

Scenario 1 (*maximum 35 points*)

Biologists study various varieties of plants and animals. A popular animal that is studied is the fruitfly. The most important reason is that the fruitfly has a short lifespan, making it easy to grow multiple generations over a short period of time. For this characteristic, the fruitfly has been used extensively in genetic research.

One study concentrates on the sexual activity and the lifespan of male fruitflies. In this study, sexual activity was manipulated by supplying individual male fruitflies with one or eight receptive virgin females per day. The study objective is to determine the relationship between sexual activity, length of the fruitfly's thorax, and the percentage of each day spent sleeping on the fruitfly's lifespan. For this, Multivariate Regression Analysis is used. The results of the analysis are shown in section Scenario 1 - Tables Multivariate Regression Analysis 1 (pages 5-7).

Question 1:

Explain if Multivariate Regression Analysis is allowed for the given dataset. Indicate exactly which tables you use in your answer.

Question 2:

Use the SPSS output in section Scenario 1 - Tables Multivariate Regression Analysis 1, to correctly finish the text underneath. Unless specified differently, assume tests are two-tailed with $\alpha = 0.05$.

... % of the variance of the dependent variable is explained by the three independent variables. This percentage is is significant / is not significant, indicated by the-test. The null-hypothesis for this test is The alternative hypothesis is The test value is, with significance level This significance level is higher / lower than α . We reject / fail to reject the null-hypothesis.

The independent variable has the highest influence on the dependent variable. This is indicated by the which has value

Question 3:

Explain which independent variables have a significant contribution in the prediction of the dependent variable.

A second Multivariate Regression Analysis is performed on the fruitflies dataset. The results of this analysis are shown in section Scenario 1 - Tables Multivariate Regression Analysis 2 (page 8). To answer the following questions you will need to use results presented in sections Scenario 1 - Tables Multivariate Regression Analysis 1 and 2.

Question 4:

Explain which independent variables have a unique, significant contribution to the prediction of the dependent variable. Indicate exactly which table you use in your explanation.

Question 5:

Does multicollinearity cause a problem in the regression analysis that is presented in the SPSS output in section Scenario 1 – Multivariate Regression Analysis 2 (page 8)? Explain your answer.

In a final analysis of the fruitflies dataset the categorical variable, TYPE, was added to the regression model. TYPE indicates what kind of female is put next to the male fruitfly in the experiment. TYPE has three valid values (0 = 'newly pregnant females'; 1 = 'virgin female'; 9 = 'not applicable'). The TYPE variable was re-coded into two dummy variables: 'newly pregnant female' and 'not applicable'. The results of the analysis are presented in section Scenario 1 – Multivariate Regression Analysis 3 (page 9).

Question 6:

Explain which model you would select for predicting the dependent variable LIFESPAN. (Use analysis results presented in sections Scenario 1 - Tables Multivariate Regression Analysis 1 (pages 5-7), 2 (page 8), and 3 (page 9)). Indicate exactly which model from which table you select.

Scenario 1 – Tables Multivariate Regression Analysis 1

Descriptive Statistics

	Mean	Std. Deviation	N
Lifespan, in days	57,44	17,564	125
Number of companions	3,60	3,626	125
Length of thorax, in mm (x.xx)	,8210	,07745	125
Percentage of each day spent sleeping	23,46	15,879	125

Descriptives

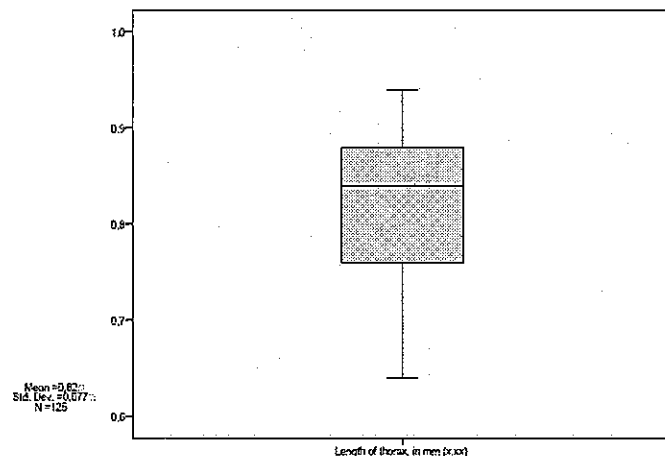
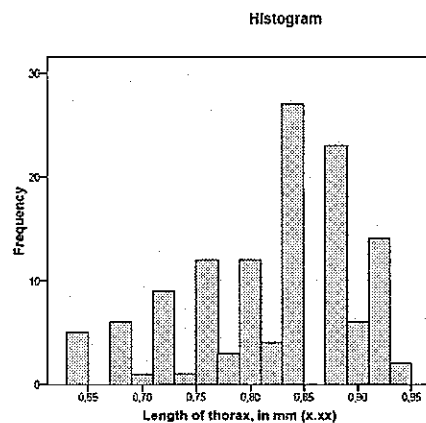
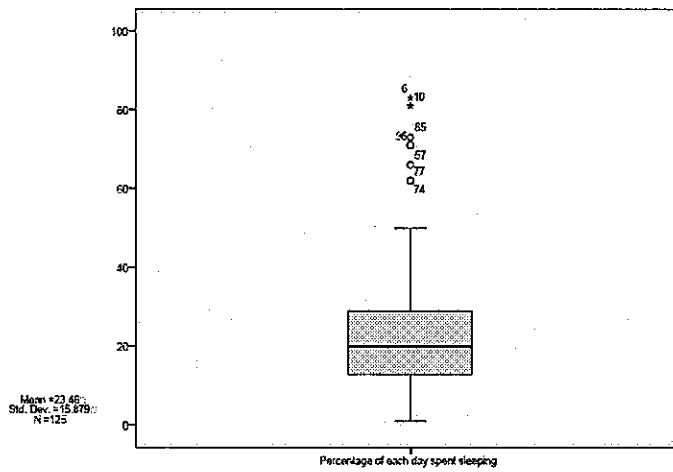
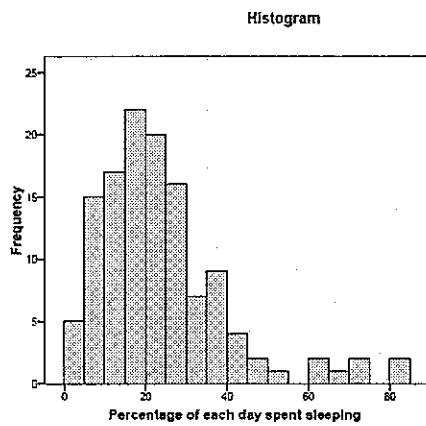
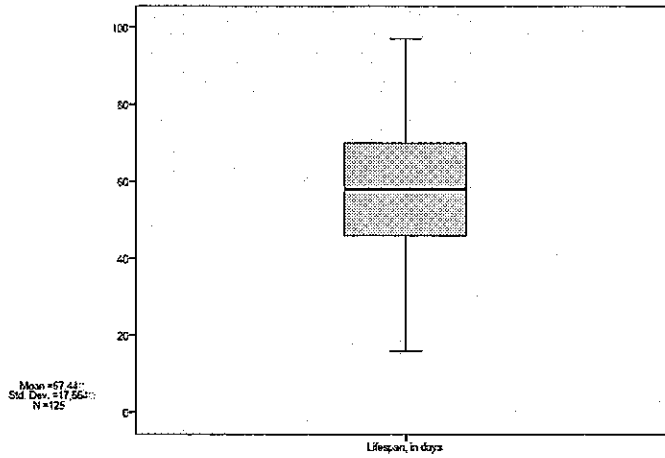
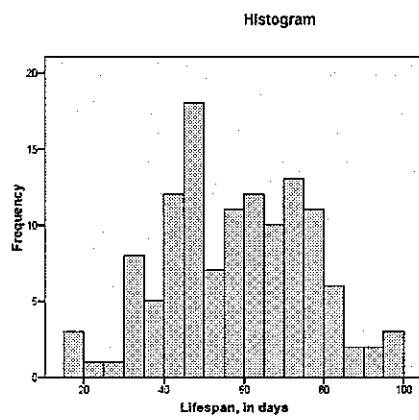
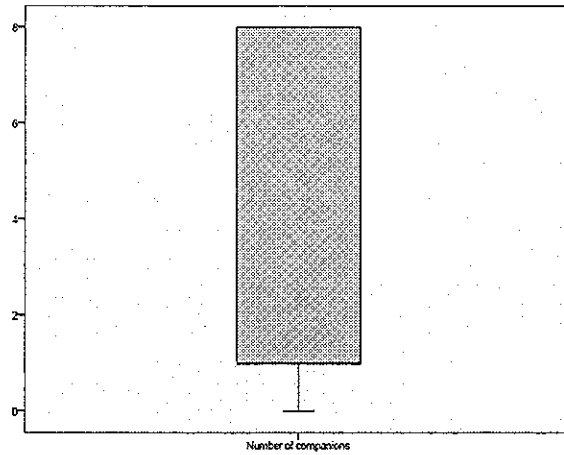
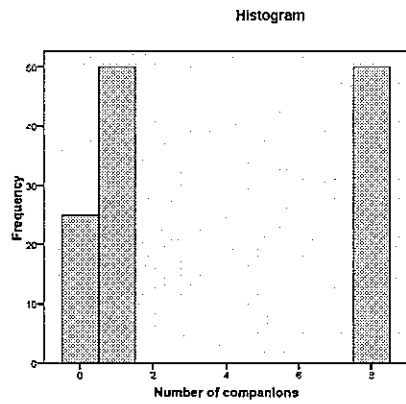
			Statistic	Std. Error
Number of companions	Mean		3,60	,324
	95% Confidence Interval for Mean	Lower Bound	2,96	
		Upper Bound	4,24	
	5% Trimmed Mean		3,58	
	Median		1,00	
	Variance		13,145	
	Std. Deviation		3,626	
	Minimum		0	
	Maximum		8	
	Range		8	
	Interquartile Range		7	
	Skewness		,381	,217
	Kurtosis		-1,838	,430
Lifespan, in days	Mean		57,44	1,571
	95% Confidence Interval for Mean	Lower Bound	54,33	
		Upper Bound	60,55	
	5% Trimmed Mean		57,42	
	Median		58,00	
	Variance		308,490	
	Std. Deviation		17,564	
	Minimum		16	
	Maximum		97	
	Range		81	
	Interquartile Range		24	
	Skewness		-,012	,217
	Kurtosis		-,410	,430
Length of thorax, in mm (x.xx)	Mean		,8210	,00693
	95% Confidence Interval for Mean	Lower Bound	,8072	
		Upper Bound	,8347	
	5% Trimmed Mean		,8247	
	Median		,8400	
	Variance		,006	
	Std. Deviation		,07745	
	Minimum		,64	
	Maximum		,94	
	Range		,30	
	Interquartile Range		,12	
	Skewness		-,638	,217
	Kurtosis		-,401	,430
Percentage of each day spent sleeping	Mean		23,46	1,420
	95% Confidence Interval for Mean	Lower Bound	20,65	
		Upper Bound	26,28	
	5% Trimmed Mean		21,87	
	Median		20,00	
	Variance		252,138	
	Std. Deviation		15,879	
	Minimum		1	
	Maximum		83	
	Range		82	
	Interquartile Range		17	
	Skewness		1,590	,217
	Kurtosis		3,148	,430

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Number of companions	,363	125	,000	,693	125	,000
Lifespan, in days	,081	125	,045	,990	125	,495
Length of thorax, in mm (x.xx)	,173	125	,000	,931	125	,000
Percentage of each day spent sleeping	,124	125	,000	,870	125	,000

a. Lilliefors Significance Correction

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Correlations

		Lifespan, in days	Number of companions	Length of thorax, in mm (x.xx)	Percentage of each day spent sleeping
Pearson Correlation	Lifespan, in days	1,000	-,303	,636	,004
	Number of companions	-,303	1,000	-,193	-,018
	Length of thorax, in mm (x.xx)	,636	-,193	1,000	,066
	Percentage of each day spent sleeping	,004	-,018	,066	1,000
Sig. (1-tailed)	Lifespan, in days	.	,000	,000	,482
	Number of companions	,000	.	,015	,421
	Length of thorax, in mm (x.xx)	,000	,015	.	,233
	Percentage of each day spent sleeping	,482	,421	,233	.
N	Lifespan, in days	125	125	125	125
	Number of companions	125	125	125	125
	Length of thorax, in mm (x.xx)	125	125	125	125
	Percentage of each day spent sleeping	125	125	125	125

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Percentage of each day spent sleeping, Number of companions, Length of thorax, in mm (x.xx)(a)		Enter

a All requested variables entered.

b Dependent Variable: Lifespan, in days

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					Sig. F Change	R Square Change	F Change	df1	df2
1	,664(a)	,440	,426	13,302	,440	31,726	3	121	,000

a Predictors: (Constant), Percentage of each day spent sleeping, Number of companions, Length of thorax, in mm (x.xx)

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16841,819	3	5613,940	31,726	,000(a)
	Residual	21410,981	121	176,950		
	Total	38252,800	124			

a Predictors: (Constant), Percentage of each day spent sleeping, Number of companions, Length of thorax, in mm (x.xx)

b Dependent Variable: Lifespan, in days

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
		1	(Constant)	-50,516			13,280		-3,804	,000	
	Number of companions	-,907	,336	-,187	-2,701	,008	-,303	-,238	-,184	,963	1,039
	Length of thorax, in mm (x.xx)	136,707	15,752	,603	8,679	,000	,636	,619	,590	,959	1,043
	Percentage of each day spent sleeping	-,043	,075	-,039	-,571	,569	,004	-,052	-,039	,996	1,004

a Dependent Variable: Lifespan, in days

Scenario 1 – Multivariate Regression Analysis 2

Variables Entered/Removed(a)

Model	Variables Entered	Variables Removed	Method
1	Length of thorax, in mm (x.xx)		Forward (Criterion: Probability-of-F-to-enter <= ,050)
2	Number of companions		Forward (Criterion: Probability-of-F-to-enter <= ,050)

a Dependent Variable: Lifespan, in days

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,636(a)	,405	,400	13,602	,405	83,761	1	123	,000
2	,662(b)	,439	,430	13,265	,034	7,317	1	122	,008

a Predictors: (Constant), Length of thorax, in mm (x.xx)

b Predictors: (Constant), Length of thorax, in mm (x.xx), Number of companions

ANOVA(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15496,641	1	15496,641	83,761	,000(a)
	Residual	22756,159	123	185,009		
	Total	38252,800	124			
2	Regression	16784,172	2	8392,086	47,690	,000(b)
	Residual	21468,628	122	175,972		
	Total	38252,800	124			

a Predictors: (Constant), Length of thorax, in mm (x.xx)

b Predictors: (Constant), Length of thorax, in mm (x.xx), Number of companions

c Dependent Variable: Lifespan, in days

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-61,052	13,004		-4,695	,000					
	Length of thorax, in mm (x.xx)	144,333	15,770	,636	9,152	,000	,636	,636	,636	1,000	1,000
2	(Constant)	-51,061	13,209		-3,866	,000					
	Length of thorax, in mm (x.xx)	136,135	15,676	,600	8,684	,000	,636	,618	,589	,963	1,039
	Number of companions	-,906	,335	-,187	-2,705	,008	-,303	-,238	-,183	,963	1,039

a Dependent Variable: Lifespan, in days

Excluded Variables(c)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	Number of companions	-,187(a)	-2,705	,008	-,238	,963	1,039	,963
	Percentage of each day spent sleeping	-,038(a)	-,542	,589	-,049	,996	1,004	,996
2	Percentage of each day spent sleeping	-,039(b)	-,571	,569	-,052	,996	1,004	,959

a Predictors in the Model: (Constant), Length of thorax, in mm (x.xx)

b Predictors in the Model: (Constant), Length of thorax, in mm (x.xx), Number of companions

c Dependent Variable: Lifespan, in days

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Scenario 1 – Multivariate Regression Analysis 3

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	Not applicable, Percentage of each day spent sleeping, Length of thorax, in mm (x.xx), Newly Pregnant Female, Number of companions(a)		Enter

a All requested variables entered.

b Dependent Variable: Lifespan, in days

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,791(a)	,626	,611	10,959	,626	39,902	5	119	,000

a Predictors: (Constant), Not applicable, Percentage of each day spent sleeping, Length of thorax, in mm (x.xx), Newly Pregnant Female, Number of companions

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	23960,918	5	4792,184	39,902	,000(a)
	Residual	14291,882	119	120,100		
	Total	38252,800	124			

a Predictors: (Constant), Not applicable, Percentage of each day spent sleeping, Length of thorax, in mm (x.xx), Newly Pregnant Female, Number of companions

b Dependent Variable: Lifespan, in days

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-60,754	11,077		-5,485	,000					
	Number of companions	-,837	,318	-,173	-2,633	,010	-,303	-,235	-,148	,729	1,372
	Length of thorax, in mm (x.xx)	138,810	12,980	,612	10,694	,000	,636	,700	,599	,958	1,044
	Percentage of each day spent sleeping	-,060	,062	-,054	-,963	,338	,004	-,088	-,054	,988	1,012
	Newly Pregnant Female	16,866	2,194	,472	7,687	,000	,310	,576	,431	,832	1,202
	Not applicable	9,563	3,037	,219	3,149	,002	,175	,277	,176	,651	1,536

a Dependent Variable: Lifespan, in days

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Scenario 2 (*maximum 35 points*)

Fun Cards Manufacturing Company, a producer of greetings cards with added microelectronic features (sound, light, and motion), is interested in orienting their business strategy towards new markets. In order to set up a long-term strategy, the company needs to get a good understanding about those factors that would influence their business strategy, therefore they hired Mighty Minds, a research company specialized in global business & strategy.

The research team of Mighty Minds employed the results of some brainstorm sessions held with the management of Fun Cards Manufacturing, and also published research studies. Finally, eight relevant variables have been selected, namely (i) Access to bandwidth, (ii) Commodity prices, (iii) Cultural regulations, (iv) Exchange rates, (v) Internal regulations, (vi) Impact on local communities, (vii) PC ownership, and (viii) Tax system. Using the data from an existing international business & strategy survey, where 200 companies have participated worldwide, they decided to apply Principal Component Analysis on the eight variables previously mentioned, in order to find out those underlying factors that best reflect the global factors influencing business strategies.

Questions

You have to answer a couple of questions. For most of the questions, you have to check the SPSS output given in section Scenario 2 – Factor Analysis (pages 15-17). When answering to these questions, always mention explicitly which table, matrix or graph you used to provide the answer (not mentioning this means fewer points!).

Question 1:

In the scenario presented above, is Principal Component Analysis the correct extraction method? Motivate your answer.

Question 2:

The assumptions required for performing factor analysis have been tested by the research team. Based on the SPSS output, fill in the empty spaces, or correct the underlined text (by stripping out the incorrect answer).

Testing assumptions means checking and statistical assumptions.

The statistical assumptions to be checked in case of factor analysis are:

1.
2.
3.
4.
5. Intercollinearity.

Intercollinearity is checked, using four measures. First, a sufficient amount of intercorrelations should exist among variables, with correlations above a value of Second, the matrix should be inspected; this matrix contains, which are those correlations unexplained when the effects of the other variables are considered. Third, the Bartlett test of sphericity should be significant. Fourth, the Measure of Sampling Adequacy should be checked, providing the degree of intercorellation, whose values below value of are unacceptable.

The conclusion is that there are / there are no problems with respect to intercollinearity, based on the following arguments:

Question 3:

How many factors should be extracted? Motivate your answer.

Question 4:

- a) What does the 'communality of a variable' mean?
- b) Assess the communalities of all variables.
- c) Why does the "Initial" column of the **Communalities** table contain only the value "1"?

a)

b)

c)

Question 5:

Does the un-rotated solution provide a good factor solution? Motivate your answer.

Question 6:

- a) What is a rotation and when should rotation be used?
- b) Describe the two types of possible rotation methods.

Use the SPSS output.

- c) Does the solution provided by Varimax approach resulted in a good factor solution? Motivate your answer.
- d) Which rotation method (Varimax or Oblimin) is the most suitable, and provides the best factor solution? Motivate your answer (specify which matrices you use).

a)

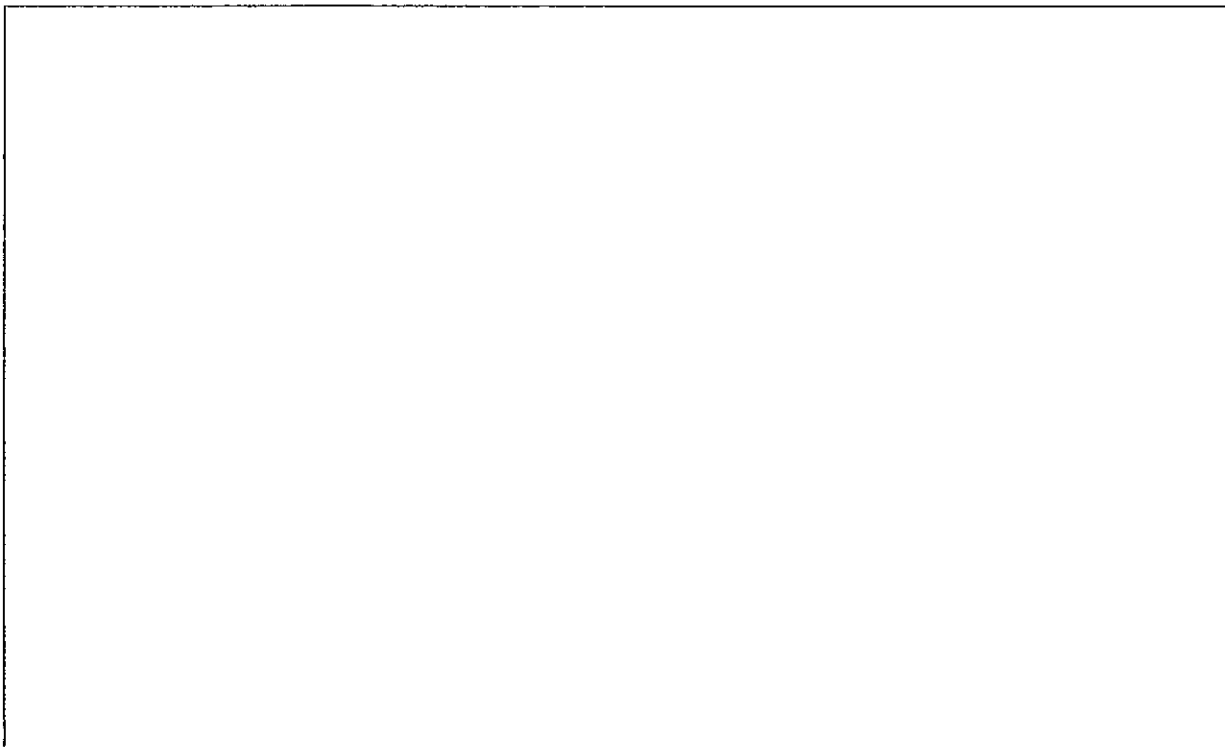
b)

c)

d)

Question 7:

Using the best factor solution, label and interpret the found factors, in the context of the case described in Scenario 2.



Scenario 2 – Tables Factor Analysis

Correlation Matrix

		Commodity Prices	Exchange Rates	Internal Regulations	Tax System	Impact Local Communities	Cultural Regulations	PC Ownership	Access To Bandwidth
Correlation	Commodity Prices	1.000	.467	.366	.324	.144	.042	.079	.190
	Exchange Rates	.467	1.000	.322	.226	.142	.165	.098	.173
	Internal Regulations	.366	.322	1.000	.300	.153	.151	.230	.230
	Tax System	.324	.226	.300	1.000	.209	.207	.050	.112
	Impact Local Communities	.144	.142	.153	.209	1.000	.425	.167	.400
	Cultural Regulations	.042	.165	.151	.207	.425	1.000	.150	.252
	PC Ownership	.079	.098	.230	.050	.167	.150	1.000	.401
	Access To Bandwidth	.190	.173	.230	.112	.400	.252	.401	1.000
Sig. (1-tailed)	Commodity Prices		.000	.000	.000	.022	.278	.136	.004
	Exchange Rates	.000		.000	.001	.023	.010	.085	.008
	Internal Regulations	.000	.000		.000	.016	.017	.001	.001
	Tax System	.000	.001	.000		.002	.002	.243	.058
	Impact Local Communities	.022	.023	.016	.002		.000	.010	.000
	Cultural Regulations	.278	.010	.017	.002	.000		.017	.000
	PC Ownership	.136	.085	.001	.243	.010	.017		.000
	Access To Bandwidth	.004	.008	.001	.058	.000	.000	.000	

Communalities

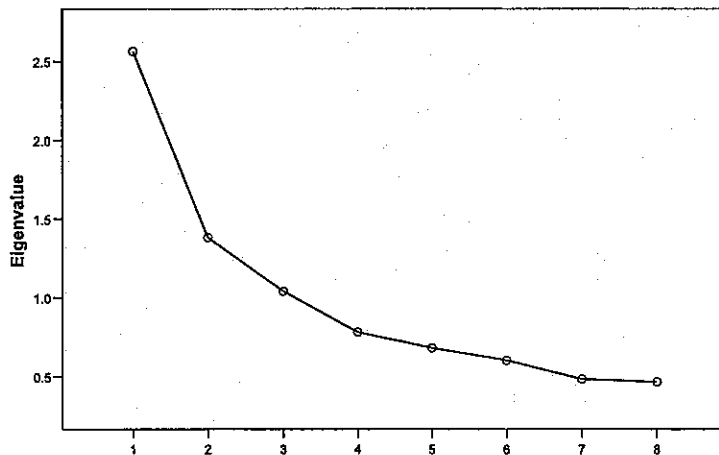
	Initial	Extraction
Commodity Prices	1.000	.664
Exchange Rates	1.000	.539
Internal Regulations	1.000	.519
Tax System	1.000	.513
Impact Local Communities	1.000	.675
Cultural Regulations	1.000	.678
PC Ownership	1.000	.742
Access To Bandwidth	1.000	.655

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.704
Bartlett's Test of Sphericity	Approx. Chi-Square	254.344
	df	28
	Sig.	.000

Scree Plot



(continued on next page)

Anti-image Matrices

	CommodityPrices	Exchange Rates	InternalRegulations	TaxSystem	ImpactLocalCommunities	CulturalRegulations	PCOwnership	AccessToBandwidth
Anti-image Covariance	.682	-.269	-.145	-.158	-.033	.095	.028	-.062
ExchangeRates	-.269	.739	-.110	-.023	.004	-.088	-.002	-.024
InternalRegulations	-.145	-.110	.763	-.142	.007	-.033	-.126	-.053
TaxSystem	-.158	-.023	-.142	.818	-.078	-.104	.029	.030
ImpactLocalCommunities	-.033	.004	.007	-.078	.715	-.257	.009	-.214
CulturalRegulations	.095	-.088	-.033	-.104	-.257	.776	-.037	-.050
PCOwnership	.028	-.002	-.126	.029	.009	-.037	.815	-.258
AccessToBandwidth	-.062	-.024	-.053	.030	-.214	-.050	-.258	.702
Anti-image Correlation	.670(a)	-.379	-.201	-.211	-.047	.131	.038	-.089
ExchangeRates	-.379	.718(a)	-.147	-.030	.005	-.117	-.002	-.033
InternalRegulations	-.201	-.147	.790(a)	-.180	.009	-.043	-.160	-.072
TaxSystem	-.211	-.030	-.180	.763(a)	-.102	-.130	.035	.040
ImpactLocalCommunities	-.047	.005	.009	-.102	.682(a)	-.345	.012	-.302
CulturalRegulations	.131	-.117	-.043	-.130	-.345	.674(a)	-.046	-.068
PCOwnership	.038	-.002	-.160	.035	.012	-.046	.658(a)	-.341
AccessToBandwidth	-.089	-.033	-.072	.040	-.302	-.068	-.341	.693(a)

a Measures of Sampling Adequacy(MSA)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.563	32.037	32.037	2.563	32.037	32.037	1.979	24.735	24.735
2	1.380	17.253	49.290	1.380	17.253	49.290	1.569	19.615	44.350
3	1.041	13.012	62.302	1.041	13.012	62.302	1.436	17.952	62.302
4	.781	9.763	72.065						
5	.681	8.517	80.582						
6	.603	7.534	88.116						
7	.484	6.055	94.171						
8	.466	5.829	100.000						

Extraction Method: Principal Component Analysis.

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Component Matrix^a

	Component		
	1	2	3
InternalRegulations	.627	-.284	.214
AccessToBandwidth	.615	.433	.298
CommodityPrices	.599	-.547	.076
ExchangeRates	.589	-.438	.028
ImpactLocalCommunities	.585	.453	-.356
TaxSystem	.534	-.294	-.377
CulturalRegulations	.511	.424	-.487
PCOwnership	.446	.386	.628

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Rotated Component Matrix^a

	Component		
	1	2	3
CommodityPrices	.812	-.013	.060
ExchangeRates	.727	.071	.074
InternalRegulations	.651	.047	.305
TaxSystem	.576	.385	-.182
CulturalRegulations	.052	.818	.077
ImpactLocalCommunities	.089	.786	.222
PCOwnership	.063	.020	.859
AccessToBandwidth	.142	.355	.713

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Component Transformation Matrix

Component	1	2	3
1	.712	.536	.454
2	-.702	.517	.489
3	.028	-.667	.744

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Pattern Matrix^a

	Component		
	1	2	3
CommodityPrices	.834	-.108	-.004
ExchangeRates	.736	-.012	.008
InternalRegulations	.654	-.040	.250
TaxSystem	.549	.342	-.265
CulturalRegulations	-.050	.834	-.001
ImpactLocalCommunities	-.013	.789	.146
PCOwnership	.037	-.030	.860
AccessToBandwidth	.081	.314	.676

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 8 iterations.

Structure Matrix

	Component		
	1	2	3
CommodityPrices	.808	.092	.088
ExchangeRates	.734	.166	.102
InternalRegulations	.677	.155	.329
TaxSystem	.597	.433	-.141
CulturalRegulations	.150	.822	.121
ImpactLocalCommunities	.196	.809	.266
PCOwnership	.142	.112	.860
AccessToBandwidth	.244	.438	.735

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

Component Correlation Matrix

Component	1	2	3
1	1.000	.240	.130
2	.240	1.000	.154
3	.130	.154	1.000

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

(continued on next page)

Scenario 3 (*maximum 20 points*)

Nutrint is a large manufacturer of nutrients. To inform customers about its products, Nutrint's marketing spending per year is high. The marketing department of Nutrint thinks that opinion and attitude towards nutrition is an important predictor of the appreciation of commercials of Nutrint.

A researcher was delegated to study the effect of various consumer attitudes on advertisement appraisal. For this, he has sent out a number of questionnaires. The researcher uses various statistical techniques to analyze the collected data. The results of the analysis are provided in the SPSS outputs underneath.

Question 1:

The researcher starts his analysis using a Factor Analysis (see Scenario 3 Tables Factor Analysis 1, pages 21-24).

- a) Given the research objective stated above, and the results that are shown in the tables, explain why the researcher uses factor analysis.
- b) Is Factor Analysis allowed? Motivate your answer.

a)
b)

Question 2:

Considering the outcome of the first Factor Analysis, the researcher decides to do a second Factor Analysis (see Scenario 3 - Tables Factor Analysis 2, pages 25-27).

Explain why the researcher executes a second Factor Analysis.

--

Question 3:

The researcher considers the results from the second Factor Analysis to proceed with the analysis (section Scenario 3 – Tables Factor Analysis 2, pages 25-27). Do you agree with this decision? Explain your position.

Question 4:

Consider the factor solution from Factor Analysis 2 (see section Scenario 3 - Tables Factor Analysis 2, pages 25-27). How would you label the three factors that were found in this solution? Explain why.

Factor 1 - label:, because
Factor 2 – label:, because
Factor 3 – label:, because

Question 5:

The next analysis the researcher applies is Multivariate Regression Analysis (see section Scenario 3 - Tables Multivariate Regression Analysis, pages 27-28). He builds a regression model using the factors extracted in Factor Analysis 2 and the remaining variables from the questionnaire. Provide the regression equation for the regression model.

Question 6:

Indicate how good the regression model is that the research found, and if the model is significant.

Question 7:

Explain which independent variables have a significant contribution to the explanation of the dependent variable y 'advertisement appraisal'.

Question 8:

Does multicollinearity provide problems in the found regression model? Motivate your answer.

Scenario 3 - Tables Factor Analysis 1

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
A person can save a lot of money by shopping around for bargains.	3,64	1,064	50
If we drink milk we don't have to worry about nutrition.	1,78	,764	50
Today's foods have so many nutrients added that I don't have to worry about nutrition.	1,74	,853	50
I usually watch the advertisements for announcements of sales.	3,64	1,064	50
I shop a lot for "specials".	3,36	1,083	50
I am concerned about getting my family to eat nutritious foods throughout the day.	3,92	,804	50
Nutrition is important and one should not be careless about it.	4,30	,814	50
Nutrition is not so important as long as we eat a lot.	1,58	,702	50
I find myself checking the prices in the grocery store even for small items.	3,72	1,011	50
I feel that foods we eat will affect our future health.	4,06	,793	50
I don't like to see children's toys lying about.	3,38	1,176	50

KMO and Bartlett's Test

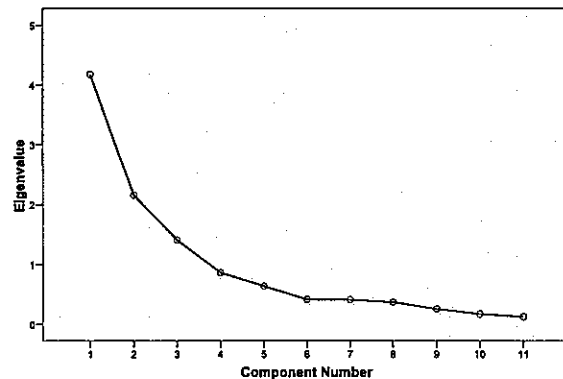
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,725
Bartlett's Test of Sphericity	Approx. Chi-Square	266,262
	df	55
	Sig.	,000

Communalities

	Initial	Extraction
A person can save a lot of money by shopping around for bargains.	1,000	,601
If we drink milk we don't have to worry about nutrition.	1,000	,784
Today's foods have so many nutrients added that I don't have to worry about nutrition.	1,000	,733
I usually watch the advertisements for announcements of sales.	1,000	,707
I shop a lot for "specials".	1,000	,834
I am concerned about getting my family to eat nutritious foods throughout the day.	1,000	,753
Nutrition is important and one should not be careless about it.	1,000	,860
Nutrition is not so important as long as we eat a lot.	1,000	,686
I find myself checking the prices in the grocery store even for small items.	1,000	,712
I feel that foods we eat will affect our future health.	1,000	,799
I don't like to see children's toys lying about.	1,000	,272

Extraction Method: Principal Component Analysis.

Scree Plot



(continued on next page)

Correlation Matrix(a)

	A person can save a lot of money by shopping around for bargains.	If we drink milk we don't have to worry about nutrition.	Today's foods have so many nutrients added that I don't have to worry about nutrition.	I usually watch the advertisements for announcements of sales.	I shop a lot for "specials"	I am concerned about getting my family to eat nutritious foods throughout the day.	Nutrition is important and one should not be careless about it.	Nutrition is not so important as long as we eat a lot.	I find myself checking the prices in the grocery store even for small items.	I feel that foods we eat will affect our future health.	I don't like to see children's toys lying about.
Correlation	1,000	-,125	-,128	,550	,557	,395	,457	,148	,473	,413	,356
A person can save a lot of money by shopping around for bargains.											
If we drink milk we don't have to worry about nutrition.	-,125	1,000	,631	,001	-,050	,104	,075	,547	,077	-,011	,118
Today's foods have so many nutrients added that I don't have to worry about nutrition.	-,128	,631	1,000	-,060	-,051	,118	-,091	,461	,032	-,037	,162
I usually watch the advertisements for announcements of sales.	,550	,001	-,060	1,000	,699	,419	,385	,094	,606	,340	,307
I shop a lot for "specials".	,557	-,050	-,051	,699	1,000	,291	,245	,149	,746	,354	,291
I am concerned about getting my family to eat nutritious foods throughout the day.	,395	,104	,118	,419	,291	1,000	,754	,084	,474	,616	,249
Nutrition is important and one should not be careless about it.	,457	,075	-,091	,386	,245	,754	1,000	-,061	,402	,761	,219
Nutrition is not so important as long as we eat a lot.	,148	,547	,461	,084	,149	,084	-,061	1,000	,176	-,174	,049
I find myself checking the prices in the grocery store even for small items.	,473	,077	,032	,606	,746	,474	,402	,176	1,000	,429	,314
I feel that foods we eat will affect our future health.	,413	-,011	-,037	,340	,354	,616	,761	-,174	,429	1,000	,369
I don't like to see children's toys lying about.	,356	,118	,162	,307	,291	,249	,219	,049	,314	,369	1,000
Sig. (1-tailed)		,194	,188	,000	,000	,002	,000	,152	,000	,001	,006
A person can save a lot of money by shopping around for bargains.											
If we drink milk we don't have to worry about nutrition.	,194		,000	,497	,364	,237	,301	,000	,297	,469	,208
Today's foods have so many nutrients added that I don't have to worry about nutrition.	,188	,000		,339	,362	,207	,265	,000	,412	,400	,131
I usually watch the advertisements for announcements of sales.	,000	,497	,339		,000	,001	,003	,258	,000	,008	,015
I shop a lot for "specials".	,000	,364	,362	,000		,020	,043	,151	,000	,006	,020
I am concerned about getting my family to eat nutritious foods throughout the day.	,002	,237	,207	,001	,020		,000	,281	,000	,000	,041
Nutrition is important and one should not be careless about it.	,000	,301	,265	,003	,043	,000		,338	,002	,000	,063
Nutrition is not so important as long as we eat a lot.	,152	,000	,000	,258	,151	,281	,338		,111	,114	,368
I find myself checking the prices in the grocery store even for small items.	,000	,297	,412	,000	,000	,000	,002	,111		,001	,013
I feel that foods we eat will affect our future health.	,001	,469	,400	,008	,006	,000	,000	,114	,001		,004
I don't like to see children's toys lying about.	,006	,208	,131	,015	,020	,041	,063	,368	,013	,004	

a Determinant = ,003

(continued on next page)

Anti-image Matrices

		A person can save a lot of money by shopping around for bargains.	If we drink milk we don't have to worry about nutrition.	Today's foods have so many nutrients added that I don't have to worry about nutrition.	I usually watch the advertisements for announcements of sales.	I shop a lot for "specials".	I am concerned about getting my family to eat nutritious foods throughout the day.	Nutrition is important and one should not be careless about it.	Nutrition is not so important as long as we eat a lot.	I find myself checking the prices in the grocery store even for small items.	I feel that foods we eat will affect our future health.	I don't like to see children's toys lying about.
Anti-image Covariance	A person can save a lot of money by shopping around for bargains.	,468	,121	,024	-.072	-.082	,019	-.084	-.151	,022	,001	-.143
	If we drink milk we don't have to worry about nutrition.	,121	,431	-.226	-.035	,027	,076	-.090	-.205	-.026	,016	-.057
	Today's foods have so many nutrients added that I don't have to worry about nutrition.	,024	-.226	,490	,025	,007	-.115	,101	-.086	,013	-.053	-.075
	I usually watch the advertisements for announcements of sales.	-.072	-.035	,025	,419	-.155	-.056	-.036	,045	-.020	,067	-.058
	I shop a lot for "specials".	-.082	,027	,007	-.155	,281	,036	,056	-.040	-.178	-.072	,027
	I am concerned about getting my family to eat nutritious foods throughout the day.	,019	,076	-.115	-.056	,036	,344	-.147	-.051	-.072	-.020	-.003
	Nutrition is important and one should not be careless about it.	-.084	-.090	,101	-.035	,056	-.147	,221	,021	-.013	-.149	,068
	Nutrition is not so important as long as we eat a lot.	-.151	-.205	-.086	,045	-.040	-.051	,021	,515	-.026	,105	,055
	I find myself checking the prices in the grocery store even for small items.	,022	-.026	,013	-.020	-.178	-.072	-.013	-.026	,358	-.007	-.039
	I feel that foods we eat will affect our future health.	,001	,015	-.053	,067	-.072	-.020	-.149	,105	-.007	,314	-.126
	I don't like to see children's toys lying about.	-.143	-.057	-.075	-.058	,027	-.003	,068	,055	-.039	-.126	,725
Anti-image Correlation	A person can save a lot of money by shopping around for bargains.	,803(a)	,270	,051	-.162	-.225	,047	-.261	-.308	,055	,003	-.245
	If we drink milk we don't have to worry about nutrition.	,270	,534(a)	-.492	-.083	,078	,197	-.291	-.434	-.066	,040	-.101
	Today's foods have so many nutrients added that I don't have to worry about nutrition.	,051	-.482	,586(a)	,055	,020	-.280	,306	-.171	,032	-.134	-.125
	I usually watch the advertisements for announcements of sales.	-.162	-.083	,055	,837(a)	-.451	-.149	-.119	,086	-.053	,184	-.105
	I shop a lot for "specials".	-.225	,078	,020	-.451	,709(a)	,116	,226	-.104	-.561	-.241	,060
	I am concerned about getting my family to eat nutritious foods throughout the day.	,047	,197	-.280	-.149	,116	,772(a)	-.532	-.122	-.205	-.060	-.007
	Nutrition is important and one should not be careless about it.	-.261	-.291	,306	-.119	,226	-.532	,654(a)	,061	-.046	-.564	,170
	Nutrition is not so important as long as we eat a lot.	-.308	-.434	-.171	,096	-.104	-.122	,061	,597(a)	-.061	,260	,069
	I find myself checking the prices in the grocery store even for small items.	,055	-.066	,032	-.053	-.581	-.205	-.046	-.061	,830(a)	-.021	-.077
	I feel that foods we eat will affect our future health.	,003	,040	-.134	,184	-.241	-.060	-.564	,260	-.021	,751(a)	-.263
	I don't like to see children's toys lying about.	-.245	-.101	-.125	-.105	,060	-.007	,170	,089	-.077	-.263	,765(a)

a Measures of Sampling Adequacy(MSA)

(continued on next page)

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,175	37,955	37,955	4,175	37,955	37,955	3,013	27,389	27,389
2	2,157	19,607	57,562	2,157	19,607	57,562	2,570	23,360	50,750
3	1,409	12,805	70,367	1,409	12,805	70,367	2,158	19,618	70,367
4	,865	7,865	78,232						
5	,638	5,800	84,032						
6	,418	3,800	87,832						
7	,412	3,741	91,573						
8	,372	3,378	94,950						
9	,255	2,319	97,269						
10	,172	1,563	98,832						
11	,128	1,168	100,000						

Extraction Method: Principal Component Analysis.

Component Matrix(a)

	Component		
	1	2	3
A person can save a lot of money by shopping around for bargains.	,731	-,114	-,230
If we drink milk we don't have to worry about nutrition.	,058	,862	,192
Today's foods have so many nutrients added that I don't have to worry about nutrition.	,004	,842	,155
I usually watch the advertisements for announcements of sales.	,757	-,027	-,365
I shop a lot for "specials".	,737	-,015	-,538
I am concerned about getting my family to eat nutritious foods throughout the day.	,739	,062	,451
Nutrition is important and one should not be careless about it.	,740	-,124	,546
Nutrition is not so important as long as we eat a lot.	,118	,782	-,247
I find myself checking the prices in the grocery store even for small items.	,788	,088	-,290
I feel that foods we eat will affect our future health.	,737	-,174	,475
I don't like to see children's toys lying about.	,500	,150	,002

Extraction Method: Principal Component Analysis.
a 3 components extracted.

Rotated Component Matrix(a)

	Component		
	1	2	3
A person can save a lot of money by shopping around for bargains.	,705	,308	-,094
If we drink milk we don't have to worry about nutrition.	-,074	,110	,875
Today's foods have so many nutrients added that I don't have to worry about nutrition.	-,091	,048	,850
I usually watch the advertisements for announcements of sales.	,813	,215	-,016
I shop a lot for "specials".	,910	,070	-,017
I am concerned about getting my family to eat nutritious foods throughout the day.	,271	,814	,129
Nutrition is important and one should not be careless about it.	,209	,902	-,049
Nutrition is not so important as long as we eat a lot.	,256	-,177	,767
I find myself checking the prices in the grocery store even for small items.	,788	,282	,106
I feel that foods we eat will affect our future health.	,252	,851	-,104
I don't like to see children's toys lying about.	,380	,312	,174

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 5 iterations.

(continued on next page)

Scenario 3 - Tables Factor Analysis 2

KMO and Bartlett's Test

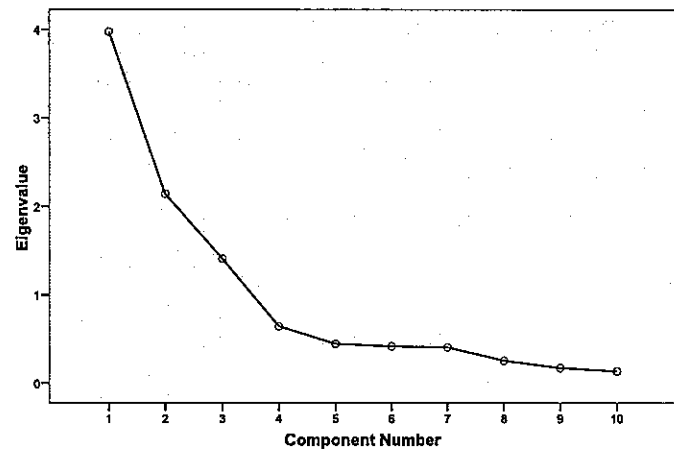
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,721
Bartlett's Test of Sphericity	Approx. Chi-Square	253,855
	df	45
	Sig.	,000

Communalities

	Initial	Extraction
A person can save a lot of money by shopping around for bargains.	1,000	,593
If we drink milk we don't have to worry about nutrition.	1,000	,786
Today's foods have so many nutrients added that I don't have to worry about nutrition.	1,000	,723
I usually watch the advertisements for announcements of sales.	1,000	,714
I shop a lot for "specials".	1,000	,841
I am concerned about getting my family to eat nutritious foods throughout the day.	1,000	,774
Nutrition is important and one should not be careless about it.	1,000	,879
Nutrition is not so important as long as we eat a lot.	1,000	,704
I find myself checking the prices in the grocery store even for small items.	1,000	,724
I feel that foods we eat will affect our future health.	1,000	,789

Extraction Method: Principal Component Analysis.

Scree Plot



Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,975	39,745	39,745	3,975	39,745	39,745	2,876	28,762	28,762
2	2,141	21,410	61,155	2,141	21,410	61,155	2,508	25,084	53,846
3	1,409	14,086	75,241	1,409	14,086	75,241	2,140	21,395	75,241
4	,643	6,435	81,676						
5	,446	4,456	86,132						
6	,418	4,176	90,308						
7	,406	4,058	94,366						
8	,255	2,555	96,920						
9	,173	1,728	98,649						
10	,135	1,351	100,000						

Extraction Method: Principal Component Analysis.

(continued on next page)

Anti-image Matrices

		A person can save a lot of money by shopping around for bargains.	If we drink milk we don't have to worry about nutrition.	Today's foods have so many nutrients added that I don't have to worry about nutrition.	I usually watch the advertisements for announcements of sales.	I shop a lot for "specials".	I am concerned about getting my family to eat nutritious foods throughout the day.	Nutrition is important and one should not be careless about it.	Nutrition is not so important as long as we eat a lot.	I find myself checking the prices in the grocery store even for small items.	I feel that foods we eat will affect our future health.
Anti-image Covariance	A person can save a lot of money by shopping around for bargains.	,498	,118	,011	-,089	-,081	,019	-,077	-,151	,016	-,027
	If we drink milk we don't have to worry about nutrition.	,118	,436	-,238	-,041	,030	,076	-,088	-,204	-,029	,005
	Today's foods have so many nutrients added that I don't have to worry about nutrition.	,011	-,238	,498	,020	,010	-,117	,113	-,082	,009	-,072
	I usually watch the advertisements for announcements of sales.	-,089	-,041	,020	,423	-,155	-,057	-,032	,050	-,024	,062
	I shop a lot for "specials".	-,081	,030	,010	-,155	,282	,036	,056	-,042	-,179	-,072
	I am concerned about getting my family to eat nutritious foods throughout the day.	,019	,076	-,117	-,057	,036	,344	-,151	-,052	-,072	-,022
	Nutrition is important and one should not be careless about it.	-,077	-,088	,113	-,032	,056	-,151	,228	,016	-,010	-,151
	Nutrition is not so important as long as we eat a lot.	-,151	-,204	-,082	,050	-,042	-,052	,016	,519	-,024	,124
I find myself checking the prices in the grocery store even for small items.	,016	-,029	,009	-,024	-,179	-,072	-,010	-,024	,361	-,015	
I feel that foods we eat will affect our future health.	-,027	,005	-,072	,062	-,072	-,022	-,151	,124	-,015	,337	
Anti-image Correlation	A person can save a lot of money by shopping around for bargains.	,827(a)	,254	,021	-,195	-,217	,047	-,229	-,297	,037	-,066
	If we drink milk we don't have to worry about nutrition.	,254	,532(a)	-,511	-,095	,084	,198	-,280	-,429	-,074	,014
	Today's foods have so many nutrients added that I don't have to worry about nutrition.	,021	-,511	,562(a)	,043	,028	-,284	,334	-,162	,022	-,175
	I usually watch the advertisements for announcements of sales.	-,195	-,095	,043	,833(a)	-,448	-,150	-,103	,107	-,061	,163
	I shop a lot for "specials".	-,217	,084	,028	-,448	,703(a)	,116	,220	-,110	-,559	-,234
	I am concerned about getting my family to eat nutritious foods throughout the day.	,047	,198	-,284	-,150	,116	,761(a)	-,538	-,122	-,206	-,065
	Nutrition is important and one should not be careless about it.	-,229	-,280	,334	-,103	,220	-,538	,661(a)	,047	-,034	-,547
	Nutrition is not so important as long as we eat a lot.	-,297	-,429	-,162	,107	-,110	-,122	,047	,597(a)	-,054	,295
I find myself checking the prices in the grocery store even for small items.	,037	-,074	,022	-,061	-,559	-,206	-,034	-,054	,825(a)	-,043	
I feel that foods we eat will affect our future health.	-,066	,014	-,175	,163	-,234	-,065	-,547	,295	-,043	,757(a)	

a Measures of Sampling Adequacy(MSA)

Component Matrix(a)

	Component		
	1	2	3
A person can save a lot of money by shopping around for bargains.	,729	-,096	-,230
If we drink milk we don't have to worry about nutrition.	,034	,865	,192
Today's foods have so many nutrients added that I don't have to worry about nutrition.	-,029	,835	,155
I usually watch the advertisements for announcements of sales.	,762	-,002	-,365
I shop a lot for "specials".	,742	,009	-,538
I am concerned about getting my family to eat nutritious foods throughout the day.	,749	,092	,451
Nutrition is important and one should not be careless about it.	,756	-,093	,546
Nutrition is not so important as long as we eat a lot.	,109	,794	-,246
I find myself checking the prices in the grocery store even for small items.	,792	,115	-,290
I feel that foods we eat will affect our future health.	,733	-,158	,475

Extraction Method: Principal Component Analysis.
a. 3 components extracted.

Rotated Component Matrix(a)

	Component		
	1	2	3
A person can save a lot of money by shopping around for bargains.	,700	,310	-,088
If we drink milk we don't have to worry about nutrition.	-,083	,105	,876
Today's foods have so many nutrients added that I don't have to worry about nutrition.	-,107	,037	,842
I usually watch the advertisements for announcements of sales.	,815	,223	-,003
I shop a lot for "specials".	,914	,079	-,003
I am concerned about getting my family to eat nutritious foods throughout the day.	,274	,823	,146
Nutrition is important and one should not be careless about it.	,213	,912	-,032
Nutrition is not so important as long as we eat a lot.	,260	-,172	,779
I find myself checking the prices in the grocery store even for small items.	,790	,291	,121
I feel that foods we eat will affect our future health.	,241	,849	-,102

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Part 3 - Tables Multivariate Regression Analysis

Correlations

		advertisement appraisal	REGR factor score 1 for analysis 1	REGR factor score 2 for analysis 1	REGR factor score 3 for analysis 1	I don't like to see children's toys lying about.
Pearson Correlation	advertisement appraisal	1,000	,369	,319	,212	,445
	REGR factor score 1 for analysis 1	,369	1,000	,000	,000	,303
	REGR factor score 2 for analysis 1	,319	,000	1,000	,000	,254
	REGR factor score 3 for analysis 1	,212	,000	,000	1,000	,117
	I don't like to see children's toys lying about.	,445	,303	,254	,117	1,000
Sig. (1-tailed)	advertisement appraisal	.	,004	,012	,070	,001
	REGR factor score 1 for analysis 1	,004	.	,500	,500	,016
	REGR factor score 2 for analysis 1	,012	,500	.	,500	,038
	REGR factor score 3 for analysis 1	,070	,500	,500	.	,209
	I don't like to see children's toys lying about.	,001	,016	,038	,209	.
N	advertisement appraisal	50	50	50	50	50
	REGR factor score 1 for analysis 1	50	50	50	50	50
	REGR factor score 2 for analysis 1	50	50	50	50	50
	REGR factor score 3 for analysis 1	50	50	50	50	50
	I don't like to see children's toys lying about.	50	50	50	50	50

Variables Entered/Removed(b)

Model	Variables Entered	Variables Removed	Method
1	I don't like to see children's toys lying about., REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1(a)		Enter

a All requested variables entered.
 b Dependent Variable: advertisement appraisal

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,588(a)	,345	,287	8,774	,345	5,931	4	45	,001

a Predictors: (Constant), I don't like to see children's toys lying about., REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1826,218	4	456,555	5,931	,001(a)
	Residual	3464,282	45	76,984		
	Total	5290,500	49			

a Predictors: (Constant), I don't like to see children's toys lying about., REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1
 b Dependent Variable: advertisement appraisal

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	76,320	4,144		18,416	,000					
	REGR factor score 1 for analysis 1	2,971	1,321	,286	2,249	,029	,369	,318	,271	,900	1,111
	REGR factor score 2 for analysis 1	2,595	1,301	,250	1,994	,052	,319	,285	,241	,928	1,078
	REGR factor score 3 for analysis 1	1,867	1,264	,180	1,477	,147	,212	,215	,178	,984	1,016
	I don't like to see children's toys lying about.	2,420	1,170	,274	2,069	,044	,445	,295	,250	,830	1,205

a Dependent Variable: advertisement appraisal

END OF THE EXAM