

Homework Set 9

- (10%) Smith and Jones are two old time widget manufacturers. They essentially have the market to themselves. Both have done studies of what happens if they price widgets at \$3 and \$6. (Other prices should be considered, but let's keep the example simple). The overall demand for widgets is known to be

$$Q = 50 - 8p$$

where p is the lowest price charged for widgets. If they both charge the same price, they will split the market 50-50; if one charges a higher price, he will get none of the market. Assume widgets cost nothing to produce. Set up the payoff matrix for both Smith and Jones and show what constitutes their optimal strategy. That is, how much should they charge?

- (20%) The following table gives the payoffs to player A from a game. The payoffs to B are exactly the negative of A's. Find their optimal strategies.

	If player A uses strategy A ₁	If player A uses strategy A ₂
If player B uses strategy B ₁	5	4
If player B uses strategy B ₂	2	6

- (15%) You have just been employed as an economic analyst by Strategic Decisions by Game Theory, Incorporated, a high powered consulting firm. On your first day on the job you are assigned to work on a rush project. Acme Nursery is just about getting ready for spring. This is the time of year when homeowners throughout Ohio think of spending far too much money on landscaping and Acme wants to get its fair share, or perhaps more than its fair share. Acme is considering two marketing campaigns: the first is to stress professional design service. The second is to attempt to become the Wal-Mart of the flower industry, offering a profusion of flowers and shrubs for sale at low prices. Acme must choose which strategy it will follow. The strategy will dictate its seasonal ad campaign and what kind of people it hires.

Alas, for Acme, it is not the only game in town. Opal Nursery, just down the street is getting ready for spring as well. You know that Opal is still going through the same thinking about what it will do this season. It turns out that both Acme and Opal have followed different strategies during the past four years. The Nursery Research Council of Northeast Ohio has gathered data on nursery sales on a year by year basis, and you have the following data:

Year	Acme Strategy	Opal Strategy	Acme Sales	Opal Sales
1994	Low Prices	Low Prices	\$75	\$75
1995	High Service	Low Prices	\$40	\$90
1996	High Service	High Service	\$40	\$80
1997	Low Prices	High Service	\$45	\$60

You know that, in the years Acme adopted a service strategy, its profits were half of its sales; in the years that Acme adopted a low price strategy, its profits were a third of sales. While you do not have data for Opal, it is perhaps reasonable to assume that it had the same profit margins.

What strategy do you recommend for Acme? Why?

Be sure to show your work.

Hint: Remember the name of your employer.

4. (10%) Two duopolists may either collude or cheat. The payoffs are summarized in the accompanying matrix. Suppose one duopolist announces a policy of meeting the competitor's price. How will the new entries in the payoff matrix change? Explain how the policy of meeting a competitor's price changes the behavior of duopolists.

		Firm 2	
		Cooperate	Cheat
Firm 1	Cooperate	$\pi_2 = 100$ $\pi_1 = 100$	$\pi_2 = 125$ $\pi_1 = 70$
	Cheat	$\pi_2 = 70$ $\pi_1 = 125$	$\pi_2 = 75$ $\pi_1 = 75$

5. (15%) Explain whether you agree or disagree with the following statements:
- If the price of a product increases, a price-taking firm will always hire more temporary workers
 - If the price of a product increases, a price-taking firm will always hire more permanent workers.
 - If the wage rate for workers increases, a price-taking firm will hire fewer workers, both in the short run and in the long run.
6. (30%) Wonder Toys Inc. (WTI) is essentially a one-toy firm. Almost all sales occur at Christmas time. Each April, marketing comes up with a new version of the toy. While it prepares and implements the marketing plan, you are left the task of manufacturing the toy. WTI routinely sells the toy at \$85 each, wholesale.

The business is faddish. The sales department tells you that the demand each year will be one of the following:

<i>Probability of Demand</i>	<i>Demand</i>
1/2	300,000 (Low Demand)
1/2	500,000 (High Demand)

Because of the faddish nature, marketing cannot tell you in advance of the Christmas Season what the demand will be.

You have three sources of manufacture:

- A Chilean supplier who can make up to 250,000 Wonder Toys a year at a price of \$10 each. But you must commit yourself to the supplier well before this year's demand is known.
- A Mexican supplier who can make as many Wonder Toys as you want at a price of \$20 each, and make these toys on very short notice.
- You also have the option of producing the toys yourself. Your plant thinks of two production "seasons": the season before demand is known and the season after demand is known. Let Q_B be the number of toys **in thousands** produced before actual demand is known and Q_A be the number **in thousands** produced after demand is known. Total production costs, in thousands of dollars, will be

$$3Q_B + 0.1Q_B^2 + 3Q_A + 0.1Q_A^2$$

- Any toys unsold by Christmas will be destroyed.
- A. As you know, the idea of accepting this kind of demand uncertainty is nonsense. You should be able to devise a pricing policy that allows

prices to fluctuate with the actual demand. You prepare a study for the CEO showing that, though the demand function is uncertain, the firm can influence demand by price. In particular each \$15 cut (increase) in price will increase (decrease) demand by 100,000 units. You have recommended that the firm initially price the toy at \$115, with the intention of keeping that price if demand turns out to be high, cutting the price to \$85 if demand turns out to be low. In that case, you can guarantee a demand for 500,000 toys. **Prepare a production schedule that minimizes the cost of meeting that demand.**

B. After reviewing your plan, the CEO decides to accept demand uncertainty. That is, the Wonder Toy will be priced at \$115, and, should demand turn out to be only 300,000 units, any excess will be thrown away. Devise a production plan fitting these conditions. You should be able to fill in the following table:

Source of Supply	If Demand Is	If Demand Is
	300,000	500,000
Chilean Supplier		
Mexican Supplier		
Domestic Production		

Defend your answer.

C. Marketing has now discovered an after-market. That is, any Wonder Toys left unsold at the end of the Christmas season can be sold to a discounter who will remainder them. The discounter is willing to pay \$20 a toy up to 400,000 units. Prepare a revised production plan. It should be of the following form:

Source of Supply	If Demand Is	If Demand Is
	300,000	500,000
Chilean Supplier		
Mexican Supplier		
Domestic Production		
Sold to Discounter		0

Defend your answer.