

You are going to become transportation engineers for five class days. Your job is to revamp the Atlanta public transit system, MARTA, by seeing what fare prices and repairs can do to the ridership and revenue. Over the next several days we will use Markov chains to determine our maximum profit for MARTA monthly over the next 5 years. You will also be responsible for setting fares and maintenance schedules. Don't forget to create a company name, too. As a conclusion to the project, you will make a presentation to the Atlanta Department of Transportation (the class) in which you will include plan for improving MARTA, your profit analysis, and an extension item.

First, we need to decide what fare should be to ride MARTA. To make this a discrete set of fares, we are advised to pick a fare from \$0, \$1, \$2, \$3, \$4, or \$5. However, this choice has a trade-off. The more expensive fares are, the fewer people will take MARTA. Since total profit should be maximized, this needs to be considered. Another factor that impacts ridership on MARTA is security, safety, and lack of delays. If the trains are not safe, then people will be less likely to ride as the trains could break down and people will be late. This is where a maintenance schedule needs to be implemented. If trains are maintained annually, then people will stay riders, but it will cost more in maintenance. Conversely, if the trains are never maintained, then riders will stop riding, but maintenance budget will be lower.

The monthly ridership model is that everyone can either ride the train or not. And every month people reassess their ridership. Most of the people decide to stick with what they did the month before, but some percentage of train riders will stop riding, and some non-riders will start. The simple ridership model can be written as such:

	Train Riders	Car Riders
Train Riders	$1-f$	$f$
Car Riders	$s$	$1-s$

Where  $f$  is the percent of maximum fares (i.e. a \$1 fare is 20% of the maximum fare of \$5). Additionally,  $s$  is the percent safety felt, which is inversely proportional to years since last maintenance was performed. If it has been 2 years since maintenance was performed on a track length, then riders are feeling only about 60% safe; whereas, if maintenance is performed that same year (0 years), then riders feel 100% safe.

You will start with the assumption that every track length has been maintained in the last year, and your goal is to give a 5 year plan to save MARTA. The first objective is to figure out how many people ride MARTA each month for the next 60 months. Insider industry knowledge says about 25% of Atlanta Metro's 6,000,000 people ride MARTA every day, while 75% don't because they work from home, walk, drive, etc. To solve this you set the fare price (but be smart about this as you are only allowed to change the fare price once a year). You then are able to figure out the ridership percentages each month, which in turn allows you to figure out how many people ride, and how much profit is made that year. Keep close attention to the percent of people that are riding at the end of December! Then you analyze which segments have to be maintained, and set the fare for the next year. Repeat this process for 5 year out.

#### Maintenance:

At the beginning of each month, each section of equipment is inspected to determine its working conditions, which is classified as state 1 = new, 2, 3, or 4 = broken. We treat this as a single person decision tree, where you have to decide which segments you have to fix.

## OUTLINE OF PROJECT

DAY 1 - Divide into groups and begin planning candy bars, cost factors and profit statements.

DAY 2, 3, 4 - Write constraints, draw graphs, etc. for your bars. Begin discussing your wrappers, commercial, etc.

DAY 5 - Final workday in class. Rough copy of wrappers, outline of commercial and presentation due.

PRESENTATION DAY - 3-5 minutes in length

### **PRESENTATION - All members must participate**

Must Include -

- Description of your candy bars
- Profit analysis
- Physical representation of candy wrappers
- TV commercial for your candy bars
  - All members must participate
  - Videotaped
  - 60 second or two 30-second commercial
- Use visual aids in the presentation

**- YOU ARE RESPONSIBLE FOR TECHNOLOGICAL ARRANGEMENTS BEFORE THE DAY OF THE PRESENTATION!**

### **WRITTEN WORK - TYPED**

Must Include -

- Cover Page - Company name, etc.
- Daily graphs, daily constraints, daily profit organized day by day
- A paragraph analyzing the overall production effectiveness of your company
- Candy wrapper designs
- Bound in some type of cover; make it look professional!!!

## **FINAL THOUGHTS**

Any problems that arise during the course of this project should be discussed with the teacher immediately. The earlier you seek assistance, the better off you and your group will be.

**Unfortunately, conflicts sometimes occur in groups. It is our hope that these will be avoided. If a conflict arises, you must let your teacher know before Friday, April 21 . If the conflict cannot be resolved, the group will be split and individual projects will be required.**

POINTS POSSIBLE ON PROJECT - TOTAL 232

DAY 1 - TOTAL - 16

COMPANY NAME - 2

DESCRIPTION - BAR 1 - 2

DESCRIPTION - BAR 2 - 2

COST - BAR 1 - 2

COST - BAR 2 - 2

PRICE - BAR 1 - 2

PRICE - BAR 2 - 2

PROFIT STATEMENT - 2

DAY 2 - TOTAL - 25

CONSTRAINTS - 4

GRAPH OF FEASIBLE SET - 4

VERTICES OF FEASIBLE SET - 4

PROFIT CALCULATION - 4

LEFTOVER INGREDIENTS - 2

ORDER PLACEMENT - 2

GROUP EFFECTIVENESS - (BASED ON EACH INDIVIDUAL) - 5

- 5 - EFFECTIVE WORK IS DONE FOR ALL PERIOD
- 4 - EFFECTIVE WORK IS DONE FOR MOST OF THE PERIOD
- 3 - EFFECTIVE WORK IS DONE FOR HALF OF THE PERIOD
- 2 - EFFECTIVE WORK IS DONE ONLY PART OF THE PERIOD
- 1 - EFFECTIVE WORK IS HARDLY DONE AT ALL
- 0 - STUDENT IS ABSENT AND/OR DOES NOT WORK AT ALL

*DAY 3 - TOTAL - 27*

- CONSTRAINTS - 4
- GRAPH OF FEASIBLE SET - 4
- VERTICES OF FEASIBLE SET - 4
- PROFIT CALCULATION - 4
- LEFTOVER INGREDIENTS - 2
- LEFTOVER CANDY BARS - 2
- ORDER PLACEMENT - 2
- GROUP EFFECTIVENESS - (BASED ON EACH INDIVIDUAL) - 5
  - 5 - EFFECTIVE WORK IS DONE FOR ALL PERIOD
  - 4 - EFFECTIVE WORK IS DONE FOR MOST OF THE PERIOD
  - 3 - EFFECTIVE WORK IS DONE FOR HALF OF THE PERIOD
  - 2 - EFFECTIVE WORK IS DONE ONLY PART OF THE PERIOD
  - 1 - EFFECTIVE WORK IS HARDLY DONE AT ALL
  - 0 - STUDENT IS ABSENT AND/OR DOES NOT WORK AT ALL

*DAY 4 - TOTAL - 25*

- CONSTRAINTS - 4
- GRAPH OF FEASIBLE SET - 4
- VERTICES OF FEASIBLE SET - 4
- PROFIT CALCULATION - 4
- LEFTOVER INGREDIENTS - 2
- LEFTOVER CANDY BARS - 2
- GROUP EFFECTIVENESS - (BASED ON EACH INDIVIDUAL) - 5
  - 5 - EFFECTIVE WORK IS DONE FOR ALL PERIOD
  - 4 - EFFECTIVE WORK IS DONE FOR MOST OF THE PERIOD
  - 3 - EFFECTIVE WORK IS DONE FOR HALF OF THE PERIOD
  - 2 - EFFECTIVE WORK IS DONE ONLY PART OF THE PERIOD
  - 1 - EFFECTIVE WORK IS HARDLY DONE AT ALL
  - 0 - STUDENT IS ABSENT AND/OR DOES NOT WORK AT ALL

*DAY 5 - TOTAL 25*

- ROUGH DRAFT - CANDY WRAPPER DESIGNS - 4
- COMMERCIAL DESCRIPTION - 4
- SLOGAN - 4
- PRESENTATION OUTLINE - 4
- TOTAL PROFIT CALCULATIONS - 4
- GROUP EFFECTIVENESS - (BASED ON EACH INDIVIDUAL) - 5
  - 5 - EFFECTIVE WORK IS DONE FOR ALL PERIOD
  - 4 - EFFECTIVE WORK IS DONE FOR MOST OF THE PERIOD
  - 3 - EFFECTIVE WORK IS DONE FOR HALF OF THE PERIOD
  - 2 - EFFECTIVE WORK IS DONE ONLY PART OF THE PERIOD
  - 1 - EFFECTIVE WORK IS HARDLY DONE AT ALL
  - 0 - STUDENT IS ABSENT AND/OR DOES NOT WORK AT ALL

*PRESENTATION - TOTAL - 90*

- COMMERCIAL - 28
  - 5 - WITHIN TIME LIMIT (TOTAL TIME WITH IN 60 SECONDS)
  - 5 - CREATIVE AND ENTERTAINING
  - 3 - PARTICIPATION

5 - QUALITY OF EDITING, LACK OF TECHNICAL DIFFICULTIES

10 - ORGANIZATION - CLEAR AND CONCISE

PROFIT ANALYSIS – 36

5 - INTRODUCTION/DESCRIPTION/PRESENTING WRAPPER

16 - INCLUDE COSTS, PRICES, PROFITS, LEFTOVERS

5 - OVERALL ORGANIZATION OF PRESENTATION

5 - INDIVIDUAL PARTICIPATION

5 - OVERALL PRESENTATION TIME (3-5 MINUTES)

ORGANIZED DAILY WORK - 40 - **REMEMBER YOU WANT THIS TO BE PROFESSIONAL**

10- COVER PAGE - COMPANY NAME, BAR DESCRIPTION, DAILY WORK , GRAPHS,  
CONSTRAINTS, PROFIT SUMMARY

10- ENHANCED GRAPHS, (INCLUDE ALL APPROPRIATE LABELS)

5 - TYPED

5- ERROR ANALYSIS - WHAT COULD YOU CHANGE TO IMPROVE YOUR PROFIT

10 - WRAPPERS- CREATIVITY, INCLUDE COMPANY NAME, SLOGANS, INGREDIENTS **This should all be bound together in some manner.**

PEER EVALUATION – 10

THIS WILL BE AN AVERAGE OF THE PRESENTATION SCORES GIVEN TO YOU BY YOUR PEERS

