

# Econ 1: Spring 2012: U.C. Berkeley: Problem Set 1

**Due at start of section following January 30 lecture**

For this problem set, we will consider a toy economy with eight workers--Lucy, Ricky, Ethel, Fred, Chingachgook, Galla Placidia, Ibn Sina, and An Lushan--that produces two commodities: lattes (large, vanilla-caramel, half-caff, sweetened, made half with skim milk and half with half-and-half--all lattes are equivalent, and take the same time and skill to make), and yoga lessons.

In a shift the eight workers could each teach at most the following number of yoga lessons: An Lushan 8; Chingachgook 8; Ibn Sina 4; Galla Placidia 3; Lucy 1; Ethel 1; Ricky 1; Fred 0.

In a shift the eight workers could prepare at most the following number of lattes: Lucy 20; Chingachgook 20; Ibn Sina 12; Ethel 10, Ricky 10, Fred 5; An Lushan 3; Galla Placidia 2.

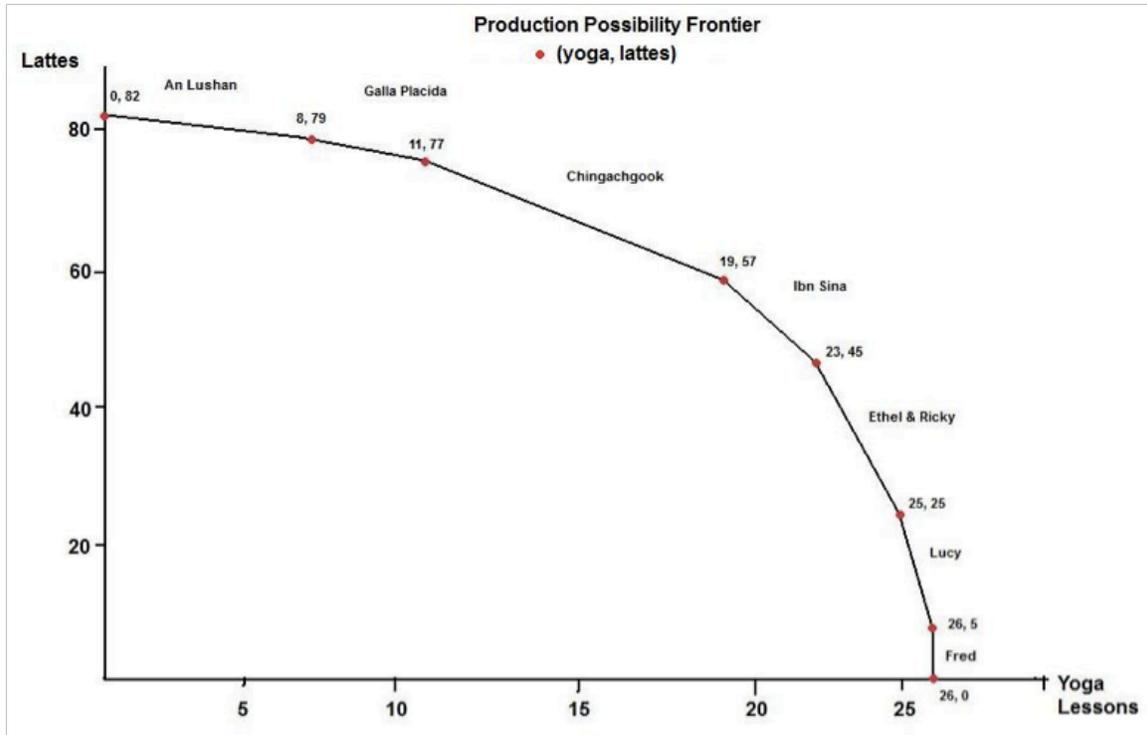
Workers can split shifts: spend half their time teaching yoga and teaching half their maximum number of lessons and the other half pulling lattes and making half their maximum number, etc.

All 8 workers want to work a full shift.

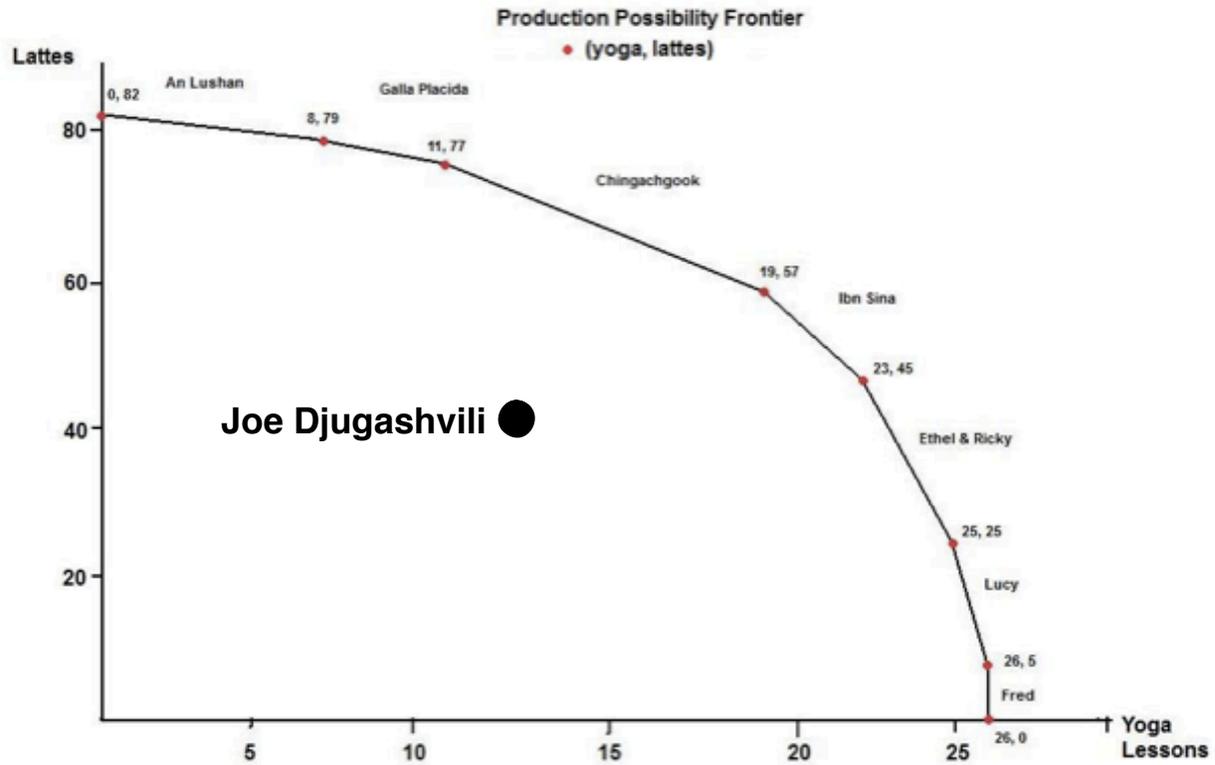
1. What is the largest number of yoga lessons that this economy could teach? **26 yoga lessons. Set everybody to work teaching yoga, and that is what you get.**
2. What is the largest number of lattes that this economy could make? **82 lattes. Set everybody to work as a barista, and that is what you get.**
3. Suppose Joe Djughashvili comes along and--out of the goodness of his heart and his desire to serve the people--volunteers to take on the onerous labor of the head of Production Distribution Coordination and assign people to shifts and tasks. He grabs four workers at random and says "you are pulling lattes". He tells the rest "you are teaching yoga classes". What is the expected value of the number of yoga classes taught? What is the expected value of the number of lattes made? **Each individual has a random 50% chance of making 0 lattes and a 50% chance of**

making as many lattes as they can make. Expected values are calculated by multiplying the outcomes by their probabilities, and adding them. So, for example, we expect Lucy to make  $50\% \times 0 + 50\% \times 20 = 10$  lattes. Add up the expected latte values for all 8 people, and get 41 lattes. Make a similar calculation for yoga lessons, and you get 13 yoga lessons.

4. Graph the Production-Possibility Frontier--the PPF--of this economy. **Start with everybody making lattes—82 lattes. Suppose you want to teach one yoga lesson. Who should you choose to teach it? A little exploring, and you realize that An Lushan could take some time off from latte-pulling to teach a yoga class and it would only reduce latte production by  $\frac{3}{8}$  of a latte--and that is the smallest number for all of the 8. So you pull An Lushan off of the barista line and put him on the mat. As more and more of his time goes to yoga teaching, the production of the economy moves on a smooth straight line from (0, 82) to (8, 79). But suppose you want to teach more yoga lessons? The person with the next lowest opportunity cost of making yoga lessons is Galla Placidia, with an opportunity cost of  $\frac{2}{3}$ . So the PPF then moves down and to the right from (8, 79) to (11, 77). And then, in order, you shift Chingachgook (2.5), Ibn Sina (3), Ethel, (10), and Ricky, (10) into teaching yoga lessons, and wind up at (26, 5) making 26 yoga lessons and 5 lattes. (It is an interesting--albeit scholastic--question whether you ever want to put Fred on a yoga mat. As long as lattes have a positive price, you don't.)**



5. Louie von Mises comes along and says that Joe Djughashvili is a really lousy head of PDC. Is Louie right or wrong? Use the PPF you drew in (4) to motivate your answer. **Louie—Ludwig von Mises—looks at what Joe’s economy is producing, and says: “Hey! It is way inside the PPF! A well-run economy could produce many more lattes and many more yoga lessons! Joe is doing it wrong...”**



6. How many yoga lessons could the economy produce and still produce as many lattes as Joe Djugashvili expected the economy he ran to produce in (4)? **From the PPF, you can produce 41 lattes and also make 23.4 yoga lessons.**

7. How many lattes could the economy produce and still produce as many yoga lessons as Joe Djugashvili expected the economy he ran to produce in (4)? **From the PPF, you can produce 13 yoga lessons and 72 lattes**

8. Suppose that lattes sell for \$4 each. What is the *opportunity cost* for each of the eight workers of putting them to work teaching an extra yoga lesson? **Fred: Infinity/undefined. Lucy:  $20 * \$4 = \$80$ . Ethel:  $10 * \$4 = \$40$ . Ricky:  $10 * \$4 = \$40$ . Ibn Sina:  $3 * \$4 = \$12$ . Chingachgook:  $2.5 * \$4 = \$10$ . Galla Placida:  $.67 * \$4 = \$2.67$ . An Lushan:  $.375 * \$4 = \$1.5$**

9. Suppose that all the students in a yoga lesson collectively pay \$15 per lesson. What is the *opportunity cost* for each of the eight workers of putting them to work pulling an extra latte? **Fred:  $0 * \$15 = \$0$ . Lucy:  $.05 * \$15 = \$0.75$ . Ethel:  $.1 * \$15 = \$1.50$ . Ricky:  $.1 * \$15 = \$1.50$ . Ibn Sina:  $.33 * \$15 = \$5$ . Chingachgook:  $.4 * \$15 = \$6$ . Galla Placida:  $1.5 * \$15 = \$22.50$ . An Lushan:  $2.67 * \$15 = \$40$ .**

10. Suppose Joe is still head of PDC. Oskar Lange comes along bearing the results of your calculations from (8) and says that he has a plan by which the economy can produce more than the random-assignment economy of (3). In what order does he tell Joe to pick the people who are going to teach the yoga lessons? **Oskar Lange tells Joe to start with the people with the lowest opportunity cost. An Lushan --> Galla Placida --> etc.**

11. What is the relationship between your answer to (10) and your answer to (4). Is Louie now happy (or at least less unhappy)? **Assigning people to teach yoga lessons by starting with those who have the lowest opportunity cost (of lattes) ensures that we end up on the PPE (as drawn in #4). Yes, Louie is less unhappy. But there are still the questions of motivation and monitoring: in a market economy you don't have to watch people all the time—if somebody breaks a contract or steals stuff, the victim will tell you; in a command economy, you do have to watch people all the time.**

12. Suppose customers are willing to pay \$4 each for lattes and \$15 for yoga lessons. Who should Joe assign to teach yoga? To pull lattes? How many lattes will the economy make and how many yoga lessons will it teach? **Like any rational person, Joe will want to maximize revenue. Since yoga lessons generate 3.75 ( $\$15/\$4$ ) times the revenue of lattes, Joe should only assign a worker to make lattes if the worker would have to give up more than 3.75 lattes in order to teach one yoga lesson. The rest should teach yoga lessons. An Lushan, Galla Placida, Chingachgook, and Ibn Sina should combine to teach 23 yoga lessons. Fred, Lucy, Ethel, and Ricky should combine to make 45 lattes.**

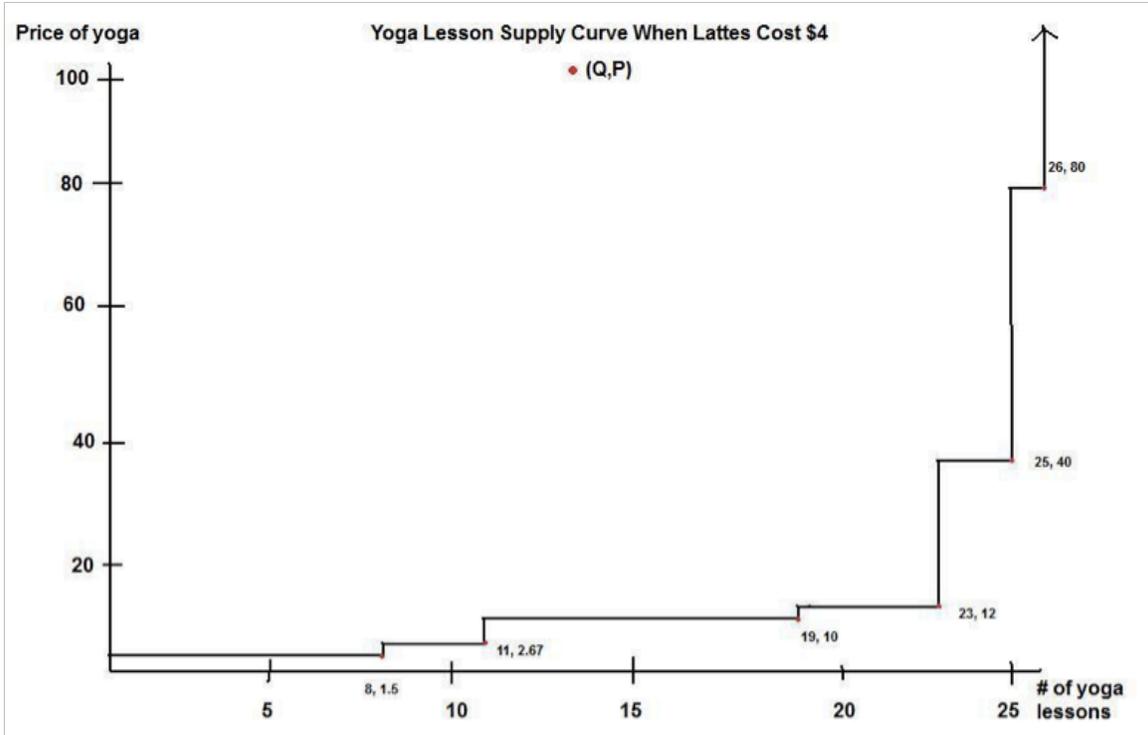
13. Suppose customers are willing to pay \$4 each for lattes but only \$5 for yoga lessons. Who should Joe assign to teach yoga? To pull lattes? How many lattes will the economy make and how many yoga lessons will it teach? **In this case, yoga lessons generate 1.25 ( $\$5/\$4$ ) times the revenue of lattes, which means Joe should assign a worker to make lattes if they would have to give up more than 1.25 lattes in order to teach one yoga lesson. The rest should teach yoga lessons. An Lushan and Galla Placida should combine to teach 11 yoga lessons. Fred, Lucy, Ethel, Ricky, Ibn Sina and Chingachgook should combine to make 77 lattes.**

14. Suppose customers are willing to pay \$4 each for lattes and \$45 for yoga lessons. Who should Joe assign to teach yoga? To pull lattes? How many lattes will the economy make and how many yoga lessons will it teach? **In this case, yoga lessons generate 11.25 ( $\$45/\$4$ ) times the revenue of lattes, which means Joe should assign a worker to make lattes if they would have to give up more than 11.25 lattes to teach one yoga lesson. The rest should teach yoga lessons. An Lushan, Galla Placida, Chingachgook, Ibn Sina, Ethel, and Ricky should combine to teach 25 yoga lessons. Fred and Lucy should combine to make 25 lattes.**

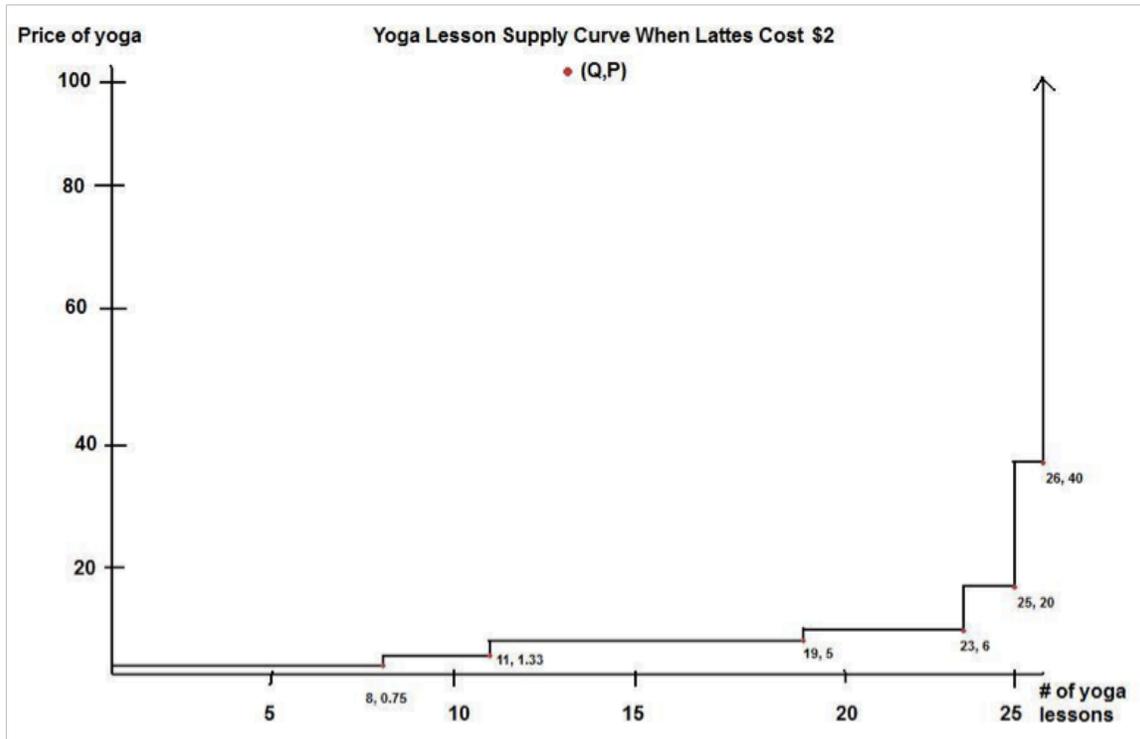
15. Which economy--(3), (12), (13), or (14)--is the worst economy? Why? **The economy in problem #3 is the worst economy because it uses an inefficient allocation of resources. The economy could produce more lattes and yoga lessons by simply reallocating which workers are assigned to which jobs.**

16. Which economy--(3), (12), (13), or (14)--is the best economy? Why? **The economies in #12, #13, and #14 are all productively efficient. (They are all on the PPF.) By that measurement, each of those three economies is equally good. To decide on anything else... we would have to know what consumers want most. That is what the prices in an economy tell us. But unless you know what the prices are, you cannot tell which point on the PPF is the best point.**

17. Suppose that the price of lattes is \$4 each. Let the price of yoga lessons vary from \$0 to \$100, and draw the supply curve for yoga lessons.

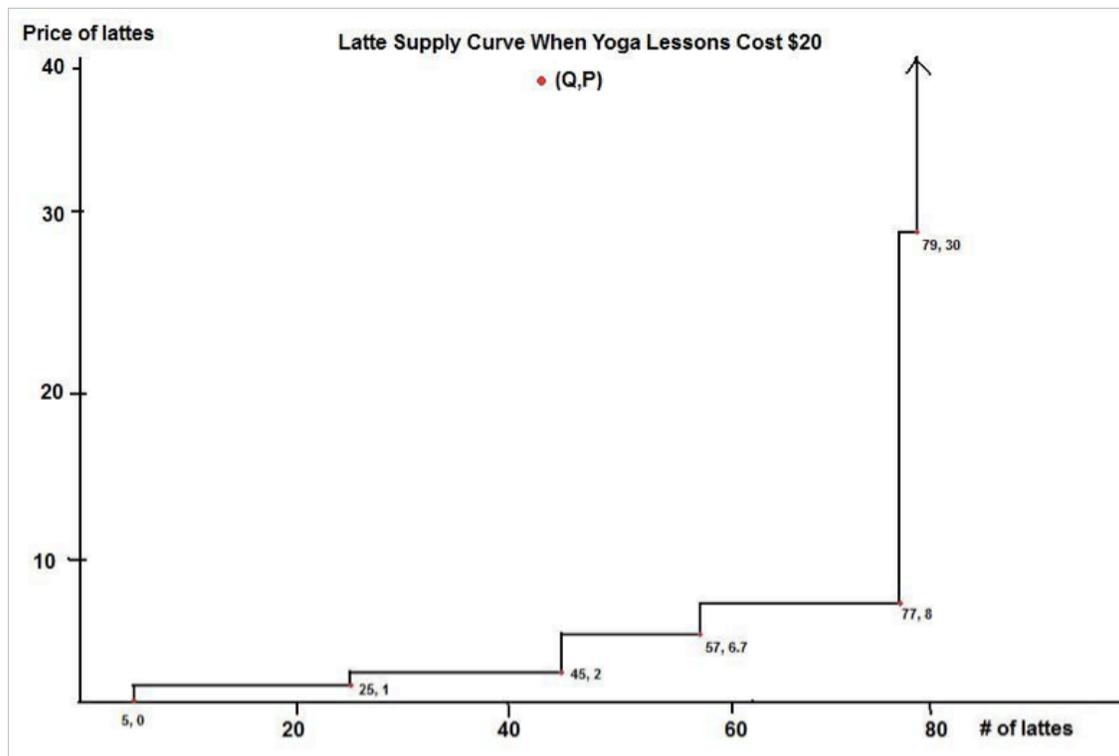


18. Suppose that the price of lattes is \$2 each. Let the price of yoga lessons vary from \$0 to \$100, and draw the supply curve for yoga lessons.

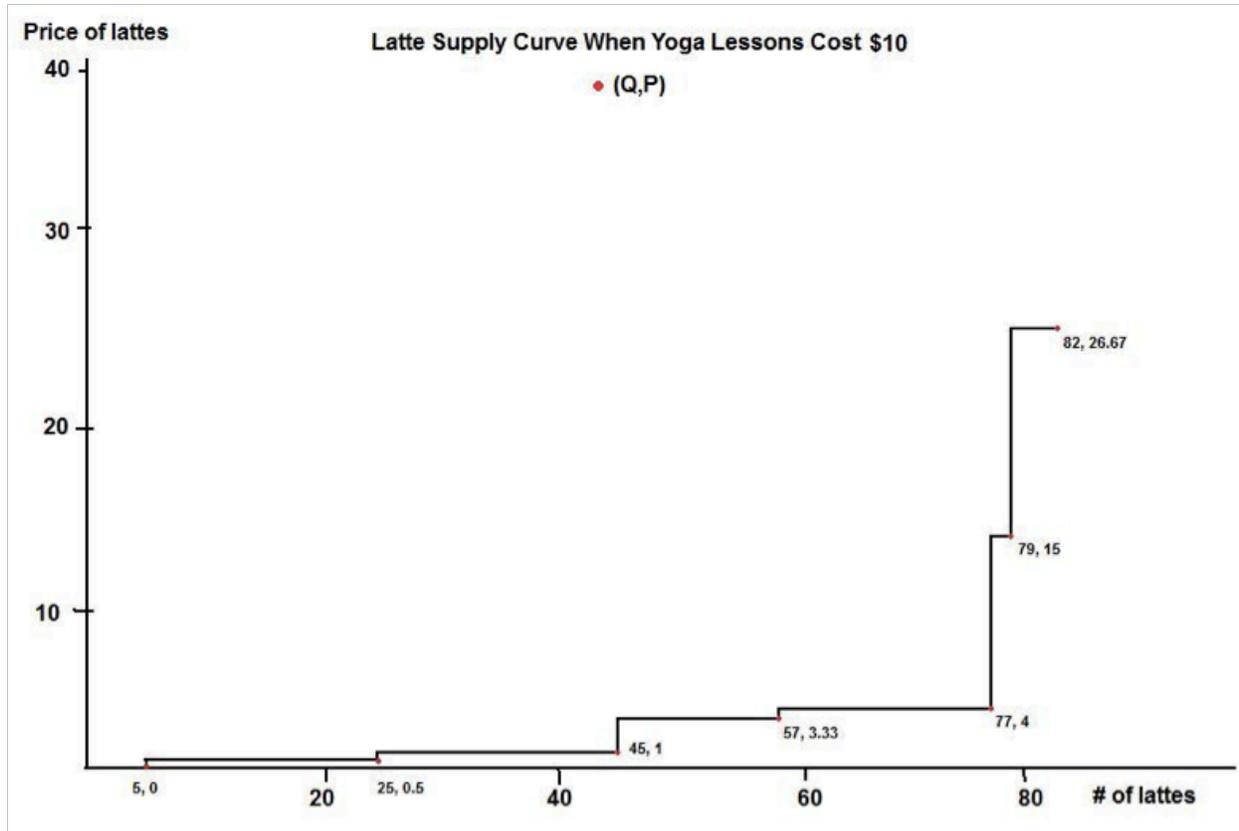


19. Why is your supply curve in (17) different from your supply curve in (18)? **The opportunity cost of supplying yoga lessons is lower in #18. For each latte not made, you give up \$4 in (17) and only \$22 in (18)**

20. Suppose that the price of yoga lessons is \$20 each. Let the price of lattes vary from \$0 to \$40, and draw the supply curve for lattes.



21. Suppose that the price of yoga lessons is \$10 each. Let the price of lattes vary from \$0 to \$40, and draw the supply curve for lattes.



22. Why is your supply curve in (20) different from your supply curve in (21)? **The opportunity cost of supplying lattes is lower in #21. In (20), each yoga lesson you don't teach costs you \$20. In (21), each yoga lesson you don't teach costs you only \$10.**

23. For the supply curve you drew in (18), suppose consumers demand 22 yoga lessons. What is the equilibrium price of yoga lessons? **You can read this off the supply curve: \$6.**

24. For the supply curve you drew in (18), suppose consumers demand 12 yoga lessons. What is the equilibrium price of yoga lessons? **You can read this off the supply curve: \$5.**

25. For the supply curve you drew in (18), suppose consumers are willing to pay \$22 for yoga lessons. What is the equilibrium quantity of yoga lessons? **From the supply curve, 25 yoga lessons.**

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26. For the supply curve you drew in (18), suppose consumers are willing to pay \$4 for yoga lessons. What is the equilibrium quantity of yoga lessons? **From the supply curve, \$4.**