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Economics 201

Some Quick Algebra Help: finding P* and Q*

Here's a quick refresher on how to calculate the equilibrium price and quantity within the demand and supply model. We'll work with the numerical values from the first section of the handout *Who Pays the Tax*.

We begin with our Demand and Supply equations (where P = price, Qd = quantity demanded, and Qs = quantity supplied):

Demand: $P = 3 - 0.5Qd$

Supply: $P = 1 + 0.5Qs$

Step 1: We know that at equilibrium, there is no surplus or shortage, and so it must be true that at equilibrium, we have Qd = Qs. In other words, we can ignore the d and s subscripts, and replace Qd and Qs with just Q. Now our demand and supply equations become:

Demand: $P = 3 - 0.5Q$

Supply: $P = 1 + 0.5Q$

Step 2: Equilibrium occurs where Demand and Supply intersect, which tells us to set the Demand and Supply equations equal to one another. Once we do that, we can solve for equilibrium Q (i.e. Q*),

$3 - 0.5Q = 1 + 0.5Q$

If we subtract 1 from both sides of this equation, and add 0.5Q to both sides, we have:

$3 - 1 = 0.5Q + 0.5Q$

$2 = Q$

$Q^* = 2$

Step 3: We find the equilibrium price (P*) by plugging our equilibrium quantity (Q*) into either the Demand or Supply equation (P* should be the same either way or else we made a mistake in step 2). Below, we'll plug into both equations anyway, just to double check our work from step 2.

Plugging Q = 2 into the Demand equation:

$P^* = 3 - 0.5(2) = \$2$

Plugging Q = 2 into the Supply equation:

$P^* = 1 + 0.5(2) = \$2$

The equilibrium price and quantity is P* = $2 and Q* = 2.