How to solve for market equilibrium in the presence of taxation

A Hint

Suppose the demand and supply for a market are described by the following equations:

$$\text{Demand: } q_D = \alpha_0 - \alpha_1 p$$
$$\text{Supply: } q_S = \beta_0 + \beta_1 p$$

Then without taxation, the equilibrium price and quantity are the solutions to the following system of equations:

$$q_D = \alpha_0 - \alpha_1 p$$
$$q_S = \beta_0 + \beta_1 p$$
$$q_D = q_S$$

, where the last equation says that in equilibrium, quantity demanded = quantity supplied. You should be able to solve this system of linear equations because there are 3 equations for 3 unknowns (p, q_D, q_S).

Now suppose we impose a per-unit tax T on this market. Regardless of whether the tax is put on the buyers or on the sellers, the result is that what the buyers pay out of pocket will be different than what the sellers actually receive. The difference is T – the tax that goes to the government. So let p_D be the price that buyers pay and let p_S be the price that sellers receive. We have:

$$q_D = \alpha_0 - \alpha_1 p_D$$
$$q_S = \beta_0 + \beta_1 p_S$$
$$q_D = q_S$$
$$p_D = p_S + T$$

Notice that for the demand curve, the relevant price is p_D, since this is what the buyers

pay. For the supply curve, the relevant price is p_S, since this is what the sellers receive. You should be able to solve this system of linear equations because there are 4 equations for 4 unknowns (p_D, p_S, q_D, q_S).

So what is the equilibrium price after taxation? That depends on whether the tax is levied on the sellers or on the buyers. If the tax is on the buyers, then $p = p_D$. If the tax is on the sellers, then $p = p_S$.