

# Welfare Economics

- Recall, the **allocation of resources** refers to:
  - how much of each good is produced
  - which producers produce it
  - which consumers consume it
- **Welfare economics** studies how the allocation of resources affects economic well-being.
- First, we look at the well-being of consumers.

# Willingness to Pay (WTP)

A buyer's **willingness to pay** for a good is the maximum amount the buyer will pay for that good.

WTP measures how much the buyer values the good.

<i>name</i>	<i>WTP</i>
Anthony	\$250
Chad	175
Flea	300
John	125

Example:  
4 buyers' WTP  
for an iPod

# WTP and the Demand Curve

**Q:** If price of iPod is \$200, who will buy an iPod, and what is quantity demanded?

**A:** Anthony & Flea will buy an iPod, Chad & John will not.

Hence,  $Q^d = 2$   
when  $P = \$200$ .

<i>name</i>	<i>WTP</i>
Anthony	\$250
Chad	175
Flea	300
John	125

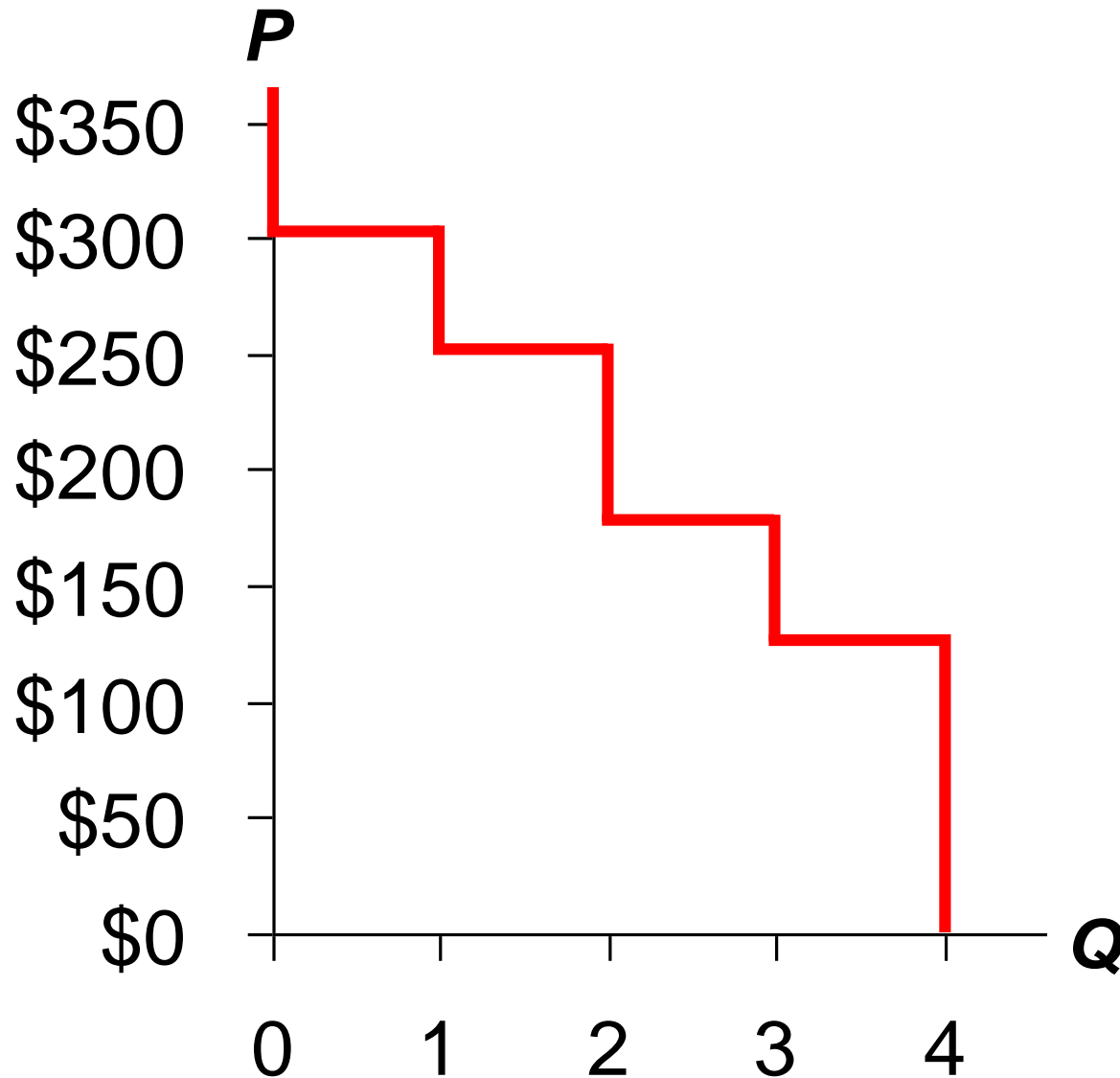
# WTP and the Demand Curve

Derive the demand schedule:

<i>name</i>	<i>WTP</i>
Anthony	\$250
Chad	175
Flea	300
John	125

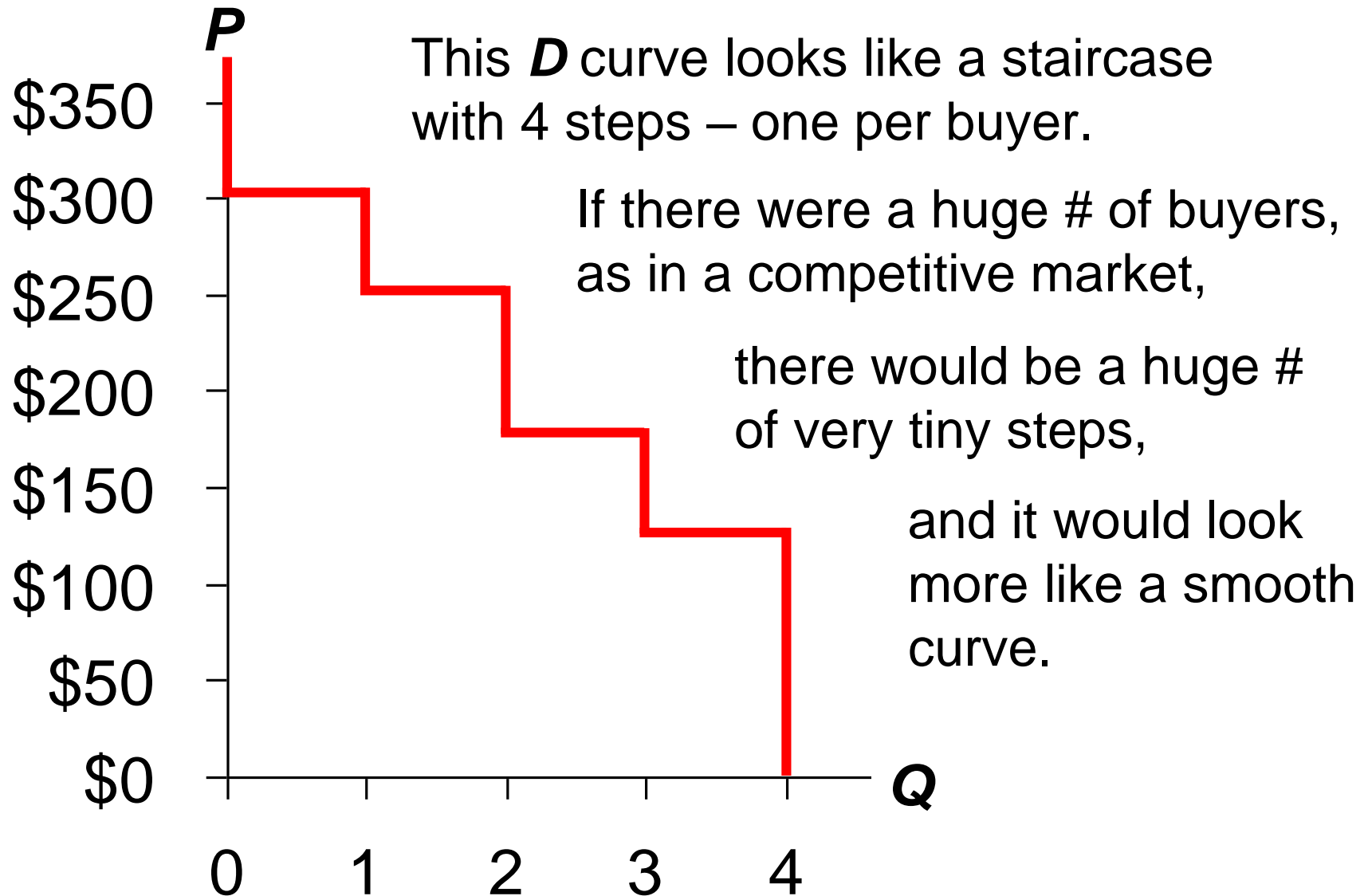
<i>P</i> (price of iPod)	who buys	<i>Q<sup>d</sup></i>
\$301 & up	nobody	0
251 – 300	Flea	1
176 – 250	Anthony, Flea	2
126 – 175	Chad, Anthony, Flea	3
0 – 125	John, Chad, Anthony, Flea	4

# WTP and the Demand Curve

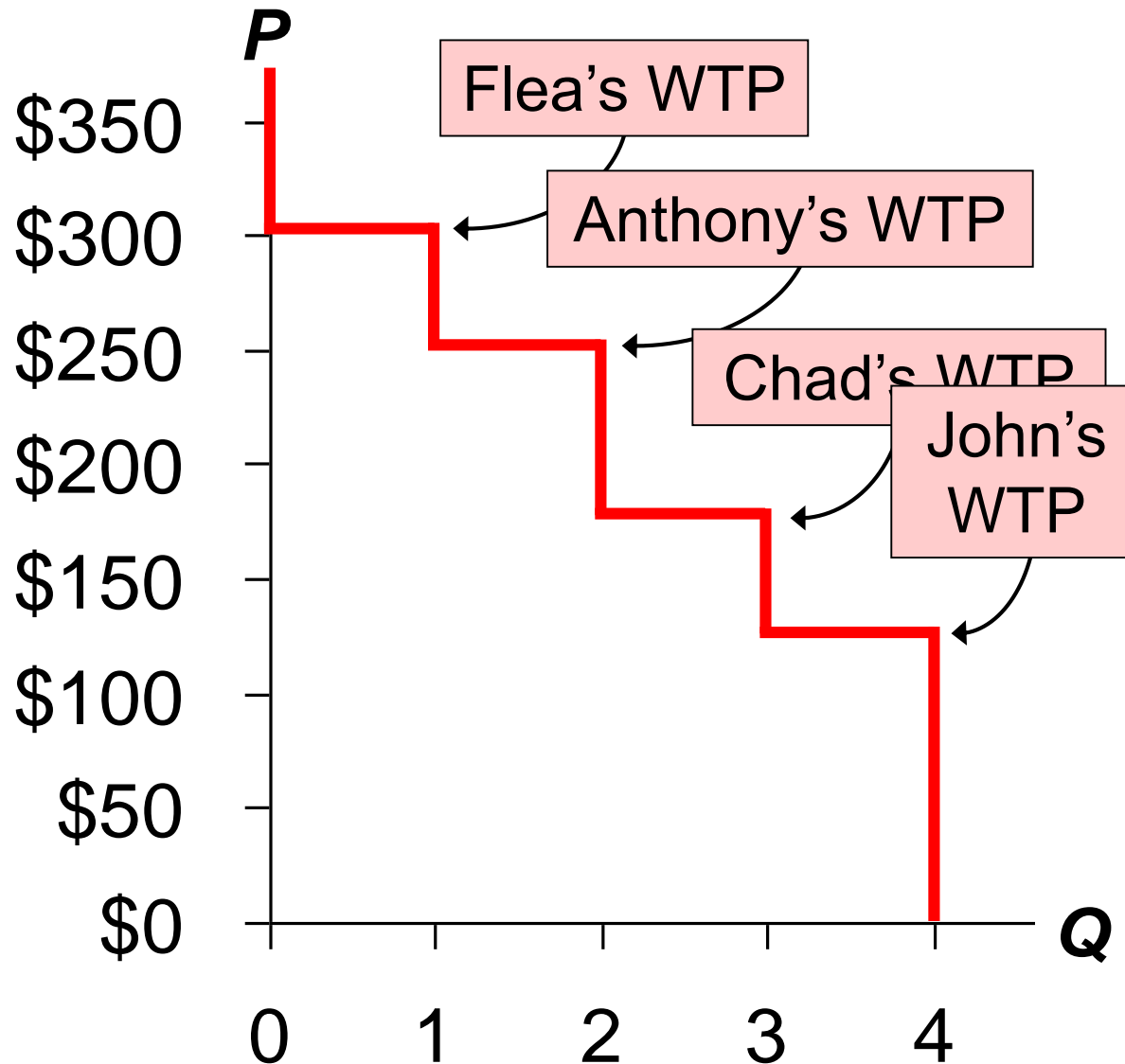


$P$		$Q^d$
\$301 & up		0
251 – 300		1
176 – 250		2
126 – 175		3
0 – 125		4

# About the Staircase Shape...



# WTP and the Demand Curve



At any  $Q$ , the height of the  $D$  curve is the WTP of the *marginal buyer*, the buyer who would leave the market if  $P$  were any higher.

# Consumer Surplus (CS)

**Consumer surplus** is the amount a buyer is willing to pay minus the amount the buyer actually pays:

$$CS = WTP - P$$

<i>name</i>	<i>WTP</i>
Anthony	\$250
Chad	175
Flea	300
John	125

Suppose  $P = \$260$ .

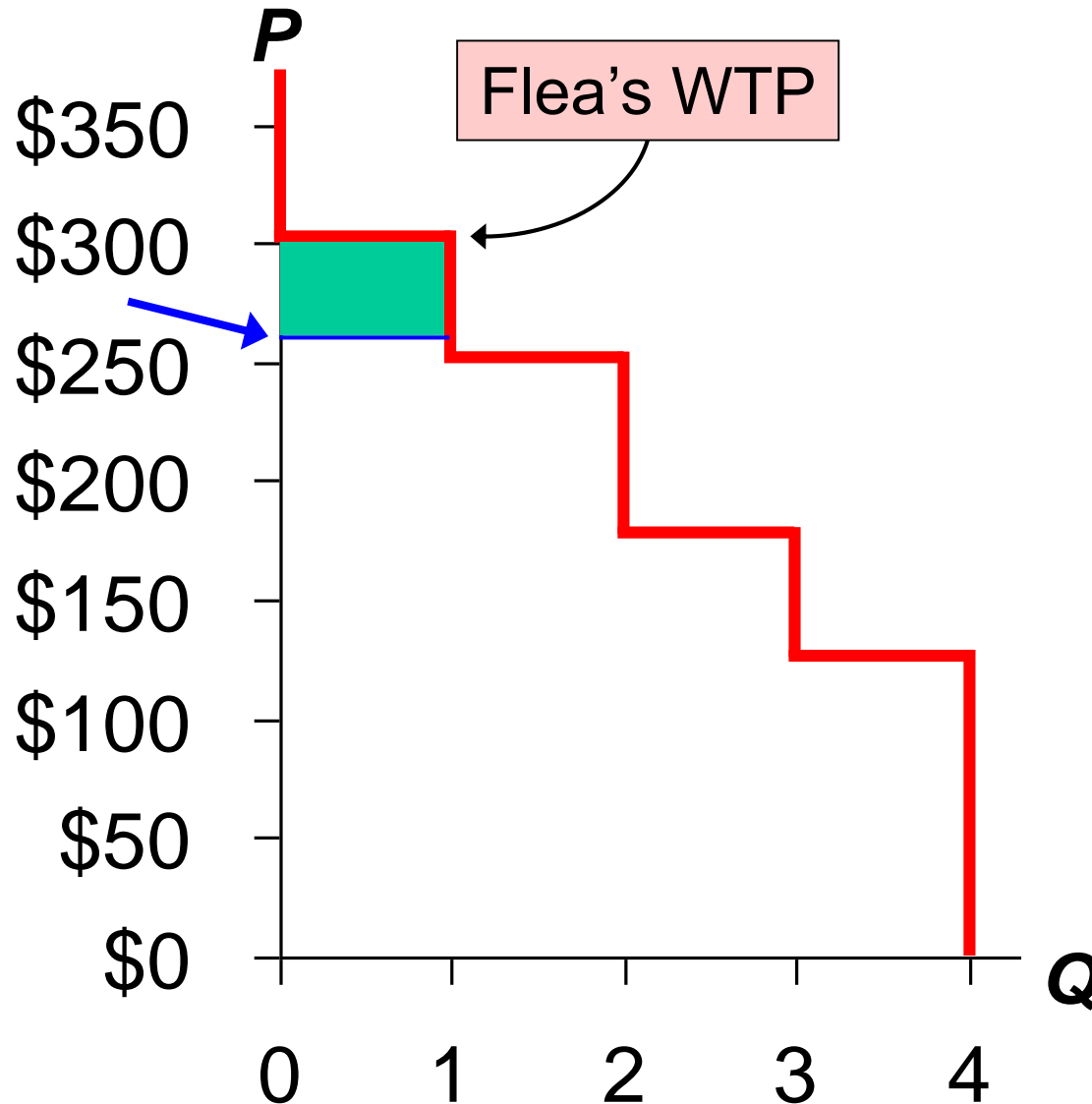
Flea's CS =  $\$300 - 260 = \$40$ .

The others get no CS because they do not buy an iPod at this price.

Total CS = \$40.



# CS and the Demand Curve

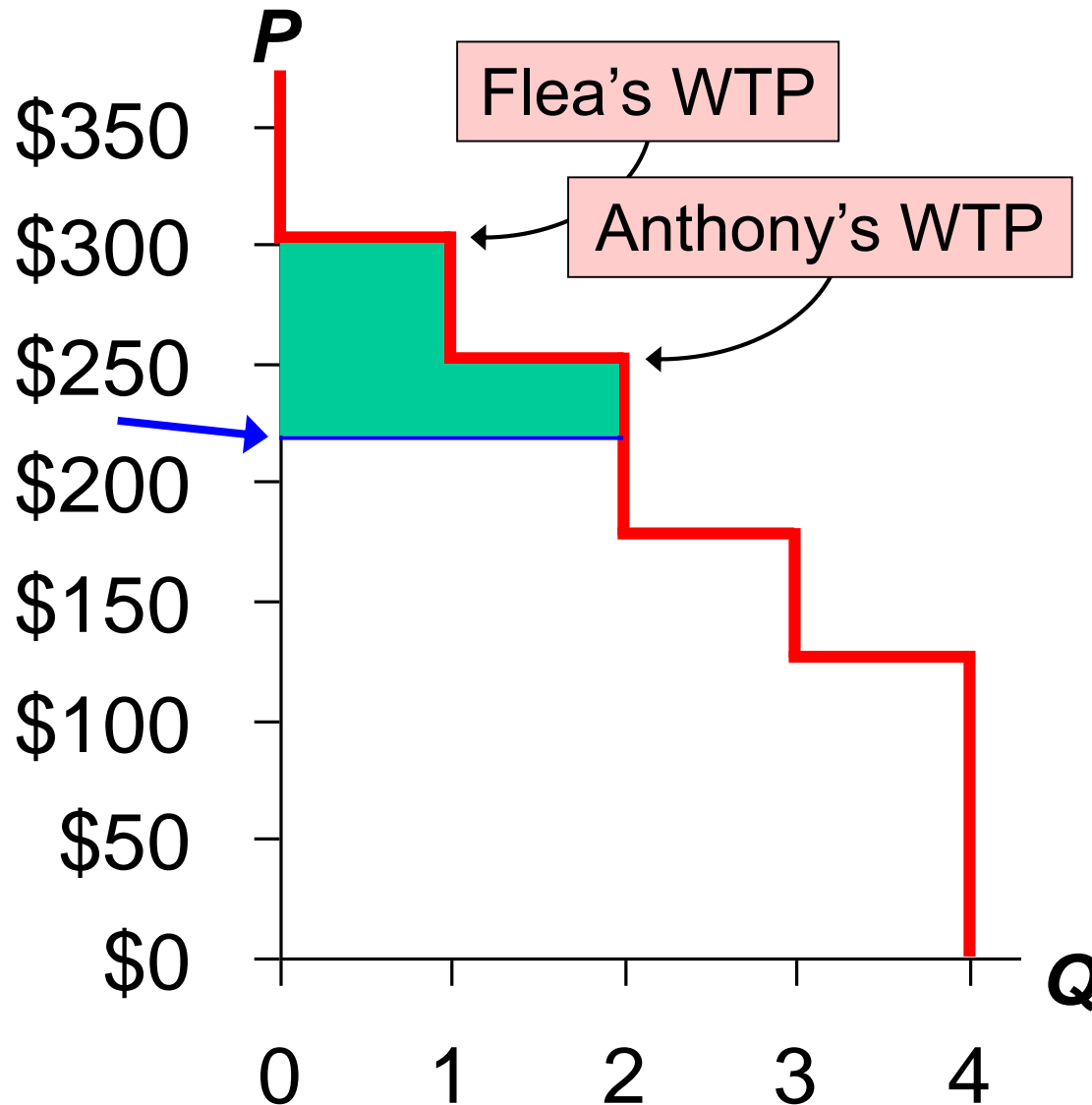


$$P = \$260$$

$$\text{Flea's CS} = \$300 - 260 = \underline{\$40}$$

$$\text{Total CS} = \underline{\$40}$$

# CS and the Demand Curve



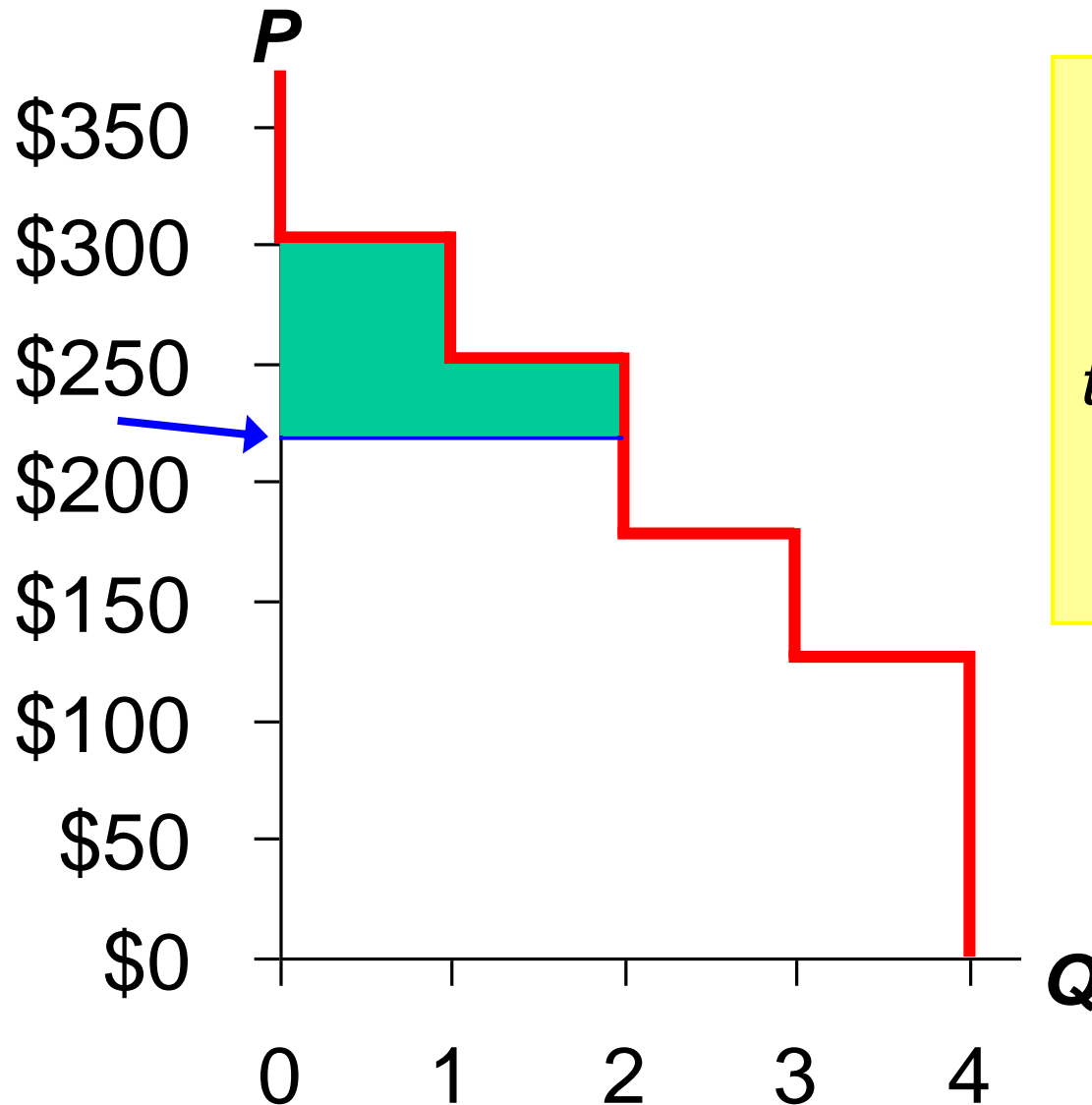
Instead, suppose  
 $P = \$220$

Flea's CS =  
 $\$300 - \$220 = \underline{\$80}$

Anthony's CS =  
 $\$250 - \$220 = \underline{\$30}$

Total CS = \$110

# CS and the Demand Curve



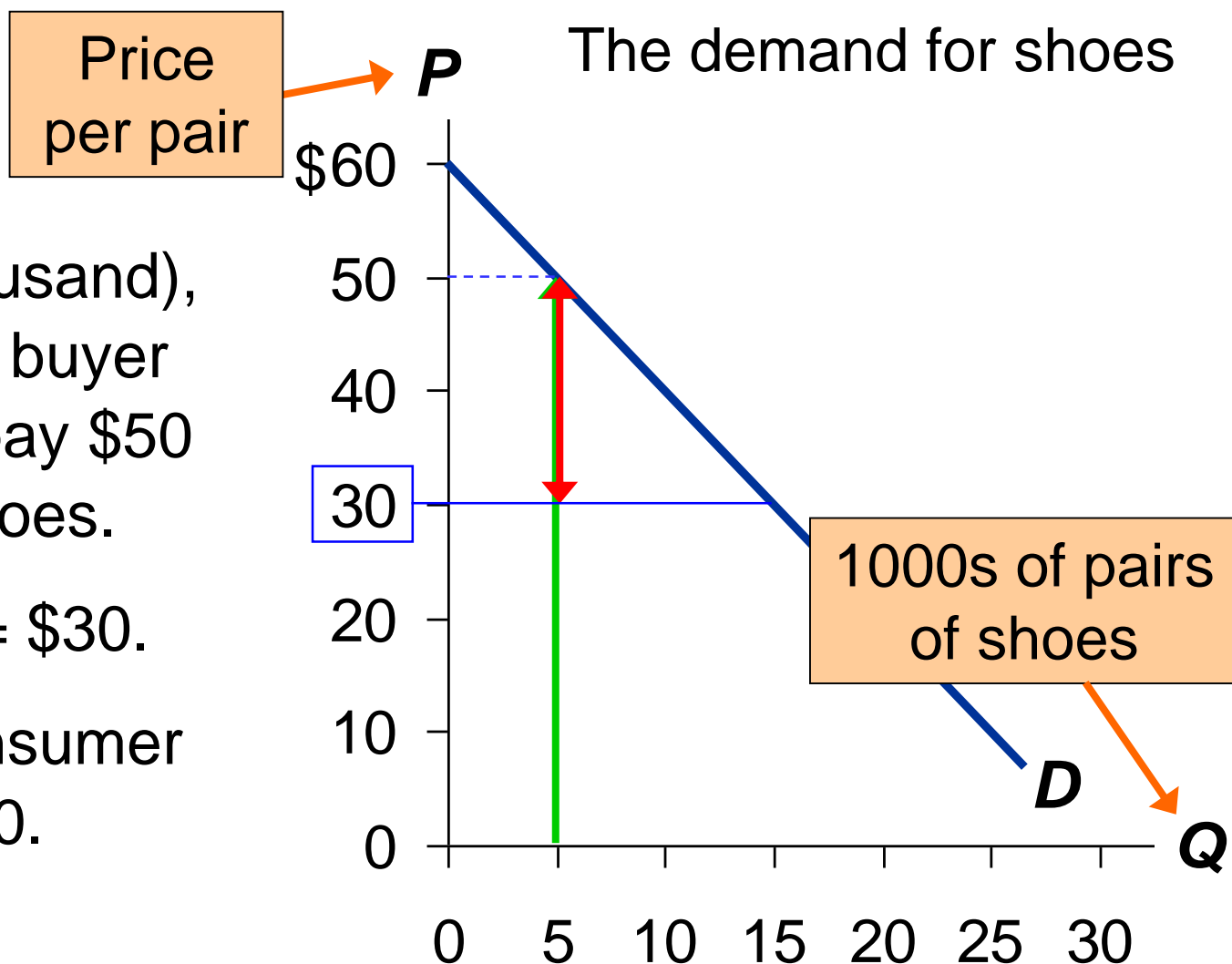
*The lesson:  
Total CS equals  
the area under  
the demand curve  
above the price,  
from 0 to  $Q$ .*

# CS with Lots of Buyers & a Smooth D Curve

At  $Q = 5$ (thousand),  
the marginal buyer  
is willing to pay \$50  
for pair of shoes.

Suppose  $P = \$30$ .

Then his consumer  
surplus = \$20.



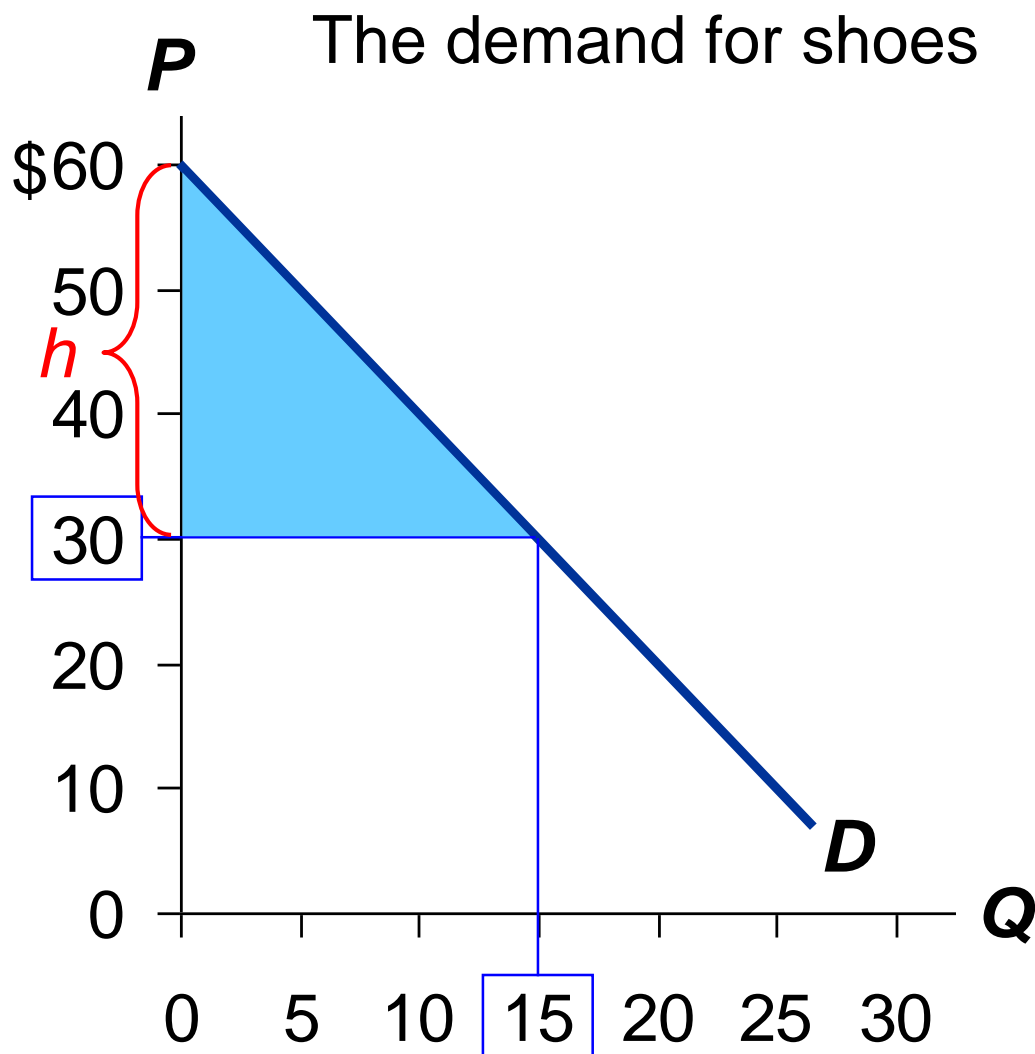
# CS with Lots of Buyers & a Smooth D Curve

CS is the area b/w  
**P** and the **D** curve,  
from 0 to **Q**.

Recall: area of  
a triangle equals  
 $\frac{1}{2} \times \text{base} \times \text{height}$

Height =  
 $\$60 - 30 = \underline{\$30}$ .

So,  
 $\text{CS} = \frac{1}{2} \times 15 \times \$30$   
 $= \underline{\$225}$ .

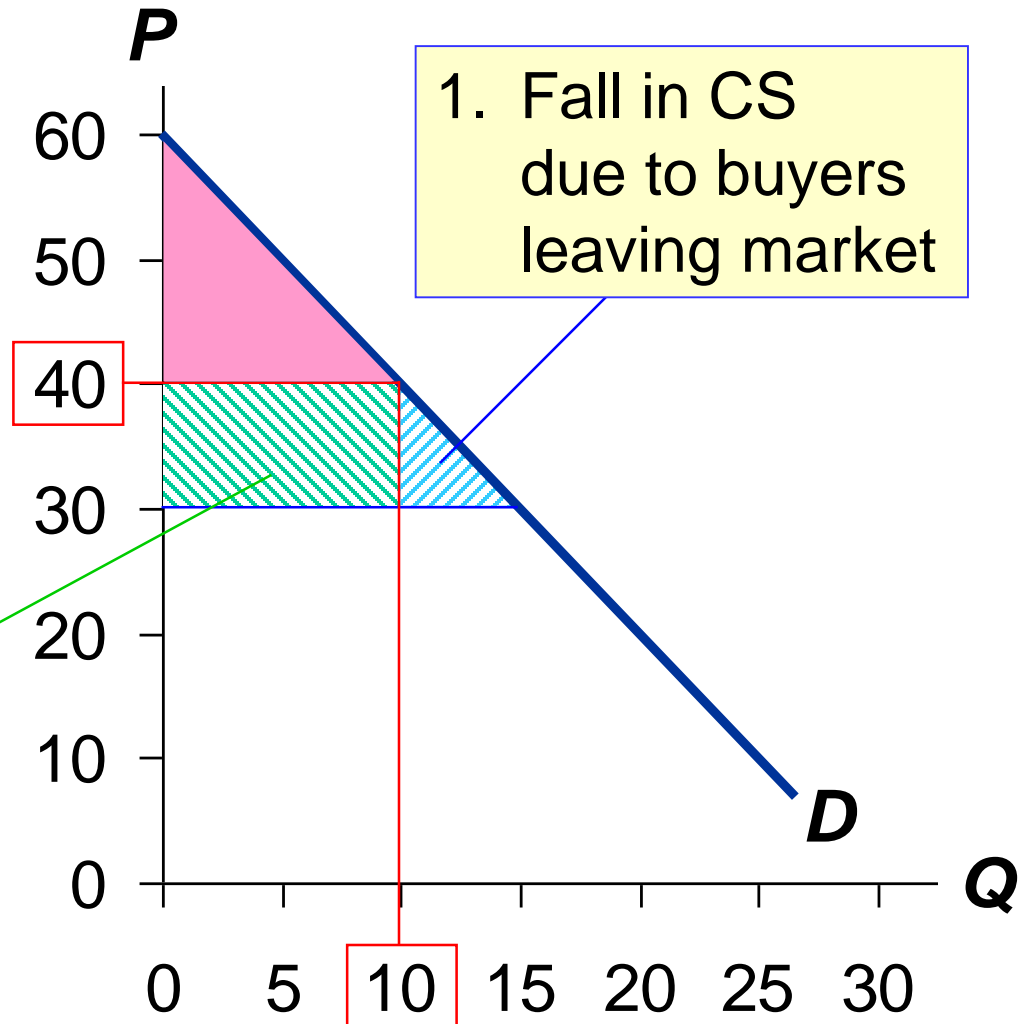


# How a Higher Price Reduces CS

If  $P$  rises to \$40,

$$\begin{aligned} CS &= \frac{1}{2} \times 10 \times \$20 \\ &= \$100. \end{aligned}$$

Two reasons for the fall in CS.



# Consumer surplus

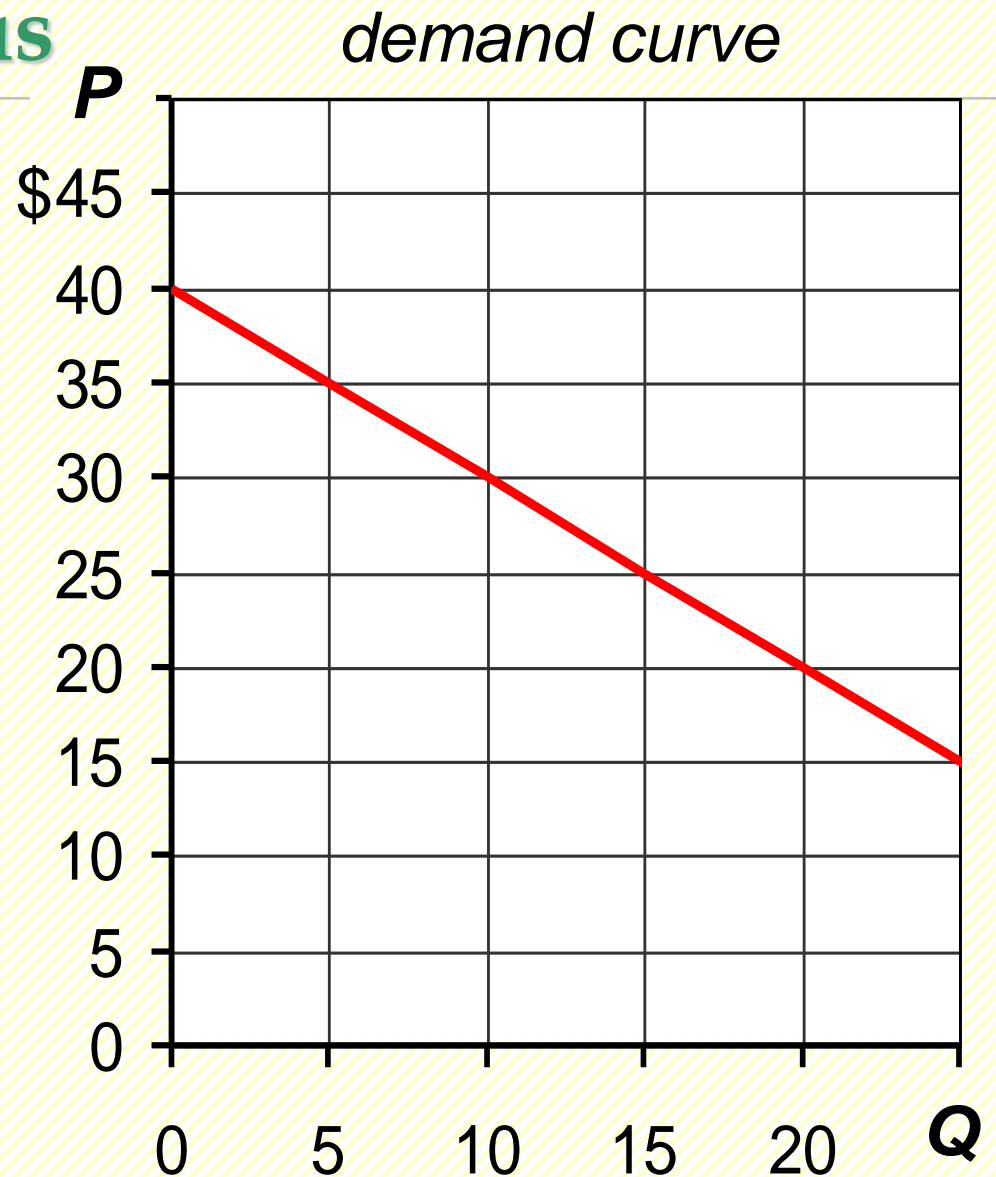
A. Find marginal buyer's WTP at  $Q = 10$ .

B. Find CS for  $P = \$30$ .

Suppose  $P$  falls to \$20.  
How much will CS increase due to...

C. buyers entering the market

D. existing buyers paying lower price



# ACTIVE LEARNING 1

## Answers

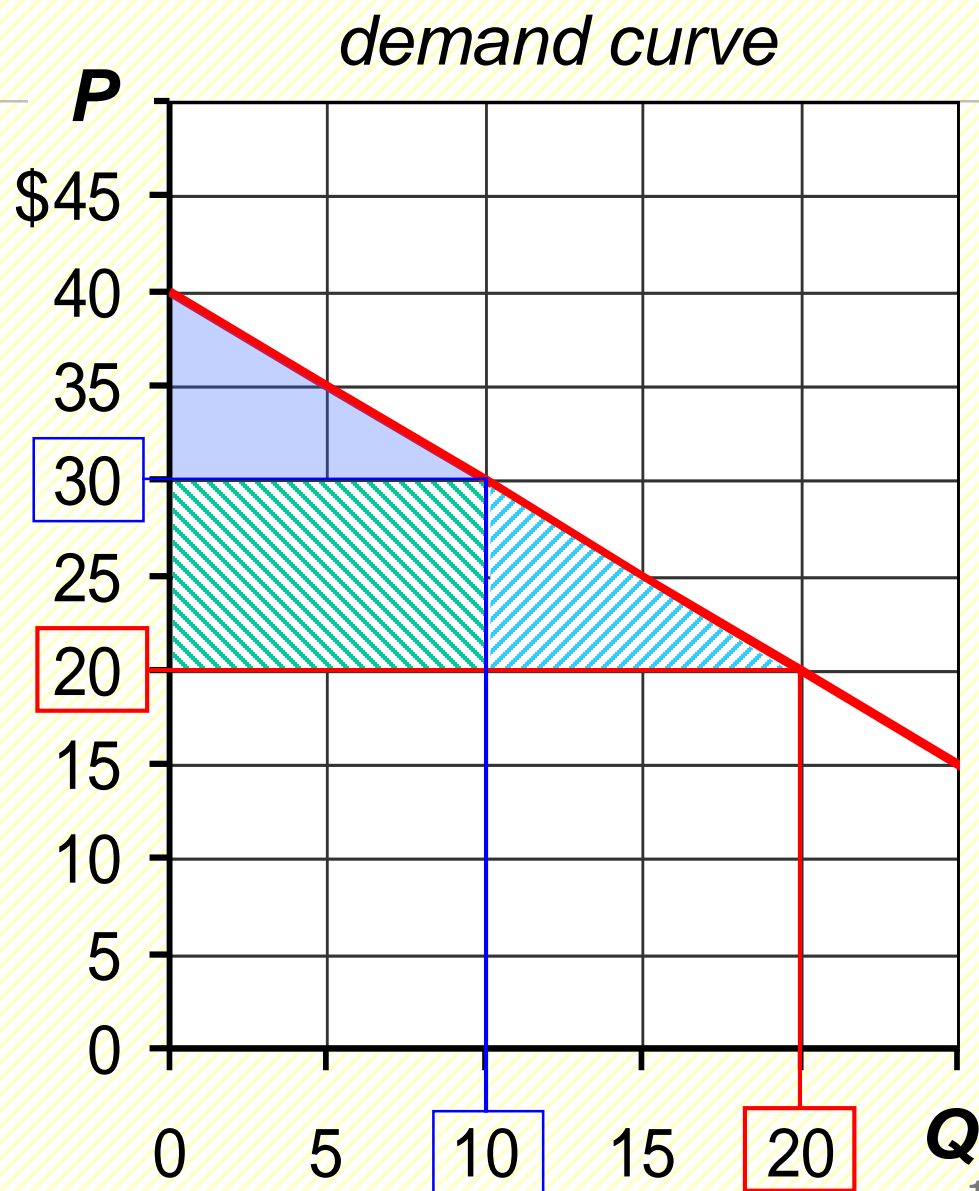
**A.** At  $Q = 10$ , marginal buyer's WTP is \$30.

**B.**  $CS = \frac{1}{2} \times 10 \times \$10 = \underline{\$50}$

**P** falls to \$20.

**C.** CS for the additional buyers  
 $= \frac{1}{2} \times 10 \times \$10 = \underline{\$50}$

**D.** Increase in CS  
on initial 10 units  
 $= 10 \times \$10 = \underline{\$100}$





# Cost and the Supply Curve

- **Cost** is the value of everything a seller must give up to produce a good (*i.e.*, opportunity cost).
- Includes cost of all resources used to produce good, including value of the seller's time.
- Example: Costs of 3 sellers in the lawn-cutting business.

<i>name</i>	<i>cost</i>
Jack	\$10
Janet	20
Chrissy	35

A seller will produce and sell the good/service only if the price exceeds his or her cost.

Hence, cost is a measure of willingness to sell.

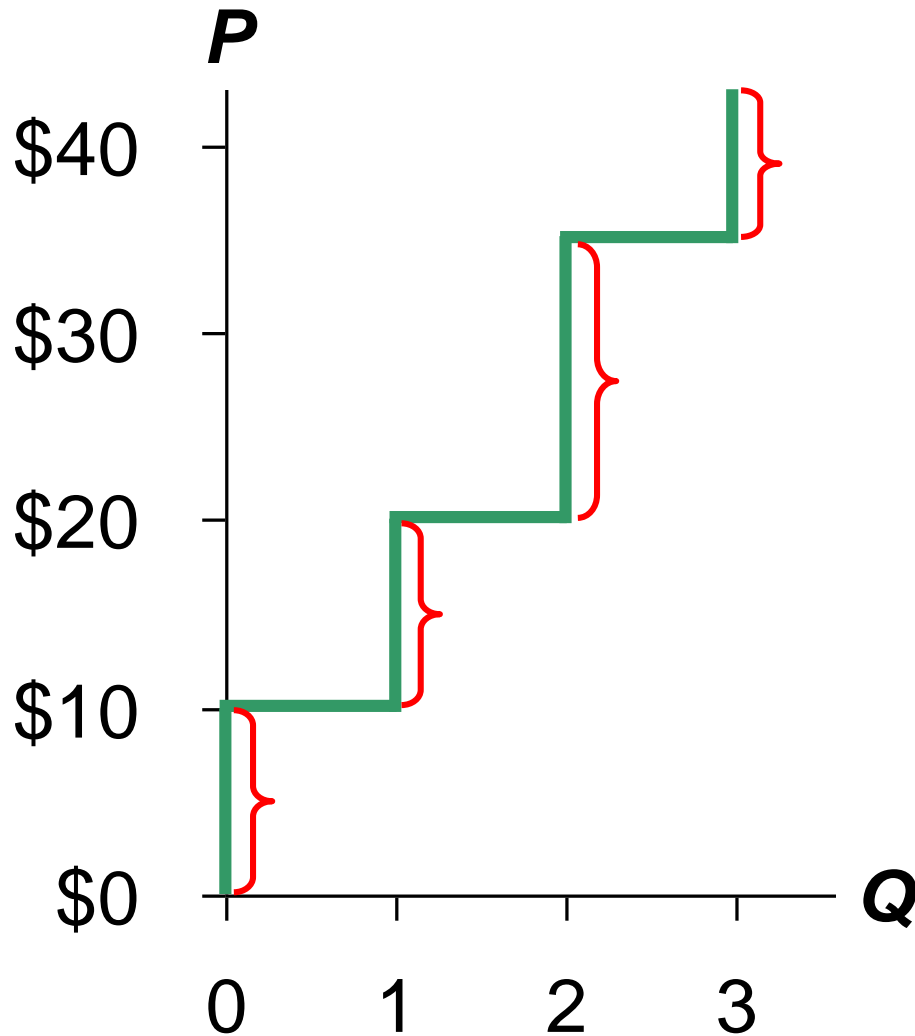
# Cost and the Supply Curve

Derive the supply schedule from the cost data:

<i>name</i>	<i>cost</i>
Jack	\$10
Janet	20
Chrissy	35

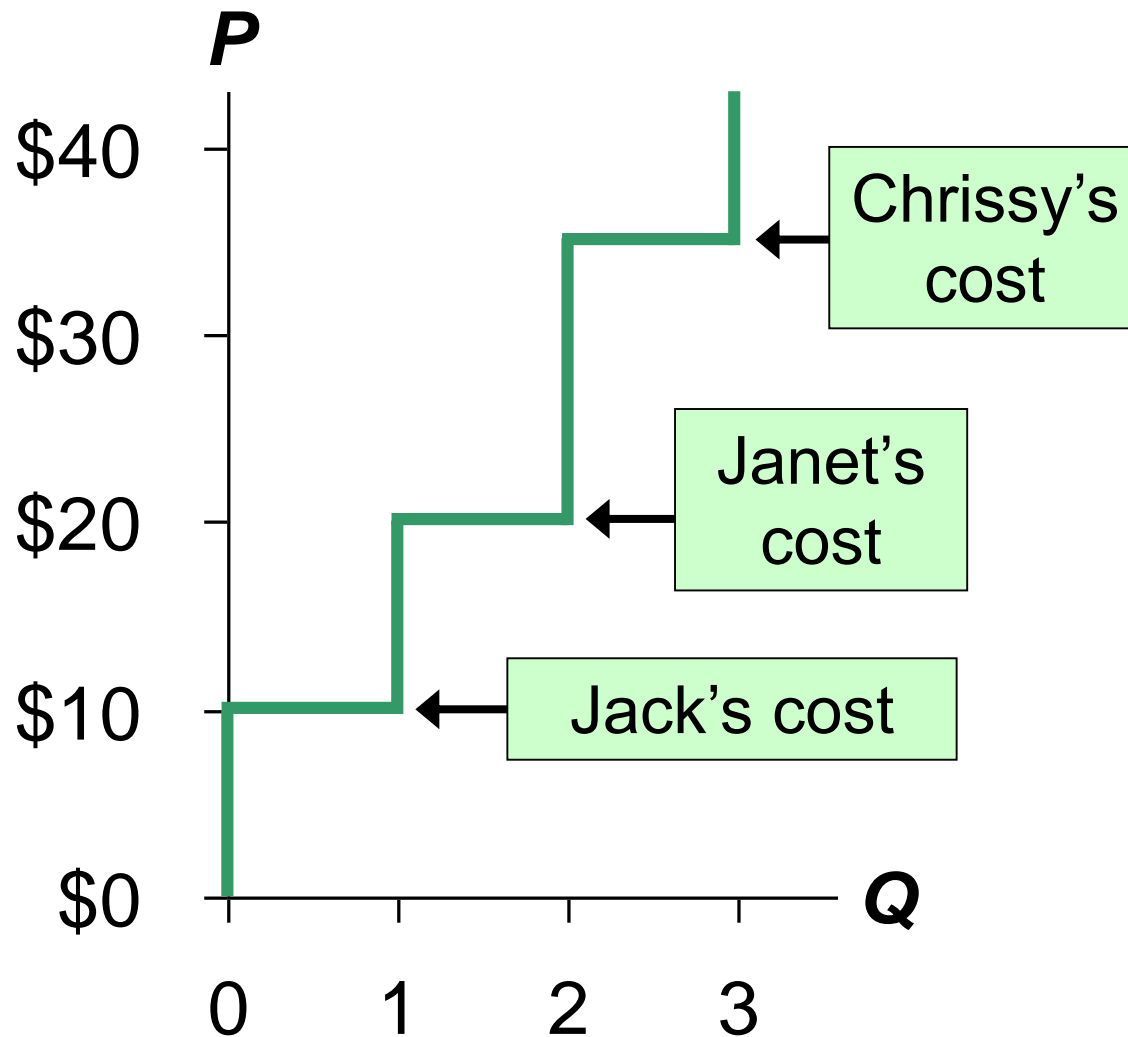
<i>P</i>	<i>Q<sup>s</sup></i>
\$0 – 9	0
10 – 19	1
20 – 34	2
35 & up	3

# Cost and the Supply Curve



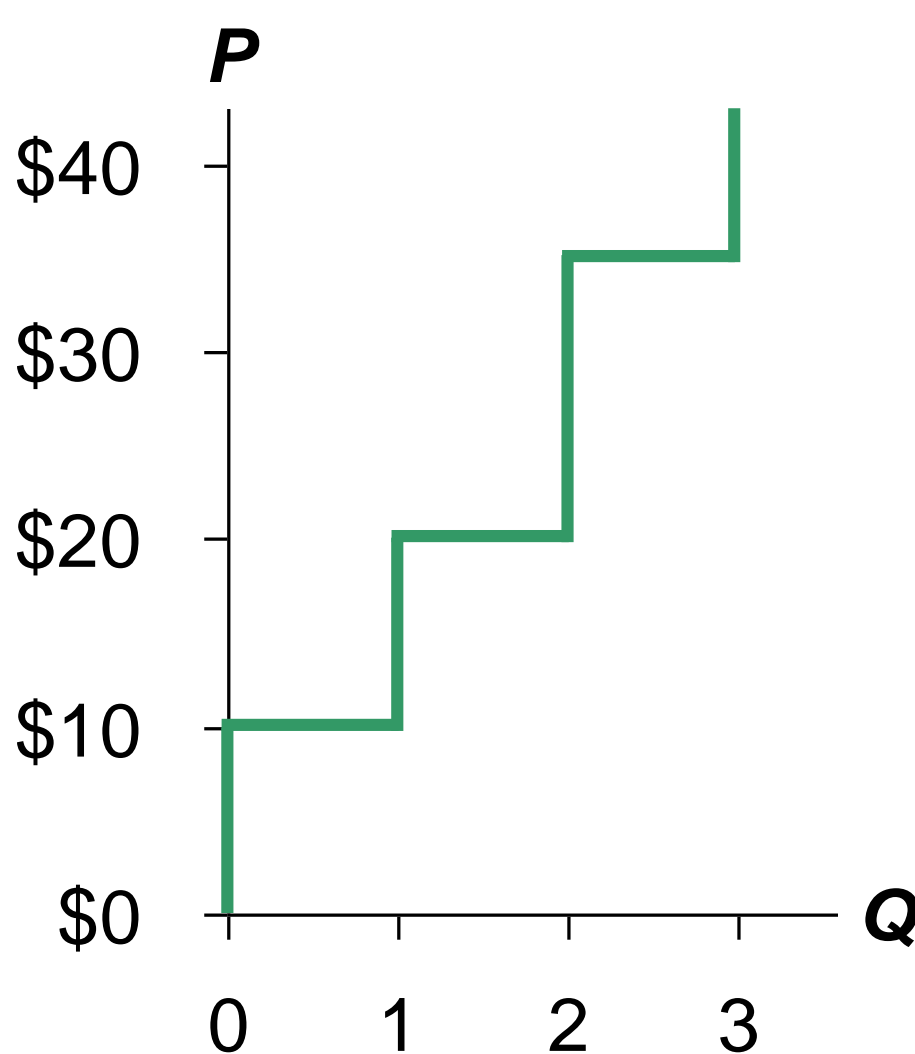
	$P$	$Q^s$
→	\$0 – 9	0
→	10 – 19	1
→	20 – 34	2
→	35 & up	3

# Cost and the Supply Curve



At each  $Q$ , the height of the  $S$  curve is the cost of the *marginal seller*, the seller who would leave the market if the price were any lower.

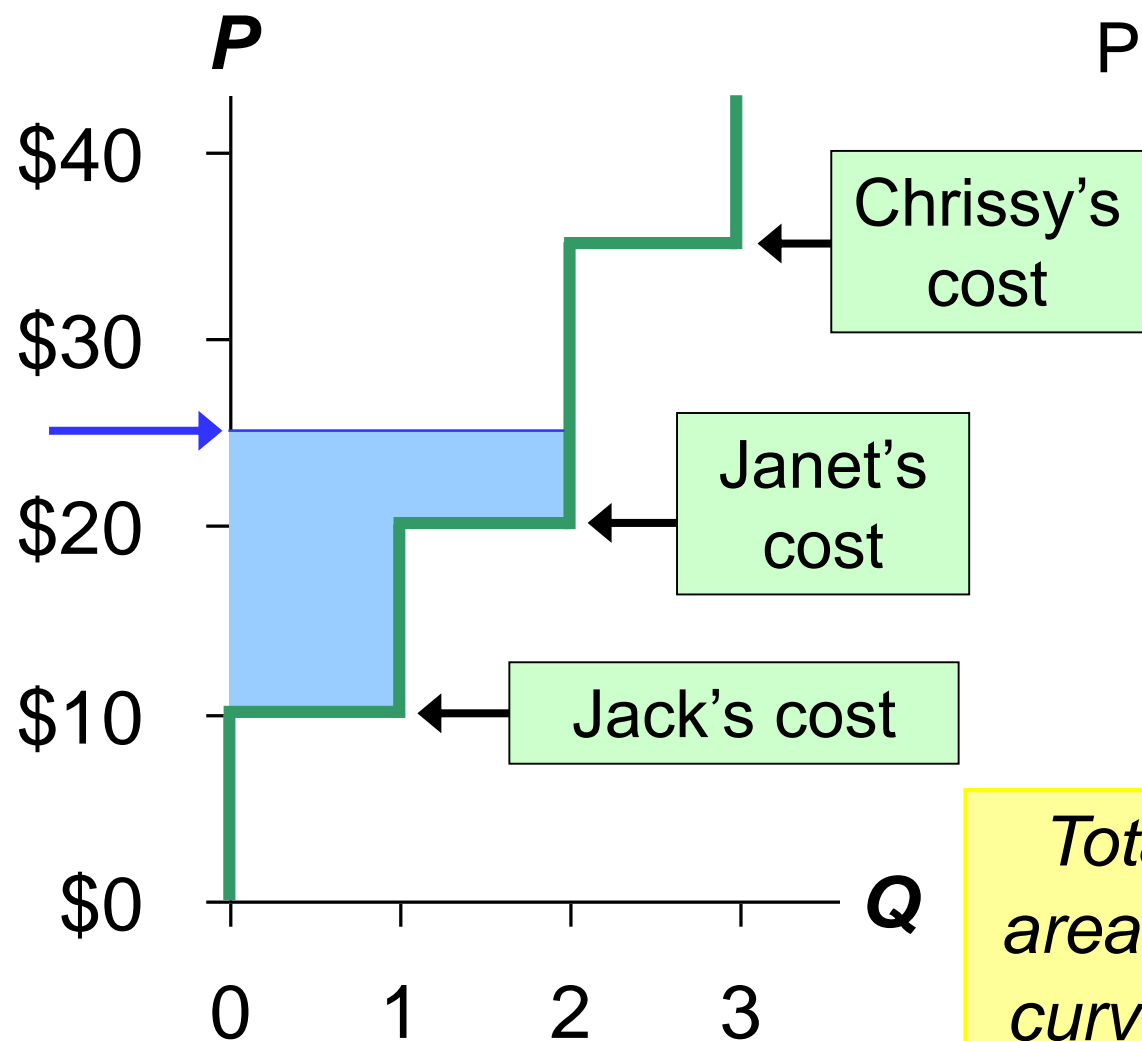
# Producer Surplus



$$PS = P - \text{cost}$$

**Producer surplus** (PS):  
the amount a seller  
is paid for a good  
minus the seller's cost

# Producer Surplus and the S Curve



$$PS = P - \text{cost}$$

Suppose  $P = \$25$ .

Jack's PS = \$15

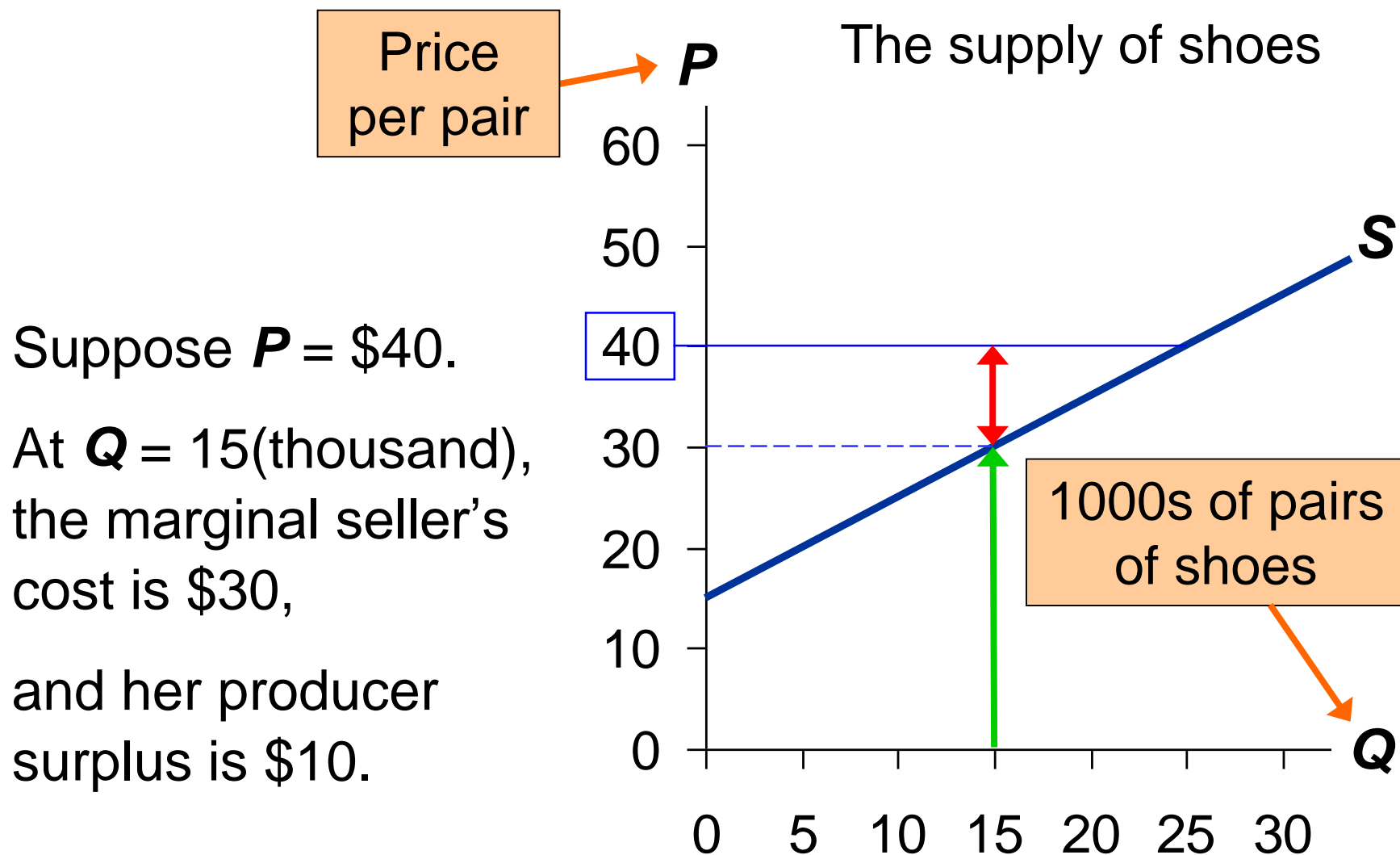
Janet's PS = \$5

Chrissy's PS = \$0

Total PS = \$20

*Total PS equals the area above the supply curve under the price, from 0 to  $Q$ .*

# PS with Lots of Sellers & a Smooth S Curve



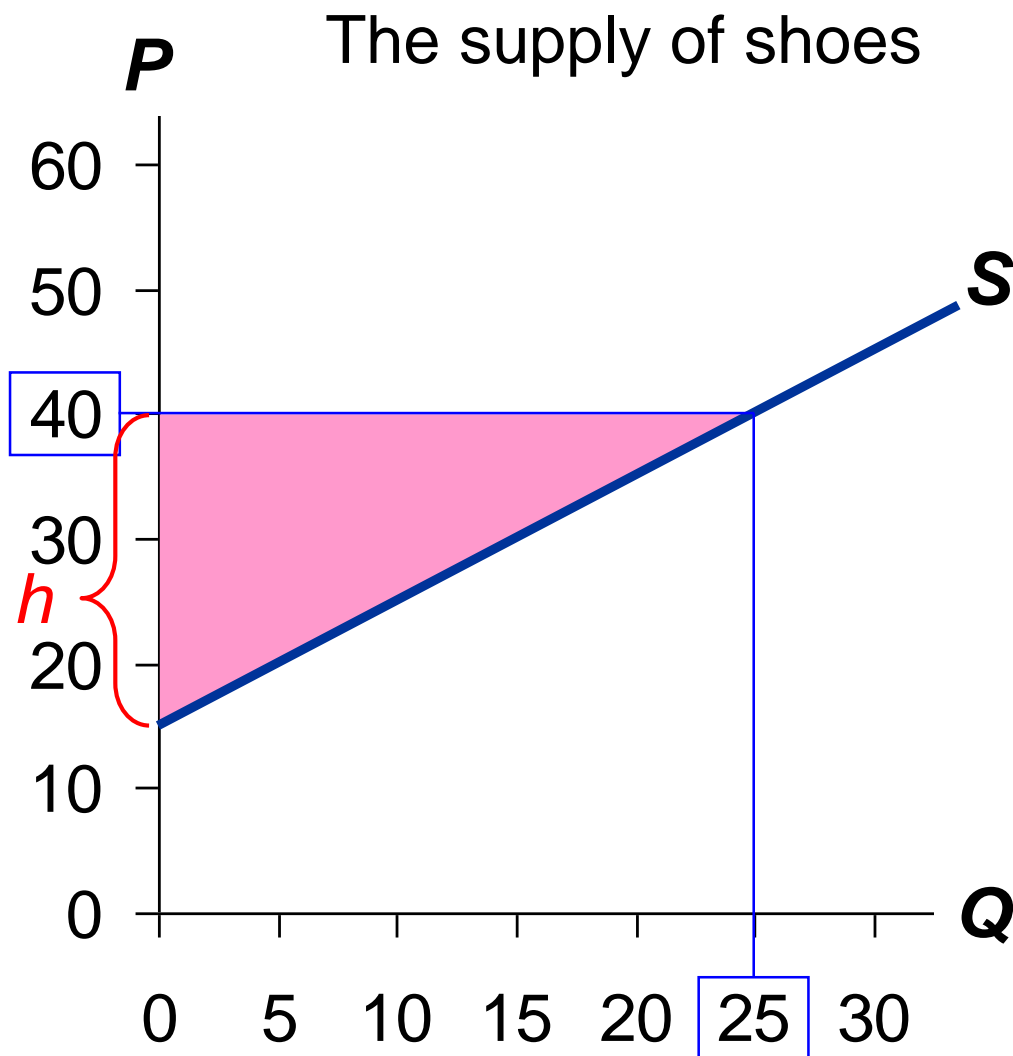
# PS with Lots of Sellers & a Smooth S Curve

PS is the area b/w  
**P** and the **S** curve,  
from 0 to **Q**.

The height of this  
triangle is  
 $\$40 - 15 = \$25$ .

So,

$$\begin{aligned} \text{PS} &= \frac{1}{2} \times b \times h \\ &= \frac{1}{2} \times 25 \times \$25 \\ &= \underline{\underline{\$312.50}} \end{aligned}$$





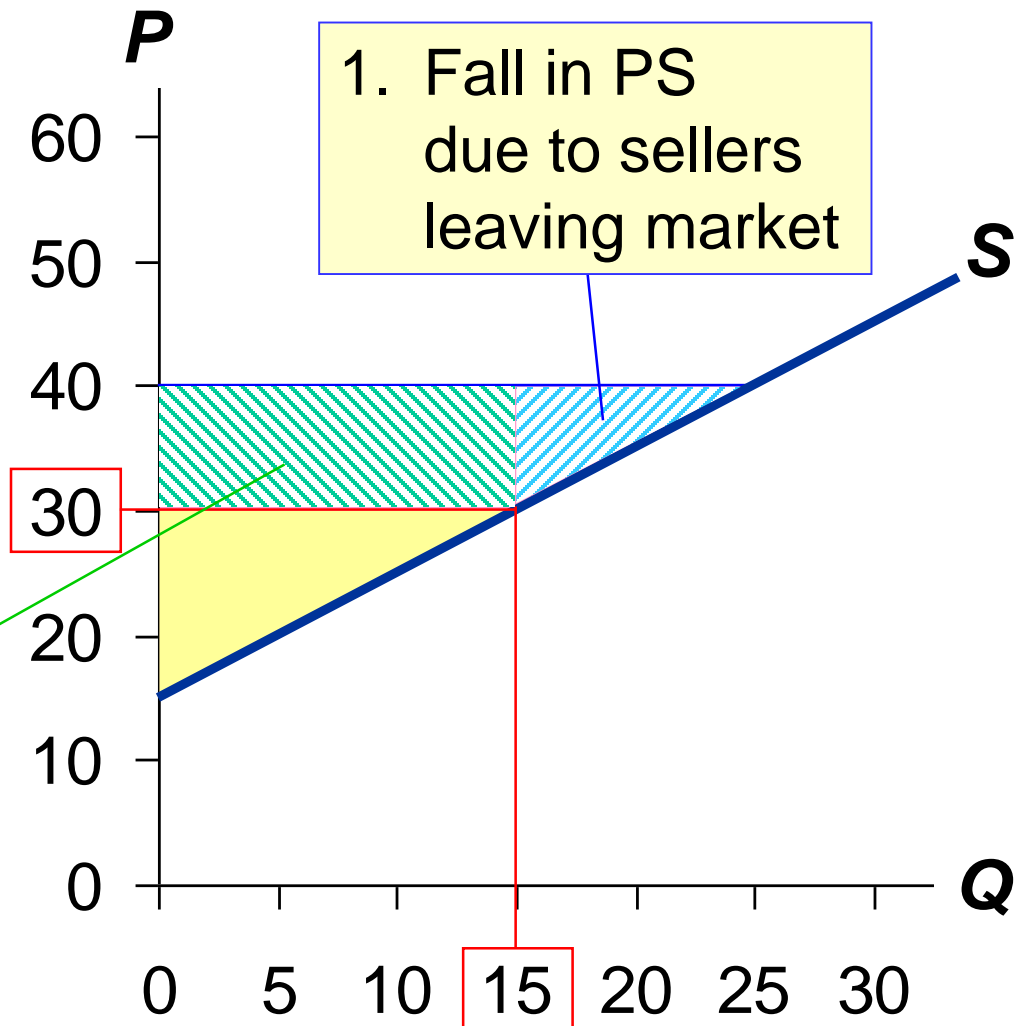
# How a Lower Price Reduces PS

If  $P$  falls to \$30,

$$PS = \frac{1}{2} \times 15 \times \$15 \\ = \underline{\$112.50}$$

Two reasons for the fall in PS.

2. Fall in PS due to remaining sellers getting lower  $P$



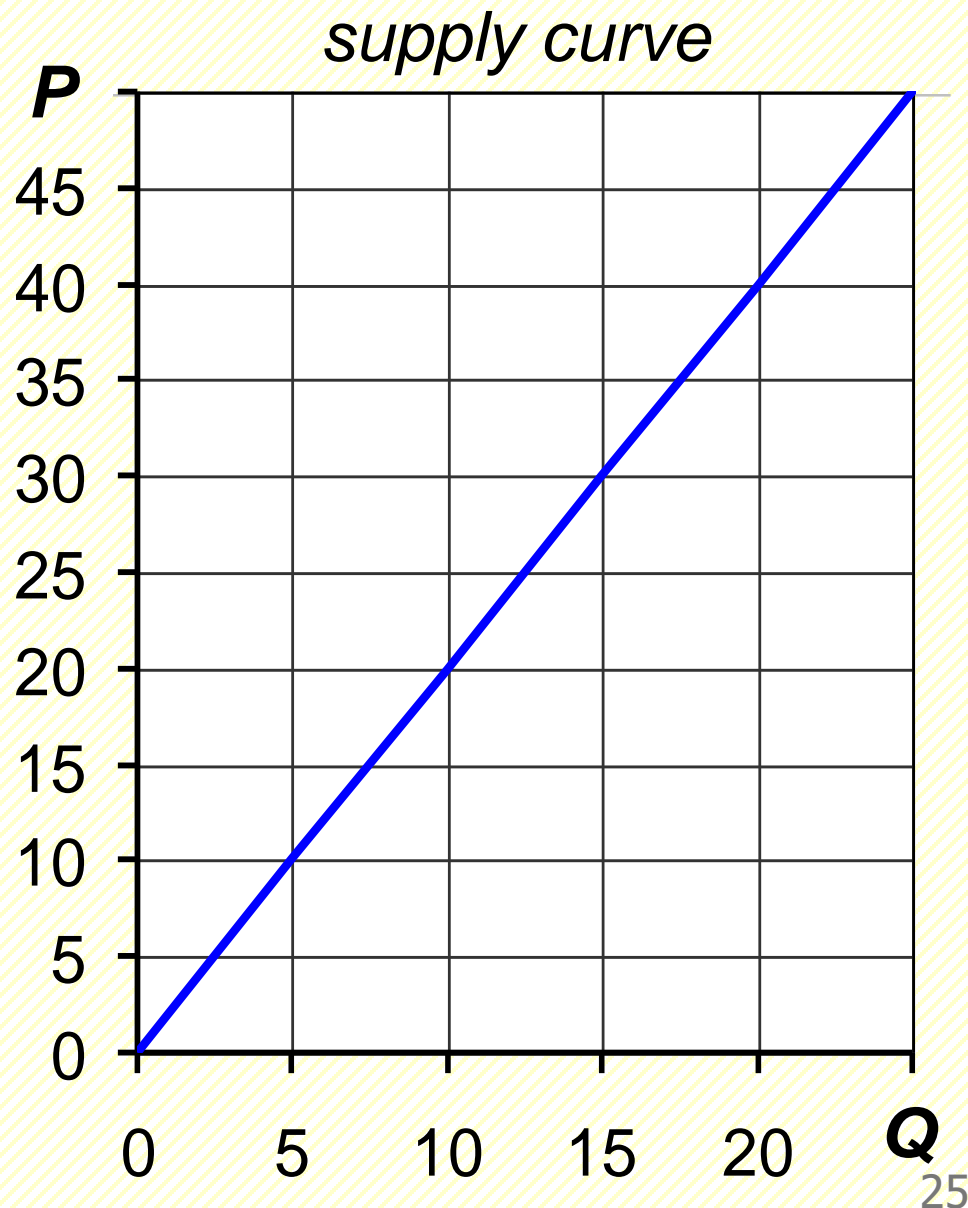
## ACTIVE LEARNING 2

### Producer surplus

- A. Find marginal seller's cost at  $Q = 10$ .
- B. Find total PS for  $P = \$20$ .

Suppose  $P$  rises to \$30.  
Find the increase in PS due to...

- C. selling 5 additional units
- D. getting a higher price on the initial 10 units



## ACTIVE LEARNING 2

### Answers

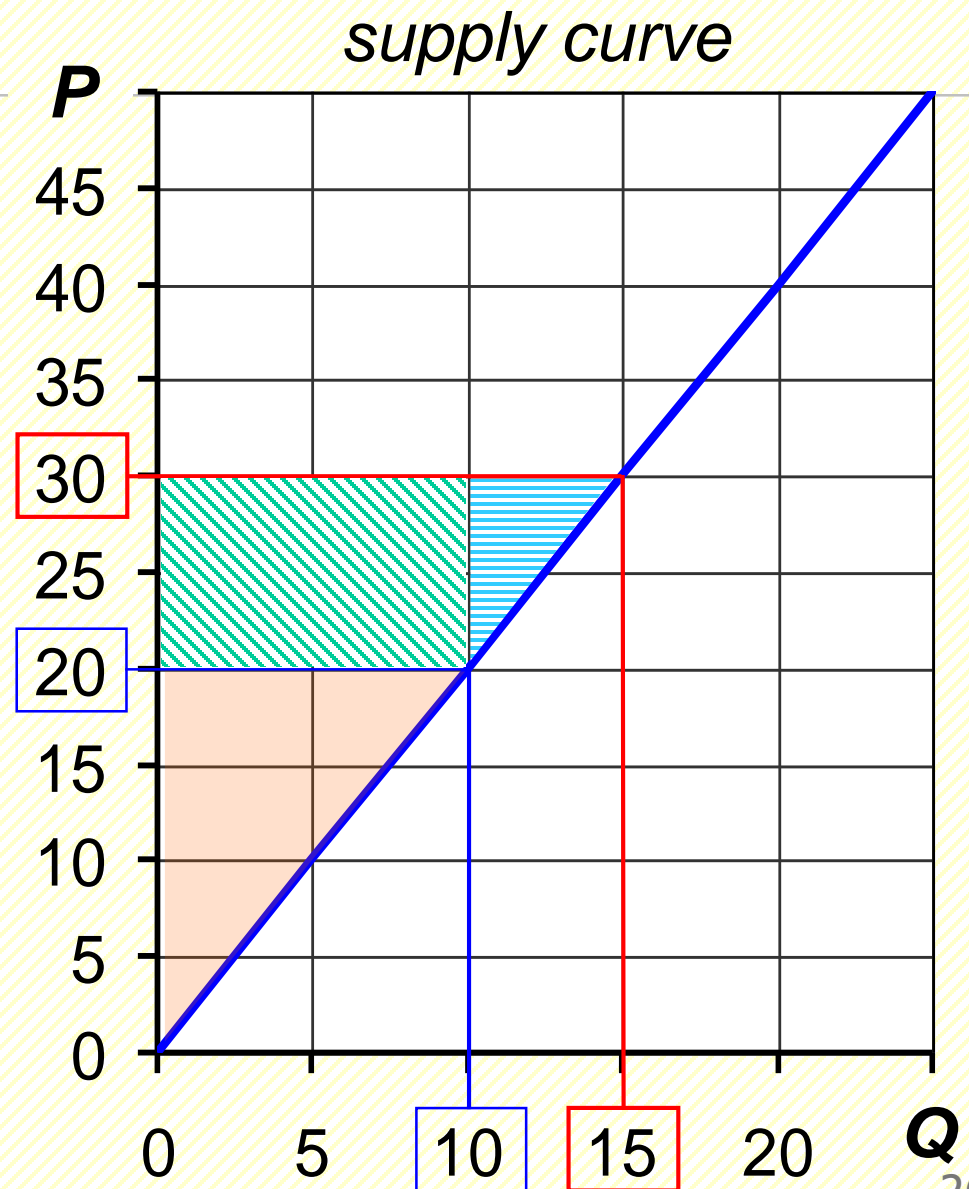
A. At  $Q = 10$ ,  
marginal cost = \$20

B.  $PS = \frac{1}{2} \times 10 \times \$20$   
= \$100

$P$  rises to \$30.

C. PS on  
additional units  
=  $\frac{1}{2} \times 5 \times \$10$  = \$25

D. Increase in PS  
on initial 10 units  
=  $10 \times \$10$  = \$100



# CS, PS, and Total Surplus

CS = (value to buyers) – (amount paid by buyers)  
= buyers' gains from participating in the market

PS = (amount received by sellers) – (cost to sellers)  
= sellers' gains from participating in the market

**Total surplus** = CS + PS  
= total gains from trade in a market  
= (value to buyers) – (cost to sellers)

# The Market's Allocation of Resources

- In a market economy, the allocation of resources is decentralized, determined by the interactions of many self-interested buyers and sellers.
- We use total surplus as a measure of society's well-being, and we consider whether the market's allocation is *efficient*.

# Efficiency

$$\text{Total surplus} = (\text{value to buyers}) - (\text{cost to sellers})$$

An allocation of resources is **efficient** if it maximizes total surplus. Efficiency means:

- The goods are consumed by the buyers who value them most highly.
- The goods are produced by the producers with the lowest costs.
- Raising or lowering the quantity of a good would not increase total surplus.

# Evaluating the Market Equilibrium

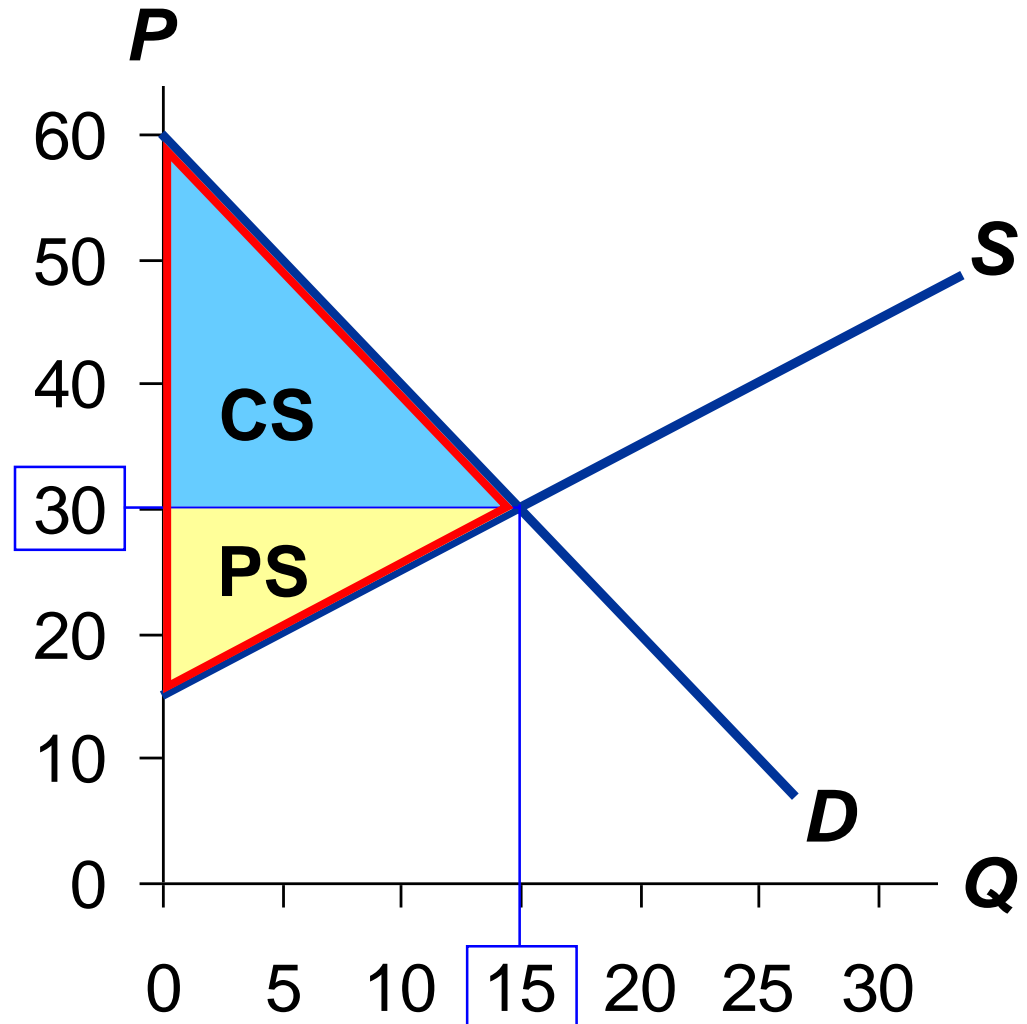
Market eq'm:

$$P = \$30$$

$$Q = 15,000$$

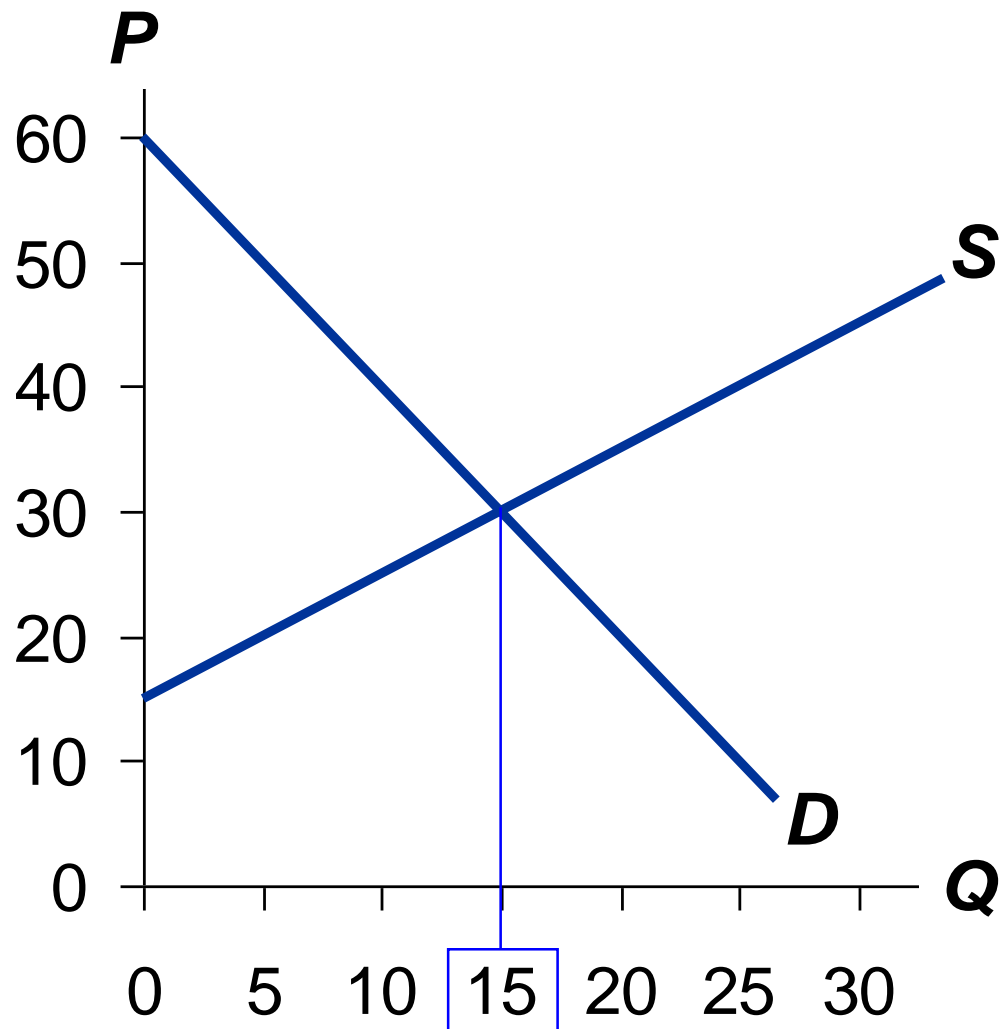
Total surplus  
= CS + PS

Is the market eq'm  
efficient?



# Does Eq'm Q Maximize Total Surplus?

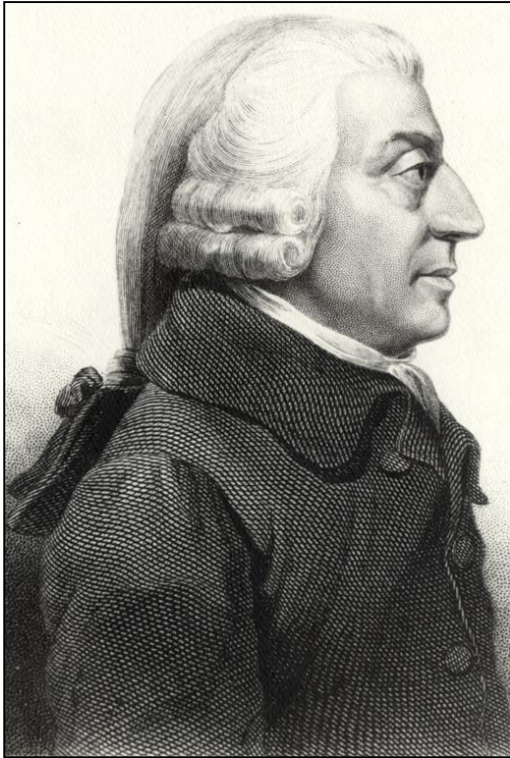
*The market eq'm quantity maximizes total surplus: At any other quantity, can increase total surplus by moving toward the market eq'm quantity.*





# Adam Smith and the Invisible Hand

Passages from *The Wealth of Nations*, 1776



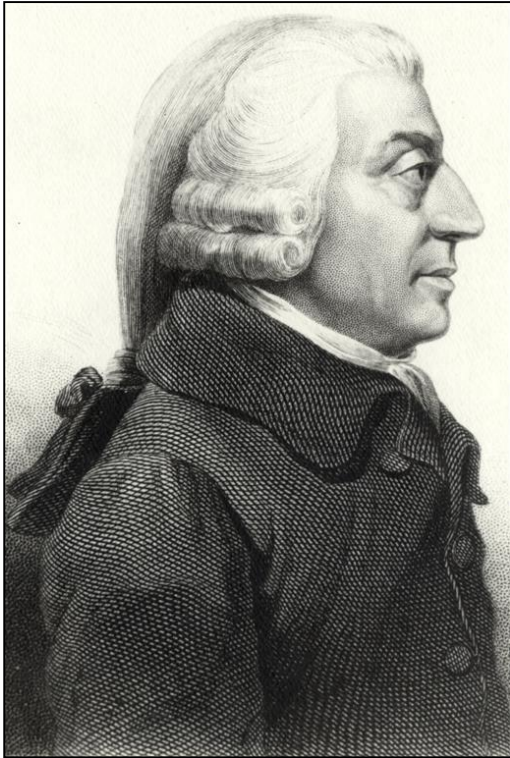
**Adam Smith,**  
1723-1790

“Man has almost constant occasion for the help of his brethren, and it is vain for him to expect it from their benevolence only. He will be more likely to prevail if he can interest their self-love in his favor, and show them that it is for their own advantage to do for him what he requires of them...

It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest....

# Adam Smith and the Invisible Hand

Passages from *The Wealth of Nations*, 1776



**Adam Smith,**  
1723-1790

“Every individual...neither intends to promote the public interest, nor knows how much he is promoting it.... He intends only his own gain, and he is in this, as in many other cases, led by **an invisible hand** to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.”

# The Free Market vs. Govt Intervention

- The market equilibrium is most efficient. No other outcome achieves higher total surplus.
- ***Laissez faire*** (French for “allow them to do”): the notion that govt should not interfere with the market.

# The free market vs. central planning

- It is impossible for a central planner (benevolent planner) to know what the buyer and seller wants. Therefore, central planning produces a **lower** total surplus than a free market approach.
- FREE MARKET IS ALWAYS MORE EFFICIENT (higher total surplus CS +PS)