Taxes and revenue

1. The supply and demand curves for the DVD market are given by $P = 2Q^s$ and $P = 42 - Q^d$, respectively.

   a) How many units will be exchanged at a price of $35? And at a price of $14? Which participants will be dissatisfied with these prices?

   b) What quantity of DVDs and at what price will they be sold in equilibrium?

   c) What will be the total revenue from DVD sales?

2. Suppose the state imposes a $9 tax on sellers for each DVD sold.

   a) What quantity of DVDs will be sold in equilibrium?

   b) What price will buyers pay?

   c) How much will buyers spend in total?

   d) How much revenue will the state collect?

   e) Graphically represent the above results.

3. For the tax described in the previous problem:

   a) What portion of the tax falls on the seller?

   b) What portion falls on the buyer?

Solutions

1. (a) First, we calculate the equilibrium:
$$2Q = 42 - Q$$
$$Q = 14$$

$$P = 28$$

At a price of 35, there will be excess supply **and only 4 units will be demanded**, since replacing $P = 35$ in the demand function gives a quantity demanded of 7. On the other hand, sellers will be willing to supply 19 units. This harms both consumers and producers: producers cannot sell due to lower demand, and consumers seek lower prices without success.

In the case of a price of 14, excess demand is generated: only 7 units will be offered, **but consumers will want to buy 14**. This harms producers, who cannot sell at the desired price, and consumers, who cannot buy what they need due to the shortage caused by the low price.

   (b) In equilibrium:
$$Q = 14$$

$$P = 28$$

   (c) Total revenue is the price multiplied by the quantity:
$$14 \cdot 28 = 392$$

2. (a) The tax creates a price difference:
$$P_d - P_o = 9$$

Now the demand is:
$$P_d = 42 - Q$$
$$9 + P_o = 42 - Q$$
$$P_o = 33 - Q$$

Matching it with supply:
$$33 - Q = 2Q$$
$$Q = 11$$

   (b) With this quantity, we find the prices:
$$P_o = 22$$

$$P_d = 31$$
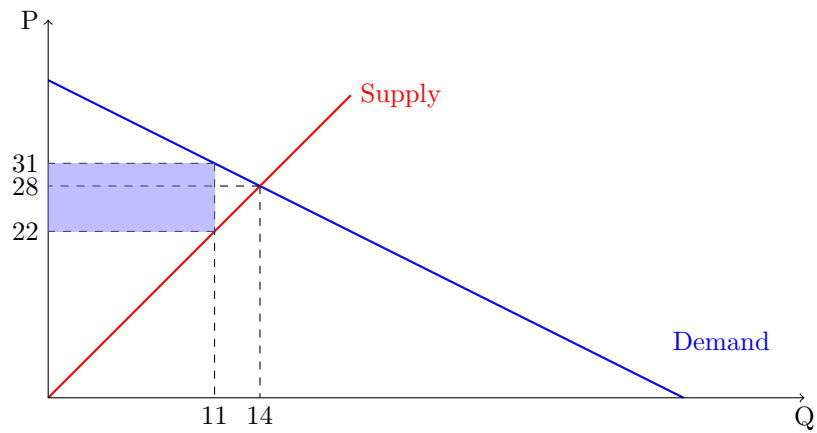
   (c) In total, consumers spend:
$$31 \cdot 11 = 341$$

   (d) The state collects:
$$9 \cdot 11 = 99$$

(e) Graphically, the marked area represents the state's revenue.

3. (a) Of the total state revenue ($99), the amount paid by buyers is:

$$(31 - 28) \cdot 11 = 33$$

This corresponds to the upper rectangle.

(b) Of the total state revenue ($99), the amount paid by sellers is:

$$(28 - 22) \cdot 11 = 66$$

This corresponds to the lower rectangle.