1. Consider a small country (Belgium) with the following demand and supply curves for corn:

\[ \text{Supply} = 3P_c; \quad \text{Demand} = 175 - 2P_c \]

Assume Belgium can import corn at a given world price of: \( P_c = 15 \). Further, assume that Belgium imposes a tariff of \( t \) per unit of import.

a) Show how: domestic price, consumption and production change as \( t \) increases. Also, calculate how consumer surplus, producer surplus, and government tariff revenue change as \( t \) increases. What happens to overall Belgian welfare as \( t \) increases?

   (i) If \( t > 20 \), what happens to the level of trade?

b) Compare the domestic equilibrium when \( t = 10 \) to the case where there is no tariff, but there is an import quota of 50 units. What happens to the tariff revenue? Which policy is better for the country?

c) Find the import quota \( L \) that corresponds to each tariff \( t \). In what sense do the tariff and quota have the same effect?

2. Consider a world of two countries (US, China) with the following demand and supply curves:

US: \( \text{Demand} = 120 - 2P_c^\text{us} \); \( \text{Supply} = 4P_c^\text{us} \) where \( P_c^\text{us} \) is the price of computers in US;

China: \( \text{Demand} = 160 - 2P_c^\text{c} \); \( \text{Supply} = 2P_c^\text{c} \) where \( P_c^\text{c} \) is the price of computers in China;

a) Assuming free trade (no tariffs), find the equilibrium price and quantities traded.

b) First, show how a US export tariff of 10 affects the volume of trade, prices in China and the US, and welfare in each country. Who pays for the US tax? Explain.

   (i) What would happen if the US replaced the tariff with an export quota of 24?

c) Now, consider the effect of a US tariff of \( St \) on computer exports (where \( t \) can be any number). Show how prices in each country change as the tariff changes.

   (i) How does the tariff affect China’s welfare (sum of consumer and producer surplus)?
   (ii) How does the tariff affect US welfare? (sum of consumer and producer surplus and government tariff revenue)? Could the US gain from this tariff? If so, explain why.
   (iii) Find the tariff that maximizes US welfare (if you can’t do this using calculus, try using a spreadsheet to calculate the optimal tariff).
(iv) Suppose the U.S. export tariff were eliminated, but a Chinese export tariff of equal size were implemented. How would this affect the level of trade, US prices, and US welfare? Explain.

3. Use the model of problem 1 to compare the effects of production subsidies and import tariffs. In particular, let the demand and supply curves, and the world price, be the same as in problem 1. Suppose the objective of the government is to raise income of domestic producers and to increase domestic production (supply) to 90 units.

a) Find how this goal can be achieved with a tariff, find the impact on domestic prices, consumption, and find the overall welfare loss from the policy.

b) Find how this goal can be achieved with a production subsidy, find the impact on consumption and find the overall welfare loss from this policy. How does the economic impact of the production subsidy differ from that of the tariff?

c) Which of the two policies achieves the goal more efficiently? Provide an economic explanation for this result.

d) Use your results to explain why economists say an import tariff is like a combination of a subsidy to producers and a tax on consumers.

4. (Import and export tariffs/subsidies). Consider a simplified “general equilibrium” model of a small country that has a single mobile input (labor) and one specific factor (K, capital). The production functions and preferences (the utility function) are given by:

\[
Q_c = 2(L_c)^{1/2}K^{1/2}; \quad Q_f = 2L_f; \quad L_f + L_c = 100, \quad K = 16
\]

\[
U = D_f + 20D_c - \left(D_c^2/8\right)
\]

a) Derive the supply and demand curves as functions of prices \((P_c, P_f)\) and find the autarky equilibrium. Explain why only the relative price matters.

b) Let world prices be \(P_c^w = 1, \quad P_f^w = 2\). Calculate domestic production and consumption of each good under free trade. Which good is imported?

c) Show how a 20% import tariff (based on the world price) affects domestic prices, production and consumption. How does the tariff affect the real returns to labor and capital?

d) Suppose the import tariff is removed, but an export tariff of 20% (based on the domestic price) is imposed. Compare your results to part (c). [NOTE: for an export tariff, the arbitrage condition states: Domestic Price + Export Tariff = World Price]

e) Finally, suppose the country simultaneously uses an import tariff of 20% (based on the world price) and an export subsidy of 20% (again, based on the world price). What is the overall impact of this policy on “real” variables (production, consumption, relative prices)? How would this policy affect the nominal price level? Explain.