

Demographic Information

Census Block Group	Num. of Households	Avg. Annual Income	Avg. Exp. per household	Sales Ares	Margin on Sales	Expenses	Net Operating Profit Before Tax	Lambda
1	730	65-70	180	10000	16.2	12.3	3.9	1
2	1130	45-50	125	15000	15.6	12	3.6	
3	1035	80-85	280	20000	14.7	11.8	2.9	
4	635	150+	350					
5	160	25-30	75					
6	105	20-25	50					
7	125	20-25	60					
8	470	40-45	115	Competitor Store Size		Max. Store Size Limit		
9	305	30-35	90	Store	Sales Area	Site	Sales Area	
10	1755	85-90	265	A	10000	X	15	
11	900	75-80	215	B	15000	Y	20	
12	290	150+	370			Z	10	

Minimum Travel Time between Site and Census Block in minutes

Site	Census Block Group											
	1	2	3	4	5	6	7	8	9	10	11	12
A	7	5	5	9	1	3	4	5	7	10	14	17
B	10	8	8	10	7	3	3	2	1	4	2	5
X	16	14	14	16	13	8	7	6	4	3	2	2
Y	12	10	10	12	9	5	4	3	2	3	2	4
Z	7	5	5	7	4	2	1	4	3	8	10	13

  

Census Block Group	1	2	3	4	5	6	7	8	9	10	11	12
Expenditure	730	1130	1035	635	160	105	125	470	305	1755	900	290
Household	180	125	280	350	75	50	60	115	90	265	215	370

Attraction

Competition		Census Block											
Site	Size	1	2	3	4	5	6	7	8	9	10	11	12
A	10000	1428.571	2000	2000	1111.111	10000	3333.333	2500	2000	1428.571	1000	714.2857	588.2353
B	15000	1500	1875	1875	1500	2142.857	5000	5000	7500	15000	3750	7500	3000

Potential Site		Census Block											
Site	Size	1	2	3	4	5	6	7	8	9	10	11	12
X	10000	625	714.2857	714.2857	625	769.2308	1250	1428.571	1666.667	2500	3333.333	5000	5000
X	15000	937.5	1071.429	1071.429	937.5	1153.846	1875	2142.857	2500	3750	5000	7500	7500
Y	10000	833.3333	1000	1000	833.3333	1111.111	2000	2500	3333.333	5000	3333.333	5000	2500
Y	15000	1250	1500	1500	1250	1666.667	3000	3750	5000	7500	5000	7500	3750
Y	20000	1666.667	2000	2000	1666.667	2222.222	4000	5000	6666.667	10000	6666.667	10000	5000
Z	10000	1428.571	2000	2000	1428.571	2500	5000	10000	2500	3333.333	1250	1000	769.2308

Probability of using site

Potential Site		Census Block											
Site	Size	1	2	3	4	5	6	7	8	9	10	11	12
X	10000	0.175879	0.155642	0.155642	0.193133	0.059574	0.130435	0.16	0.149254	0.132075	0.412371	0.378378	0.582192
A	10000	0.40201	0.435798	0.435798	0.343348	0.774468	0.347826	0.28	0.179104	0.075472	0.123711	0.054054	0.068493
B	15000	0.422111	0.40856	0.40856	0.463519	0.165957	0.521739	0.56	0.671642	0.792453	0.463918	0.567568	0.349315
X	15000	0.242494	0.216606	0.216606	0.264188	0.086777	0.183673	0.222222	0.208333	0.185841	0.512821	0.477273	0.676393
A	10000	0.369515	0.404332	0.404332	0.313112	0.752066	0.326531	0.259259	0.166667	0.070796	0.102564	0.045455	0.05305
B	15000	0.387991	0.379061	0.379061	0.422701	0.161157	0.489796	0.518519	0.625	0.743363	0.384615	0.477273	0.270557
Y	10000	0.221519	0.205128	0.205128	0.241935	0.083832	0.193548	0.25	0.25974	0.233333	0.412371	0.378378	0.410628
A	10000	0.379747	0.410256	0.410256	0.322581	0.754491	0.322581	0.25	0.155844	0.066667	0.123711	0.054054	0.096618
B	15000	0.398734	0.384615	0.384615	0.435484	0.161677	0.483871	0.5	0.584416	0.7	0.463918	0.567568	0.492754
Y	15000	0.299145	0.27907	0.27907	0.323741	0.12069	0.264706	0.333333	0.344828	0.313433	0.512821	0.477273	0.511022
A	10000	0.34188	0.372093	0.372093	0.28777	0.724138	0.294118	0.222222	0.137931	0.059701	0.102564	0.045455	0.08016
B	15000	0.358974	0.348837	0.348837	0.388489	0.155172	0.441176	0.444444	0.517241	0.626866	0.384615	0.477273	0.408818

Probability of using site

Potential Site		Census Block											
Site	Size	1	2	3	4	5	6	7	8	9	10	11	12
Y	20000	0.362694	0.340426	0.340426	0.38961	0.154696	0.324324	0.4	0.412371	0.378378	0.583942	0.54902	0.582192
A	10000	0.310881	0.340426	0.340426	0.25974	0.696133	0.27027	0.2	0.123711	0.054054	0.087591	0.039216	0.068493
B	15000	0.326425	0.319149	0.319149	0.350649	0.149171	0.405405	0.4	0.463918	0.567568	0.328467	0.411765	0.349315
Z	10000	0.327869	0.340426	0.340426	0.353635	0.170732	0.375	0.571429	0.208333	0.168675	0.208333	0.108527	0.176532
A	10000	0.327869	0.340426	0.340426	0.275049	0.682927	0.25	0.142857	0.166667	0.072289	0.166667	0.077519	0.134995
B	15000	0.344262	0.319149	0.319149	0.371316	0.146341	0.375	0.285714	0.625	0.759036	0.625	0.813953	0.688474

Expenditures per Facility per Census Block

Potential Site		Census Block											
Site	Size	1	2	3	4	5	6	7	8	9	10	11	12
X	10000	23110.55	21984.44	45105.06	42923.82	714.8936	684.7826	1200	8067.164	3625.472	191783.5	73216.22	62469.18
A	10000	52824.12	61556.42	126294.2	76309.01	9293.617	1826.087	2100	9680.597	2071.698	57535.05	10459.46	7349.315
B	15000	55465.33	57709.14	118400.8	103017.2	1991.489	2739.13	4200	36302.24	21752.83	215756.4	109824.3	37481.51
X	15000	31863.74	30595.67	62772.56	58715.75	1041.322	964.2857	1666.667	11260.42	5101.327	238500	92352.27	72576.92
A	10000	48554.27	57111.91	117175.5	69589.04	9024.793	1714.286	1944.444	9008.333	1943.363	47700	8795.455	5692.308
B	15000	50981.99	53542.42	109852	93945.21	1933.884	2571.429	3888.889	33781.25	20405.31	178875	92352.27	29030.77
Y	10000	29107.59	28974.36	59446.15	53770.16	1005.988	1016.129	1875	14038.96	6405	191783.5	73216.22	44060.39
A	10000	49898.73	57948.72	118892.3	71693.55	9053.892	1693.548	1875	8423.377	1830	57535.05	10459.46	10367.15
B	15000	52393.67	54326.92	111461.5	96786.29	1940.12	2540.323	3750	31587.66	19215	215756.4	109824.3	52872.46
Y	15000	39307.69	39418.6	80874.42	71951.44	1448.276	1389.706	2500	18637.93	8603.731	238500	92352.27	54832.67
A	10000	44923.08	52558.14	107832.6	63956.83	8689.655	1544.118	1666.667	7455.172	1638.806	47700	8795.455	8601.202
B	15000	47169.23	49273.26	101093	86341.73	1862.069	2316.176	3333.333	27956.9	17207.46	178875	92352.27	43866.13
Y	20000	47658.03	48085.11	98655.32	86590.91	1856.354	1702.703	3000	22288.66	10386.49	271576.6	106235.3	62469.18
A	10000	40849.74	48085.11	98655.32	57727.27	8353.591	1418.919	1500	6686.598	1483.784	40736.5	7588.235	7349.315
B	15000	42892.23	45079.79	92489.36	77931.82	1790.055	2128.378	3000	25074.74	15579.73	152761.9	79676.47	37481.51
Z	10000	43081.97	48085.11	98655.32	78595.28	2048.78	1968.75	4285.714	11260.42	4630.12	96890.63	21000	18941.85
A	10000	43081.97	48085.11	98655.32	61129.67	8195.122	1312.5	1071.429	9008.333	1984.337	77512.5	15000	14484.94
B	15000	45236.07	45079.79	92489.36	82525.05	1756.098	1968.75	2142.857	33781.25	20835.54	290671.9	157500	73873.21

Expenditures per Facility

Potential Site

Site	Size	Expenditure	Market Share	Margin on Sales	Expenses	NOP(BT)	Profit Before Tax
X	10000	474885.1	0.286624	16.2	12.3	3.9	18520.52
A	10000	417299.5	0.251867				
B	15000	764640.4	0.461509				
X	15000	607410.9	0.366611	15.6	12	3.6	21866.79
A	10000	378253.7	0.2283				
B	15000	671160.4	0.405088				
Y	10000	504699.5	0.304618	16.2	12.3	3.9	19683.28
A	10000	399670.8	0.241227				
B	15000	752454.8	0.454155				
Y	15000	649816.7	0.392206	15.6	12	3.6	23393.4
A	10000	355361.7	0.214484				
B	15000	651646.6	0.39331				
Y	20000	760504.7	0.459013	14.7	11.8	2.9	22054.64
A	10000	320434.4	0.193403				
B	15000	575885.9	0.347584				
Z	10000	429443.9	0.259197	16.2	12.3	3.9	16748.31
A	10000	379521.2	0.229065				
B	15000	847859.8	0.511738				

## Question

- 1 When  $\lambda = 1$ , the best choice is Location Y with a store size of 15,000 sq.ft. This is the site with the highest NOP before tax.
- 2 The NOP before tax will be \$23,393.40. The expected market share will be 39.2%. See calculations above for justification.
- 3 When  $\lambda = .5$ , the best choice is Location Y with a store size of 15,000 sq. ft. This is the site with the highest NOP before tax. The NOP before tax will be \$23,121.53. The expected market share will be 38.8%. Change  $\lambda$  on "Data" sheet to 0.5 and see "Calculations" sheet for justification.

When  $\lambda = 5$ , the best choice is Location Y with a store size of 15,000 sq. ft. This is the site with the highest NOP before tax. The NOP before tax will be \$22,450.45. The expected market share will be 37.6%.

Sensitivity checks for different travel demand elasticities are robust. The optimal site is Location Y with a store size of 15,000 sq. ft.

## 4 Shortcomings:

- A. Net Present Value is ignored. An analysis should look at forecasts of expected costs and benefits over many years into the future.
- B. This is a short term analysis. Spatial and demographic changes are ignored. For example, the problem does not account for forecasted population growth and movement in Census Block. According to the map, rich households are on the edge of the city. I presume these are the suburbs. This may be evidence of the "poor chasing the rich" trend that has been well documented in most metro areas. Long term strategy may consider location X if the suburbs continue to move away from the center of the city.
- C. There may be different city and local tax rates depending on the census group one chooses.
- D. The real estate price and construction costs are also not taken into account in this problem.
- E. Size may not be an adequate approximation of the attractiveness of a furniture store. Other qualitative aspects such as perceived quality of the furniture, friendliness of the sales staff, and the customer's loyalty to an existing store may confound the size variable.
- F. At first glance, a long travel time to the store may be seen as a disincentive to visit a furniture store. To counteract such a disincentive, furniture stores can emulate automobile dealers who establish "motor miles" in many communities. This strategy of locating all or most dealers in one area is effective in drawing many customers from great distances away.
- G. Other factors, most of which are not quantifiable, may also alter a customer's perception of the utility of the shopping center. For example, consider the effect of an established firm's reputation or the lure of a new store. The visibility of a store and the nature of adjoining stores or neighborhoods may also influence the store's ability to attract customers, but these factors are not easily measured.