked to select a number out of a hat. If the number “2” was selected, the number was recorded and the passengers in the flight watched the usual bio-security video program. If the number “1” was selected, the number was recorded and the passengers in the flight watched the extra detailed bio-security program. The flight attendance recorded this information for each flight on behalf of the head officer.

After 5 flights had been contacted, the head officer called eleven officers at the airport. Ten officer then checked baggage of every passenger to check if any of the 10 items are falsely declared or not declared while one officer calculate the mean score for each flight on the written test. This score could then be compared to the mean score the other ten officers obtained through search.

The results of the study showed that people who viewed the video program containing extra detailed information changed their declaring habits by not declaring unnecessary items but declaring necessary items.

60. Using O's for observation and X's for treatment (or the diagram style the book), draw a diagram of the study. What type of research design would you call this? Why? What are the independent and dependent variables? [5 marks]

61. State the null hypothesis for this study.
62. How many stages and what kind of sampling did the head officer use in the study? Were the sampling procedures probability or non-probability based? [3 marks]
63. What is head officer's unit of analysis?
64. What is head officer's sampling element (select one of the stages and tell me the sampling element for that stage)?
65. Assuming that both the test and observation data were recorded on the same interval or ratio scale, what statistical test would you use in this study to test the hypothesis?
66. Describe the concept of "sampling error." What influences sampling error? [2 marks]

Use the following research description and SPSS output to answer Questions 67-72 following it. [7 marks in total: 1 mark for each question unless otherwise stated.]

Regression analysis was performed to determine which (hypothetical) independent variables (gender, age, having a geography class) best predict geography survey scores. The SPSS output appears below.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.488 ^a	.238	.212	5.135

a. Predictors: (Constant), Geography class, Gender, Age

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	740.567	3	246.856	9.360	.000 ^a
	Residual	2373.487	90	26.372		
	Total	3114.053	93			

a. Predictors: (Constant), Geography class, Gender, Age

b. Dependent Variable: Total Correct

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	22.557	3.017		7.477	.000
	Gender	-4.388	1.076	-.380	-4.077	.000
	Age	.183	.081	.212	2.259	.026
	Geography class	-2.153	1.191	-.167	-1.808	.074

a. Dependent Variable: Total Correct

67. What are the independent and dependent variable? [2 marks]

68. What are the Pearson product moment correlation coefficient and the coefficient of determination? [2 marks]

69. Is the regression model statistically significant? YES/NO (choose one)

70. Which independent variable is the best predictor of scores?

71. What is the actual regression equation?

Use the following research description and SPSS output to answer Questions 72-78 following it. [7 marks in total: 1 mark for each question unless otherwise stated.]

A sprint race competition was held at Mawson Lakes to find out which undergraduate program has the fastest students. Each program was allowed to pick its 10 fastest students to run the 100 meter dash. Four programs entered teams—Biodiversity, Recreation, Engineering, and Information Technology. After running the race, the race times (in seconds) of the competing teams were entered into SPSS. Answer the questions below based on the SPSS ANOVA results.

Descriptives

TIME100M

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Biodiversity	10	13.9400	.41952	.13266	13.6399	14.2401	13.20	14.50
Recreation	10	13.4800	.44171	.13968	13.1640	13.7960	12.90	14.10
Engineering	10	14.2700	.27101	.08570	14.0761	14.4639	14.00	14.80
Information Technology	10	14.2700	.56184	.17767	13.8681	14.6719	13.50	15.30
Total	40	13.9900	.53195	.08411	13.8199	14.1601	12.90	15.30

ANOVA

TIME100M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.194	3	1.398	7.356	.001
Within Groups	6.842	36	.190		
Total	11.036	39			

Multiple Comparisons

Dependent Variable: TIME100M

	(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	Biodiversity	Recreation	.4600	.19496	.104	-.0651	.9851
		Engineering	-.3300	.19496	.342	-.8551	.1951
		Information Technology	-.3300	.19496	.342	-.8551	.1951
	Recreation	Biodiversity	-.4600	.19496	.104	-.9851	.0651
		Engineering	-.7900*	.19496	.001	-1.3151	-.2649
		Information Technology	-.7900*	.19496	.001	-1.3151	-.2649
	Engineering	Biodiversity	.3300	.19496	.342	-.1951	.8551
		Recreation	.7900*	.19496	.001	.2649	1.3151
		Information Technology	.0000	.19496	1.000	-.5251	.5251
	Information Technology	Biodiversity	.3300	.19496	.342	-.1951	.8551
		Recreation	.7900*	.19496	.001	.2649	1.3151
		Engineering	.0000	.19496	1.000	-.5251	.5251
LSD	Biodiversity	Recreation	.4600*	.19496	.024	.0646	.8554
		Engineering	-.3300	.19496	.099	-.7254	.0654
		Information Technology	-.3300	.19496	.099	-.7254	.0654
	Recreation	Biodiversity	-.4600*	.19496	.024	-.8554	-.0646
		Engineering	-.7900*	.19496	.000	-1.1854	-.3946
		Information Technology	-.7900*	.19496	.000	-1.1854	-.3946
	Engineering	Biodiversity	.3300	.19496	.099	-.0654	.7254
		Recreation	.7900*	.19496	.000	.3946	1.1854
		Information Technology	.0000	.19496	1.000	-.3954	.3954
	Information Technology	Biodiversity	.3300	.19496	.099	-.0654	.7254
		Recreation	.7900*	.19496	.000	.3946	1.1854
		Engineering	.0000	.19496	1.000	-.3954	.3954

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

72. Which team won the competition (overall fastest time)?
- Biodiversity
 - Recreation
 - Engineering
 - Information Technology
73. Overall, are the mean race times of the 4 teams statistically different?
- YES
 - NO
74. What is the statistical significance level of the ANOVA?
75. Which statistic measures the ratio of between group differences divided by within group variances?
- 4.194
 - 11.036
 - 1.398
 - 7.356
76. The Biodiversity students claimed that the Recreation students cheated (not true!) and that the overall mean sprint times between Biodiversity and Recreation students were not statistically different (at the .05 level). You decide--do the mean sprint times of the Recreation students statistically differ from the Biodiversity students using the most "liberal" post hoc test of group difference?
- YES
 - NO
77. The Engineering students made a similar claim, that they were faster than the Information Technology students using the most "liberal" test of group difference. What is the p-value of the most "liberal" post-hoc comparison between Engineering and IT students?
- 1.000
 - .000
 - .099
 - .024
78. Another name for Tukey's post hoc test of group difference is Tukey's HSD. HSD stands for honestly significant difference. The Tukey's test adjusts for the increased possibility of finding differences between means—when none actually exist—because it is known that the probability of finding mean differences increases with the sheer number of comparisons. What do we call the error of finding a difference in group means when none actually exists?
- Null hypothesis error
 - Alternative hypothesis error
 - Type I error
 - Type II error

Use the following SPSS output to answer Questions 79-83 following it.
 [7 marks in total: 1 mark for each question unless otherwise stated.]

A factor model was created and tested to determine if gender and age group affect geography survey scores. The two factors were gender (M/F) and age group (2 groups aged 18 to 24 and age 25 and above).
 Note: Q24 in the output below is the gender variable.

Descriptive Statistics

Dependent Variable: Total Correct

Gender	Age Group	Mean	Std. Deviation	N
Male	18-24	18.74	5.465	31
	25 and above	22.54	3.455	13
	Total	19.86	5.219	44
Female	18-24	14.18	4.856	40
	25 and above	18.60	6.022	10
	Total	15.06	5.351	50
Total	18-24	16.17	5.581	71
	25 and above	20.83	5.033	23
	Total	17.31	5.787	94

Tests of Between-Subjects Effects

Dependent Variable: Total Correct

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	828.712 ^a	3	276.237	10.879	.000
Intercept	23418.631	1	23418.631	922.259	.000
Q24	308.914	1	308.914	12.165	.001
AGEGRP	288.638	1	288.638	11.367	.001
Q24 * AGEGRP	1.687	1	1.687	.066	.797
Error	2285.341	90	25.393		
Total	31275.000	94			
Corrected Total	3114.053	93			

a. R Squared = .266 (Adjusted R Squared = .242)

79. What are the independent and dependent variable(s)? [2 marks]

80. How would you describe the factor model?

- a. 2 x 3
- b. 3 x 3
- c. 2 x 2
- d. 3 x 2

81. What is the p-value associated with the overall factor model?

82. What is the p-value associated with the factor interaction?

83. Should the researcher conclude that gender and age group have significant effects on geography scores? Also determine if the research can conclude that gender and age group interact to have a significant effect on geography scores. [2 marks]

BONUS QUESTION (Not required—extra credit).

84. Although different survey techniques; cover-by-line intercept, cover-by-point and frequency produce what type of data? What implications does this have for analysis? [2 marks]

85. List the influences on park management. [3 marks]

86. In planning a monitoring program there are 12 steps that need to be considered before you undertake the field work. Discuss the steps which need to be considered for program planning [6 marks]

87. Interpret the results of the repeated measures ANOVA (presented in the table below) for species richness [7 marks].

Species Richness is just the number of plants per unit area. Species richness was used as an indicator for environmental outcomes in a trial examining the effectiveness and efficiency of three different herbicides. The herbicides were applied twice to the different plots containing the weed.

Repeated measures ANOVA results based on total species richness data

Between subjects	df	F	p
Treatment	2	10.01	< 0.001
Site	2	0.126	0.881
Site x Treatment	4	15.192	< 0.001
Within subjects			
Time	1	61.9	< 0.001
Time x Treatment	2	1.47	0.234
Time x Site	2	11.03	< 0.001
Time x Site x Treatment	4	7.78	< 0.001

ENVT2006 Applied Research and Evaluation
Final Exam Answer sheet

Answer sheet

Question	Answer
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