Case – LAB – SPW – Google Ad words

GSBA 539

Scenario

The Smart Partyware (SPW) Company's business model is direct-to-consumer marketing. Over the years they have gained dedicated upscale customers and currently have 500,000 members in their database.

In the direct-marketing industry, the response rate is measured as a percentage of customers who buy the directly mailed product. Smart Partyware's historical response rate for direct mail to selected members is approximately 10%—far above the industry average. Smart Partyware wants to increase the response rate well beyond the 10% and now every marketing campaign at SPW now starts with trial marketing followed by building data-mining models and then selecting appropriate members to send the partyware by UPS. Applichem has signed a Memorandum of Understanding (MOU) with SPW. They will acquire 10 percent of SPW for an undisclosed sum and have an option to buy up to a total of 49% in the following year at current valuation determined by independent evaluators.

John Runner one of the founders of SPW has a vested interest—he wanted to increase the revenue and profit of SPW so that the valuation of SPW in a year will be high and Applichem will have to pay more for the shares of SPW. John and other executives' contracts with SPW allowed them to sell up to 25% of their shares as part of the deal with Applichem. John Runner was sure his prodigy Vijay would be able to do his magic once again and would be able to increase revenue and profit.

Vijay knew he had fully leveraged the power of data mining; increasing the efficiency of the algorithms would not increase the revenue and profit by 50%. His first approach was to buy a potential member list from data brokers to increase the number of members at SPW. This approach was not successful; the additional revenue from new members was not substantial. In fact, the profit from new members was negligible after taking into account the amount of money paid for the data acquisition and the cost of phone-based marketing to enroll them as new members. The second approach was revamping the site and doing Search Engine Marketing (SEM).

SPW signed up with Google AdSense and created an account with Google. Based on "Partyware" search wording Google AdSense gave a list of nearly 800 keywords and phrases that people normally search, along with the level of competition, the number of local monthly searches, and the approximate cost per click (CPC). The total amount spent per month on the "partyware" keyword was approximately $250,000. SPW agreed to allocate $20,000 for ad budget the first month, and based on the success or failure the next month's budget would be decided. Based on the keyword bidding SPW wants to sign-up as many visitors to its website as members and increase its membership base.

Exhibit 1: Sample Keywords from Google AdSense

Keyword	Competition	Local Monthly Searches	Approximate CPC	Cost
Party supplies paper	0.46	22200	$0.92	$20,424.00
Blue party supplies	0.95	6600	$0.81	$5,346.00
Elegant party supplies	0.92	1900	$1.15	$2,185.00
Elegant disposable plates	1	1900	$1.10	$2,090.00
Bamboo plates disposable	1	1300	$1.46	$1,898.00
Elegant disposable tableware	1	720	$1.03	$741.60
Elegant disposable dinnerware	1	720	$1.10	$792.00
Disposable plastic dinnerware	1	720	$1.02	$734.40
Fancy disposable plates	0.98	260	$1.21	$314.60
Disposable catering platters	0.98	210	$1.49	$312.90

Plan of action

Vijay had informed John Runner last month about the campaign to enroll new members and had asked him for a budget of $300,000 for Adwords Marketing. John Runner had sanctioned Vijay request for money and was eager to know the progress in enrolling profitable new customers. John asked Vijay to submit a report on the Google Adword campaign in the next two weeks.

Vijay discussed with Olga to create an action plan which will used to write his report to John Runner. Vijay and Olga agreed on to submit a report to include the following; currently they are given $20,000 for the month to bid on keywords.

PART 1 – K-Means Clustering (Partitional Clustering)

1. Build a K-Means Clustering Model to predict the right set of keywords to bid

   MODEL 1

   i) K = 6 (select the number of clusters to be 6)

   ii) Bid on the following Clusters, Cluster1, Cluster5 and Cluster6 – Cluster 1 has large monthly searches, Cluster5 is competitor (Smarty had a party) website (trying to lure competitor customers to your website) and Cluster6 is high competition

   Answer the following questions,

   a) Provide the cluster Means and cluster standard deviations.
   b) Interpret Cluster1, Cluster5 and Cluster 6 based on the means
   c) What is the net profit
   d) What is the estimated signups per month
   e) What is the estimated signups per year
   f) How many estimated monthly clicks are allowed
   g) How many estimated monthly clicks are allowed if there is no budget constraints

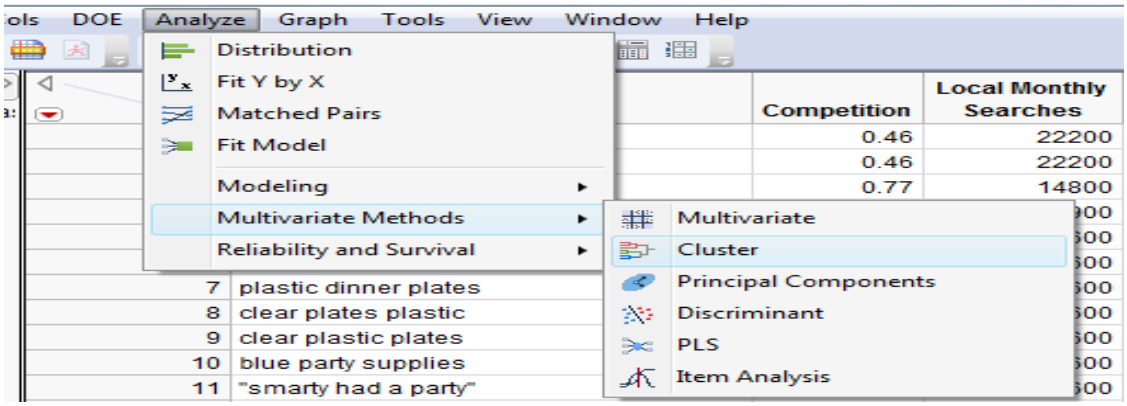
Step A: Use the given data to build a clustering model in JMP
Step B: Obtain the Descriptive Statistics on the clusters.
Step C: Using your business insights select the cluster(s) you will select for bidding.
Step D: Copy and paste the data to Excel – Dashboard and select the Keywords
Step E: Select the Keywords you want to bid-on

Step A: Use the given data to build a clustering model in JMP

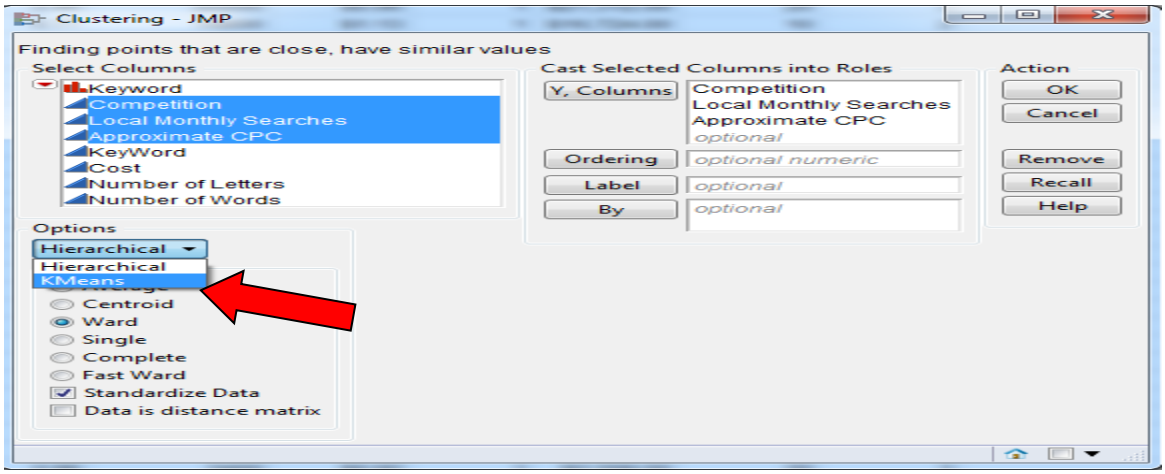
1. Open the Case4_GoogleAdwords_PartyWare.jmp file in JMP, you should see the following file in JMP
2. You should get a Screen like this.

	Keyword	Competition	Local Monthly Searches	Approximate CPC	KeyWord	Cost	Number of Letters	Number of Words
1	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3
2	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3
3	party cups	0.77	14800	$1.13	1	$16,724.00	10	2
4	party napkins	0.93	9900	$1.20	1	$11,880.00	13	2
5	smarty had a party	0.41	6600	$0.31	1	$2,046.00	18	4
6	plastic plates clear	1	6600	$0.88	1	$5,808.00	20	3
7	plastic dinner plates	1	6600	$0.86	1	$5,676.00	21	3
8	clear plates plastic	1	6600	$0.92	1	$6,072.00	20	3
9	clear plastic plates	1	6600	$0.90	1	$5,940.00	20	3
10	blue party supplies	0.95	6600	$0.81	1	$5,346.00	19	3

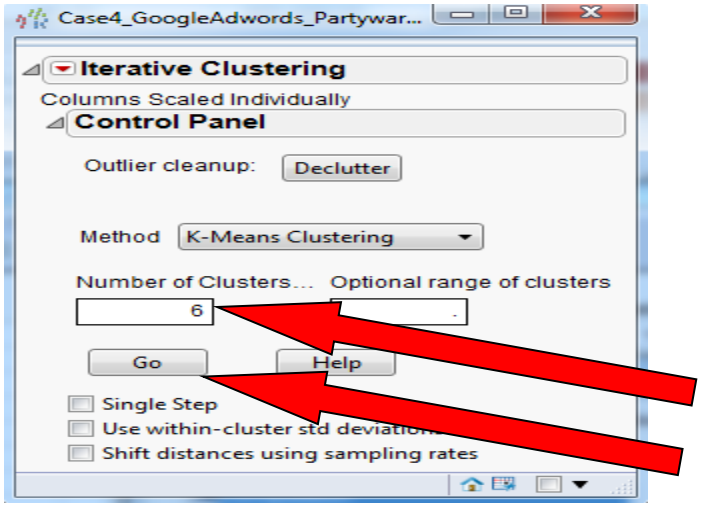
3. Click,
   Analyze menu→ Modeling → Partition



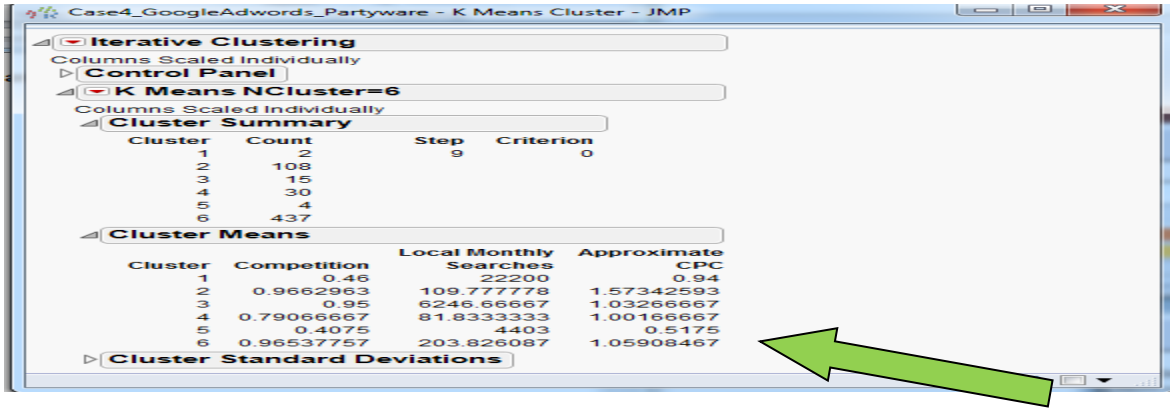
4. For Y, Columns, select Variables you want (I have selected Competition, Local Monthly Searches and Approximate CPC); under options, select from K-means → OK.



5. The following screen will show up, Select the number of clusters you want, I have selected (n=6) six clusters and Click GO.

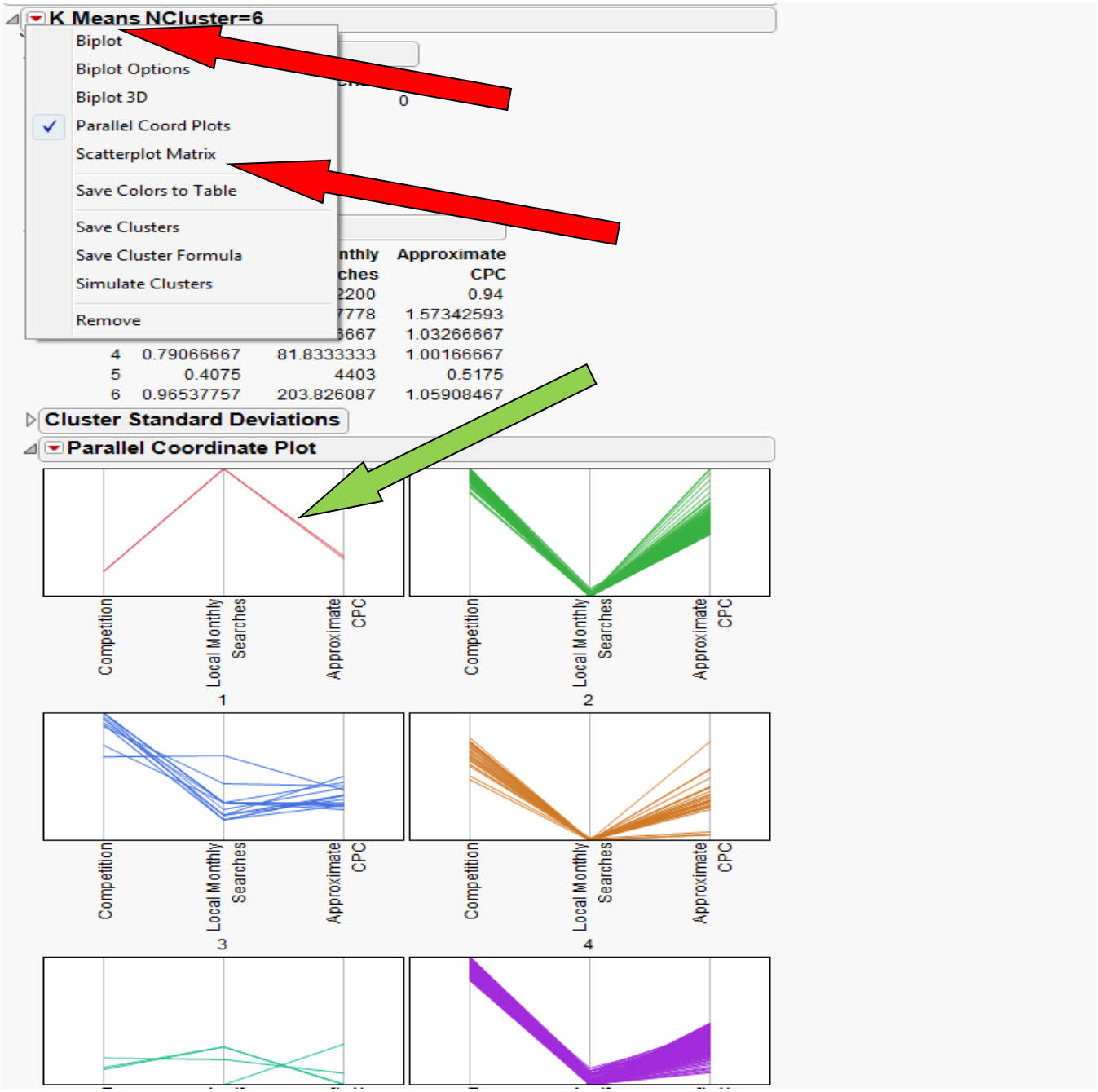


6. The following screen will show up, it has created six clusters, interpret it
The Cluster 1 → it has 2 words in it and the summary statistics is as follows,
Average Competition is low, Average Search is High and Average CPC is $0.94 (Assign a name if possible, I would call this cluster, generic Party ware search), do the same for other clusters, interpreting the clusters helps you to decide whether you want to bid on the cluster.



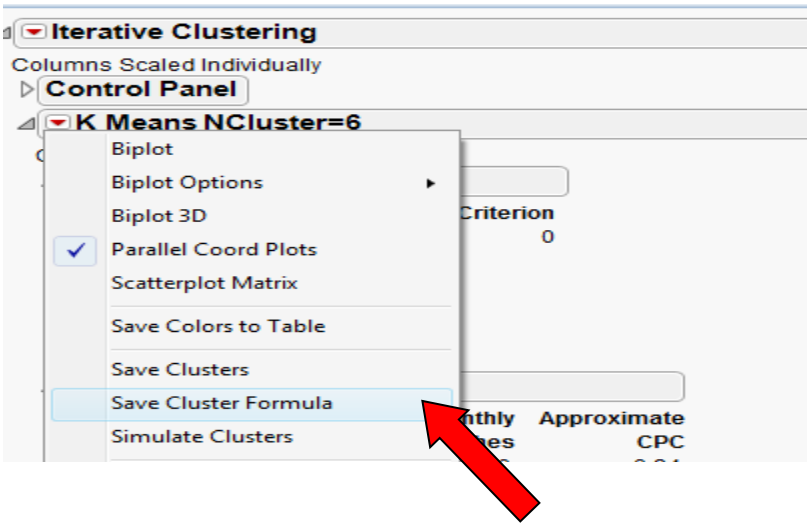
Step B: Obtain the Descriptive Statistics on the clusters

6b. You can also use the parallel coordinate plot to enable your interpretation,
Click on the K-means red triangle Δ and select Parallel Co-ord plots as shown below, it helps your interpretation of each cluster.
The Cluster 1 → it has 2 words in it and the summary statistics is as follows,
Average Competition is low, Average Search is High and Average CPC is $0.94 (Assign a name if possible, I would call this cluster, generic Party ware search).



Step C: Using your business insights select the cluster(s) you will select for bidding.

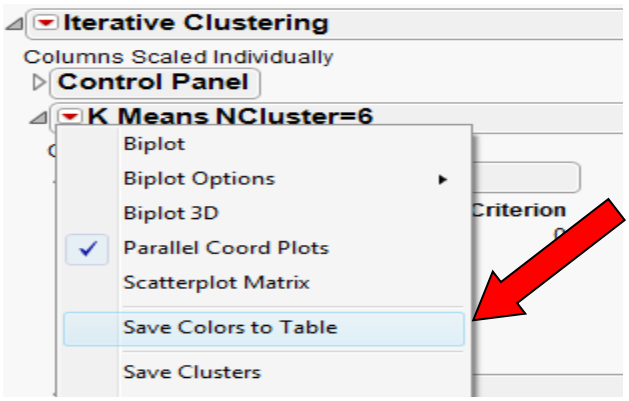
7. If you want to interpret the cluster more, you can visualize the cluster using 3-D scatterplot, to do it, first save the cluster, as follows, Click on the K-means red triangle Δ and select Save Cluster Formula as shown below, the clusters will be saved in the dataset.



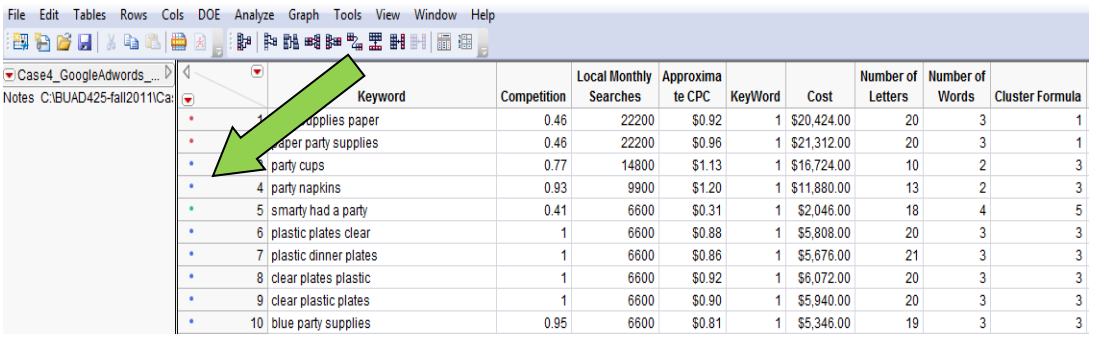
The cluster formula is stored in the dataset as shown,

Number of Letters	Number of Words	Cluster Formula
20	3	1
20	3	1
10	2	3
13	2	3
18	4	5
20	3	3

8. To color code the clusters so that you can visualize the cluster using 3-D scatterplot, Click on the K-means red triangle Δ and select Save Cluster Formula as shown below, the clusters will be saved in the dataset.

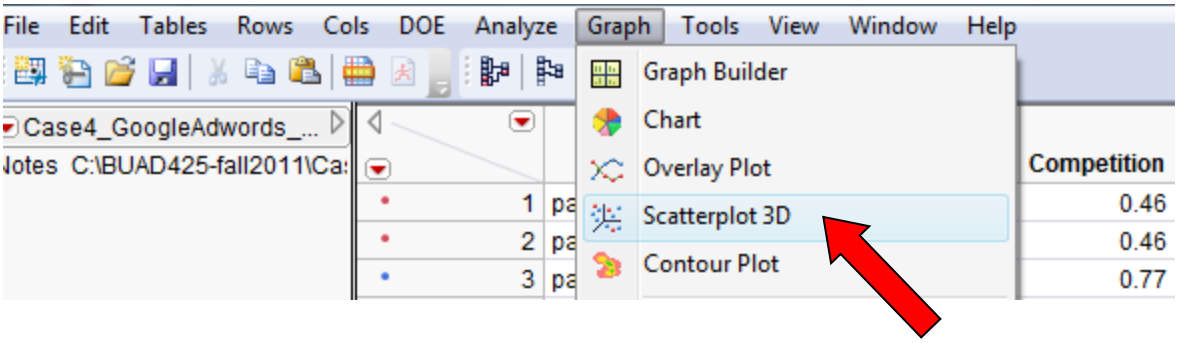


The cluster formula is stored in the dataset as shown,

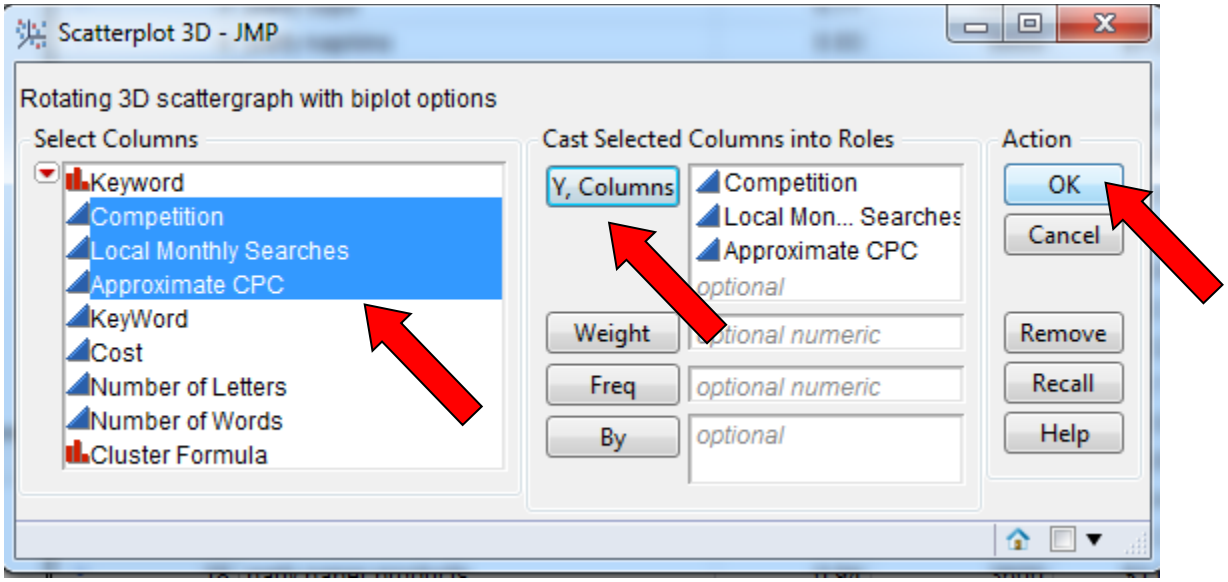


	Keyword	Competition	Local Monthly Searches	Approximate CPC	KeyWord	Cost	Number of Letters	Number of Words	Cluster Formula
1	upplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
2	aper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3	1
3	party cups	0.77	14800	$1.13	1	$16,724.00	10	2	3
4	party napkins	0.93	9900	$1.20	1	$11,880.00	13	2	3
5	smarty had a party	0.41	6600	$0.31	1	$2,046.00	18	4	5
6	plastic plates clear	1	6600	$0.88	1	$5,808.00	20	3	3
7	plastic dinner plates	1	6600	$0.86	1	$5,676.00	21	3	3
8	clear plates plastic	1	6600	$0.92	1	$6,072.00	20	3	3
9	clear plastic plates	1	6600	$0.90	1	$5,940.00	20	3	3
10	blue party supplies	0.95	6600	$0.81	1	$5,346.00	19	3	3

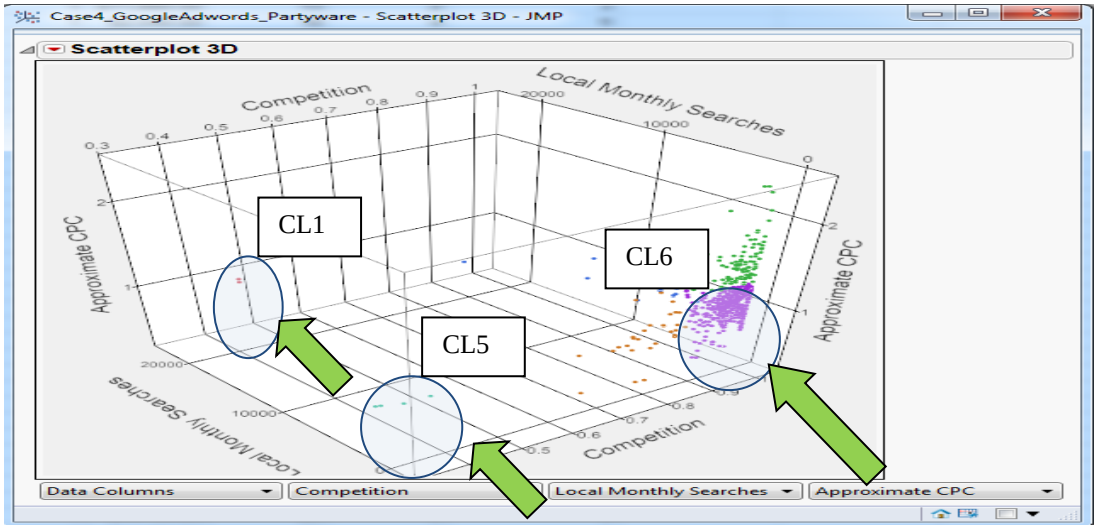
9. To Visualize the clusters in 3-D, go to Graphs (in the dataset page), select Scatterplot 3D



10. Now select the variables (quantitative variables) you want as follows,
Variables (I have selected Competition, Local Monthly Searches and Approximate CPC).



11. You get the following printout, use it to decide the clusters you want to "bid-on" based on your Interpretation of the clusters.
Example, I want to bid on Cluster1, Cluster5 and Cluster6 because they have lower CPC and Cluster1 has larger searches, Cluster5 is competitor (Smarty had a party) website (trying to lure competitor customers to your website) and Cluster6 is high competition.



Step D: Copy and paste the data to Excel – Dashboard and select the Keywords

12. Highlight the columns in the JMP dataset sheet as shown below, copy it using CNTRL-C

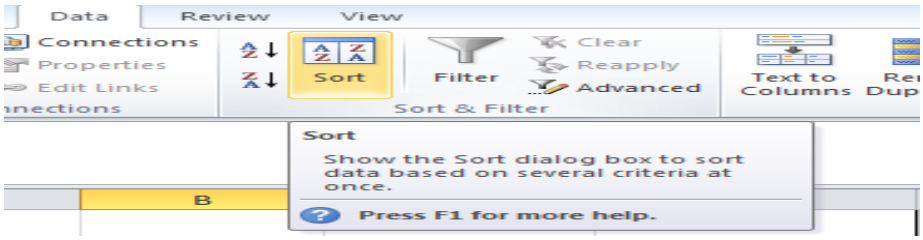
	Keyword	Competition	Local Monthly Searches	Approximate CPC	KeyWord	Cost	Number of Letters	Number of Words	Cluster Formula
1	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
2	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3	1
3	party cups	0.77	14800	$1.13	1	$16,724.00	10	2	3
4	party napkins	0.93	9900	$1.20	1	$11,880.00	13	2	3
5	smarty had a party	0.41	6600	$0.31	1	$2,046.00	18	4	5
6	plastic plates clear	1	6600	$0.88	1	$5,808.00	20	3	3
7	plastic dinner plates	1	6600	$0.86	1	$5,676.00	21	3	3

13. Paste it using Excel file, GSBA539_Clustering_Keyword-1.xls, Input Data sheet, starting at cell A2
You will get a new column, that column is the cluster column, as shown below,

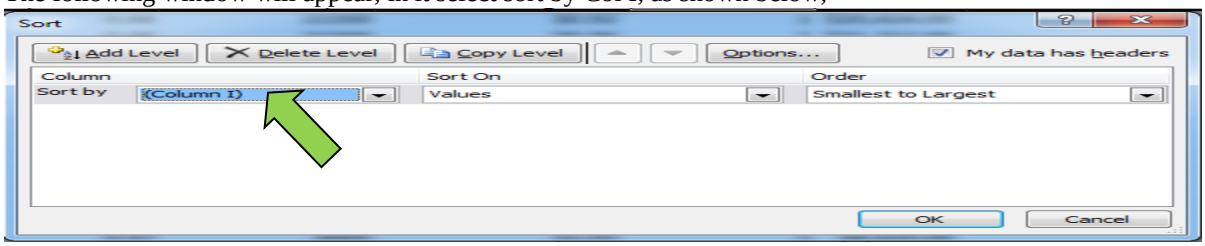
	A	B	C	D	E	F	G	H	I
1	Keyword	Competition	Local Monthly Se	Estimated Avg. CPC	KW selection	Total Cost	Number of Letters	Number of Words	
2	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
3	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3	1
4	party cups	0.77	14800	$1.13	1	$16,724.00	10	2	3

Step E: Select the Keywords you want to bid-on

14. Now sort the keywords based on clusters, Select Data and click on Sort option as shown below,



15. The following window will appear, in it select sort by Col I, as shown below,



16. The data will be sorted by Column I as shown below,

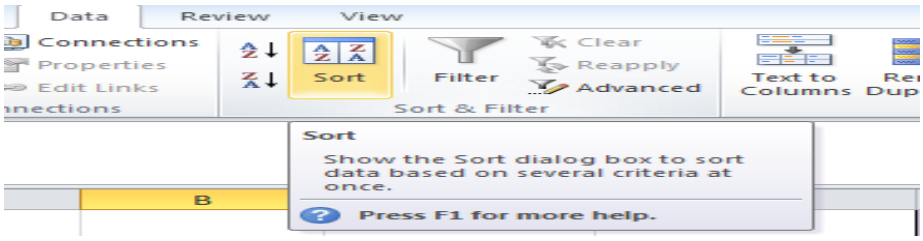
	A	B	C	D	E	F	G	H	I
1	Keyword	Competition	Local Monthly Se	Estimated Avg. CPC	KW selection	Total Cost	Number of Letters	Number of Words	
2	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
3	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3	1
4	bamboo plates disposable	1	1300	$1.46	1	$1,898.00	24	3	2
5	bamboo disposable plates	1	1300	$1.45	1	$1,885.00	24	3	2
6	wholesale plastic tumblers	0.97	880	$1.62	1	$1,425.60	26	3	2
7	wholesale disposable plates	0.97	880	$1.36	1	$1,196.80	27	3	2
8	[party napkins]	0.99	880	$1.49	1	$1,311.20	15	2	2
9	[party cups]	0.9	720	$1.39	1	$1,000.80	12	2	2
10	eco disposable plates	0.98	390	$1.47	1	$573.30	21	3	2
11	bamboo disposable plates	1	390	$1.37	1	$534.30	26	3	2
12	bamboo disposable dinnerware	1	320	$1.54	1	$492.80	28	3	2
13	[plastic party supplies]	0.97	320	$1.34	1	$428.80	24	3	2
14	[elegant party supplies]	0.96	320	$1.34	1	$428.80	24	3	2

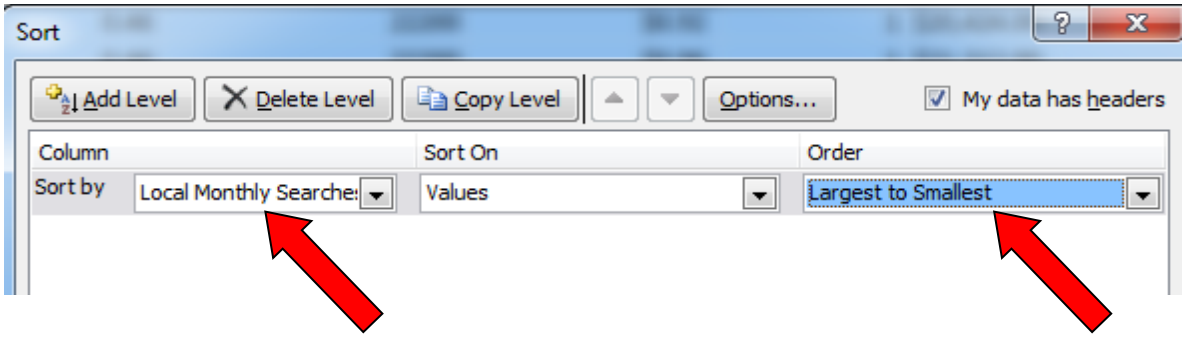
17. Now you have to manually put "1" in rows corresponding to the clusters you have selected to bid-on in KW selection column and manually put "0" in rows corresponding to the clusters you have not selected to bid on in KW selection column as shown below,

Bid on the following Clusters, Cluster1, Cluster5 and Cluster6

	Keyword	Competition	Local Monthly Se	Estimated Avg. CPC	KW selection	Total Cost	Number of Letters	Number of Words	
2	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
3	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20		1
4	bamboo plates disposable	1	1300	$1.46	0	$1,898.00	24		2
5	bamboo disposable plates	1	1300		0	$1,885.00	24	3	2
6	wholesale plastic tumblers	0.97	880	2	0	$1,425.60	2	3	2
7	wholesale disposable plates	0.97	880	$1.36	0	$1,196.80	27	3	2
8	[party napkins]	0.99	880	$1.49	0	$1,311.20	15	2	2
9	[party cups]	0.9	720	$1.39	0	$1,000.80	12		2

18. Now sort the keywords based on Local Monthly searches from Largest to smallest as shown below, (the dashboard is designed so that the keywords have to be sorted by Local Monthly searches to calculate the metrics appropriately)





19. Now switch to the Keyword Dashboard sheet to get the KPIs, if you like the clusters keep it, otherwise select some other clusters. (You can also refine it further based on keywords)

	#Impressions	Avg. CPC
Available Search Volume	259095	$1.00
Available Head KV	127300	$0.93
Available Mid&Tail KV	131795	$1.07
Selected KV	**151084**	**$0.93**
Est. Impressions Share(%)	75%	
Est. Impressions	113,313	

Break-even Analysis (First M

Monthly Budget	$20,000
Revenue per Conversion	$15
Est. CTR%	20.00%
Monthly Clicks if no budget constraint	22,663
Monthly Clicks allowed	21407
Actual CPC	$0.93
Assumed CR	5.00%
CPC Scale	15%
CR Scale (Non Linear)	10%
Amount Spent	$19,999
Net Profit	**($3,950)**
Estimated Signups per Month	**2,874**
Estimated Signups per Year	**34,482**

20. Now use this information to answer the questions in the case.
    Note: Save the JMP as Case4_GoogleAdwords_PartyWare_K1.jmp, so the original file is not modified.

2. Rebuild a K-Means Clustering Model to predict the right set of keywords to bid (Repeat the above steps)
   MODEL 2
   i) K = 5 (select the number of clusters to be 5)
   ii) Bid on the following Clusters, Cluster1, Cluster2 and Cluster3

   Answer the following questions,
   a) Provide the cluster Means and cluster standard deviations.
   b) Interpret Cluster1, Cluster2 and Cluster 3 based on the means
   c) What is the net profit
   d) What is the estimated signups per month
   e) What is the estimated signups per year
   f) How many estimated monthly clicks are allowed
   g) How many estimated monthly clicks are allowed if there is no budget constraints

PART 2 –Hierarchical Clustering

3. Build a Hierarchical Clustering Model to predict the right set of keywords to bid

MODEL 3

i) K = 6 (select the number of clusters to be 6)

ii) Bid on the following Clusters, Cluster1, Cluster3 and Cluster4 – Cluster 1 has large monthly searches etc.,

Answer the following questions,

a) What is the net profit

b) What is the estimated signups per month

c) What is the estimated signups per year

d) How many estimated monthly clicks are allowed

e) How many estimated monthly clicks are allowed if there is no budget constraints

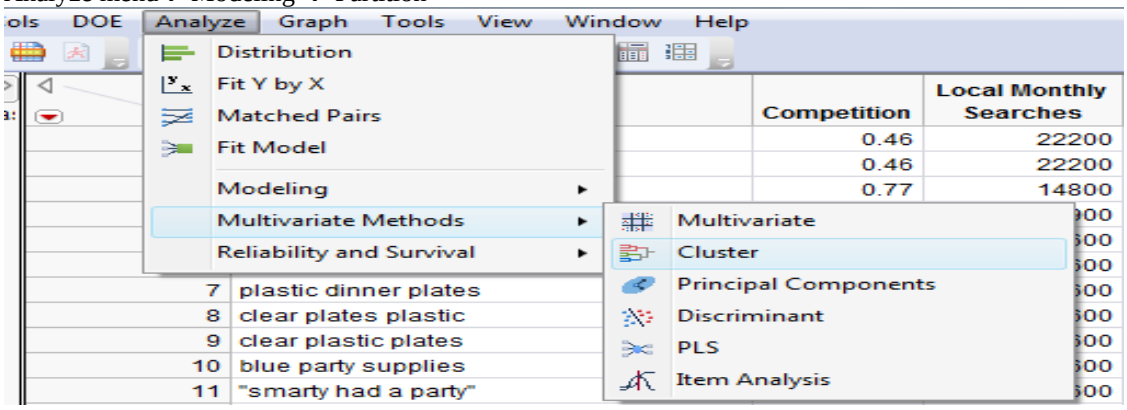
Step A: Use the given data to build a clustering model in JMP
Step B: Obtain the Descriptive Statistics on the clusters.
Step C: Using your business insights select the cluster(s) you will select for bidding.
Step D: Copy and paste the data to Excel – Dashboard and select the Keywords
Step E: Select the Keywords you want to bid-on

Step A: Use the given data to build a clustering model in JMP

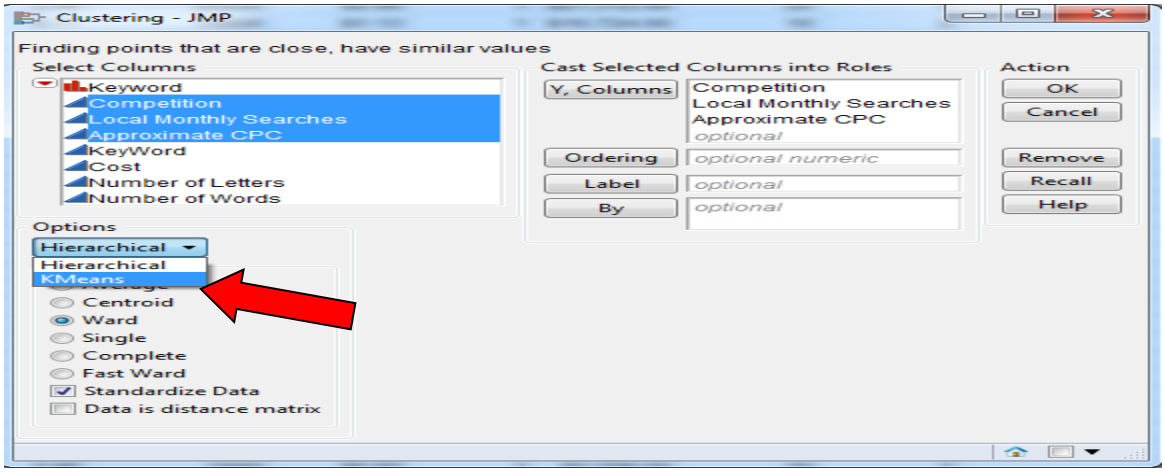
1. Open the Case4_GoogleAdwords_PartyWare.jmp file in JMP (original file), you should see the following file in JMP
2. You should get a Screen like this.

	Keyword	Competition	Local Monthly Searches	Approximate CPC	KeyWord	Cost	Number of Letters	Number of Words
1	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3
2	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3
3	party cups	0.77	14800	$1.13	1	$16,724.00	10	2
4	party napkins	0.93	9900	$1.20	1	$11,880.00	13	2
5	smarty had a party	0.41	6600	$0.31	1	$2,046.00	18	4
6	plastic plates clear	1	6600	$0.88	1	$5,808.00	20	3
7	plastic dinner plates	1	6600	$0.86	1	$5,676.00	21	3
8	clear plates plastic	1	6600	$0.92	1	$6,072.00	20	3
9	clear plastic plates	1	6600	$0.90	1	$5,940.00	20	3
10	blue party supplies	0.95	6600	$0.81	1	$5,346.00	19	3

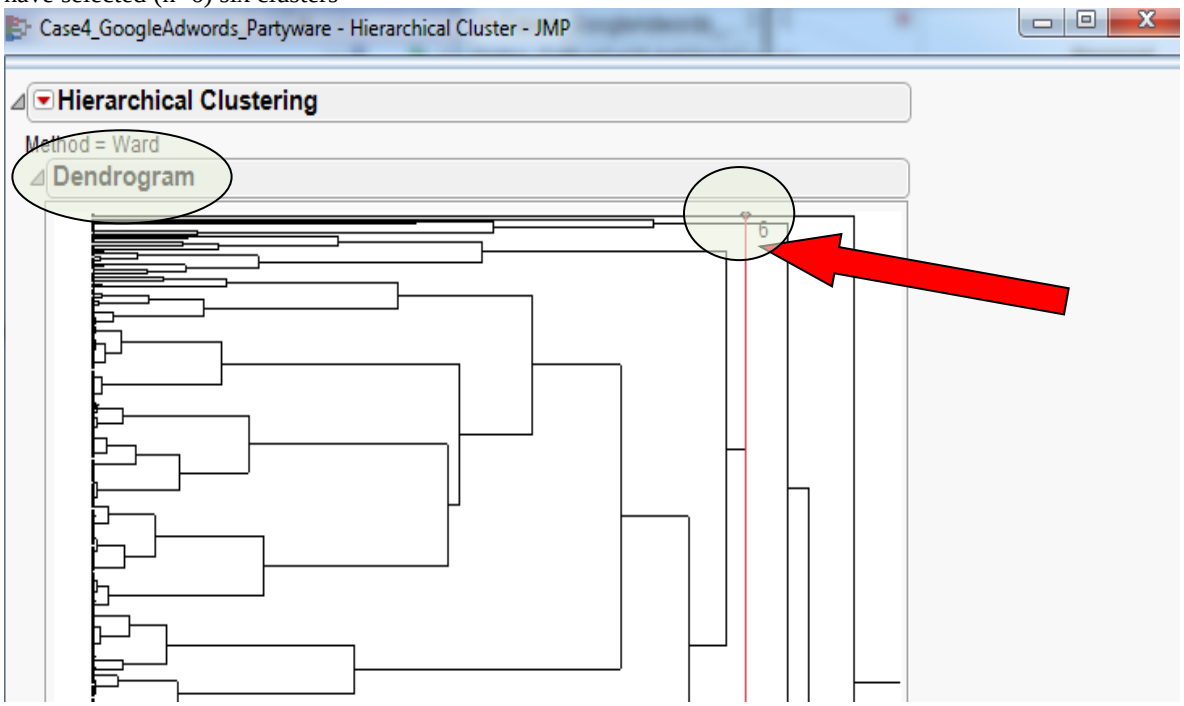
3. Click,
Analyze menu→ Modeling → Partition



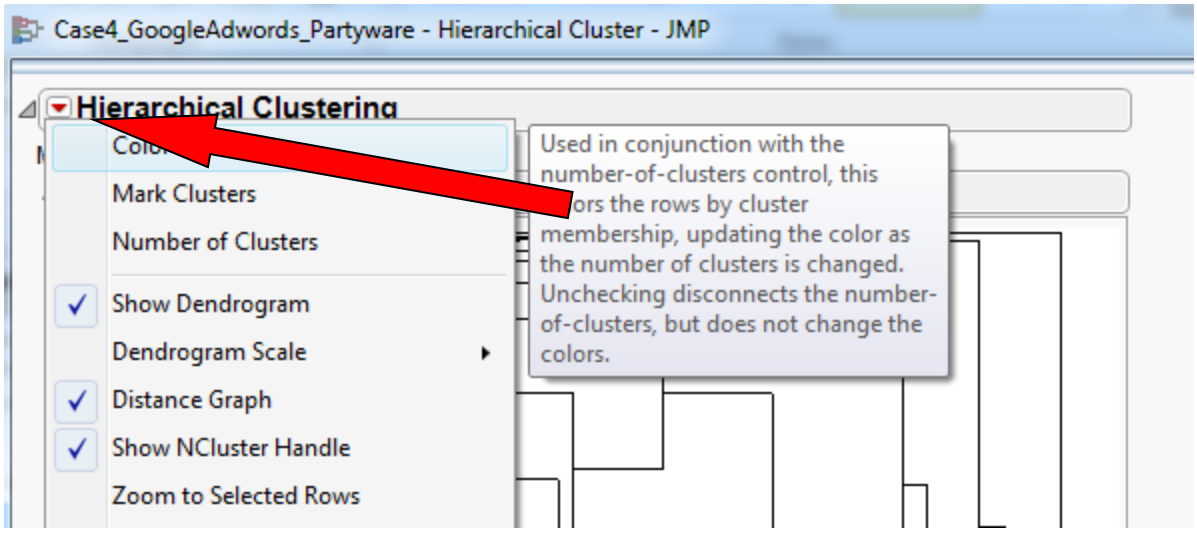
4. For Y, Columns, select Variables you want (I have selected Competition, Local Monthly Searches and Approximate CPC); under options, select from Hierarchical→ OK.



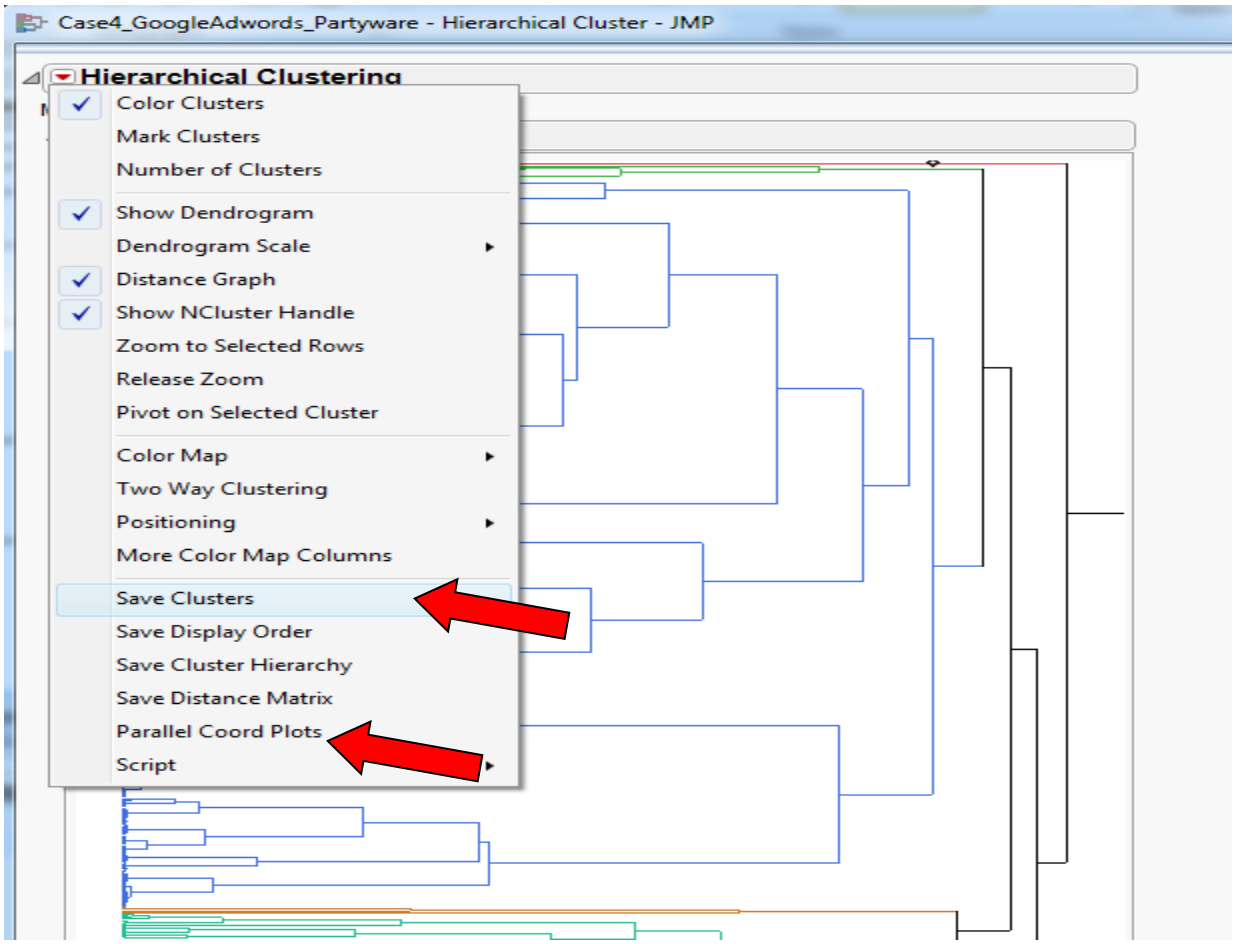
5. The following screen will show up, Select the number of clusters you want by moving the dot on the Dendrogram, I have selected (n=6) six clusters



6. To color code the clusters so that you can visualize the cluster using 3-D scatterplot, Click on the Hierarchical red triangle Δ and select Color Clusters as shown below, the clusters will be colored in the dataset.



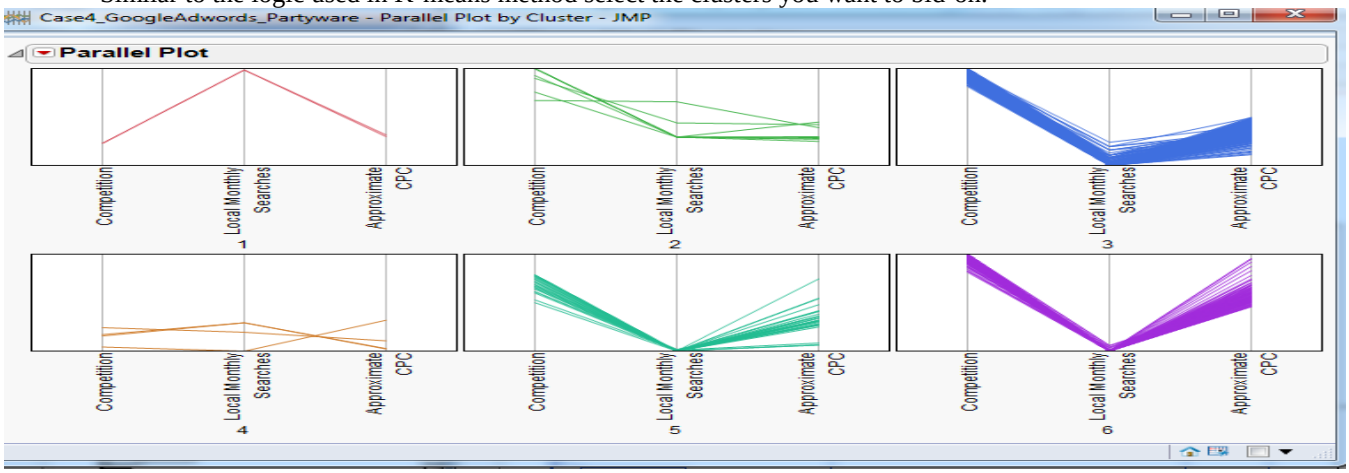
7. To save the clusters so that you can visualize the cluster using 3-D scatterplot, Click on the Hierarchical red triangle Δ and select Save Cluster Formula as shown below, the clusters will be saved in the dataset.



Step B: Obtain the Descriptive Statistics on the clusters

8. You can use the parallel coordinate plot to enable your interpretation,
Click on the Hierarchical red triangle Δ and select Parallel Co-ord plots as shown above, it helps your interpretation of each cluster.

Similar to the logic used in K-means method select the clusters you want to bid-on.



Step C: Using your business insights select the cluster(s) you will select for bidding.

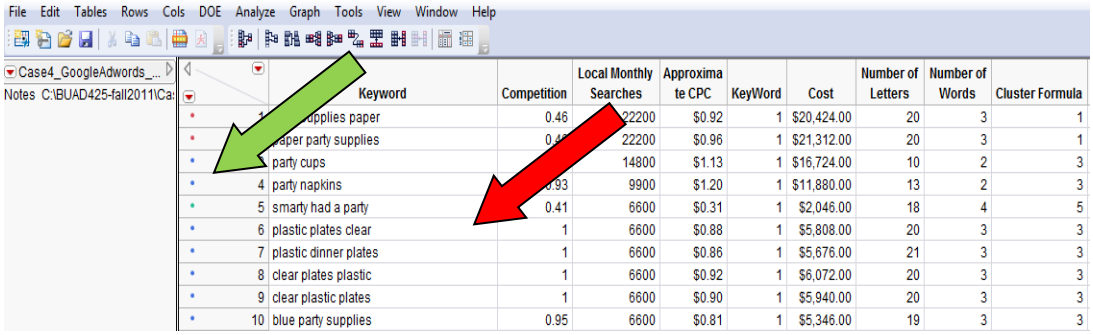
9. If you want to interpret the cluster more, you can visualize the cluster using 3-D scatterplot, to do it, first save the cluster, as follows, Click on the Hierarchical red triangle Δ and select Save Cluster as shown above, the clusters will be saved in the dataset.

   The cluster formula is stored in the dataset as shown,

Cost	Number of Letters	Number of Words	Cluster
$20,424.00	20	3	1
$21,312.00	20	3	1
$16,724.00	10	2	2
$11,880.00	13	2	2
$2,046.00	18	4	4
$5,808.00	20	3	2
$5,676.00	21	3	2

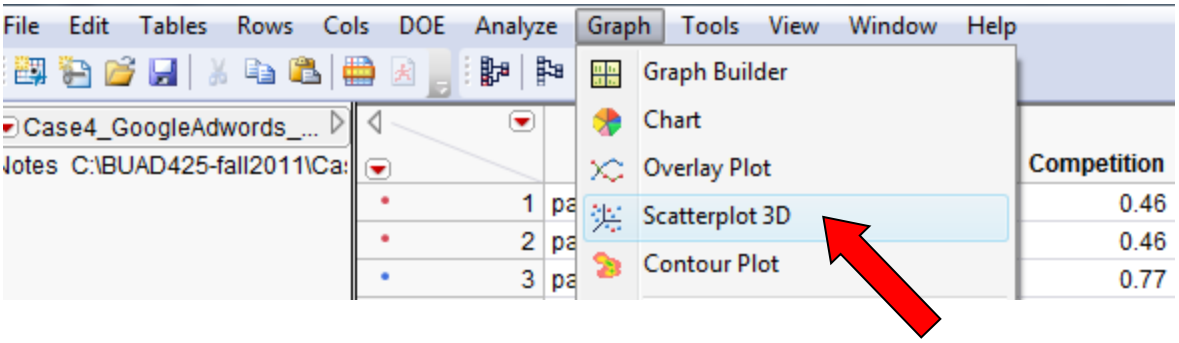
10. To color code the clusters so that you can visualize the cluster using 3-D scatterplot, Click on the Hierarchical red triangle Δ and select Save Cluster as shown above, the clusters will be saved in the dataset.

    The cluster formula is stored in the dataset as shown,

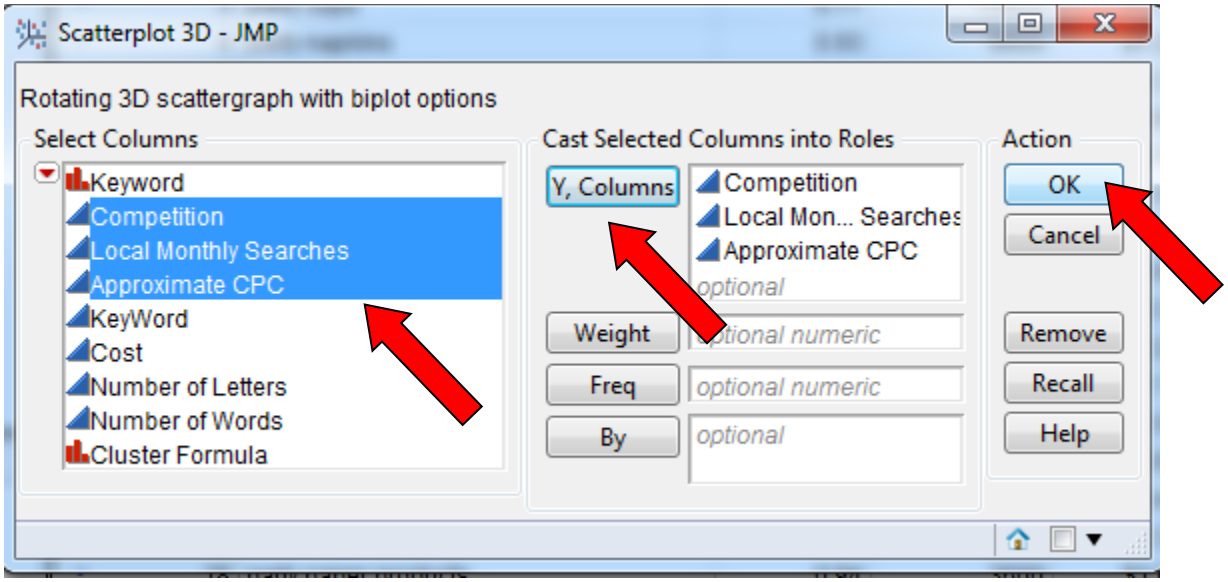


	Keyword	Competition	Local Monthly Searches	Approximate CPC	KeyWord	Cost	Number of Letters	Number of Words	Cluster Formula
1	upplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
2	aper party supplies	0.4	22200	$0.96	1	$21,312.00	20	3	1
3	party cups		14800	$1.13	1	$16,724.00	10	2	3
4	party napkins	0.93	9900	$1.20	1	$11,880.00	13	2	3
5	smarty had a party	0.41	6600	$0.31	1	$2,046.00	18	4	5
6	plastic plates clear	1	6600	$0.88	1	$5,808.00	20	3	3
7	plastic dinner plates	1	6600	$0.86	1	$5,676.00	21	3	3
8	clear plates plastic	1	6600	$0.92	1	$6,072.00	20	3	3
9	clear plastic plates	1	6600	$0.90	1	$5,940.00	20	3	3
10	blue party supplies	0.95	6600	$0.81	1	$5,346.00	19	3	3

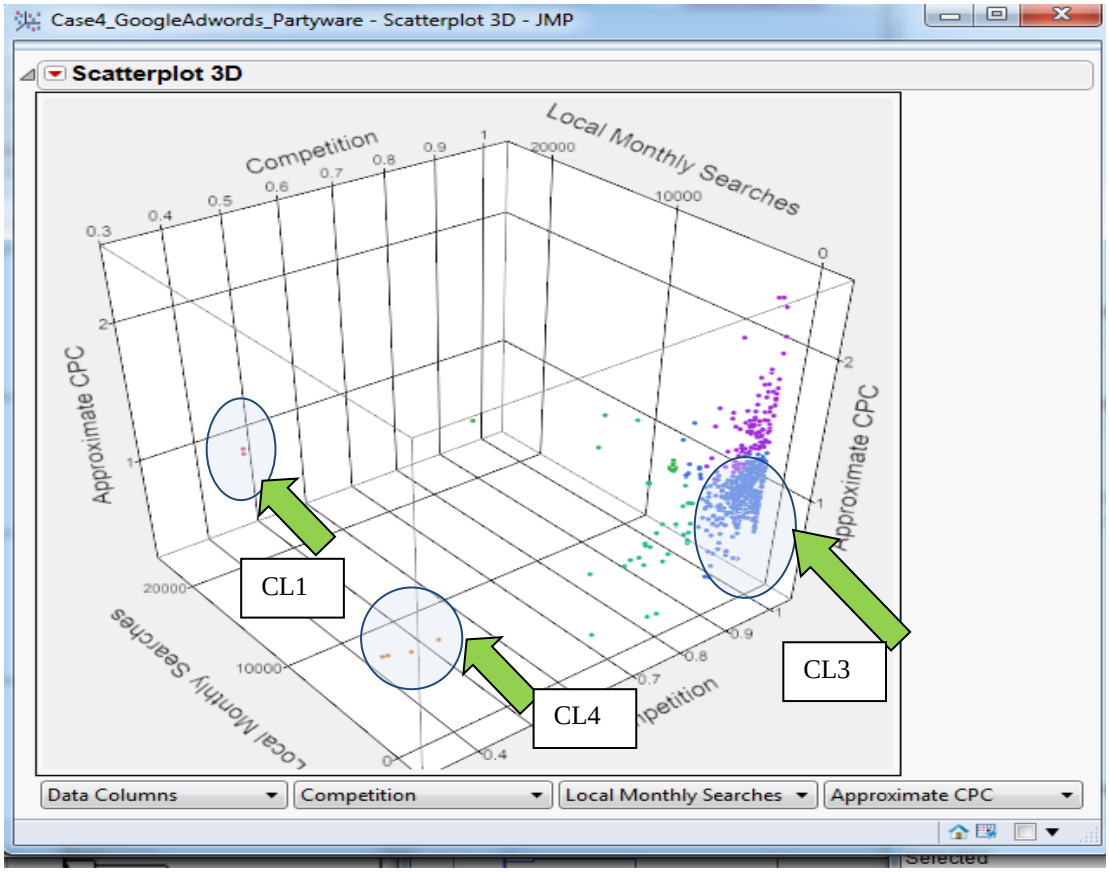
11. To Visualize the clusters in 3-D, go to Graphs (in the dataset page), select Scatterplot 3D



12. Now select the variables (quantitative variables) you want as follows,
Variables (I have selected Competition, Local Monthly Searches and Approximate CPC).



13. You get the following printout, use it to decide the clusters you want to "bid-on" based on your Interpretation of the clusters.
Example, I want to bid on Cluster1, Cluster4 and Cluster3



Step D: Copy and paste the data to Excel – Dashboard and select the Keywords

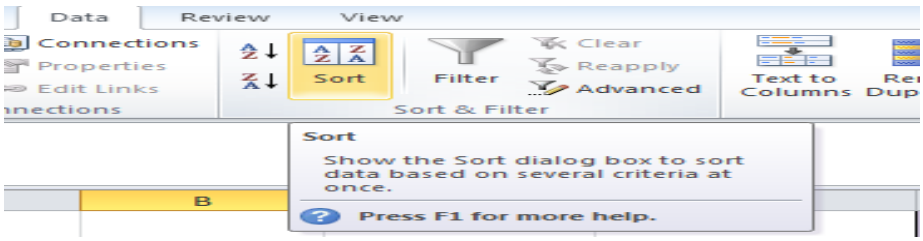
14. Highlight the columns in the JMP dataset sheet as shown below, copy it using CNTRL-C

15. Paste it using Excel file, , GSBA539_Clustering_Keyword-1.xls, Input Data sheet, <u>starting at cell A2</u>
You will get a new column, that column is the cluster column, as shown below,

	A	B	C	D	E	F	G	H	I
1	Keyword	Competition	Local Monthly Se	Estimated Avg. CPC	KW selection	Total Cost	Number of Letters	Number of Words	
2	party supplies paper	0.46	22200	$0.92	1	$20,424.00	20	3	1
3	paper party supplies	0.46	22200	$0.96	1	$21,312.00	20	3	1
4	party cups	0.77	14800	$1.13	1	$16,724.00	10	2	3

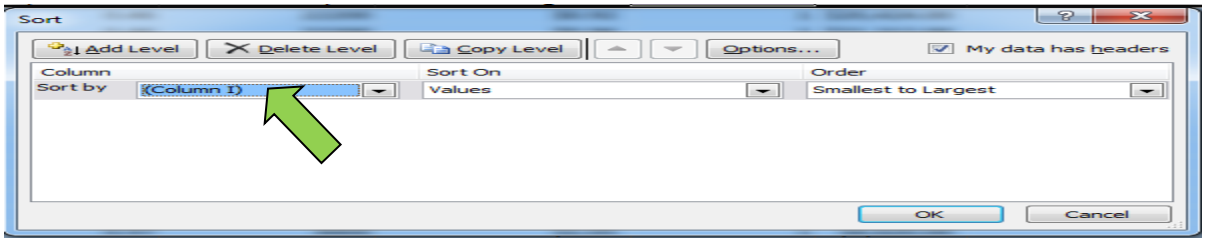
Step E: Select the Keywords you want to bid-on

16. Now sort the keywords based on clusters, Select Data and click on Sort option as shown below,



Bid on the following Clusters, Cluster1, Cluster3 and Cluster4

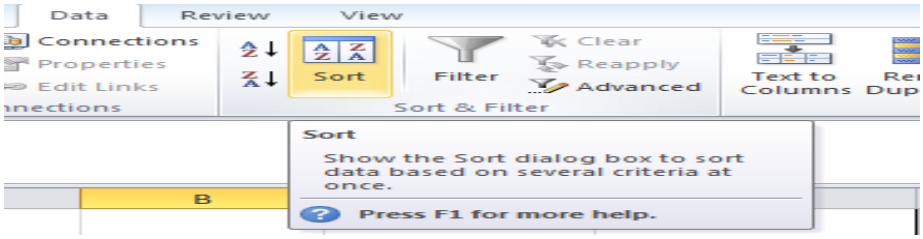
17. The following window will appear, in it select sort by Col I, as shown below,

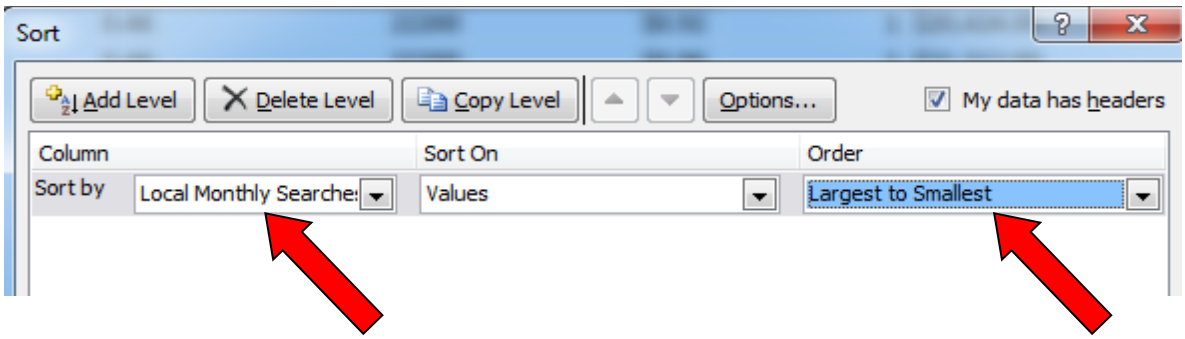


18. The data will be sorted by Column I

19. Now you have to manually put "1" in rows corresponding to the clusters you have selected to bid-on in KW selection column and manually put "0" in rows corresponding to the clusters you have not selected to bid on in KW selection column

20. Now sort the keywords based on Local Monthly searches from Largest to smallest as shown below, (the dashboard is designed so that the keywords have to be sorted by Local Monthly searches to calculate the metrics appropriately)





21. Now switch to the Keyword Dashboard sheet to get the KPIs,

	#Impressions	Avg. CPC
Available Search Volume	259095	$1.00
Available Head KV	127300	$0.93
Available Mid&Tail KV	131795	$1.07
Selected KV	**182471**	**$0.96**
Est. Impressions Share(%)	75%	
Est. Impressions	136,853	

Break-even Analysis (First M

Monthly Budget	$20,000
Revenue per Conversion	$15
Est. CTR%	20.00%
Monthly Clicks if no budget constraint	27,371
Monthly Clicks allowed	20765
Actual CPC	$0.96
Assumed CR	5.00%
CPC Scale	15%
CR Scale (Non Linear)	10%
Amount Spent	$19,999
Net Profit	**($4,430)**
Estimated Signups per Month	**2,701**
Estimated Signups per Year	**32,414**

22. Now use this information to answer the questions in the case.

4. Adjust the Hierarchical Clustering Model to predict the right set of keywords to bid (Repeat the above steps for hierarchical clustering).

MODEL 4

i) K = 5 (select the number of clusters to be 5)

ii) Bid on the following Clusters, Cluster1, Cluster2 and Cluster3

Answer the following questions,

a) What is the net profit
b) What is the estimated signups per month
c) What is the estimated signups per year
d) How many estimated monthly clicks are allowed

How many estimated monthly clicks are allowed if there is no budget constraints

Which is the best Clustering Model among the four models?

a) Based on Profit
b) Based on Number of Signups