

**JAIPURIA INSTITUTE OF MANAGEMENT, NOIDA**

**PGDM / PGDM (M) / PGDM (SM)**

**FIFTH TRIMESTER (Batch 2021-23)**

**END TERM EXAMINATIONS, FEBRUARY 2023**

<b>Course Name</b>	<b>Marketing Research</b>	<b>Course Code</b>	<b>20131</b>
<b>Max. Time</b>	<b>2 Hours</b>	<b>Max. Marks</b>	<b>40 MM</b>

- Cluster analysis is a statistical method used to group similar objects into respective categories. The goal of performing a cluster analysis is to sort different objects or data points into groups in a manner that the degree of association between two objects is high if they belong to the same group, and low if they belong to different groups. Cluster analysis differs from many other statistical methods due to the fact that it's mostly used when researchers do not have an assumed principle or fact that they are using it as the foundation of their research.

Cluster analysis discovers structures in data without explaining why those structures exist. For example, when cluster analysis is performed as part of market research, specific groups can be identified within a population. The analysis of these groups can then determine how likely a population cluster is to purchase products or services. If these groups are defined clearly, a marketing team can then target varying cluster with tailored, targeted communication.

- Explain different steps involved in cluster analysis. (7 marks)
  - Suppl. Sheet no. 1 contains information about 49 cities in U.S. Kellogg's wants to use this information for their marketing strategy. Analyse the information provided to you in this sheet, assuming that you are Marketing manager at Kellogg's (8 marks)
  - What additional statistical tests would you recommend for the information on Suppl. Sheet no. 1. Explain. (5 marks)
- Company X is the leading global retailer. To understand the impact of advertising and pricing on its sales, the company uses different advertising and pricing combinations. The data and its analysis is provided in Suppl. Sheet no. 2. Interpret the given information so as to provide valuable recommendations to the company. (10 marks)
  - A leading Indian financial service provider wants to understand the impact of age, gender and education. Based on analysis of a limited amount of data (Sheet no. 3), draw your interpretations. (10 marks)



# SUPPL. SHEET #1

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
1	Mean	24.34694	14.59184	6.040816	31.87755	7.020408163	20.91837	4.08E-17	-4.1E-17	-1.2E-17	2.99E-16	1.01E-16	-2.5E-16							
2	Std dev	18.11025	16.4721	11.1448	1.99617	2.888631901	3.334396	1	1	1	1	1	1							
3		Column	9	10	11	12	13	14												
4	City	Cluster	z Black	z Hispanic	z Asian	z Age	z Unemp	z income												
5	Los Angeles	24	-0.57133	1.542497	0.355249	-0.439617421	1.480155	0.024482												
6	Memphis	25	1.69258	-0.82514	-0.4523	0.061341966	0.736282	-0.27542												
7	San Francisco	44	-0.73698	-0.03593	2.06008	2.065179513	-0.37953	3.023526												
8	Omaha	34	-0.62655	-0.70373	-0.4523	0.061341966	-0.75146	-0.27542											165.3482	
9	City #	City	%age Black	%age Hispanic	%age Asian	Median Age	Unemployment rate	Per capita income(00's)	z Black	z Hispanic	z Asian	z Age	z Unemp	z Income	Distance from 1 to 1	Distance ^2 to 2	Distance ^2 to 3	Distance ^2 to 4	Min Distance	Assigned to
10	1	Albuquerque	3	35	2	32	5	18	-1.17872	1.238954	-0.36257	0.061342	-0.75146	-0.87523	7.016897	15.08608	27.04372	4.44672	4.44672	4
11	2	Atlanta	67	2	1	31	5	22	2.355188	-0.76443	-0.4523	-0.43962	-0.75146	0.324386	19.60865	3.266853	30.102	9.505167	3.266853	2
12	3	Austin	12	23	3	29	3	19	-0.68177	0.510449	-0.27285	-1.44154	-1.49534	-0.57533	11.68898	14.78223	32.23795	4.411405	4.411405	4
13	4	Baltimore	59	1	1	33	11	22	1.91345	-0.82514	-0.4523	0.562301	1.480155	0.324386	13.52578	1.212861	26.96212	12.05718	1.212861	2
14	5	Boston	26	11	5	30	5	24	0.091278	-0.21806	-0.09339	-0.94058	-0.75146	0.924195	9.780438	7.717853	18.93672	3.32289	3.32289	4
15	6	Charlotte	32	1	2	32	3	20	0.422582	-0.82514	-0.36257	0.061342	-1.49534	-0.27542	16.3033	6.601068	23.98015	1.676812	1.676812	4
16	7	Chicago	39	20	4	31	9	24	0.809103	0.328323	-0.18312	-0.43962	0.736282	0.924195	5.032486	3.873518	19.48122	7.102106	3.873518	2
17	8	Cincinnati	38	1	1	31	8	21	0.753886	-0.82514	-0.4523	-0.43962	0.364346	0.024482	9.259088	1.360387	24.97923	3.506272	1.360387	2
18	9	Cleveland	47	5	1	32	13	22	1.250842	-0.58231	-0.4523	0.061342	2.224028	0.324386	9.381499	2.827259	28.64125	12.75265	2.827259	2
19	10	Columbus	23	1	2	29	3	13	-0.07437	-0.82514	-0.36257	-1.44154	-1.49534	-2.37475	21.98167	14.77613	49.61466	7.546867	7.546867	4
20	11	Dallas	30	21	2	30	9	22	0.312147	0.389031	-0.36257	-0.94058	0.736282	0.324386	3.520536	4.751479	24.71547	5.660316	3.520536	1
21	12	Denver	13	23	2	34	7	23	-0.62655	0.510449	-0.36257	1.063261	-0.00759	0.624291	6.415243	9.536884	13.07848	3.848943	3.848943	4
22	13	Detroit	76	3	1	31	9	21	2.852145	-0.70373	-0.4523	-0.43962	0.736282	0.024482	17.97118	1.700234	36.15315	14.65559	1.700234	2
23	14	El Paso	3	69	1	29	11	13	-1.17872	3.30305	-0.4523	-1.44154	1.480155	-2.37475	10.88078	32.50553	62.55287	28.0051	10.88078	1
24	15	Fort Worth	22	20	2	30	9	20	-0.12959	0.328323	-0.36257	-0.94058	0.736282	-0.27542	3.078873	5.662687	27.53352	4.537368	3.078873	1
25	16	Fresno	9	30	13	28	13	16	-0.84742	0.93541	0.624433	-1.9425	2.224028	-1.47504	5.577794	18.37833	46.09383	18.2029	5.577794	1
26	17	Honolulu	1	5	71	37	5	24	-1.28916	-0.58231	5.828653	2.566139	-0.75146	0.924195	49.81239	58.32659	19.60205	47.61727	19.60205	3
27	18	Houston	28	28	4	30	7	22	2.020171	0.813993	-0.18312	-0.94058	-0.00759	0.324386	3.972443	6.898872	23.09371	4.978902	3.972443	1
28	19	Indianapolis	22	1	1	32	5	21	-0.12959	-0.82514	-0.4523	0.061342	-0.75146	0.024482	11.68407	5.623641	20.45181	0.35165	0.35165	4
29	20	Jacksonville	25	0	2	32	19	19	0.03606	-0.70373	-0.36257	0.061342	-0.00759	-0.57533	8.753829	3.410142	24.01824	1.09039	1.09039	4
30	21	Kansas City	30	4	1	33	6	21	0.312147	-0.64302	-0.4523	0.562301	-0.37953	0.024482	10.6714	3.524699	19.0342	1.364073	1.364073	4
31	22	Las Vegas	11	13	4	33	5	20	-0.73698	-0.09664	-0.18312	0.562301	-0.75146	-0.27542	9.07795	8.970302	18.31566	0.704171	0.704171	1
32	23	Long Beach	14	24	14	30	8	21	-0.57133	0.571158	0.714161	-0.94058	0.364346	0.024482	2.568309	9.667705	20.78967	5.327826	2.568309	4
33	24	Los Angeles	14	40	10	31	11	21	-0.57133	1.542497	0.355249	-0.43962	1.480155	0.024482	0	12.2774	24.15201	11.02173	0	1
34	25	Memphis	55	1	1	32	9	20	1.69258	-0.82514	-0.4523	0.061342	0.736282	-0.27542	12.2774	0	28.98115	7.606484	0	2
35	26	Miami	27	63	1	36	12	17	0.146495	2.938798	-0.4523	2.06518	1.852091	-1.17514	10.96849	22.62751	38.55048	25.46892	10.96849	1
36	27	Milwaukee	31	6	2	30	5	22	0.367364	-0.5216	-0.36257	-0.94058	-0.75146	0.324386	10.97794	5.433386	23.78297	2.392694	2.392694	4
37	28	Minneapolis	13	2	4	32	5	23	-0.62655	-0.76443	-0.18312	0.061342	-0.75146	0.624291	11.20567	8.477371	15.48488	0.885629	0.885629	4
38	29	Nashville	23	1	1	33	3	24	-0.07437	-0.82514	-0.4523	0.562301	-1.49534	0.924195	17.1717	9.792292	15.28483	2.563027	2.563027	2
39	30	New Orleans	62	4	2	32	7	18	2.079102	-0.64302	-0.36257	0.061342	-0.00759	-0.87523	15.59036	1.103737	33.52214	8.245393	1.103737	2
40	31	NY	29	24	7	34	11	27	0.25693	0.571158	0.086066	1.063261	1.480155	1.823908	7.198553	10.26497	11.15449	13.08685	7.198553	1
41	32	Oakland	44	14	15	33	10	24	1.08519	-0.03593	0.803889	0.562301	1.108219	0.924195	7.38843	4.398176	13.77755	10.10247	4.398176	2
42	33	Oklahoma City	16	5	2	32	6	17	-0.4609	-0.58231	-0.36257	0.061342	-0.37953	-1.17514	10.19072	6.758993	27.88813	0.998054	0.998054	4
43	34	Omaha	13	3	1	32	5	20	-0.62655	-0.70373	-0.4523	0.061342	-0.75146	-0.27542	11.02173	7.606484	21.80697	0	0	4
44	35	Philadelphia	40	6	3	33	9	23	0.86432	-0.5216	-0.27285	0.562301	0.736282	0.624291	8.633051	1.870802	17.50259	5.561893	1.870802	2
45	36	Phoenix	5	20	2	31	4	19	-1.06829	0.328323	-0.36257	-0.43962	-1.1234	-0.57533	9.374723	12.76024	25.89079	1.747548	1.747548	4
46	37	Pittsburgh	26	1	2	35	7	21	0.091278	-0.82514	-0.36257	1.56422	-0.00759	0.024482	12.78879	5.474154	16.56169	3.439999	3.439999	4
47	38	Portland	8	3	5	35	7	20	-0.90263	-0.70373	-0.09339	1.56422	-0.00759	-0.27542	11.67525	9.690689	16.38318	3.017031	3.017031	4
48	39	Sacramento	15	16	15	32	8	20	-0.51611	0.085488	0.803889	0.061342	0.364346	-0.27542	3.913136	7.423928	17.09331	3.458099	3.458099	4
49	40	St. Louis	48	1	1	33	8	23	1.306059	-0.82514	-0.4523	0.562301	0.364346	0.624291	12.39109	1.348179	19.67726	6.055185	1.348179	2
50	41	San Antonio	7	56	1	30	5	17	-0.95785	2.513837	-0.4523	-0.94058	-0.75146	-1.17514	8.415201	22.20029	39.66382	12.2758	8.415201	1
51	42	San Diego	9	21	12	31	8	20	-0.84742	0.389031	0.534705	-0.43962	0.364346	-0.27542	2.773884	9.289287	20.22997	3.713075	2.773884	1
52	43	San Francisco	11	14	29	36	6	31	-0.73698	-0.03593	2.06008	2.06518	-0.37953	3.023526	24.15201	28.98115	0	21.80697	0	3
53	44	San Jose	5	27	20	30	8	26	-1.06829	0.753284	1.252529	-0.94058	0.364346	1.524004	5.419489	17.40038	13.22124	10.71126	5.419489	1
54	45	Seattle	10	4	12	35	5	28	-0.7822	-0.64302	0.534705	1.56422	-0.75146	2.123813	18.26013	17.40984	3.897153	9.020281	3.897153	3
55	46	Toledo	20	4	1	32	6	19	-0.24003	-0.64302	-0.4523	0.061342	-0.37953	-0.57533	9.607522	5.103112	23.89469	0.381364	0.381	



Adv	Price	Sale	Between-Subjects Factors		
1	1	41	N		
1	1	25	ad	1.00	9
1	1	23		2.00	9
1	2	21		3.00	9
1	2	20	price	1.00	9
1	2	16		2.00	9
1	3	10		3.00	9
1	3	11			
1	3	8			

### Tests of Between-Subjects Effects

Dependent Variable:			Type III Sum of Squares	df	Mean Square	F	Sig.	
2	1	28						
2	1	30	Corrected Model	3837.630 <sup>a</sup>	8	479.704	28.035	0.000
2	1	32	Intercept	17277.370	1	17277.370	1009.716	0.000
2	2	28	ad	828.963	2	414.481	24.223	0.000
2	2	22	price	2498.741	2	1249.370	73.015	0.000
2	3	11	ad * price	509.926	4	127.481	7.450	0.001
2	3	22	Error	308.000	18	17.111		
2	3	18	Total	21423.000	27			
3	1	35	Corrected Total	4145.630	26			

a. R Squared = .926 (Adjusted R Squared = .893)

### Multiple Comparisons

Dependent Variable:			LSD			
(I)	(J)		Mean Difference (I-J)	Std. Error	Sig.	
(I) ad	1.00	2.00	-1.0000	1.94999	0.614	
		3.00	-12.2222*	1.94999	0.000	
	2.00	1.00	1.0000	1.94999	0.614	
		3.00	-11.2222*	1.94999	0.000	
	3.00	1.00	12.2222*	1.94999	0.000	
		2.00	11.2222*	1.94999	0.000	
(I) price	1.00	2.00	11.2222*	1.94999	0.000	
		3.00	23.5556*	1.94999	0.000	
	2.00	1.00	-11.2222*	1.94999	0.000	
		3.00	12.3333*	1.94999	0.000	
	3.00	1.00	-23.5556*	1.94999	0.000	
		2.00	-12.3333*	1.94999	0.000	

Based on observed means.

\*. The mean difference is significant at the 0.05 level.

Between-Subjects Factors			
		Value Label	N
age	1.00	less than 50	12
	2.00	more than 50	12
gender	1.00	female	12
	2.00	male	12
education	1.00	high school	8
	2.00	graduate	8
	3.00	PG	8

SUPPL. SHEET #3

Tests of Between-Subjects Effects					
Dependent Variable:					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	497.833 <sup>a</sup>	11	45.258	33.943	0.000
Intercept	5460.167	1	5460.167	4095.125	0.000
age	150.000	1	150.000	112.500	0.000
gender	0.667	1	0.667	0.500	0.493
education	127.583	2	63.792	47.844	0.000
age * gender	160.167	1	160.167	120.125	0.000
age * education	18.250	2	9.125	6.844	0.010
gender * education	22.583	2	11.292	8.469	0.005
age * gender * education	18.583	2	9.292	6.969	0.010
Error	16.000	12	1.333		
Total	5974.000	24			
Corrected Total	513.833	23			

a. R Squared = .969 (Adjusted R Squared = .940)