

Profit Maximization in the Long Run

Costs: $TC = 36 + 6Q + Q^2$

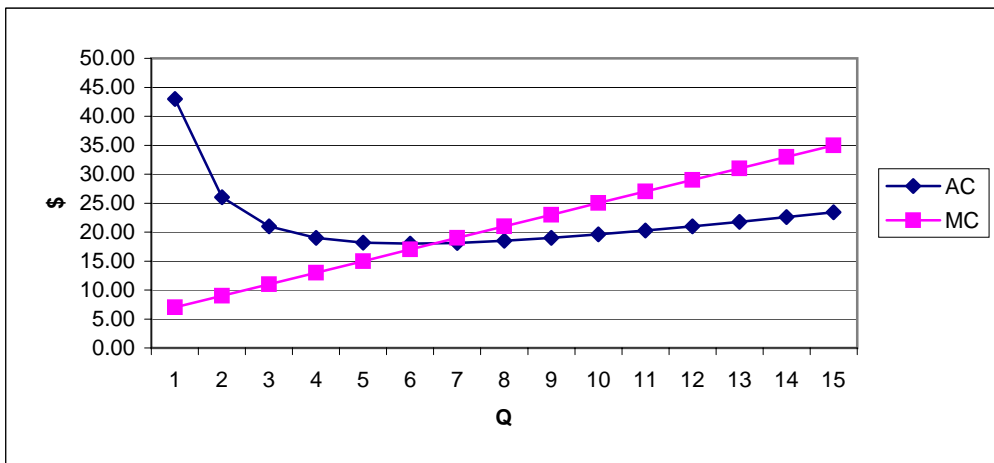
Market Demand: $P = 78 - Q$

Question 1

Q	TC	AC	MC
0	36.00		
1	43.00	43.00	7.00
2	52.00	26.00	9.00
3	63.00	21.00	11.00
4	76.00	19.00	13.00
5	91.00	18.20	15.00
6	108.00	18.00	17.00
7	127.00	18.14	19.00
8	148.00	18.50	21.00
9	171.00	19.00	23.00
10	196.00	19.60	25.00
11	223.00	20.27	27.00
12	252.00	21.00	29.00
13	283.00	21.77	31.00
14	316.00	22.57	33.00
15	351.00	23.40	35.00

In the long run, he must be paid enough to cover his average costs. His minimum AC is \$18 so the price would have to be at least \$18 for Rick to remain in business. At that price, he would produce 6 rentals.

The problem does not ask for a graph but here's what Rick's cost curves would look like:



Question 2

If all rental companies have the same cost structure and firms can enter or leave the market at will, the long run price in the market will fall to the minimum AC of \$18. At any higher price, firms would earn profits and the market would attract new competitors.

At $P=18$ the market quantity can be found using the demand curve:

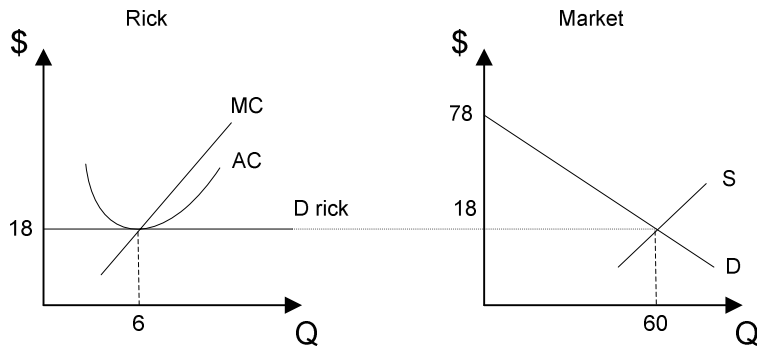
$$P = 78 - Q$$

$$Q = 78 - P$$

$$Q = 60$$

At a price of \$18, each firm would want to produce 6 rentals because that's the highest Q where MR is greater than or equal to MC . That's where profits are highest.

Since 60 units would be purchased in the market, and each firm would want to supply 6, there would be 10 firms all together.



Question 3

Rick's total costs rise by the amount of the tax:

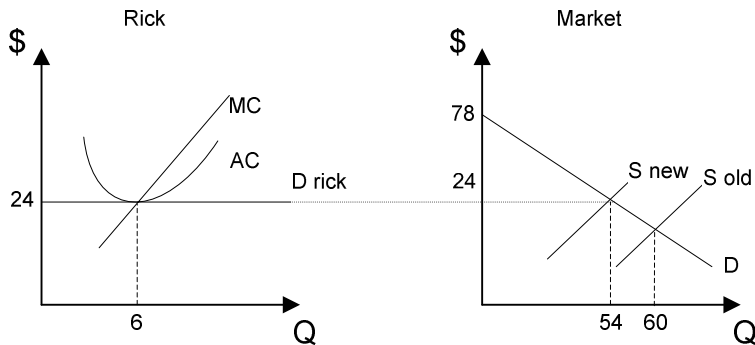
Q	Prod Cost	Tax	TC	AC	MC
0	36.00	0	36.00		
1	43.00	6	49.00	49.00	13.00
2	52.00	12	64.00	32.00	15.00
3	63.00	18	81.00	27.00	17.00
4	76.00	24	100.00	25.00	19.00
5	91.00	30	121.00	24.20	21.00
6	108.00	36	144.00	24.00	23.00
7	127.00	42	169.00	24.14	25.00
8	148.00	48	196.00	24.50	27.00
9	171.00	54	225.00	25.00	29.00
10	196.00	60	256.00	25.60	31.00
11	223.00	66	289.00	26.27	33.00
12	252.00	72	324.00	27.00	35.00
13	283.00	78	361.00	27.77	37.00
14	316.00	84	400.00	28.57	39.00
15	351.00	90	441.00	29.40	41.00

His new minimum AC is \$24 at Q=6. In the long run, the market price will have to rise to \$24; otherwise, firms will lose money and eventually shut down. At a price of \$24, the market Q will be given by the demand curve:

$$Q = 78 - P$$

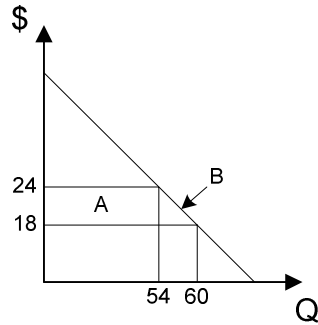
$$Q = 54$$

Each firm would produce 6 rentals and there would be $65/6 = 9$ firms in the industry. The tax, therefore, would cause one firm to shut down. The graphs look like this:



Question 4

The tax is not efficient because the loss of consumer surplus due to the higher price is less than the amount of revenue raised by the government:



$$\begin{aligned} \text{Lost CS} &= A+B \\ \text{Lost CS} &= (24-18)*54+(1/2)*(24-18)*(60-54) \\ \text{Lost CS} &= 342 \end{aligned}$$

$$\begin{aligned} \text{Tax Rev} &= A \\ \text{Tax Rev} &= (24-18)*54 \\ \text{Tax Rev} &= 324 \end{aligned}$$

$$\begin{aligned} \text{DWL} &= \text{Revenue} - \text{Lost CS} \\ \text{DWL} &= -18 \end{aligned}$$