

**Questions to be handed in**

*(Please....use plenty of paper, spread out your answers and write legibly.)*

	Albania	Belarus
Total Labor Force	500	1000
Production Technology for...		
Grapes	Q= 2 L	Q = 4 L
Olives	Q = 10 L	Q = 12 L

1. Create a table showing the unit labor requirement and the marginal product of labor for each country and good.

**In Albania, one labor can produce 2 units of grapes, so one unit of grape production needs ½ a unit of labor. Therefore, the unit labor requirement for grapes in Albania is ½. Similarly one unit of olives production needs 1/10 units of labor, and therefore the unit labor requirement for olives in Albania is 1/10. We can follow the same procedure to determine unit labor requirement for each good in Belarus.**

**In Albania, one worker can produce 2 units of grapes, therefore  $MPL_{grapes}=2$ . On the other hand one worker can produce 10 units of Olives, therefore  $MPL_{olive}=10$ . Following the same logic in Belarus, the marginal products are given as  $MPL_{grapes}=4$   $MPL_{olive}=12$ .**

	Albania	Belarus
<b>Unit labor requirement:</b>		
Grapes	<b>1/2</b>	<b>1/4</b>
Olives	<b>1/10</b>	<b>1/12</b>
<b>Marginal Product of labor</b>		
Grapes	<b>2</b>	<b>4</b>
Olives	<b>10</b>	<b>12</b>

2. In order to derive the production possibilities frontier, describe using both words and an equation, how you determine

- a. where the PPF hits the "grape output" axis in Albania

**If all workers produce grapes, then the total grape production is**

$Q_{grapes} = MPL_{grapes} * L_{grapes} = 2 * 500 = 1000$ . **The PPF hits the "grape output" axis at the point 1000.**

- b. where the PPF hits the "olive output" axis in Albania

If all workers produce olives, then the total olive production is

$$Q_{olives} = MPL_{olives} * L_{olives} = 10 * 500 = 5000 \text{ The PPF hits the "olive output" axis at the point 5000.}$$

c. what determines the slope of the PPF.

The PPF is a straight line hitting two points 1000 and 5000. Each point on the PPF describes a feasible quantity of output of the two goods. Moves along the PPF represent the change in output caused by increasing labor in one sector and decreasing it in another.

The slope of the PPF depends on the opportunity costs of production. You can see that by examining how a change in output results from a change in labor.

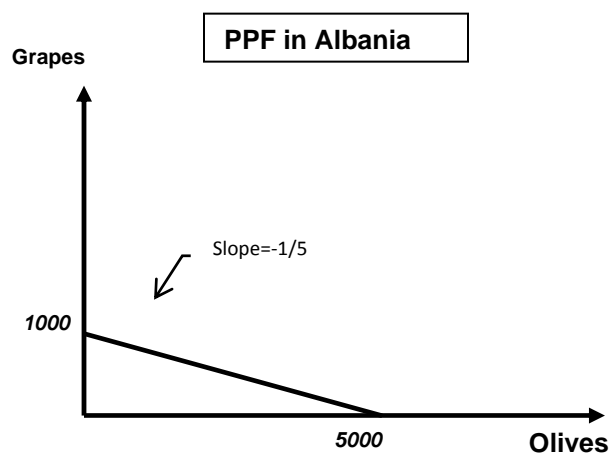
$$\frac{Q_{grapes}}{Q_{olives}} = \frac{MPL_{grapes} * L_{grapes}}{MPL_{olives} * L_{olives}}$$

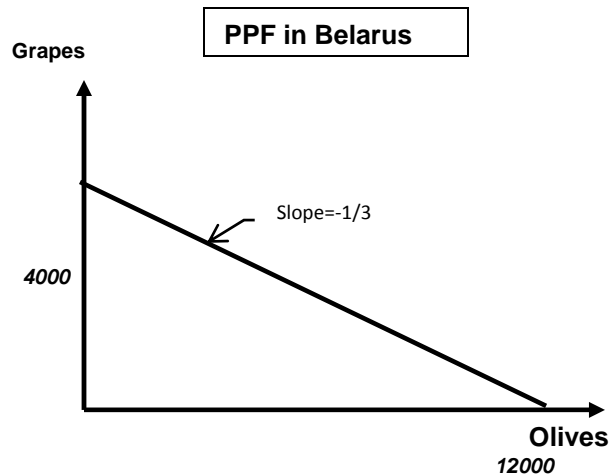
so

$$\Delta \frac{Q_{grapes}}{Q_{olives}} = \frac{MPL_{grapes}}{MPL_{olives}} \Delta \frac{L_{grapes}}{L_{olives}} = \frac{2}{10} \left( \frac{1}{-1} \right) = -1/5$$

That equation just says that a change in output depends on the ratio of MPL in the two sectors multiplied by the change in labor in the two sectors (since every worker who leaves one sector moves into the other the change in labor = -1). In this model the MPL is a constant, so that slope is constant.

3. Draw the PPF for both Albania and Belarus. Be sure to label the numeric values of each axis.





4. What is the opportunity cost of producing one more unit of grapes in Albania? in Belarus?

**Albania: Producing 1 unit of grapes requires 1/2 workers. These workers could have produced 5 units of olives. The opportunity cost of producing one more unit of grape is 5 olives.**

**Belarus: Producing 1 unit of grapes requires 1/4 workers. These workers could have produced 3 units of olives. The opportunity cost of producing one more unit of grape is 3 olives.**

5. Autarky prices: for each country

a. what is the autarky price of grapes / price of olives?

$$\text{Albania: } \frac{P_g^A}{P_o^A} = \frac{w^A a_g^A}{w^A a_o^A} = \frac{a_g^A}{a_o^A} = 5$$

$$\text{Belarus: } \frac{P_g^B}{P_o^B} = \frac{w^B a_g^B}{w^B a_o^B} = \frac{a_g^B}{a_o^B} = 3$$

b. what is the autarky price of olives / price of grapes.

$$\text{Albania: } \frac{P_o^A}{P_g^A} = \frac{a_o^A}{a_g^A} = \frac{1}{5}$$

$$\text{Belarus: } \frac{P_o^B}{P_g^B} = \frac{a_o^B}{a_g^B} = \frac{1}{3}$$

c. In Albania one good is more expensive in autarky. Explain why this is.

**In Albania grapes require 5 times more labor than olives; since workers are paid the same wage in both sectors this must mean that grapes are 5 times more expensive than olives.**

6. Suppose Albania and Belarus are free to trade.

a. Describe the pattern of trade

**Belarus has comparative advantage in grapes, so it will specialize in grapes and export grapes. Albania has comparative advantage in olives, so it will export olives.**

b. What happens to the composition of output in each country?

**Belarus will increase the production of grapes and therefore it will engage more labors in grape production. Some of the workers who could have produced olives will engage in grapes production. Therefore, olives production will decrease in Belarus. In Albania olives production will increase at the cost of grapes production.**

c. What is the possible range in which the world price of olives/grapes could fall?

**Under free trade the world price of olives/grapes will be same for both the countries. The price will settle somewhere between the autarky prices for Albania and Belarus, between 1/5 and 1/3.**

7. Pick the number in the middle of this possible price range. At this relative price...

a. Show what happens to the PPF and the CPF in each country.

b. What is the Belarussian wage relative to the Albanian wage?

**Price of each goods are determined by the equation**

$$P_g^B = w^B a_g^B$$

**Therefore wage in Belarus is  $w^B = \frac{P_g^B}{a_g^B}$**

**Under free trade both countries face the same price for grapes, therefore we can write  $P_g$  for grapes' price and  $P_o$  for olives' price.**

To determine the relative wage we can divide Belarussian wage by Albanian wage and get

$$\frac{w^B}{w^A} = \frac{P_g a_o^A}{P_o a_g^B} = 4 \frac{1/10}{1/4} = 1.6$$

c. What happens to that relative wage if the price of olives/grapes were to rise?

**The Belarussian wage will fall relative to the Albanian wage. The reason is that Belarus is exporting (selling) grapes and importing (buying) olives. Its real wage rises when the export good it produces rises in value. Its real wage falls when the export good it produces falls in value.**

8. Explain, in words, which country gains from trade in this exchange, and why.

**Both the countries gain from trade, because under free trade they specialize and export the good in which they have comparative advantage and import the other one. Therefore, they will be able to buy the imported good at a lower world price, consume more and reach a higher utility level.**

9. For each of the following scenarios, what happens to: the opportunity costs of producing one more unit of olives; the autarky price of olives / price of grapes, and the pattern of trade if...

a. Belarus were to become twice as productive in both sectors.

**The opportunity costs of producing one more unit of olives; the autarky price of olives / price of grapes, and the pattern of trade will remain same as before because there is no change in the relative productivity.**

b. Belarus were to become twice as productive only in olive production.

**The opportunity cost of producing one more unit of olives is 1/6 units of grapes. Note that before the increase in productivity the opportunity costs of producing one more unit of olives was 1/3 grapes and after the increase in olive productivity the opportunity cost of olives decreases, because one more unit of labor from olive production can now produce less grapes. The autarky price of olives / price of grapes is 1/6 and Belarus will export olives and Albania will export grapes. The pattern of trade reverses.**

c. Albania were to double its population.

**The opportunity costs of producing one more unit of olives; the autarky price of olives / price of grapes, and the pattern of trade will remain same as before because there is no change in the relative productivity.**

10. This question applies the Ricardian model in the multi-good case. Suppose that wages in the US are \$20/ hour while wages in Mexico are \$4/hour.

Good	US unit labor requirement	Mexico unit labor requirement
Apples	1	2
Bananas	1	4
Cherries	1	5
Dates	1	6
Eggplant	1	10

a. Which goods will the US export? Which will Mexico export?

Good	US unit labor requirement	Price in US	After tariff price of US goods	Mexico unit labor requirement	Price in Mexico	After tariff price of Mexican goods
Apples	1	20	26	2	8	14
Bananas	1	20	26	4	16	22
Cherries	1	20	26	5	20	26
Dates	1	20	26	6	24	30
Eggplant	1	20	26	10	40	46

**We can compare the prices of different goods between US and Mexico and the country with lowest price will be the exporter of the corresponding good. From the third and sixth column of the above table we can conclude that US will export dates and eggplant. Mexico will export Apples and Bananas. The price of cherries is same for both the countries so both will produce cherries.**

b. Suppose there is a tariff (tax) of \$6 on any good crossing the border in any direction. How does that change your answer?

**We can add the tariff \$6 to the price of goods' in each country and then compare which country has lower export price than the domestic price of the other country. Comparing the after tariff price we**

can conclude that US will export only eggplant because that is the only good whose export price (inclusive of tariff) is lower than the Mexican domestic price. Similarly Mexico will export only Apples.