

Question 1. (15 points) Alice would develop a game-playing software if she could get \$1,000 or more from its combined sales. The market for that software is Bob, Carol, and Dave. Alice knows that Bob would pay \$600 for the software, Carol \$400, and Dave \$250. If price discrimination is illegal then she would not produce the software, and the potential buyers would be deprived of \$1,250 worth of value (= the sum of what it is worth to each of them). Suppose that a limited form of price discrimination is allowed: the ratio of highest to lowest sale price is not allowed to exceed r (where r need not be integer).

1. What is the smallest r for which Alice would develop the software? (If no such r exists then say so and briefly explain why.)
2. Repeat if Carol's willingness to pay had been \$350 (rather than \$400)
3. Repeat if Carol's willingness to pay had been \$300

Question 2. (20 points) Alice is a software producer who has already developed a word processor, a spreadsheet, and a web browser. The potential buyers are Bob, Carol, and Dave, all of whom want to buy all of these three softwares as long as the price does not exceed what they're willing to pay. Bob is willing to pay \$50 for the word processor, \$40 for the spreadsheet, \$30 for the browser. Carol is willing to pay \$30 for the word processor, \$40 for the spreadsheet, \$50 for the browser. Dave is willing to pay \$20 for the word processor, \$35 for the spreadsheet, \$40 for the browser. Assume that Alice has all this information about the prices they're willing to pay. Suppose that Alice is restricted to selling to all customers for the same price, whether for an individual software or for a bundle of them. The price a customer is willing to pay for a bundle is the sum of what that customer is willing to pay for the individual components of that bundle; for example Bob is willing to pay \$70 for a bundle consisting of the spreadsheet and browser, Dave is willing to pay \$90 for a bundle consisting of all three softwares.

1. What price list should Alice advertise in order to maximize her revenue? (She is free to offer or not offer any set of bundles or individual softwares that she chooses.) State what her revenue would be for the price list you propose, and who would buy what from that list.
2. Repeat if Dave is willing to pay \$40 rather than \$20 for the word processor

Question 3. (15 points) Alice has developed a game-playing software for which Bob and Carol are willing to pay \$20, and Dave is willing to pay \$70; what each is willing to pay measures the value they get out of playing the game (their enjoyment of it). Assume that Alice knows what each of them is willing to pay, and that she is restricted to selling to all customers for the same price. There is no competitor to Alice's software. If a customer buys for less than what they're willing to pay, the difference is that customer's *surplus*; for example if Dave pays \$50 for the software then his surplus is \$20 (the value he gets remains \$70, because it is a measure of the enjoyment he gets from playing the game). Note that a customer who does not buy the game gets zero value (zero enjoyment) from it.

1. When Alice maximizes her revenue, what is the total combined value received by her customers (= the sum of their three individual values)? What is the surplus for each customer?
2. Repeat when Alice wants to maximize her market share (i.e., the number of users of her software) rather than her revenue.
3. Repeat assuming that Alice is allowed to price-discriminate and can do it effectively (i.e., she can sell to each for exactly what they're willing to pay).

Question 4. (15 points) Alice has already developed, at a cost of \$900 to herself, software for which Bob is willing to pay \$1,000, and 100 other potential buyers are each willing to pay \$8. Assume that Alice has all this information about the prices they're willing to pay, and that she is restricted to selling to all customers for the same price. There is no competitor to Alice's software.

If Alice is allowed to maximize her revenue, she would sell her software for \$1,000, which would give Bob a value of \$1,000 and zero value to the other 100 potential buyers (and every customer's surplus would be zero). Suppose that, unexpectedly, the government does not allow Alice to maximize her revenue, on the grounds that she has no competition, and forces Alice to sell her software for no more than X dollars where $X < \$1,000$ (she can charge less than X if she so chooses, but she is not allowed to charge more). For each of the following values for X , summarize what happens (total customer values, surplus for each, revenue for Alice, total profit or loss for Alice) and state who the winner(s) and loser(s) are from the government's intervention (compared to no intervention).

1. $X = \$8$
2. $X = \$5$
3. $X = \$10$

Date due: Tuesday February 13, 2018 at the beginning of class