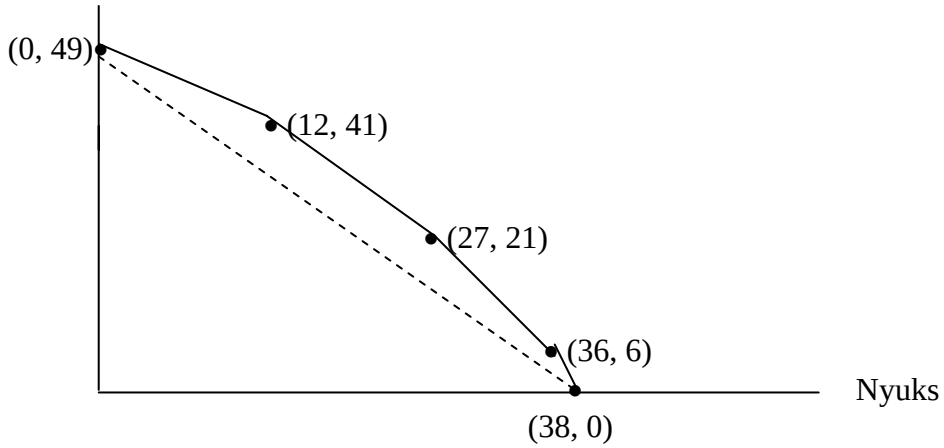
1. (20 pts.) Consider the following world of four Stooges (Moe, Larry, Curly, and Shemp). Each faces the given tradeoff between the daily production of *nyuks* and *pratfalls*.

Moe: 12 nyuks OR 8 pratfalls
Larry: 9 nyuks OR 15 pratfalls
Shemp: 2 nyuks OR 6 pratfalls
Curly: 15 nyuks OR 20 pratfalls

A. Graph this world's production possibilities frontier.



Pairs in parentheses represent production points. The first number is nyuks, the second is pratfalls. The dashed line represents society's PPF if the extreme points are attainable and all individuals face the same opportunity costs.

This graph consists of five points representing the efficient transition of Stooges in production. The two extreme points are straightforward. If all Stooges make nyuks and none make pratfalls, society produces at the point (38, 0). If all Stooges make pratfalls and none make nyuks, society produces at the point (0, 49).

Assume for the moment that society is producing only nyuks. The relevant question then is "Which Stooge must give up the fewest nyuks to get one pratfall?" This is equivalent to the question, "Which Stooge gains the most pratfalls by giving up one nyuk?" The Stooges opportunity costs are

Moe: (3/2 nyuks per pratfall) or (2/3 pratfalls per nyuk)
Larry: (3/5 nyuks per pratfall) or (5/3 pratfalls per nyuk)
Shemp: (1/3 nyuk per pratfall) or (3 pratfalls per nyuk)
Curly: (3/4 nyuks per pratfall) or (4/3 pratfalls per nyuk)

If Shemp wants a pratfall, he must give up only 1/3 of a nyuk. This is the lowest of any Stooge. (Conversely, if Shemp gives up a nyuk, he gains 3 pratfalls, the most of any Stooge.) Consequently, Shemp is the first Stooge to shift from nyuks to pratfalls, and, after his complete switch, society produces at (36, 6). Following similar reasoning, Larry shifts production next (27, 21), followed by Curly (12, 41), and lastly by Moe (0, 49).

The frontier bulges outward because of the combination of the Stooges' differing opportunity costs of production and the efficient allocation of Stooges to production. Without the former

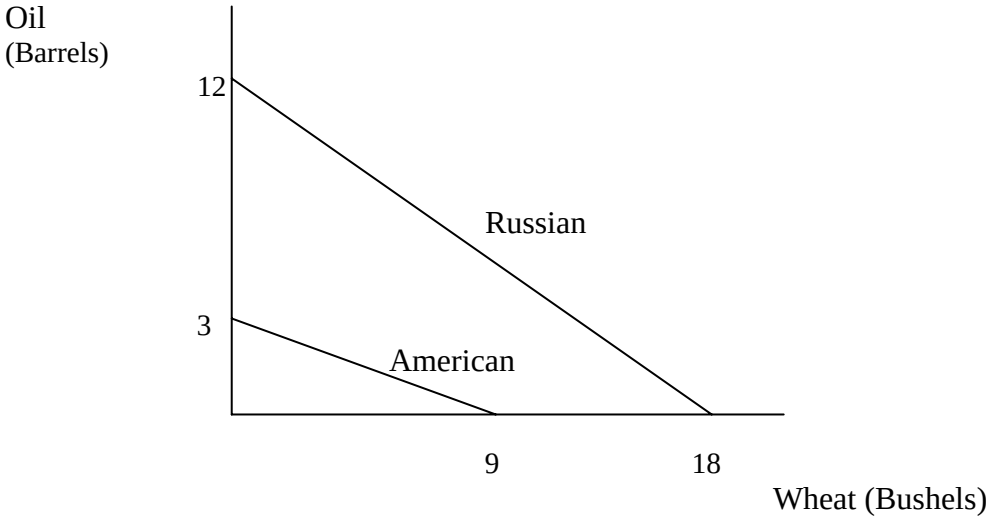
condition, the PPF is merely a straight line (specifically, the dashed line of the above graph). Without the latter condition, the "frontier" could be perfectly inefficient. Such a graph would lie below the aforementioned straight line at every interior point, and would look like a tilted bowl (i.e., it would be convex).

B. Determine whether the following points are inefficient, efficient, or unattainable: 1) [37 nyuks, 3 pratfalls], 2) [27 nyuks, 21 pratfalls], 3) [32 nyuks, 4 pratfalls], and 4) [7 nyuks, 45 pratfalls]

Above, I showed that Shemp should be the first to switch from nyuk production to pratfall production and that he gives up 1/3 nyuk to make 1 pratfall. If he gives up 1 nyuk, he receives 3 pratfalls, so (37 nyuks, 3 pratfalls) is on the PPF and therefore efficient. I have already shown that (27 nyuks, 21 pratfalls) is the efficient production outcome if Shemp and Larry specialize in pratfalls and Curly and Moe specialize in nyuks. The production possibility (32 nyuks, 4 pratfalls) is clearly inefficient since (36 nyuks, 6 pratfalls) can be produced if Shemp specializes in pratfalls and the other Stooges specialize in nyuks. Finally, to make at least 45 pratfalls, Moe must spend at least half his time making pratfalls and the other Stooges must specialize entirely in pratfalls. If Moe spends at least half his time making pratfalls, though, he can produce at most 6 nyuks. The production outcome (7 nyuks, 45 pratfalls) is therefore unattainable.

2. (20 pts.) The U.S. and Russia both produce wheat and oil. Suppose that in isolation the typical American worker can grow 9 bushels of wheat or extract 3 barrels of oil in a week. The typical Russian worker, though, can grow 18 bushels of wheat or extract 12 barrels of oil in the same length of time.

A. On the same graph, draw out the typical worker's PPF in each country.



B. Which country's workers have the absolute advantage in wheat-growing? In extracting oil?

A Russian worker can grow 18 bushels of wheat each week compared to an American worker who can produce only 9 bushels of wheat. Likewise, in a week the Russian can extract 12 barrels

of oil, but the American can extract only 3 barrels. Russia therefore has the absolute advantage in producing both goods.

C. Which country has the comparative advantage in growing wheat?

The Russian worker must give up growing 3/2 bushels of wheat to extract 1 barrel of oil. The American worker must give up 3 bushels to produce 1 barrel. Since Russia faces the lower opportunity cost of extracting oil, its comparative advantage lies in oil production. This implies that the U.S. has the comparative advantage in wheat-production.

To more directly see this latter point, the converse approach shows that a Russia worker must give up 2/3 barrels of oil to produce 1 bushel of wheat, while an American worker need give up only 1/3 barrels of oil to produce 1 bushel. Since the U.S. faces the lower opportunity cost of growing wheat, its comparative advantage is in wheat production.

D. Assume that the countries' populations are the same. Further suppose that the American negotiators are dominant at the trading table. Could the typical American worker ever consume more than 5 barrels of oil in a week? More than 6 barrels? Explain.

Suppose that the American negotiators are *so* good that the Russians are actually indifferent between trading and producing. In this case, the terms of trade are 3/2 bushels of wheat for 1 barrel of oil or equivalently 2/3 barrels of oil for 1 bushel of wheat. If the Americans totally specialize in growing wheat, each worker produces 9 bushels of wheat and each bushel can be traded for 2/3 barrels of oil. Under this scenario, each American could consume 6 barrels of oil but no more. If the terms of trade were any more favorable to the Americans, the Russians would be better off not trading and would choose to produce instead, so an American worker could never consumer more than 6 barrels of oil in a week.

Note: I assume the populations are the same to rule out one country demanding more than the other country can provide, even at the given terms of trade. In 1999, the U.S. population was about 273M (million), while Russia's population was 146.5M.

Extra note: For the record on wheat, the U.S. presently produces about 42M bushels per week, of which it *exports* about 18M bushels. Russia produces about 21M weekly bushels and *imports* about 2.8M weekly bushels. Regarding oil, the U.S. produces about 54.6M barrels per week and *imports* about 75M barrels a week. Russia produces about 43M barrels a week, of which it *exports* about 25M.