

# Principles of Transportation – Terminal Mgt Game

## In-Class Assignment #1 (Homework #7)

### OBJECTIVE:

To improve student skills by managing trans. and inventory in an uncertain environment.

### INFORMATION:

You must schedule orders, hire transportation, and manage inventory levels so that all weekly customer demands are satisfied while inventories and costs are minimized and profits maximized.

### Demand:

Product demand for each week is uncertain. Weekly demand can vary from 78,000 units to 112,000 units per week. Your average demand is 95,000 and most weeks it hovers just below that amount. There is no limit on the number of weeks that you will be required to supply product to your customers.

Demand for each week will be determined by a random selection. Any amount selected will be replaced immediately. As a result, this amount could be selected again!! Furthermore, to represent a realistic bell curve of demand, there will be more possibilities around the average demand.

### POSSIBLE REVENUES & COSTS:

1.	Order Change Cost	Each change in order or truck level is \$5,000
2.	Ending Inventory Cost	\$15 for each 1,000 units of Ending Inventory each week (including amounts over 180,000)
3.	Excess Inventory Storage Cost	\$35 penalty for each 1,000 units over 180,000 units of Ending Inventory. This cost occurs because the warehouse capacity is 180,000 units. Inventory over this amount must be stored in a rented warehouse. This \$35 is in addition to the \$15 you are already paying.
4.	Stock Out Cost	\$440 for each 1,000 units that are out of stock. This represents the profit lost on these units.  If you stock, record a zero for Ending Inventory and a Zero (0) Beginning Inventory in the next week (i.e., there are no back-orders).
5.	Transportation Costs	You will pay \$100 per truck that can carry 1,000 units.
6.	Revenues	You will make \$200 per 1,000 units your trucks deliver to the customer each week.

### Changing Order:

Production/order decisions are made two weeks ahead of demand. For example, a production decision made during week 1 goes into effect in week 4. It takes time to make changes in the production schedule (extra workers must be hired or released workers must be given a two week notice). Order level changes must be made one thousands of units.

### APPLICATION:

To start:

Beginning Inventory in week 1 is 200,000 units for all companies (see attached worksheets). Also, your predecessor has placed orders for weeks 1 and 2.

Next:

The production level for weeks 1, 2, and 3 must be determined (line 2. {Order} on worksheet). This initial production level can be any amount, but it must be the same for all 3 weeks. Production capacity is unlimited. After setting production, calculate the total amount available for sale (add lines 1. {begin inv} and 2. {order}). At this point, a demand amount will be drawn for the week and used by all companies. You need to determine if you have enough truck capacity with your current amount. If you do not have enough trucks, you will only be able to deliver the number of trucks you have available. Finally, you have to set the ending inventory. You will either subtract the demand amount from the inventory available for sale (line 3. {total} minus line 4. {demand}) to get the Ending Inventory for the week (line 6. {end}). The other option is only if you do not have enough trucks. Then, Ending Inventory will be available for sale minus truck capacity (line 3. {total} minus line 5. {trucks}). The Ending Inventory becomes the Beginning Inventory (line 1. {begin}) for week 2. Note, you can never start with a negative beginning inventory. In those cases, you will start with ZERO (i.e., no back orders.)

Finally:

Calculate the revenues and costs for week 1. Then, your team must set orders and truck levels for week 4. Once this production amount is determined, a demand figure will be drawn for week 2. Then the entire process is repeated.

An unknown number of weeks will be simulated. You're team will have until the next class to total out your costs for the week and choose your production level. The objective is to maintain the lowest total cost possible.

The teams will be ranked and bonus points will be awarded in place of the annual cash bonuses successful managers receive. Poor performance will be overlooked since you are "interns" to the company. Non-performance will not be accepted and will be dealt with by the "swift sword of logistics justice!!!"

Name:

Week #	1	2	3	4	5
1. Beginning Inventory Higher of last week's Ending Inv. or zero	200,000				
2. Order	95,000	70,000			
3. Total for Sale (1+2)					
4. Demand Drawn weekly as a random number					
5. Truck Capacity Each Truck carries 1,000 units					
6. Ending Inventory (larger of 3-4 or 3-5)					
Order Change \$5,000 if 2 or 5 changes	(set week 3)	(set week 4)	(set week 5)	(set week 6)	(set week 7)
Ending Inventory \$15 per 1,000					
Excess Inv. \$35 per 1,000 for units > 180k					
Truck Costs \$100 per Truck					
Stock Out Cost \$450 per 1,000 if 6<0 or 4>5					
Weekly Revenue \$200 per 1,000 units					
Weekly Total Cost All costs					
Weekly Profit Revenue minus Costs					
Cumulative Total Profit Running Total of all weeks to this point					

Week #	6	7	8	9	10
1. Beginning Inventory Higher of last week's Ending Inv. or zero					
2. Order					
3. Total for Sale (1+2)					
4. Demand Drawn weekly as a random number					
5. Truck Capacity Each Truck carries 1,000 units					
6. Ending Inventory (larger of 3-4 or 3-5)					
Order Change \$5,000 if 2 or 5 changes	(set week 8)	(set week 9)	(set week 10)	(set week 11)	(set week 12)
Ending Inventory \$15 per 1,000					
Excess Inv. \$35 per 1,000 for units > 180k					
Truck Costs \$100 per Truck					
Stock Out Cost \$450 per 1,000 if 6<0 or 4>5					
Weekly Revenue \$200 per 1,000 units					
Weekly Total Cost All costs					
Weekly Profit Revenue minus Costs					
Cumulative Total Profit Running Total of all weeks to this point					

Name:

Week #	11	12	13	14	15
1. Beginning Inventory Higher of last week's Ending Inv. or zero					
2. Order					
3. Total for Sale (1+2)					
4. Demand Drawn weekly as a random number					
5. Truck Capacity Each Truck carries 1,000 units					
6. Ending Inventory (larger of 3-4 or 3-5)					
Order Change \$5,000 if 2 or 5 changes	(set week 13)	(set week 14)	(set week 15)	(set week 16)	(set week 17)
Ending Inventory \$15 per 1,000					
Excess Inv. \$35 per 1,000 for units > 180k					
Truck Costs \$100 per Truck					
Stock Out Cost \$450 per 1,000 if 6<0 or 4>5					
Weekly Revenue \$200 per 1,000 units					
Weekly Total Cost All costs					
Weekly Profit Revenue minus Costs					
Cumulative Total Profit Running Total of all weeks to this point					

Week #	16	17	18	19	20
1. Beginning Inventory Higher of last week's Ending Inv. or zero					
2. Order					
3. Total for Sale (1+2)					
4. Demand Drawn weekly as a random number					
5. Truck Capacity Each Truck carries 1,000 units					
6. Ending Inventory (larger of 3-4 or 3-5)					
Order Change \$5,000 if 2 or 5 changes	(set week 18)	(set week 19)	(set week 20)	(set week 21)	(set week 22)
Ending Inventory \$15 per 1,000					
Excess Inv. \$35 per 1,000 for units > 180k					
Truck Costs \$100 per Truck					
Stock Out Cost \$450 per 1,000 if 6<0 or 4>5					
Weekly Revenue \$200 per 1,000 units					
Weekly Total Cost All costs					
Weekly Profit Revenue minus Costs					
Cumulative Total Profit Running Total of all weeks to this point					