Ham and Eggs Exercise, ECON 233, Darren Grant.

This exercise illustrates the "efficiency" properties of perfect competition in a very non-technical way. I list below a set of islands in which the inhabitants can produce ham or eggs. The table below tells how many pounds of ham or eggs each island could produce in a day if all the inhabitants devoted their time to the production of that commodity. (They can't do all the Ham and all the Eggs–they must choose.) An island can, if it wishes, devote some fraction of its day to Ham and the other fraction to Eggs.

Island	Pounds of Ham in a Day	Eggs in a Day
Apple	8	14
Ball	8	13
Victor	7	15
Pop	11	12
Echo	5	3
Fixins	7	10
Whisky	8	16
Delta	9	12
Gotcha	5	9
Happy	2	2
Mandible	3	9
Jumpin Jack	10	16
Keg	7	10
Nibbles	5	11
Lazy	8	15

It takes one Pound of Ham and two Eggs to make a ham and egg sandwich. Your goal is to maximize the total number of ham and egg sandwiches produced by all islands jointly.

1. First we will get into groups and try to solve this problem administratively–that is, like a very difficult math problem.

2. Then each group will represent one island, maximize its "profits," and we will simulate a competitive market. We will find that the market reaches the best solution in a surprisingly simple way! We will also find that this solution maximizes the production of ham and egg sandwiches–that is, it achieves economic efficiency.

Cost of Driving Assignment, ECON 233, Darren Grant. On the day noted on your class calendar, we will go over this in class and I will also collect a copy from each person to review. So please bring two copies to class on that day, one to go over, and one to turn in. Your work should be typed and stapled together; you should show your calculations, not just the final answer to each question; and you should attach a copy of the relevant printouts from edmunds.com. If you don't do this, it will be hard to give you much credit for your work.

In this problem we will estimate the economic costs of driving for your car (if possible). The Web site **edmunds.com** contains a "Used Car Appraiser" that gives values for used cars that aren't too rare or too old. (It takes a little hunting to find it.) Pick a car: yours, a friend's, whatever. It must meet three criteria: 1) it's on the used car section of the Web site, 2) it must not be the first year of the model, and 3) the same model, one year older, must also be on the used car section of the Web site. We will consider the following costs of driving: gas, maintenance, depreciation, insurance, and interest.

At the top of your sheet, put *all* of the following: your annual insurance cost, annual mileage, gas mileage, typical annual maintenance costs for a car your age and type, the current price of the gas that you put in your car, the replacement value (retail) of your car, the value of the same car one year older with the same mileage, and the value of the same car one year older with an additional year's mileage. These last three come from the web site–you'll have to use the used car vehicle appraiser. Then:

a) Calculate the per mile cost of gas.

b) Calculate the per mile maintenance cost.

c) Calculate the average cost per mile of insurance.

d) Calculate the "opportunity cost of capital," that is, the interest paid (or foregone) on the money you have invested in the car, for one year. You can probably find an interest rate on the web site or you can make up your own (reasonable) interest rate.

e) Calculate the average interest cost per mile.

f) Calculate *total* depreciation on the car as the difference between the retail value of the car and the value of the same car one year older with an extra year's mileage.

g) Calculate *age* depreciation as the difference between the value of the car and the value of the same car one year older with the same mileage.

h) Calculate *use* depreciation as the difference between total depreciation and age depreciation.

I) Calculate the *average* depreciation cost per mile.

j) Calculate the *marginal* depreciation cost–the amount the car depreciates for each mile it is driven.

k) Classify each of the following costs as either fixed or variable: gas, maintenance, insurance, interest, age depreciation, and use depreciation.

l) Calculate the average costs of driving the car, per mile. Use (some of) your results in a)-j).

m) Calculate the marginal costs of driving the car, per mile. Use (some of) your results in a)-j).

n) The State of Texas reimburses mileage for private cars driven on state business at about 40¢ per mile. If no one else needed to use your car, and you needed to travel on state business, should you drive your own car or take a state car of the same level of quality, safety, and comfort? What about if the reimbursement rate was 20¢ per mile?

o) An analog here to "increasing output with existing capacity" would be driving faster. We know that the law of diminishing returns applies whenever a firm tries to increase output by using more of a variable input with its existing capacity. What is the law of diminishing returns? In the current situation, what is the fixed factor? The variable input? The output? How does driving faster exhibit diminishing returns?

Oligopoly Pricing Game, Darren Grant, ECON 233.

You are a competitor in a duopoly with one other firm that is equal to you in capabilities, costs, etc. Both you and your competitor produce identical products. You are trying to maximize your firm's profits, just as your competitor is trying to maximize his/her firm's profits.

Overall product demand is given by the equation $P = 100 - Q$, where Q is the total market quantity. So, if there are two firms, and the first produces Q_1 and the second Q_2, then the market price for everybody is $P = 100 - (Q_1 + Q_2)$. The marginal cost of producing the product is \$10.

So, if you produce 15 units and your competitor produces 15 units, the price will be 100 - (15 + 15) = \$70. You will earn \$70*15 = \$1050 in revenue, and will have \$10*15 = \$150 in costs, for a profit of \$900. So will your competitor.

The "rules of competition" in this duopoly can vary, however. We will execute this simulation several times, each with a different set of rules, enumerated in order below.

1. *Cournot*. You and another player simultaneously and anonymously determine the amount that you wish to produce. Then your and your rivals' choices are revealed, market price is set according to the total quantity produced and the demand curve above, and all units are sold at the market price.

2a. *Leader*. You get to choose your quantity first. This is then revealed to your rival, who then chooses his quantity. Then market price is set according to the total quantity produced and the demand curve above, and all units are sold at the market price.

2b. *Follower*. After seeing the leader's quantity, you choose your own quantity. Then market price is set according to the total quantity produced and the demand curve above, and all units are sold at the market price.

3. *Cartel*. You and your rival get to work out together the price you will charge and the amount each firm will produce. The price and total quantity produced must satisfy the demand curve above.

If there is time, we'll also do this fourth market type, which is leader/follower in prices, not quantities.

4. *Bertrand*. The "leader" in #2 first chooses the *price* he/she will charge (to the dollar). You can instanteously meet all demand at this price at the marginal cost of \$10 per unit, and do not need to build capacity in advance. Then the "follower" in #2 chooses his/her *price*. The firm with the lower price gets all the sales, unless the prices are equal, in which case you will share sales.

Happy Bread Exercise, ECON 233, Darren Grant.

This assignment is comprehensive. It goes through price determination in a monopoly, a perfectly competitive market in the short run, and a perfectly competitive market in the long run. For each type of market, you will: 1) state the rules that are followed to determine price, 2) compute numerically the price and output of the firms in the situation described below, and 3) illustrate the price setting rule graphically.

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Each island in a chain of islands in the North Pacific has one manufacturer of "happy bread," a bread made out of poppy seeds that makes you very, very happy. On each island are six potential customers. One of these is willing to pay $6 (and no more) for a loaf each day, one will pay $5 each day, one will pay $4 each day, one $3, one $2, and one $1. Thus, if the market price of happy bread is $4, three customers will buy on each island. The first will receive $2 of consumer surplus, the second $1, and the third no consumer surplus (though he buys anyway), for a total of $3 in consumer surplus on that island.

The machinery for happy bread allows the manufacturer to make up to four loaves (and no more) per day at a marginal cost of $1.50 per loaf; the fixed cost is $2 per day.

When conducting simulations, students will be grouped into islands, and one student will represent the consumers on that island, while another will represent the manufacturer. The first student will attempt to maximize the total consumer surplus received by consumers on the island, while the second student will try to maximize the profits of the manufacturer. In all exercises, keep all prices in even dollar amounts.

Initially, it is difficult to preserve the bread for very long and there are pirates on the seas, so it is not possible for a manufacturer on one island to sell bread to another island. So each manufacturer is a monopoly on its island.

Part I: MONOPOLY. Let us see what price, quantity, and profit are when the market structure is monopoly.

1. Calculate the marginal revenue to the manufacturer from selling the second loaf, the third loaf, and the fourth loaf of happy bread.

2. What rule of thumb does the firm follow in setting the price in a monopoly?

3. What is the price of happy bread? How many loaves does the monopolist make? How much profit is earned by the monopolist?

4. Illustrate this price setting decision on a graph with a MC, MR, ATC, and D curves. Put numbers at all the important points of intersection but you don't have to draw the graphs to scale, or put numbers on the axes.

Now it becomes possible to preserve the bread for a long time and the pirates become investment bankers, so any firm can sell the bread to any island, and the market becomes perfectly competitive.
Part II: PERFECT COMPETITION–SHORT RUN. Let us see what price, quantity, and profit are in the short run when the market is perfectly competitive. Here, "short run" means that the number of firms in the market is fixed; we are not allowing the entry of new firms or the exit of existing firms.

1. In perfect competition firms produce until the MC exceeds the price (or they can't produce any more). How much happy bread will each firm produce at a price of $2? $3? $4?

2. What is market supply? That is, how much total happy bread is produced by all firms on all islands, at each price? Fill this in on the table below. Then, remembering that there are six potential customers on each island, fill in market demand. The total number of islands in class is _____.

Price	Quantity Supplied	Quantity Demanded	Surplus, Market Clearing, or Shortage?
$4			
$3			
$2			

3. At a price of $2 does the market clear, or is there a surplus of happy bread, or a shortage? What about $3? $4? Put this information in the table too.

4. What price-setting rule does the perfectly competitive market obey in the short run?

5. What is the price of happy bread? How many loaves does each firm make? How much profit does each firm make?

6. Illustrate this situation on a market supply/demand graph. Fill in numbers for the point of intersection.

Part III. PERFECT COMPETITION–LONG RUN. Now let's see what price, quantity, and profit are in the long run, when firms have had an opportunity to enter or exit.

1. What is the ATC of four loaves? That is, what is ATC when the firm makes four loaves per day?

2. What price setting rule does the perfectly competitive market obey in the long run?

3. What will the price be in the market in the long run? How much happy bread will each firm make? How much profit will it make?

4. Has there been entry, exit, or neither, from the short run situation in Part II?

5. Illustrate how price is determined in the long run on a firm's cost-curve graph. Include numbers for the important point of intersection.

FINALE. What happens to price as the monopoly gives way to short-run perfect competition and then to perfect competition in long run equilibrium? What about total output? Profit? Consumer surplus?

Graphing Problem Set, Darren Grant, ECON 233. We will work on this in class.

We have developed many graphs to illustrate pricing in the short run and long run in various market structures. Here are the possibilities:

1. Perfectly competitive market: short run
2. Perfectly competitive market: long run
3. Monopoly: short run
4. Monopoly: long run
5. Monopolistic competition: short run
6. Monopolistic competition: long run
7. Oligopoly: short run

I am leaving out long run in an oligopoly, which can have different outcomes.

These outcomes can be illustrated using five different graphs, some of which are market-level graphs, some of which are firm-level; some are both. We have done all of these graphs in class, and four of the five are illustrated in your book.

A) Draw separate, different graphs for #1, 2, 3, 5 (market-level graph), and 6.

B) Outcomes #4 and #7 can be illustrated using two of the graphs you have already drawn. Identify them.

C) Label each graph as market-level, firm-level, or both.

D) Assume costs and overall product demand is the same in each market, and that the market is profitable in the short run. Then, rank the following prices from highest to lowest: #2, #3, #5, #6.