

Problem Set One Solutions

Chapter 1

3. Residents of your city are charged a fixed weekly fee of \$6 for garbage collection. They are allowed to put out as many cans as they wish. The average household disposes of three cans of garbage per week under this plan. Now suppose that your city changes to a “tag” system. Each can of refuse to be collected must have a tag affixed to it. The tags cost \$2 each and are not reusable. What effect do you think the introduction of the tag system will have on the total quantity of garbage collected in your city? Explain briefly.

Answer: In the first case, the cost is \$6/week no matter how many cans you put out, so the cost of disposing of an extra can of garbage is \$0. Under the tag system, the cost of putting out an extra can is \$2, regardless of the number of the cans. Since the relevant costs are higher under the tag system, we would expect this system to reduce the number of cans collected.

6. Suppose that in the last few seconds you devoted to question 1 on your physics exam, you earned 4 extra points, while in the last few seconds you devoted to question 2 you earned 10 extra points. You earned a total of 48 and 12 points, respectively, on the two questions, and the total time you spent on each was the same. If you could take the exam again, how – if at all – should you reallocate your time between the questions?

Answer: Even though you earned four times as many points from the first question than from the second, the last minute you spent on question 2 added 6 more points to your total score than the last minute you spent on question 1. That means you should have spent more time on question 2.

9. For each long-distance call anywhere in the continental United States, a new phone service will charge users 30 cents per minute for the first 2 minutes and 2 cents per minute for additional minutes in each call. Tom’s current phone service charges 10 cents per minute for all calls, and his calls are never shorter than 7 minutes. If Tom’s dorm switches to the new phone service, what will happen to the average length of his calls?

Answer: For a seven-minute call the two phone systems charge exactly the same amount, 70 cents. But at that point under the new plan, the marginal cost is only 2 cents per minute, compared to 10 cents per minute under the current plan. And since the benefit of talking additional minutes is the same, Tom will make longer calls under the new plan.

10. The meal plan at University A lets students eat as much as they like for a fixed fee of \$500 per semester. The average student there eats 250 pounds of food per semester. University B charges \$500 for a book of meal tickets that entitles the student to eat 250 pounds of food per semester. If the student eats more than 250 pounds, he or she pays \$2 for each additional pound; if the student eats less, he or she gets a \$2 per pound refund. If students are rational, at which university will average food consumption be higher? Explain briefly.

Answer: At University A, students will keep eating until the benefit from eating an extra pound of food equals \$0, since that is the extra cost to them for each extra pound of food eaten. At University B, the cost of eating an extra pound of food is \$2, so people will stop eating when the benefit of eating an extra pound equals \$2. Food consumption will thus be higher at University A.

Chapter 2

2. Ted can wax a car in 20 minutes or wash a car in 60 minutes. Tom can wax a car in 15 minutes or wash a car in 30 minutes. What is each man's opportunity cost of washing a car? Who has comparative advantage in washing cars?

Answer: In time it takes Ted to wash a car he can wax three cars. So his opportunity cost of washing one car is three wax jobs. In the time it takes Tom to wash a car, he can wax two cars. So his opportunity cost of washing one car is two wax jobs. Because Tom's opportunity cost of washing a car is lower than Ted's, Tom has a comparative advantage in washing cars.

3. Toby can produce 5 gallons of apple cider or 2.5 ounces of feta cheese per hour. Kyle can produce 3 gallons of apple cider or 1.5 ounces of feta cheese per hour. Can Toby and Kyle benefit for specialization and trade? Explain.

Answer: Since Kyle and Toby face the same opportunity cost of producing a gallon of apple cider ($\frac{1}{2}$ ounce of feta cheese), they cannot gain from specialization and trade. If Kyle wants to buy a gallon of apple cider, Toby will require $\frac{1}{2}$ ounce of feta cheese in exchange. But Kyle can produce $\frac{1}{2}$ ounce of feta cheese himself by producing one less gallon of apple cider. The same applies for Toby trying to buy apple cider instead, so specialization and trade fails to generate any benefits.

4. Nancy and Bill are auto mechanics. Nancy takes 4 hours to replace a clutch and 2 hours to replace a set of brakes. Bill takes 6 hours to replace a clutch and 2 hours to replace a set of brakes. Determine whether anyone has an absolute advantage at either task and, for each task, determine who has a comparative advantage.

Answer: In time it takes Nancy to replace a set of brakes she can complete one-half of a clutch replacement. So her opportunity cost of replacing a set of brakes is one-half of a clutch replacement. In the time it takes Bill to replace a set of brakes, he can complete one-third of a clutch replacement. So his opportunity cost of replacing a set of brakes is one-third of a clutch replacement. Because Bill's opportunity cost of replacing a set of brakes is lower than Nancy's, Bill has a comparative advantage in replacing brakes. That means that Nancy has a comparative advantage in replacing clutches. Nancy also has an absolute advantage over Bill in replacing clutches, since it takes her two hours less than it takes Bill to perform that job. Since each takes the same amount of time to replace a set of brakes, neither person has an absolute advantage in that task.

9. Susan can pick 4 pounds of coffee in an hour or 2 pounds of nuts. Tom can pick 2 pounds of coffee in an hour or 4 pounds of nuts. Each works 6 hours a day.
- What is the maximum number of pounds of coffee the two can pick in a day?
 - What is the maximum number of pounds of nuts the two can pick in a day?
 - If Susan and Tom were picking the maximum number of pounds of coffee when they decided that they would like to begin picking 4 pounds of nuts per day, who should pick the nuts and why? How many pounds of coffee would they still be able to pick?
 - Now suppose Susan and Tom were picking the maximum number of pounds of nuts when they decided that they would like to begin picking 8 pounds of coffee per day, who should pick the coffee and why? How many pounds of nuts would they still be able to pick?
 - Would it be possible for Susan and Tom to pick a total of 26 pounds of nuts and 20 pounds of coffee each day? If so, how much of each good should each person pick?

Answer: a. Their maximum possible coffee output is 36 pounds per day (12 from Tom, 24 from Susan).

b. Their maximum possible output of nuts is also 36 pounds per day (12 from Susan, 24 from Tom).

c. Tom should be sent to pick nuts, since his opportunity cost (half a pound of coffee per pound of nuts) is lower than Susan's (2 pounds of coffee per pound of nuts). Since it would take Tom only one hour to pick four pounds of nuts, he can still pick 10 pounds of coffee in his 5 working hours that remain. Added to Susan's 24 pounds, they will have a total of 34 pounds of coffee per day.

d. Susan should be sent to pick coffee, since her opportunity cost (half a pound of nuts per pound of coffee) is lower than Tom's (2 pounds of nuts per pound of coffee). It will take Susan 2 hours to pick 8 pounds of coffee, which means that she can still pick 8 pounds of nuts. So they will have a total of 32 pounds per day of nuts.

e. Yes, it is possible. To pick 26 pounds of nuts per day, Tom should work full time picking nuts (24 pounds per day) and Susan should spend one hour per day picking nuts (2 pounds per day). Susan would still have 5 hours available to devote to coffee picking, so she can pick 20 pounds of coffee per day.