Case 1 - My School Bus

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My School Bus provides bus service to students

- Public transit: $1,000 annually on average
- My School Bus: $1,040 for one-way and $1,300 for two-way annually
- Current Cost: $215 per day per bus, 14 total buses and 188 - 190 total days

Year	Performance
1	Loss
2	Loss
3	Loss
4	Loss
5	$8,000

My School Bus is looking to…...

1. Break even: make $45,000 per bus (total 14 buses)
2. Profit: make $60,000 per bus (total 14 buses)
3. Or even better

Our goal is to generate a desirable revenue (>$60,000) while accommodating as many students as possible.

Assumptions

- Bus routes are fixed, meaning we cannot combine or cancel routes.
- The maximum capacity for each bus is 55.
- For each route there is only one bus.
- We are only allowed to change prices.
- For the same distance range, the price for every bus route is the same.
- The price for each distance range can only be changed to the ones that Reubens suggested since there is no data on price sensitivity.
- If there are multiple pricing strategies that generate more than $60,000 per bus annually, we would pick the one that accommodates the most students

Model Development

In the proposed solution, Paul Reuben suggested possible prices for each distance category:

Less than 8km:	$1,100	+20% ridership
	$1,200	+10% ridership
	$1,300	no change
8 to 18km:	$1,200	+10% ridership
	$1,300	no change
	$1,400	-10% ridership
	$1,500	-20-25% ridership [1]
18 to 30km:	$1,300	no change
	$1,400	-1% ridership
	$1,700	-20% ridership

[1]: We take the average here, which means we assume that when the price for 8-18km 2-way customers is changed to $1,500, the ridership of this distance will drop by 22.5%.

Model Development (cont’ d)

Bus capacity:

One constraint is that for each bus, the maximum capacity is 55.

Actually we would not violate this constraint under any circumstances. The maximum number of students taking one bus happens when 2-way less-than-8km ride is charged at $1,100 and 2-way 8-18km at $1,200. In that case, the bus with the most students is Route 31 Bus, which has 54 students.

Model Development (cont' d)

So we set up an Excel file to calculate the revenue of each distance range pricing policy and the optimal one is the combination of the following :

5-8kms rate change Policy 2																	
Prices 5-8kms 1v	880																
Prices 5-8kms 2v	1100																
Ridership change	1.2																
Route	1	2	3	4	20	21	22	23	30	31	32	33	34	35	Total		
8kms-1way	0	0	0	0	0	0	0	1	0	0	0	2	1	2	6		
8kms-2way	5	0	4	13	19	1	1	4	0	18	7	2	1	16	91		
Total 8kms rider	5	0	4	13	19	1	1	5	0	18	7	4	2	18	97		
Revenue	5500	0	4400	14300	20900	1100	1100	5280	0	19800	7700	3960	1980	19360	105380		
8-18kms rate change Policy 1																	
Prices 8-18km 1v	960																
Prices 8-18km 2v	1200																
Ridership change	1.1																
Route	1	2	3	4	20	21	22	23	30	31	32	33	34	35	Total		
8-18kms-1way	0	0	1	0	0	1	1	1	0	1	0	1	0	0	6		
8-18kms-2way	15	32	32	11	10	20	35	10	51	35	33	40	13	14	351		
Total 8-18kms ri	15	32	33	11	10	21	36	11	51	36	33	41	13	14	357		
Revenue	18000	38400	39360	13200	12000	24960	42960	12960	61200	42960	39600	48960	15600	16800	426960		
18-30kms rate change Policy 1																	
Prices 18-30kms	1120																
Prices 18-30kms	1400																
Ridership change	0.99																
Route	1	2	3	4	20	21	22	23	30	31	32	33	34	35	Total		
18-30kms 1way	1	1	0	0	0	0	0	0	0	0	0	0	1	0	3		
18-30kms 2way	19	14	0	2	0	0	3	0	0	0	7	2	23	3	73		
Total 18-30kms r	20	15	0	2	0	0	3	0	0	0	7	2	24	3	76		
Revenue	27720	20720	0	2800	0	0	4200	0	0	0	9800	2800	33320	4200	105560		
Most Revenue Policy															637900		45564.29
Constraint	40	47	37	26	29	22	40	16	51	54	47	47	39	35	Optimal, also accommodates the most students		

Base Solution

The solution is the following pricing strategy:

Less than 8km: $1,100 per person, total $105,380

8-18km: $1,200 per person, total $426,960

More than 18km: $1,400 per person, total $105,560

The total revenue is $637,900, so $45,564.29 per bus per year. This strategy is also the one that accommodates the most students and fits the maximum capacity constraint. Unfortunately, this strategy is unable to generate the desirable revenue of $60,000, but it is the most profitable one.

Sensitivity Analysis

- There is no data on price sensitivity, so the data of ridership impact of different pricing policies is based on the estimation of Paul Reuben, which lacks precision and accuracy.
- Since the difference between revenues in each pricing policy is insignificant, the rounding of ridership undermines the accuracy of the analysis.
- We are not given enough data to approximate the quantitative relationship between ridership and prices with a distribution and therefore find the theoretical optimal solution.

Conclusion

- According to our analysis, the optimal revenue is $45,564.29 per bus per year under the price segmentation below:

Distance	Annual price per student
Less than 8km	$1,100
8 - 18km	$1,200
18 - 30km	$1,400

- The optimal solution reaches the break-even point but not the desired revenue of $60,000 per bus per year. To further improve the solution, we need more data on the relationship between the ridership and the price.