Exam #2 (75 Points Total)

- **Expected value** is given by summing likelihood times value over all possible outcomes:

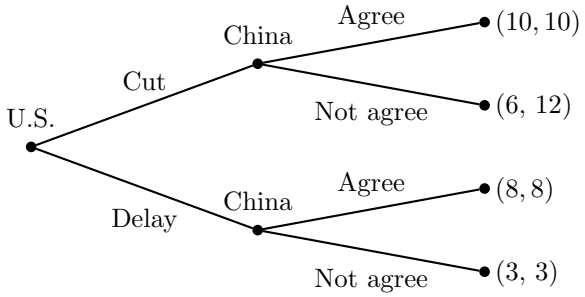
$$\text{Expected Value} \quad = \sum_{\text{Outcomes } i} \text{Probability}(i) \cdot \text{Value}(i).$$

- A **Pareto efficient** (or **Pareto optimal**) allocation or outcome is one in which it is not possible find a different allocation or outcome in which nobody is worse off and at least one person is better off. An allocation or outcome B is a **Pareto improvement over A** if nobody is worse off with B than with A and at least one person is better off.

- In an **ascending price auction**, the price starts out at a low value and the bidders raise each other's bids until nobody else wants to bid. In a **descending price auction**, the price starts out at a high value and the auctioneer lowers it until somebody calls out, "Mine." In a **first-price sealed-bid auction**, the bidders submit bids in sealed envelopes; the bidder with the highest bid wins, and pays an amount equal to his or her bid (i.e., the highest bid). In a **second-price sealed-bid auction**, the bidders submit bids in sealed envelopes; the bidder with the highest bid wins, but pays an amount equal to the *second-highest* bid.

(5 points) Name:

1. The following game is just one example of how game theory might be applied to international climate negotiations. (Repeat, it's just one example.) The game involves player 1 (the U.S.) choosing whether to unilaterally cut emissions ("cut") or whether to delay ("delay") in the hopes of reaching agreement on an international climate treaty. In either case, player 2 (China) then chooses whether to agree to an international climate treaty ("agree") or refuse to be part of an international treaty ("not agree"). The outcomes could be considered to be measures of societal well-being in the two countries (U.S., China). Analyze the following sequential move game using backward induction.



   (a) (5 points) Identify (e.g., by circling) the likely outcome of this game.

   (b) (5 points) Is this outcome Pareto efficient? Yes No (Circle one. If it is not Pareto efficient, identify, e.g., with a star, a Pareto improvement.)

2. "A Pareto efficient outcome may not be good, but a Pareto inefficient outcome is in some meaningful sense bad."

   (a) (5 points) Give an example or otherwise explain, as if to a non-economist, the first part of this sentence, "A Pareto efficient outcome may not be good."

   (b) (5 points) Give an example or otherwise explain, as if to a non-economist, the second part of this sentence, "A Pareto inefficient outcome is in some meaningful sense bad."

3. (5 points) "If situation A is Pareto efficient and situation B is Pareto inefficient, situation A must be a Pareto improvement over situation B." Do you agree with this claim? If so, explain. If not, provide a counter-example or otherwise explain.

4. Consider a division problem such as the division of cake or the allocation of fishing quotas.

   (a) (5 points) Economists tend to place a great deal of importance on providing opportunities to trade (e.g., allowing the buying and selling of fishing quotas). Briefly explain why this is.

   (b) "Even if there are opportunities to trade, the initial allocation of resources (e.g., the determination of who gets the fishing quotas in an ITQ system) is important because it helps determine whether or not we reach *the* Pareto efficient allocation of resources."

      i. (5 points) Is there such a thing as "*the* Pareto efficient allocation of resources"? Circle one (Yes No) and explain briefly.

      ii. (5 points) Do you agree that initial allocations are important in order to achieve Pareto efficiency, or do you think that they're important for a different reason, or do you think that they're not important? Support your answer with a brief explanation.

5. Catalytic converters are devices that reduce the amount of pollution produced by motor vehicles. Imagine that each of the 500,000 residents of X-ville (including you) owns a car without a catalytic converter, and that each of you has to decide whether or not to purchase one. Imagine further that (1) it will cost you $100 to purchase and install a catalytic converter; (2) *each* car that does not have a catalytic converter results in extra pollution that imposes health costs of one-tenth of one penny ($0.001) on you and every other resident of the city; and (3) like your fellow X-villians, you just want to do whatever has the lowest cost for you personally.

   (a) (5 points) If you and other X-ville residents are each allowed to choose whether or not to purchase a catalytic converter, what outcome does game theory predict?

   (b) (5 points) Is this outcome Pareto efficient? Explain briefly, e.g., by identifying a Pareto improvement if the outcome is Pareto inefficient.

   (c) (5 points) "The central difficulty here is that each resident must decide what to do without knowing what the other residents are doing. If you knew what the others decided, you would behave differently." Do you agree with this argument? Circle one (Yes No) and briefly explain.

6. It just so happens that eBay is currently running an auction for a collection of *all five* *NSYNC bobblehead dolls. Imagine that your value for such a collection is $20, meaning that you are indifferent between having the dolls and having $20.

   (a) (5 points) In a first-price sealed bid auction, should you bid an amount b that is (less than equal to more than) your true value ($20)? Circle one and explain briefly. It may help to write down an expected value calculation.

   (b) (5 points) In a second-price sealed bid auction, explain why it makes sense to bid your true value (i.e., $20). *Hint:* Consider the highest bid *excluding* your own bid. If that bid is more than $20, can you do better than bidding your true value? If that bid is less than $20, can you do better than bidding your true value?

   (c) (5 points) What does it mean for a player to have a **dominant strategy**? Write a definition and then write down or circle one of the following (first-price, second-price, both, neither) to indicate in which auction each player has a dominant strategy.