MICROECONOMICS 3
PROBLEMS #4

GENERAL EQUILIBRIUM. PRODUCTION AND COMPARATIVE ADVANTAGE

Problem #1

Paul and John want to consume 60 sweets and 60 lollipops each. Assume that Paul is able to produce 10 sweets or 30 lollipops per hour, while John is able to produce 30 sweets or 10 lollipops per hour.

a) Specify Paul's and John's comparative advantage.
b) Assuming that Paul and John do not help each other, how many hours does each one of them have to work per day?
c) Now assume that Paul and John decide to cooperate in a possibly most efficient way. How many hours per day will each one of them have to work now?

Problem #2

On the Veritas island it is illegal to trade with other countries. Only 2 goods are consumed on this island: milk and wheat. The production possibilities frontier in the north takes the form: $m = 60 - 6w$, while in the south it is: $m = 40 - 2w$, where m is the amount of milk and w – the amount of wheat. The economy remains in a competitive equilibrium and 1 unit of wheat is exchanged for 4 units of milk.

a) At the given equilibrium prices, in the production of which good will the northern and southern farms specialize?
b) Friendly Vikings discovered the possibility to trade with Veritas and offered exchange of wheat for milk at a rate: 1 unit of wheat for 3 units of milk. If the Veritas island permits free trade with the Vikings, a new price ratio will appear on the island. How will production (output) of the farmers in the north and in the south change?
c) Specify the interval of exchange rates that may be proposed by the Vikings, under which farmers from the Veritas island will not change their decision regarding the choice of the good that they produce.

Problem #3

A given country consists of two regions, A and B, producing goods X and Y. The production functions for region A are given by: $X_A = LAX^{1/2}$, $Y_A = LAY^{1/2}$, where LAX and LAY denote labor devoted to production of goods X and Y in region A, respectively. Moreover, it is known that $LAX + LAY = 100$. Similarly, production functions for region B are given by: $X_B = (1/2)LBX^{1/2}$, $Y_B = (1/2)LBY^{1/2}$, where LBX and LBY denote labor devoted to production of goods X and Y in region B, respectively. Moreover, it is known that $LBX + LBY = 100$.

a) Specify the formulae describing production possibility frontiers in both regions.
b) What condition must be fulfilled for efficient allocation of production with no labor mobility?

c) Specify the formula for the production possibilities frontier for the entire country, assuming again no labor mobility. If total output is $X = 12$, what is the output for Y?

Problem #4

Assume that the economy in a given country consists of only two persons. It is only possible to produce two goods (drill drivers and markers). Production possibilities frontiers of these persons are given by: $D + M = 40$ and $D + 2M = 60$. Because of close relationships between the persons composing this economy, we can only speak of utility from the point of view of their joint consumption.

a) Provide the production possibilities frontier in algebraic and graphical form.
b) Assuming that the utility function is given by the formula $U(D,M) = DM^2$, find the optimum consumption level of both goods.
c) Assuming that the utility function is given by the formula $U(D,M) = DM$, find the optimum consumption level of both goods.

Problem #5

Robinson Crusoe decided that he will spend exactly 10 hours per day searching for food. He can spend this time looking for coconuts or fishing. He is able to catch 2 fish or find 3 coconuts in 1 hour. Robinson's utility function is $U(F,C) = 3F^{0.6}C^{0.3}$, where F is his daily consumption of fish and C – of coconuts.

a) How many fish should Robinson catch and how many coconuts should he find so that his consumption maximizes his utility?
b) Illustrate the equilibrium with a graph.

One day a native inhabitant of another island arrives on Robinson's island. The visitor offers Robinson trade of 3 fish for 1 coconut. However, trade is not free, it costs 1 fish (that must be paid prior to the exchange).

c) Will Robinson decide to trade? Justify your answer and provide a graph.
d) What will Robinson produce?
e) What will Robinson consume?

Provide your answers to the above questions again assuming that Robinson's production possibilities frontier is given by: $100 = (F^2)/4 + (C^2)/9$.

Problem #6

Two goods are produced on an island – milk and wheat. The only limited resource is land. There are 1000 acres of land on the island. From 1 acre one can produce either 10 units of milk or 16 units of wheat. The inhabitants' utility function is given by the formula U(M,W) = MW, where M – milk and W – wheat. Is it true that in equilibrium the inhabitants will produce the same amount of wheat and milk?

Problem #7

Al and Bill are the only employees in a small factory, which produces pens and pecils. Al can produce 5 pens or 20 pencils per hour, while Bill can produce 3 pens or 6 pencils per hour. Specify comparative advantages of Al and Bill.

Problem #8

What must the competitive equilibrium price ratio be for goods x and y that guarantees efficient consumption and production when the production possibilities frontier is $x^2 + 4y^2 = 200$ and the utility function is $U = (xy)^{1/2}$? What will the production (consumption) of x and y be?

Multiple-choice problems:

Problem #1

The competitive price of coconuts is 6 per kg and the price of fish is 3 per kg. How many kgs of fish could one produce if one forwent 1 kg of coconuts?

a. 0.5kg
b. 2kg
c. One cannot tell, the data provided is insufficient.

Problem #2

The marginal rate of transformation (MRT):

a. is the alternative cost of one good expressed in terms of the other good.
b. is the slope of the frontier of the production possibilities set.
c. Shows how much of one good may a producer produce if he/she forgoes some amount of the other good.
d. Letters b and c are correct.
e. Letters a, b , and c are correct.