CITY UNIVERSITY LONDON

Microeconomics Pre-sessional September 2016

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Organisation of the Microeconomics Pre-sessional

Introduction	10:00-10:30
Demand and Supply	10:30-11:10
Break	
Consumer Theory	11:25-13:00
Lunch Break	
Problems – Refreshing by Doing	14:00-14:30
Theory of the Firm	14:30 -15:30
Break	
Problems – Refreshing by Doing	15:45 -16:30

Demand and Supply

- The Market Demand Function
- The Market Supply Function
- Equilibrium
- Characterizing Demand and Supply
- Elasticity

Competitive Markets

N buyers

M sellers

M and N large enough that no agent can influence the market price

The Market Demand Function

The market demand function tells us how Q^d (the quantity of a good demanded by the sum of all consumers in the market) depends on various factors

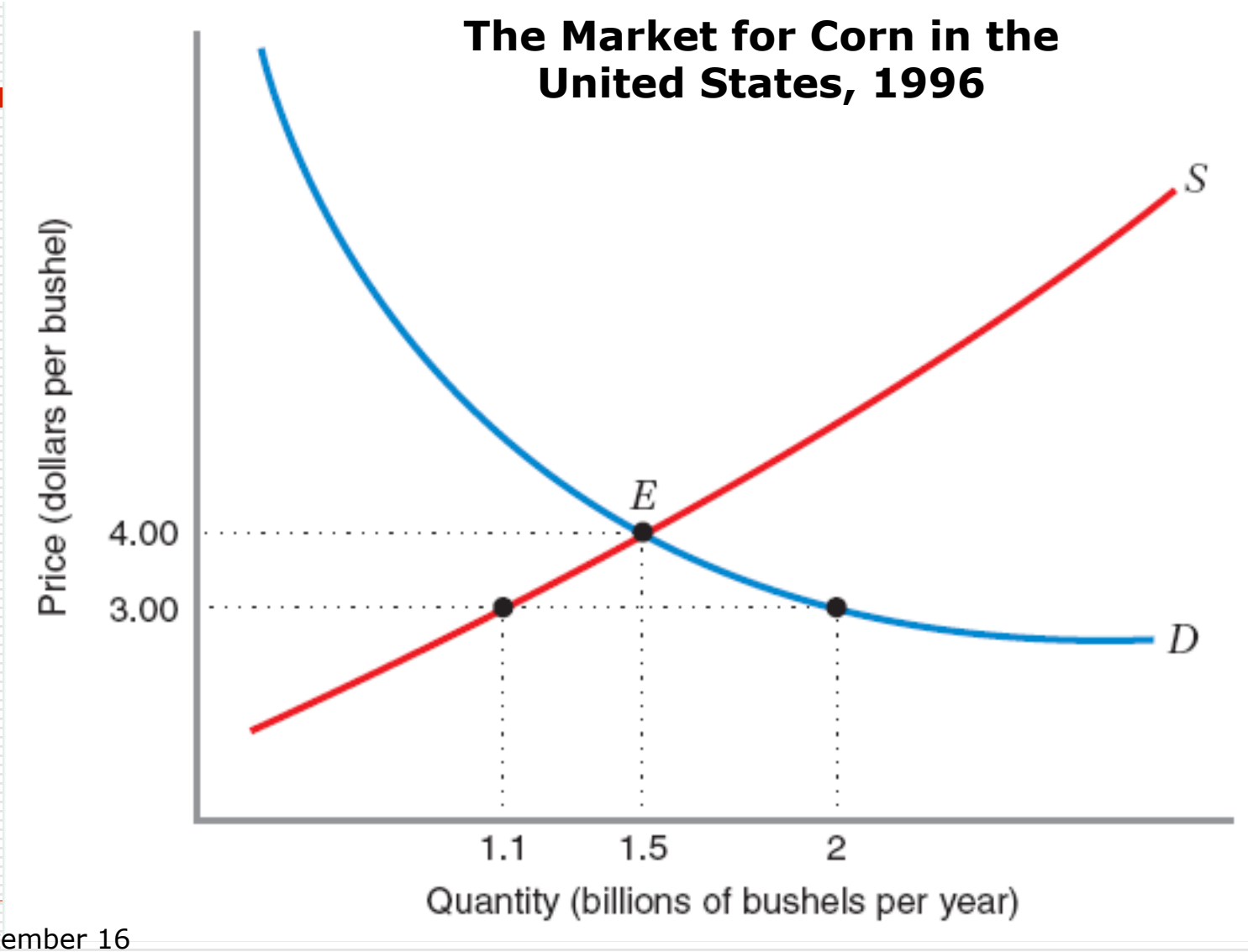
$$Q^d = Q(p,p_o,I,\ldots)$$

The Demand Curve

The demand curve plots the aggregate quantity of a good that consumers are willing to buy at different prices, *holding constant other demand drivers such as prices of other goods,* consumer income, and quality

$$Q^d = Q(p)$$

Derived demand, Direct demand, Market demand curve



Reminder

When we graph demand (and supply) functions, we always graph P on vertical axis and Q on horizontal axis, but we write demand as Q as a function of P.

If P is written as function of Q, it is called the **inverse demand.**

Normal Form: $Q^{d=}100-2P$

Inverse form: $P = 50 - Q^d/2$

The Law of Demand

The Law of Demand states that the quantity of a good demanded decreases when the price of this good rises

The demand curve *shifts* when factors other than own price change:

- If the change increases the willingness of consumers to acquire the good, the demand curve shifts **right**
- If the change decreases the willingness of consumers to acquire the good, the demand curve shifts **left**

Rule

A move **along** the demand curve for a good can only be triggered by a change in the price of that good.

Any change in another factor that affects the consumers' willingness to pay for the good results in a **shift** in the demand curve for the good.

The Market Supply Function

The market supply function tells us how the quantity of a good supplied by the sum of all producers in the market depends on various factors

$$Q^s = Q(p, p_o, W, \ldots)$$

The Market Supply Curve

The market supply curve plots the aggregate quantity of a good that will be offered for sale at different prices

$$Q^s = Q(P)$$

The Law of Supply

Definition: The **Law of Supply** states that the quantity of a good offered increases when the price of this good increases.

The supply curve **shifts** when factors other than own price change:

- If the change increases the willingness of producers to offer the good at the same price, the supply curve shifts **right**
- If the change decreases the willingness of producers to offer the good at the same price, the supply curve shifts **left**

Rule

A move **along** the supply curve for a good can only be triggered by a change in the price of that good.

Any change in another factor that affects the producers' willingness to offer for the good results in a **shift** in the supply curve for the good.

Linear demand and supply analysis

Linear demand and supply curves can be expressed as equations with an *intercept* and a *slope*:

$$Q = I + S * P$$

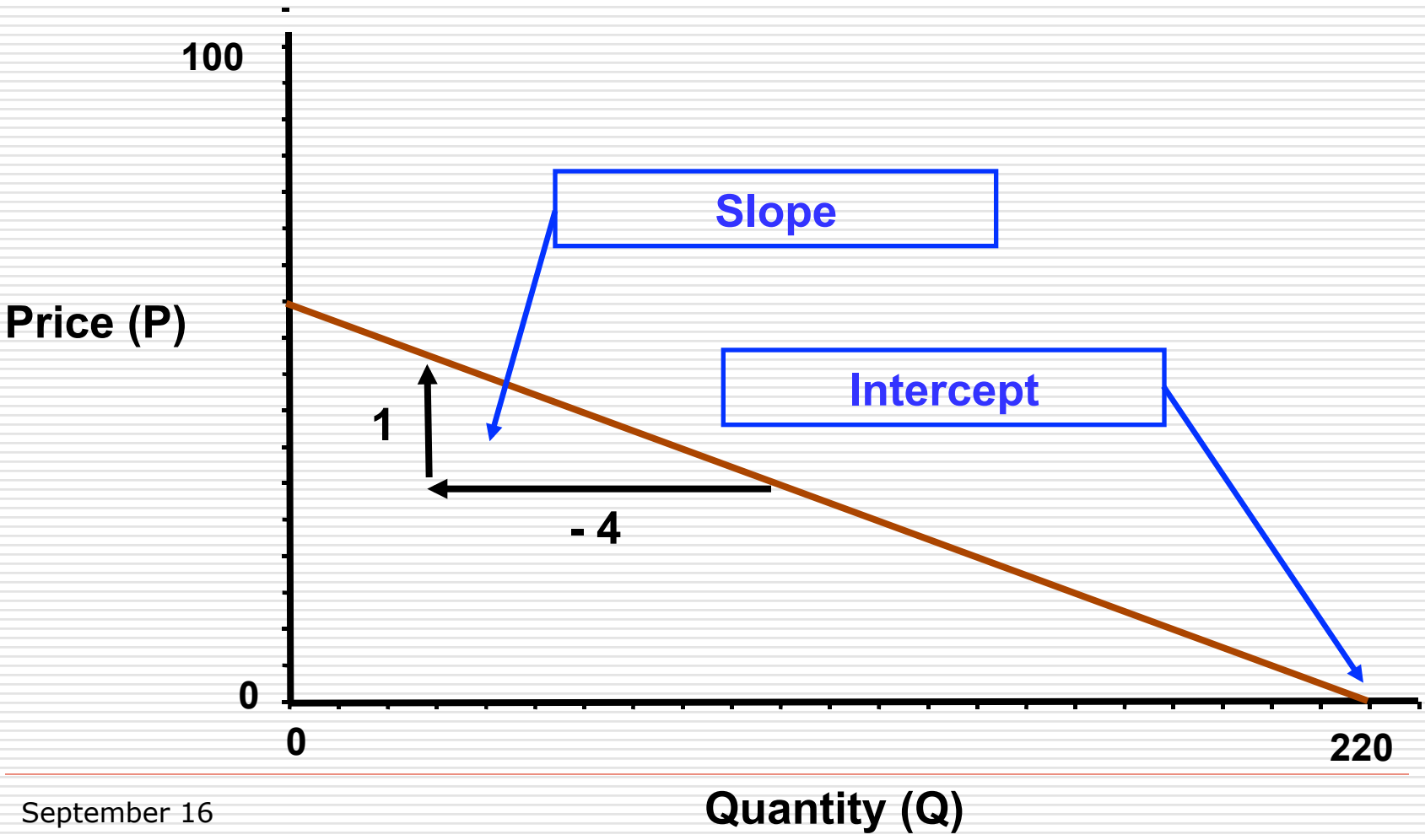
Q = Quantity

I = Intercept

S = Slope

Linear demand and supply analysis

Example: Q = 220 - 4*P



Linear demand curves

$Q_D = I_D + S_D * P$

Q_D is the amount of the good demanded at price P

I_D is the intercept for the demand curve – the amount that would be demanded if the price was zero

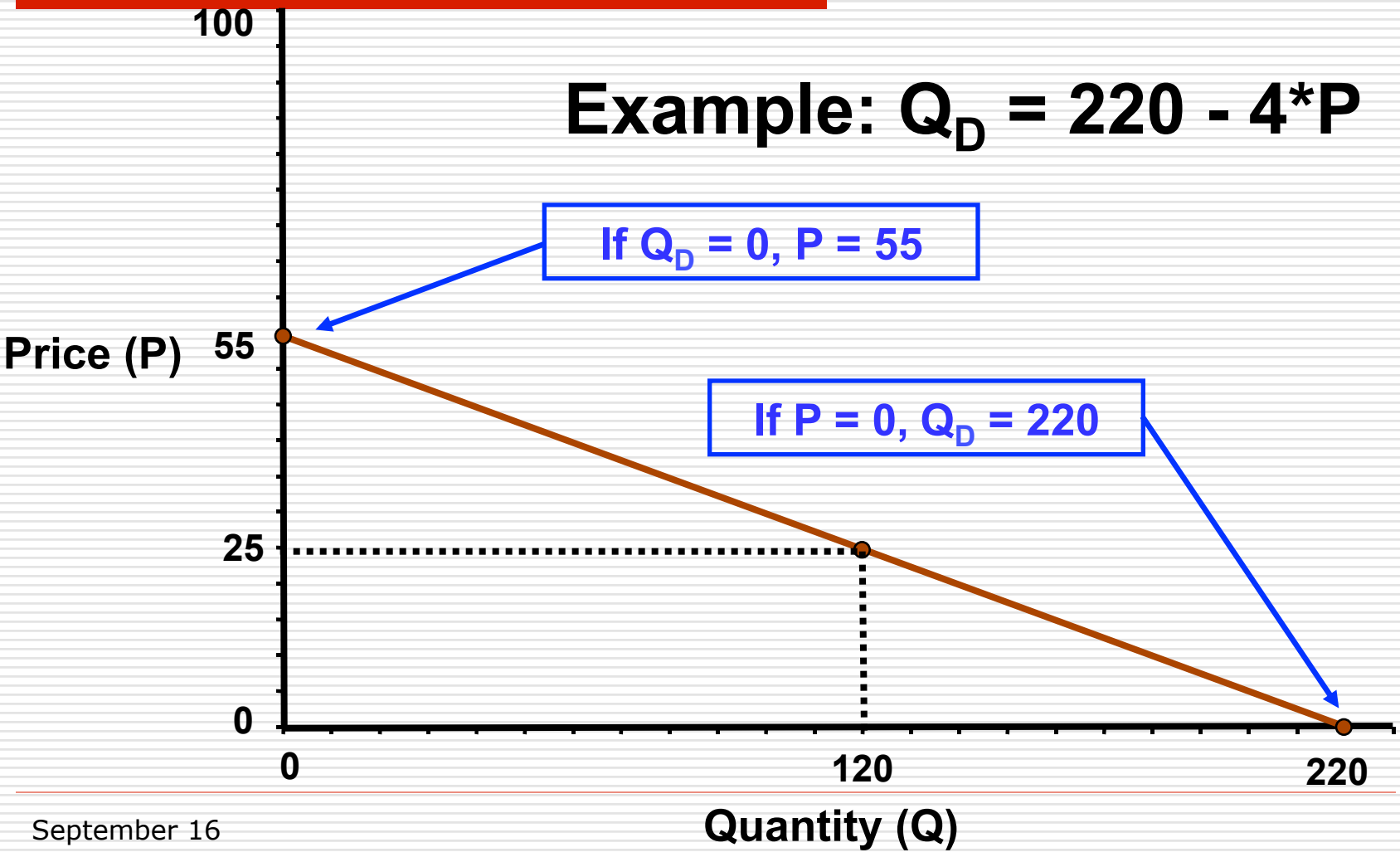
S_D is the slope of the demand curve – the change in the amount demanded when the price changes by one

Calculating values for a linear demand curve

Example: $Q_D = 220 - 4*P$

If P = 10	$Q_D = 220 - 4*10 = 180$
If P = 30	$Q_D = 220 - 4*30 = 100$
If P = 55	$Q_D = 220 - 4*55 = 0$
	(No demand if price = 55)
If P = 60	$Q_D = 220 - 4*60 = -20$
	(Obviously impossible!)

Drawing a linear demand curve



Linear supply curves

$Q_S = I_S + S_S * P$

Q_S is the amount of the good supplied at price P

I_S is the intercept for the supply curve – the amount that would be supplied if the price was zero

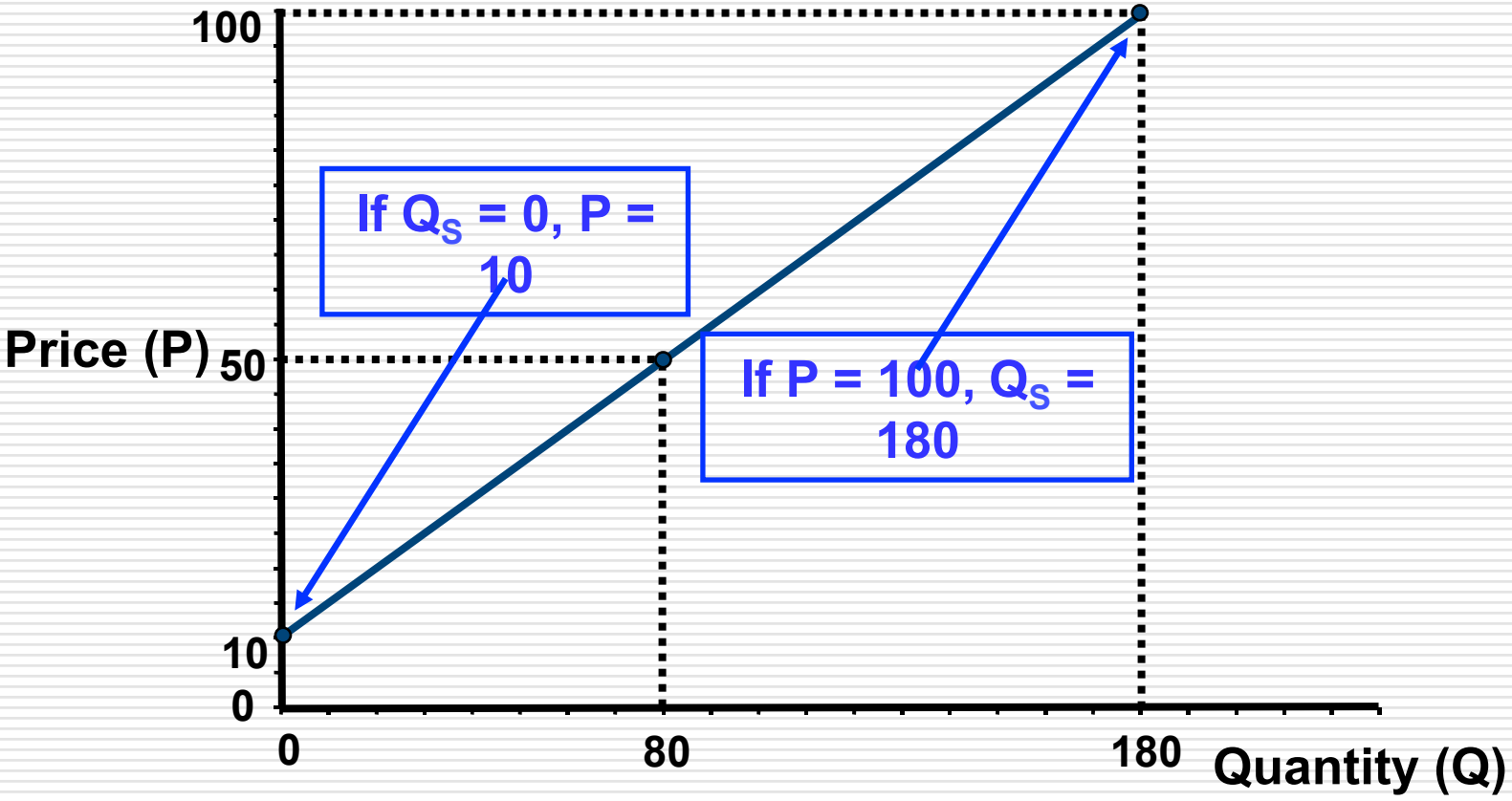
S_S is the slope of the supply curve – the change in the amount supplied when the price changes by one

Calculating values for a linear supply curve

Example: $Q_S = -20 + 2*P$

If P = 50	$Q_S = -20 + 2*50 = 80$
If P = 20	$Q_S = -20 + 2*20 = 20$
If P = 10	$Q_S = -20 + 2*10 = 0$
	(No supply if price = 10)
If P = 1	$Q_S = -20 + 2*1 = -18$
	(Obviously impossible!)

Drawing a linear supply curve
Example: $Q_S = -20 + 2*P$



Calculating the equilibrium point

$Q_S = -20 + 2*P$

$Q_D = 220 - 4*P$

In equilibrium, QS = QD, therefore

$-20 + 2*P$	=	$220 - 4*P$
$6P$	=	240
P^*	=	40

Calculating the equilibrium point

$Q_S = -20 + 2*P$

$Q_D = 220 - 4*P$

Substituting for P in the supply equation,

$Q_S = -20 + 2*40 = 60$

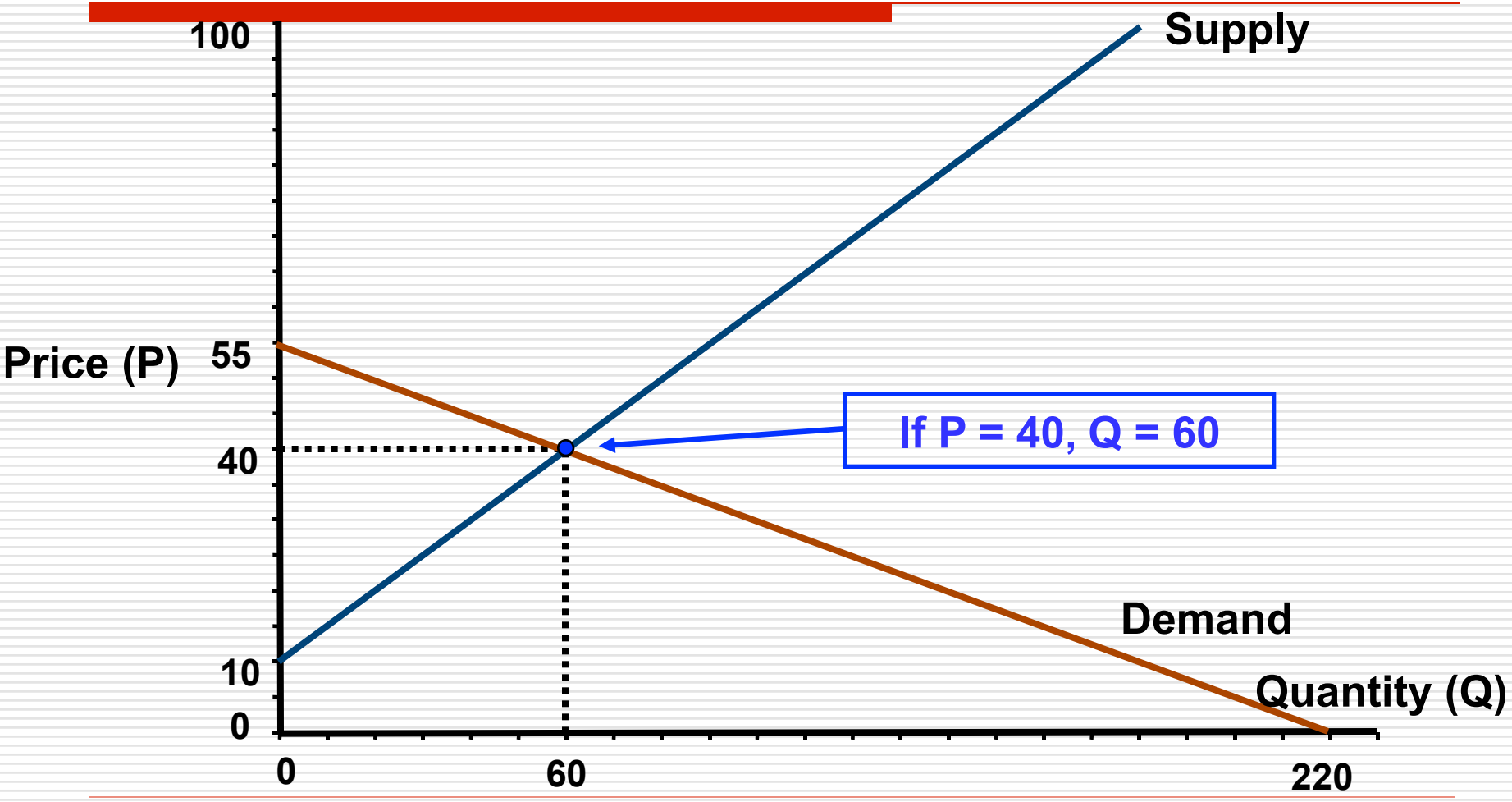
Substituting for P in the demand equation,

$Q_D = 220 - 4*40 = 60$ $\quad\quad$ $P = 40$

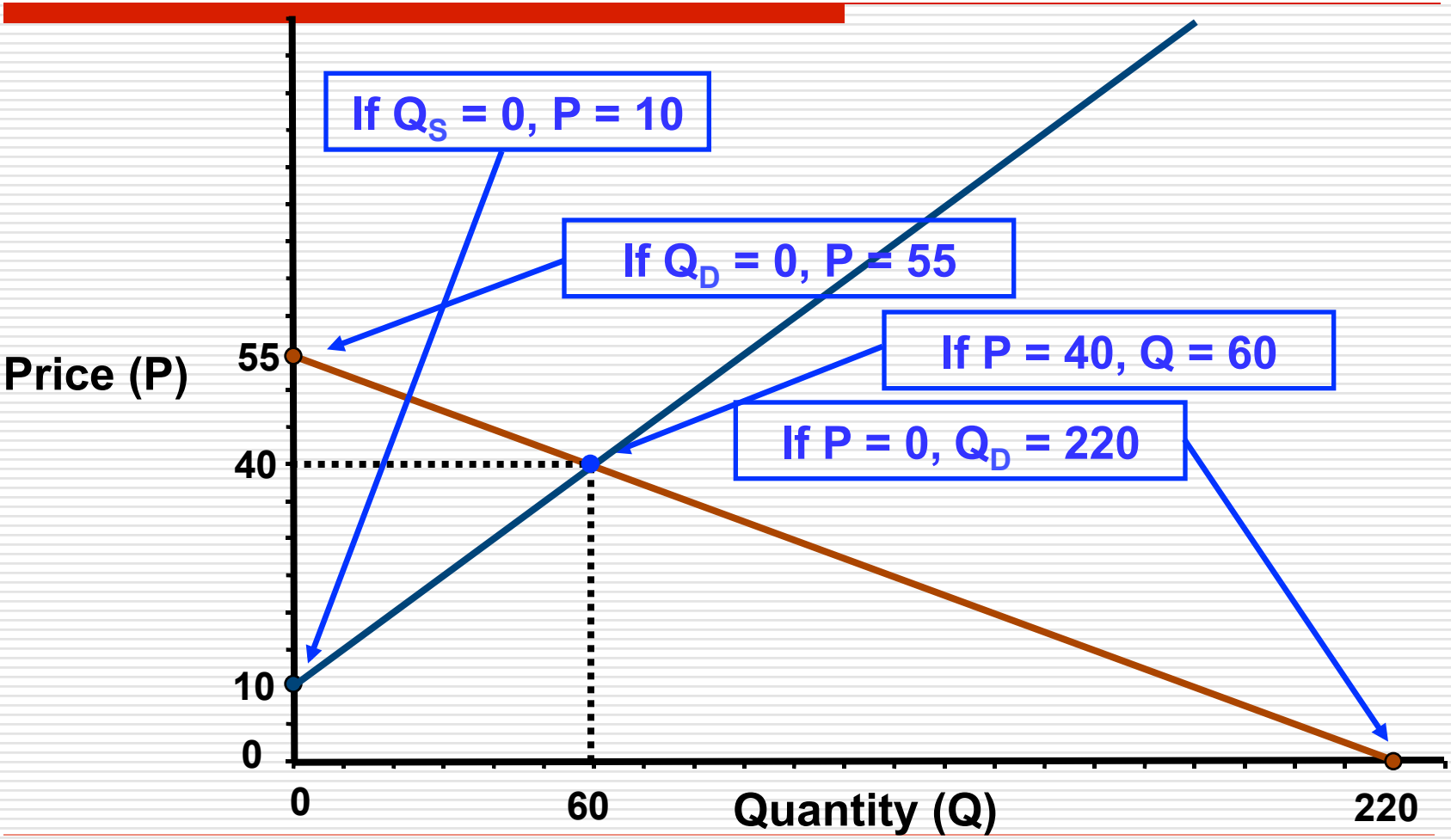
Giving the equilibrium position:

$P = 40$ and $Q_D = Q_S = 60$

Drawing a market equilibrium



Drawing a market equilibrium



Example
The Market for Cranberries

$Q^d = 500 - 4p$

$Q^S = -100 + 2p$

p = price of cranberries (dollars per barrel)

Q = demand or supply in millions of barrels per year

Example
The Market for Cranberries

a. The equilibrium price of cranberries is calculated by equating demand to supply:

$$Q^d = Q^S \ldots \text{ or} \ldots$$

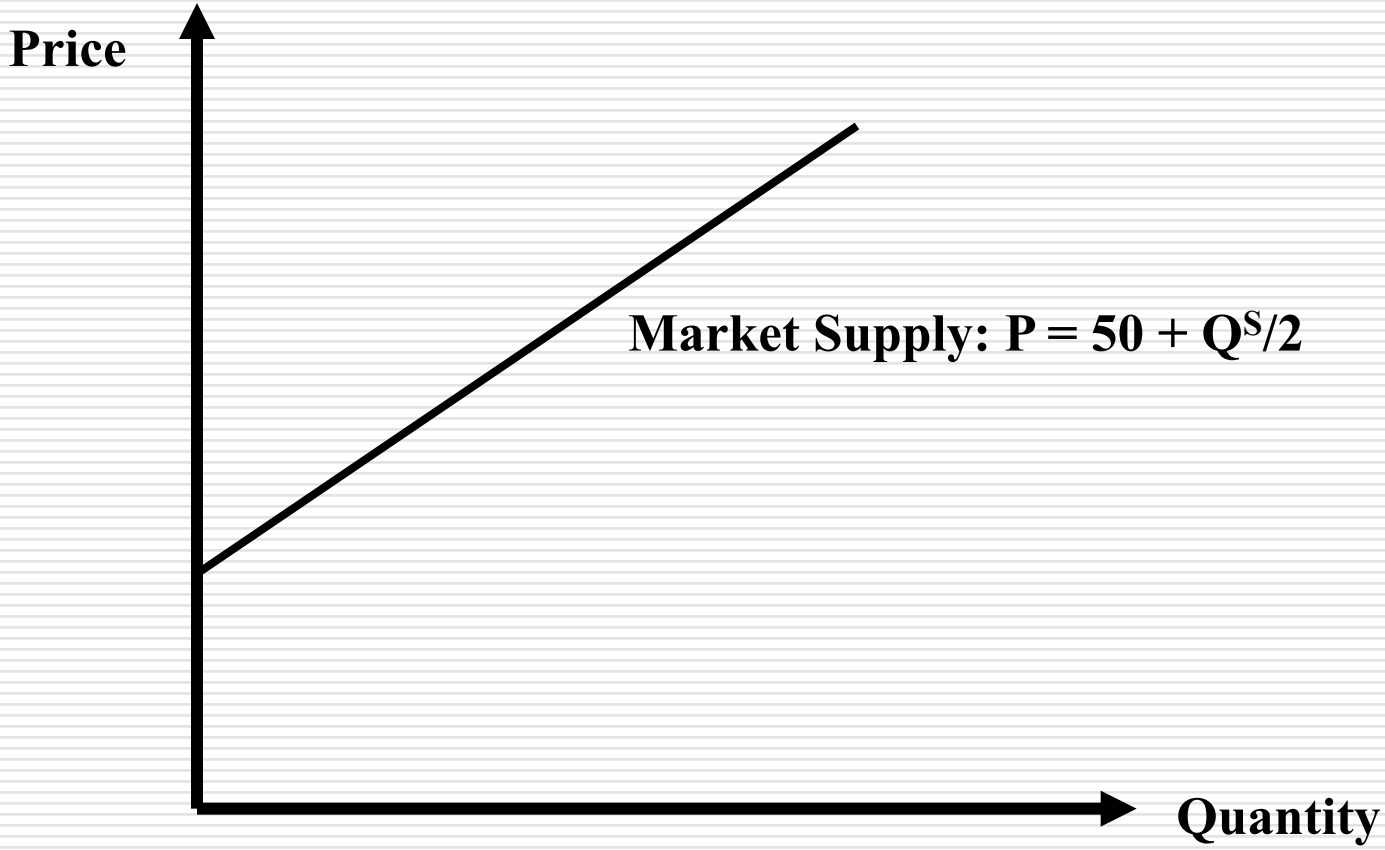
$$500 - 4p = -100 + 2p \ldots \text{solving,}$$

$$p^* = \$100$$

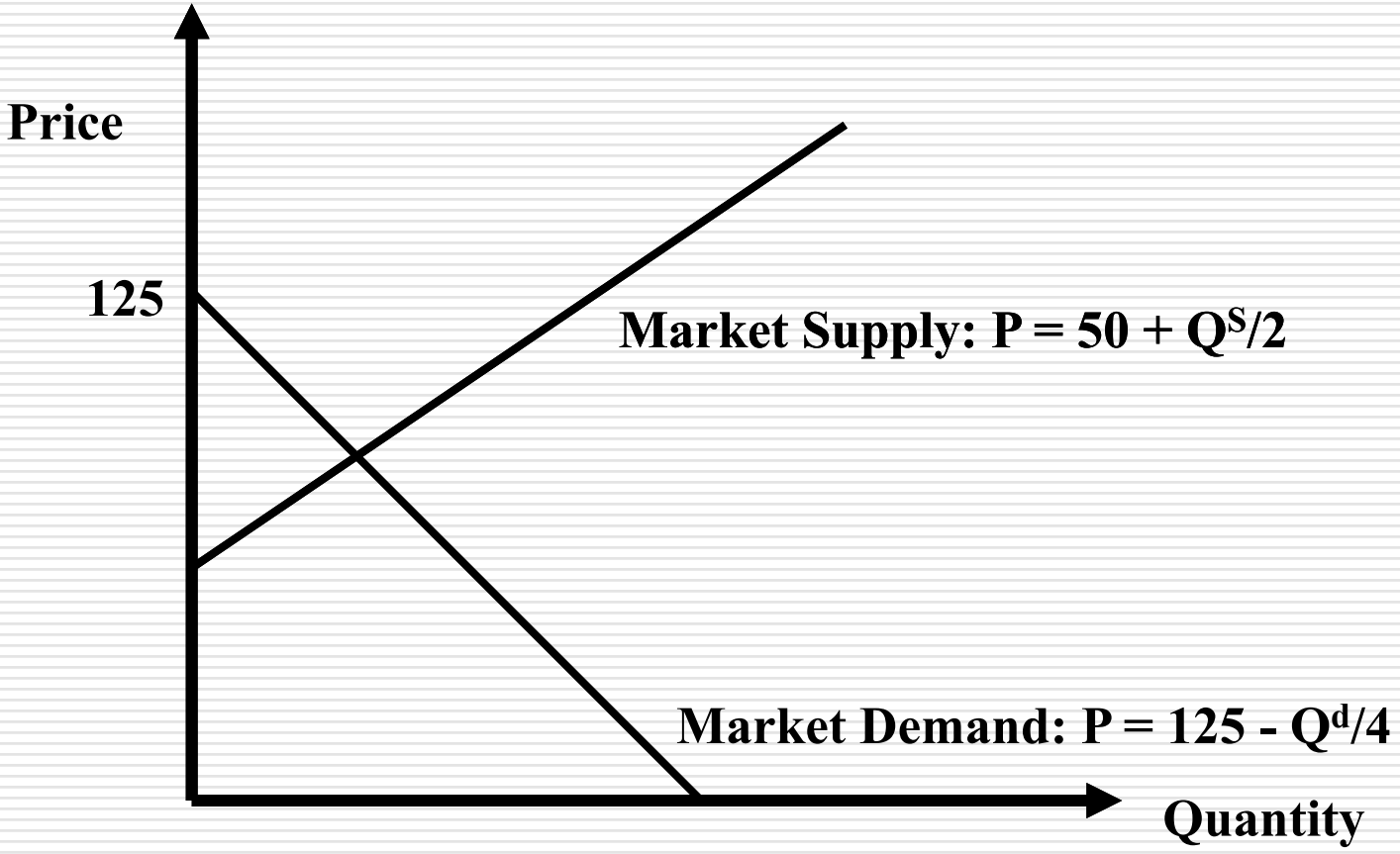
b. plug equilibrium price into either demand or supply to get equilibrium quantity:

$$Q^* = \$100$$

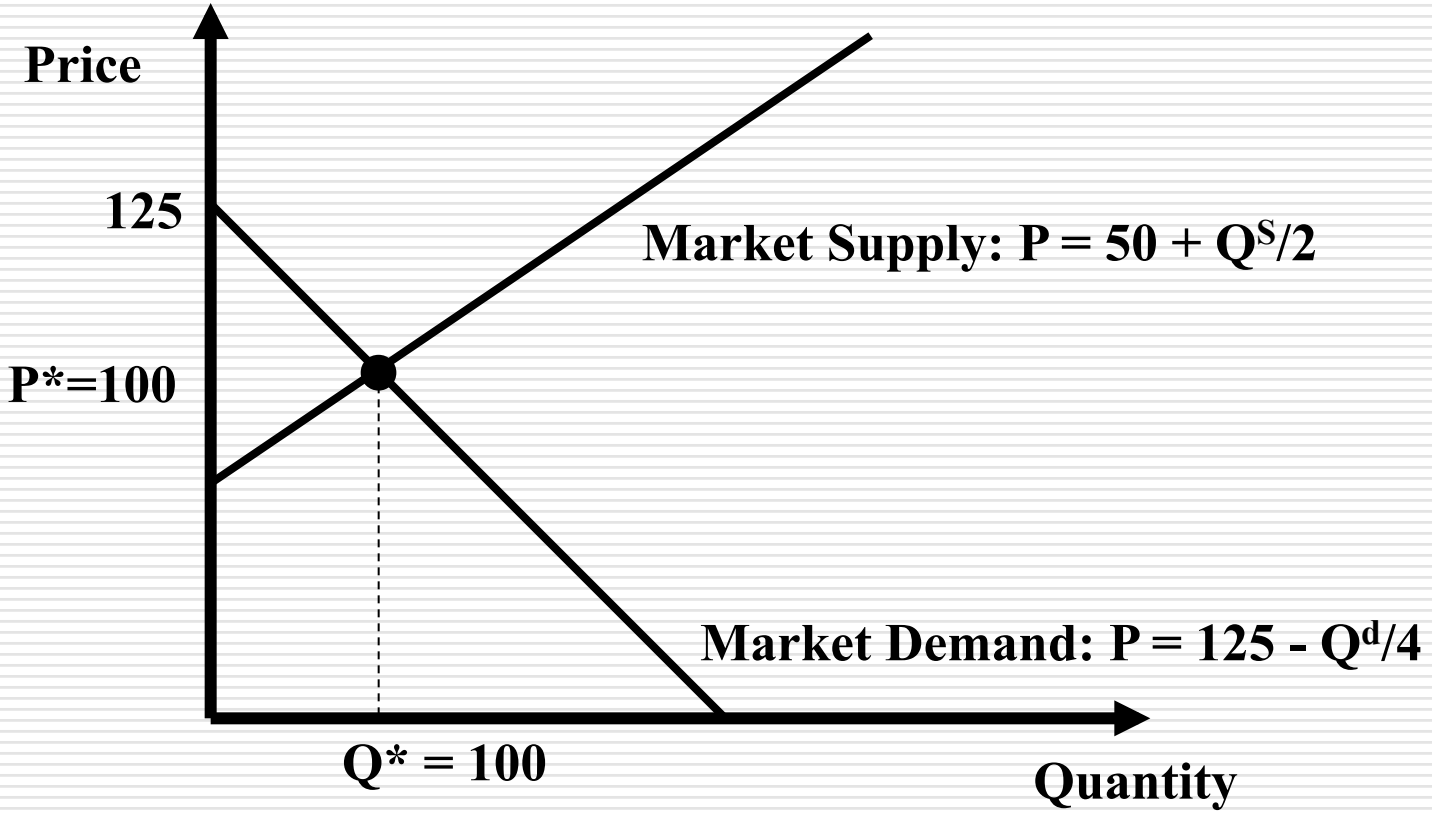
Example
The Market for Cranberries



Example
The Market for Cranberries



Example
The Market for Cranberries

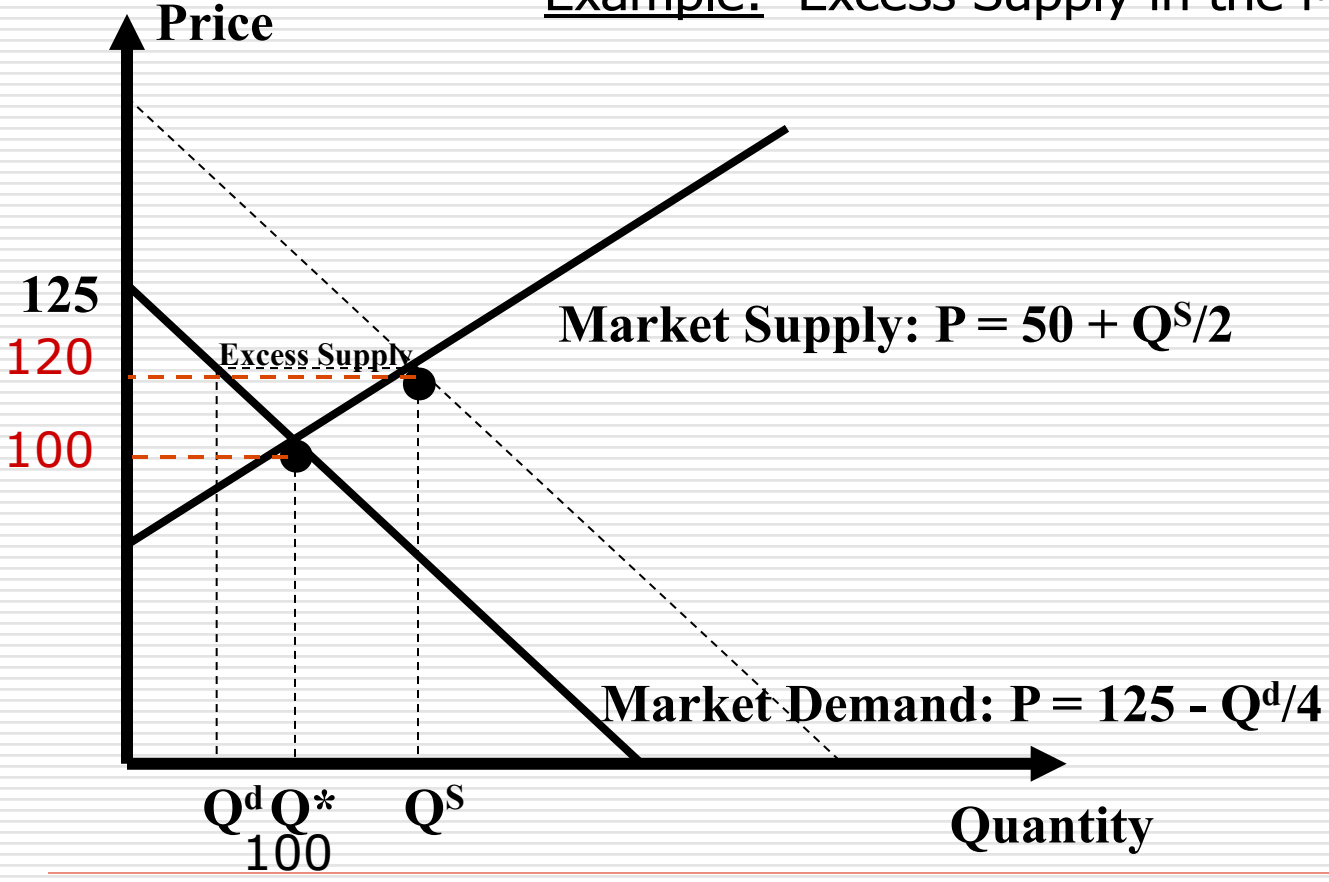


Example
The Market for Cranberries

Definition: If sellers cannot sell as much as they would like at the current price, there is **excess supply** or surplus

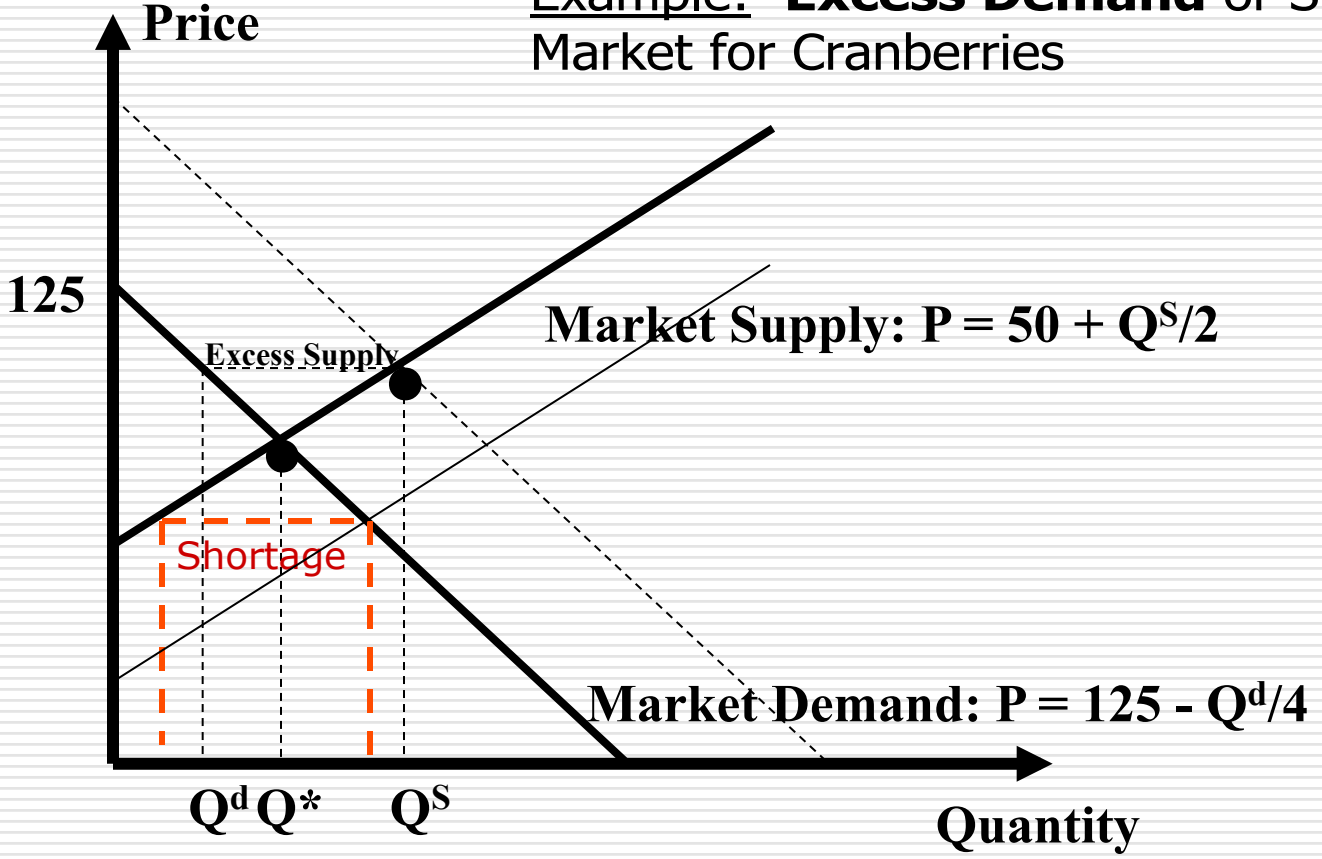
Example
The Market for Cranberries

Example: Excess Supply in the Market for Cranberries



Example
The Market for Cranberries

Example: **Excess Demand** or Shortage in the Market for Cranberries



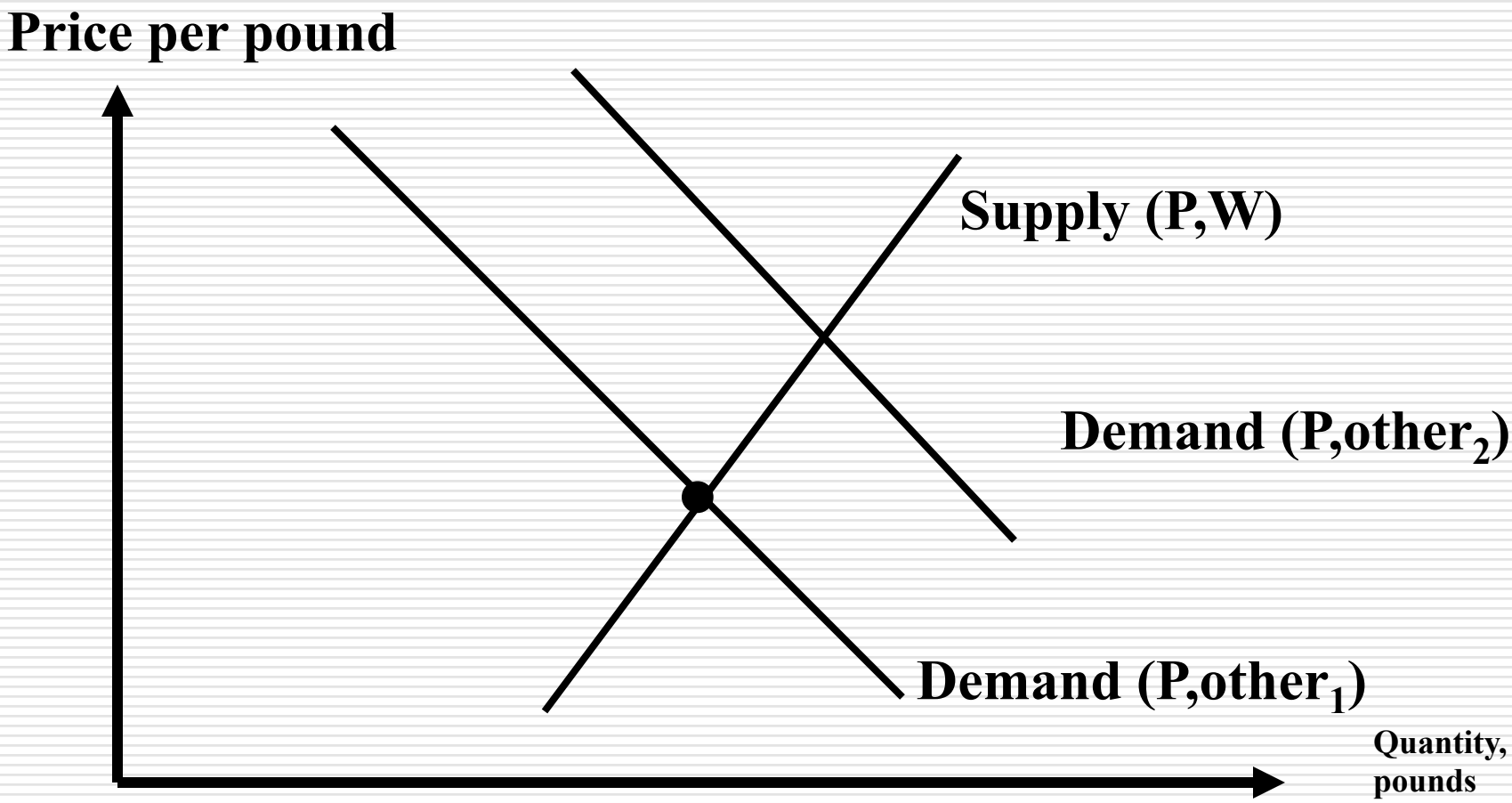
Excess Supply

- If there is no excess supply or excess demand, there is no pressure for prices to change and we are in equilibrium.

- When a change in an exogenous variable causes the demand curve or the supply curve to shift, the equilibrium shifts as well.

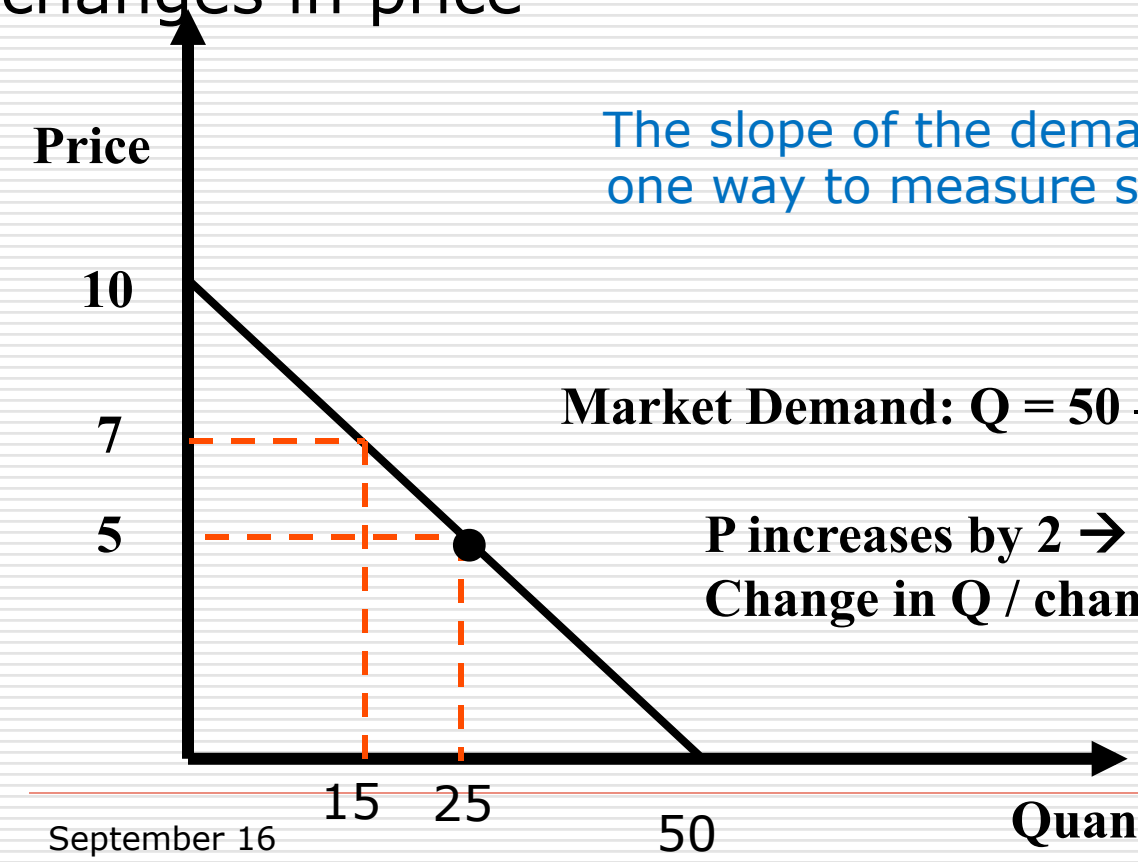
Shifts in Supply and Demand

Example: Coffee Beans, revisited



4. Price Elasticity of Demand

Elasticity of Demand: how sensitive is demand to changes in price



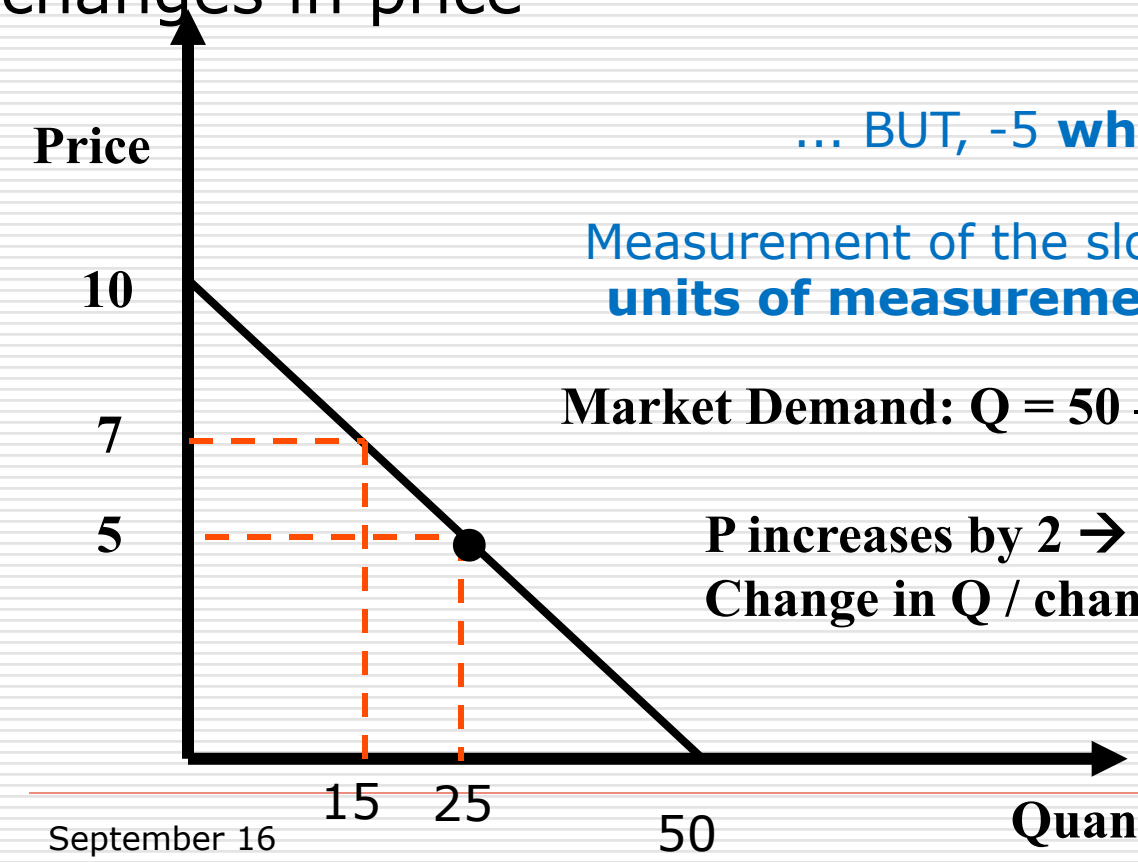
The slope of the demand curve is one way to measure sensitivity...

Market Demand: Q = 50 – 5P

P increases by 2 → Q falls by 10
Change in Q / change in P = -10 / 2 = -5

4. Price Elasticity of Demand

Elasticity of Demand: how sensitive is demand to changes in price



... BUT, -5 **what**?

Measurement of the slope **depends on units of measurement for P and Q**

Market Demand: Q = 50 – 5P

P increases by 2 → Q falls by 10
Change in Q / change in P = -10 / 2 = -5

4. Price Elasticity of Demand

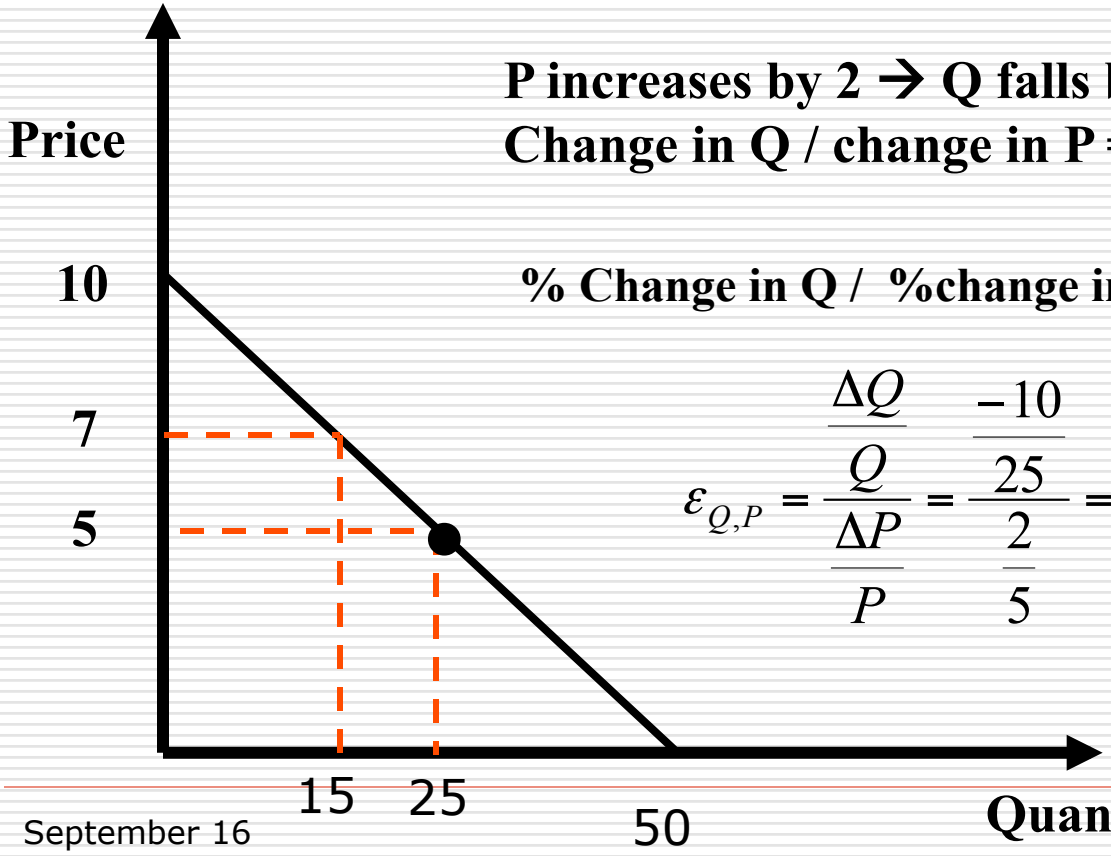
Price Elasticity of Demand is the **percentage change** in quantity demanded, brought **about by a 1 percent change** in price

$$\varepsilon_{Q,P} = \frac{\%\ \text{change in quantity}}{\%\ \text{change in price}} = \frac{\frac{\Delta Q}{Q} * 100\%}{\frac{\Delta P}{P} * 100\%}$$

$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$$

4. Price Elasticity of Demand

E.g. Market Demand: Q = 50 – 5P



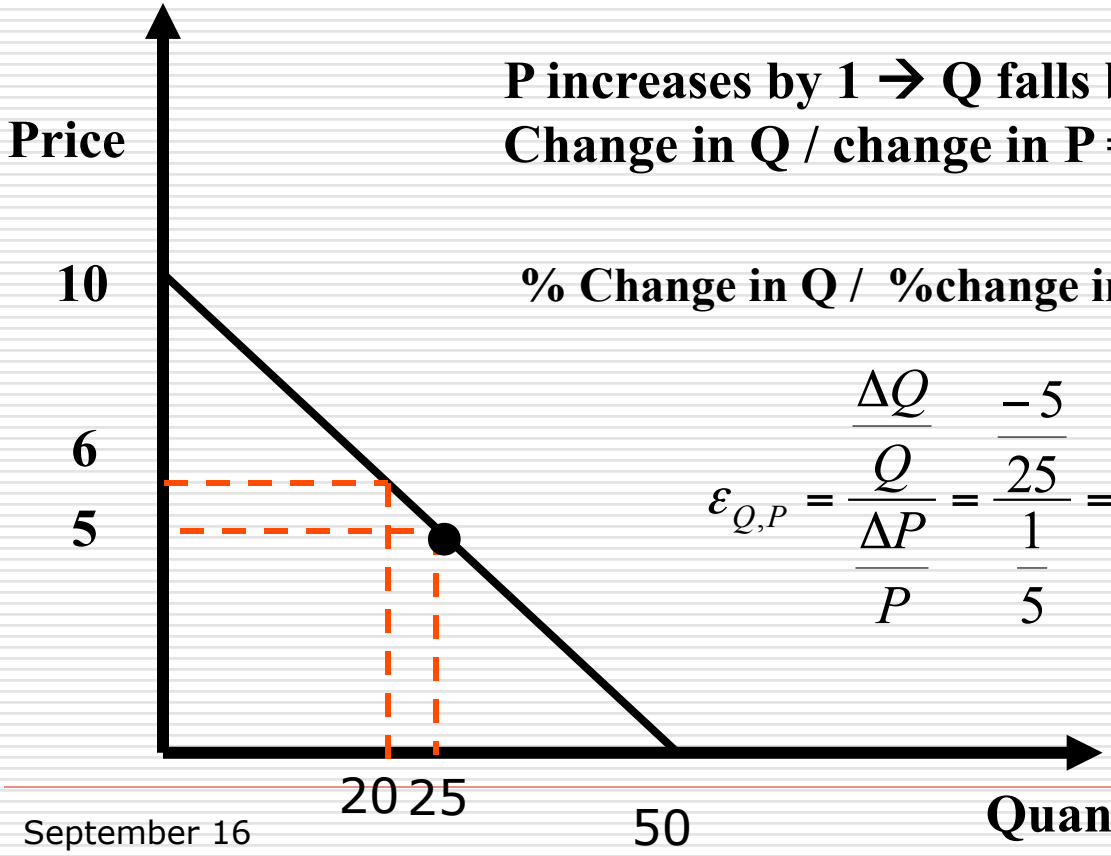
P increases by 2 → Q falls by 10
Change in Q / change in P = -10 / 2 = -5

% Change in Q / %change in P =

$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\frac{-10}{25}}{\frac{2}{5}} = \frac{-10}{2}\frac{5}{25} = -1$$

4. Price Elasticity of Demand

E.g. Market Demand: Q = 50 – 5P



P increases by 1 → Q falls by 5
Change in Q / change in P = -5 / 1 = -5

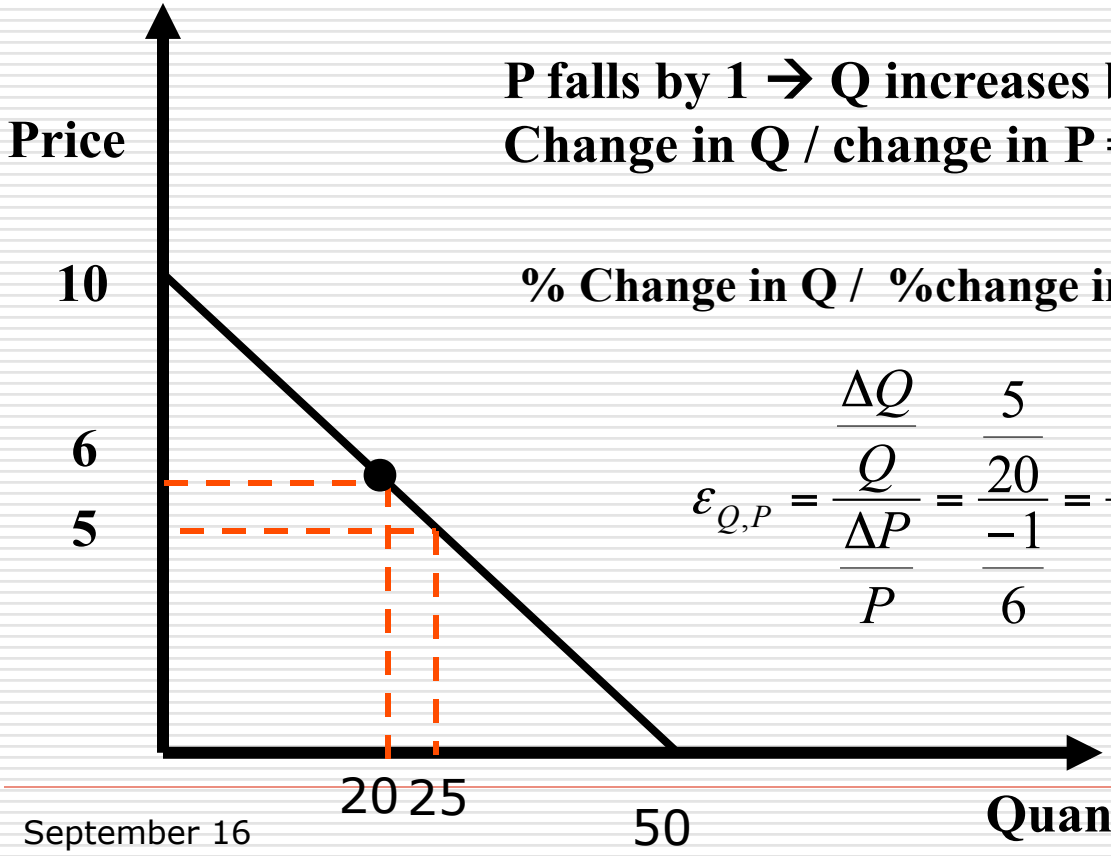
% Change in Q / %change in P =

$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\frac{-5}{25}}{\frac{1}{5}} = \frac{-5}{1}\frac{5}{25} = -1$$

Same elasticity?
For every initial point?

4. Price Elasticity of Demand

E.g. Market Demand: Q = 50 – 5P



P falls by 1 → Q increases by 5
Change in Q / change in P = 5 / -1 = -5

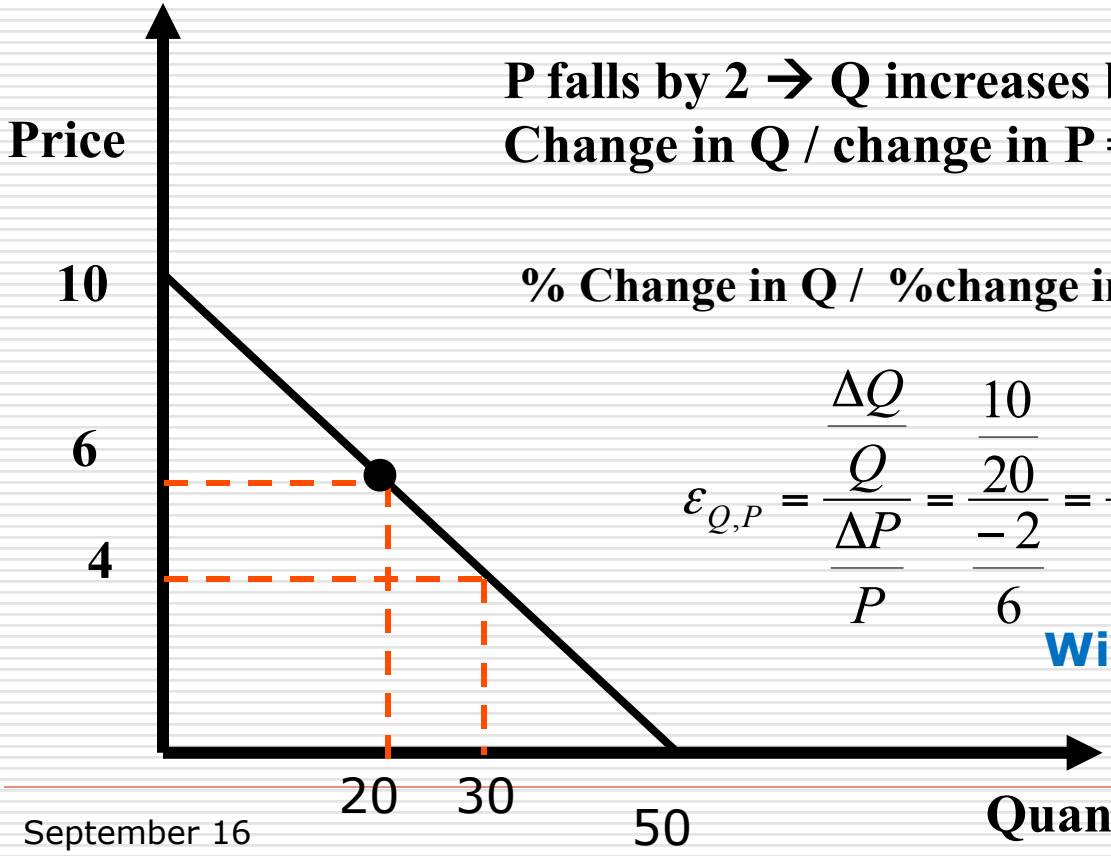
% Change in Q / %change in P =

$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\frac{5}{20}}{\frac{-1}{6}} = \frac{5}{-1}\frac{6}{20} = -1.5$$

NO!

4. Price Elasticity of Demand

E.g. Market Demand: Q = 50 – 5P



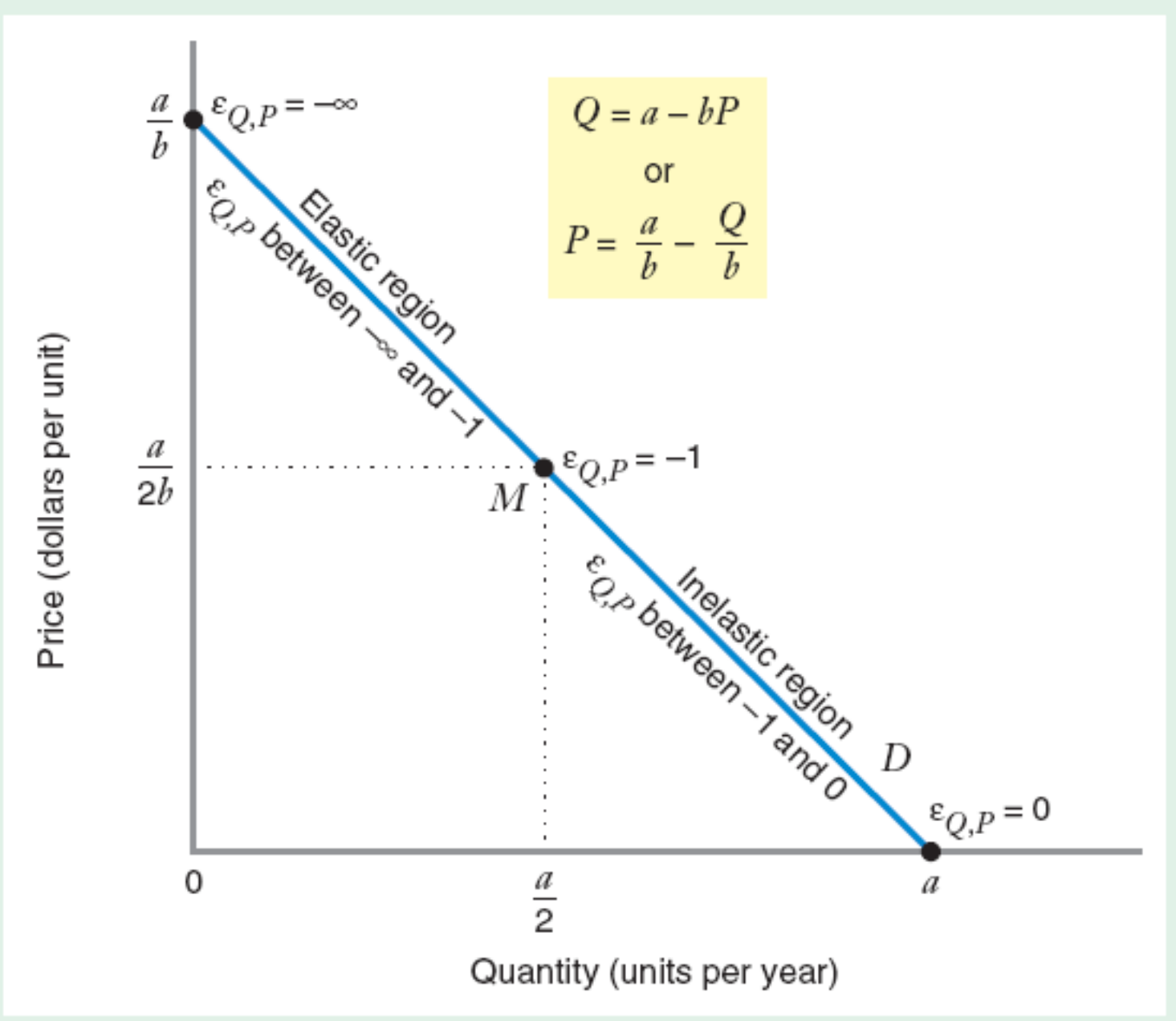
P falls by 2 → Q increases by 10
Change in Q / change in P = 10 / -2 = -5

% Change in Q / %change in P =

$$\varepsilon_{Q,P} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\frac{10}{20}}{\frac{-2}{6}} = \frac{10}{-2}\frac{6}{20} = -1.5$$

Will this happen for every demand function?

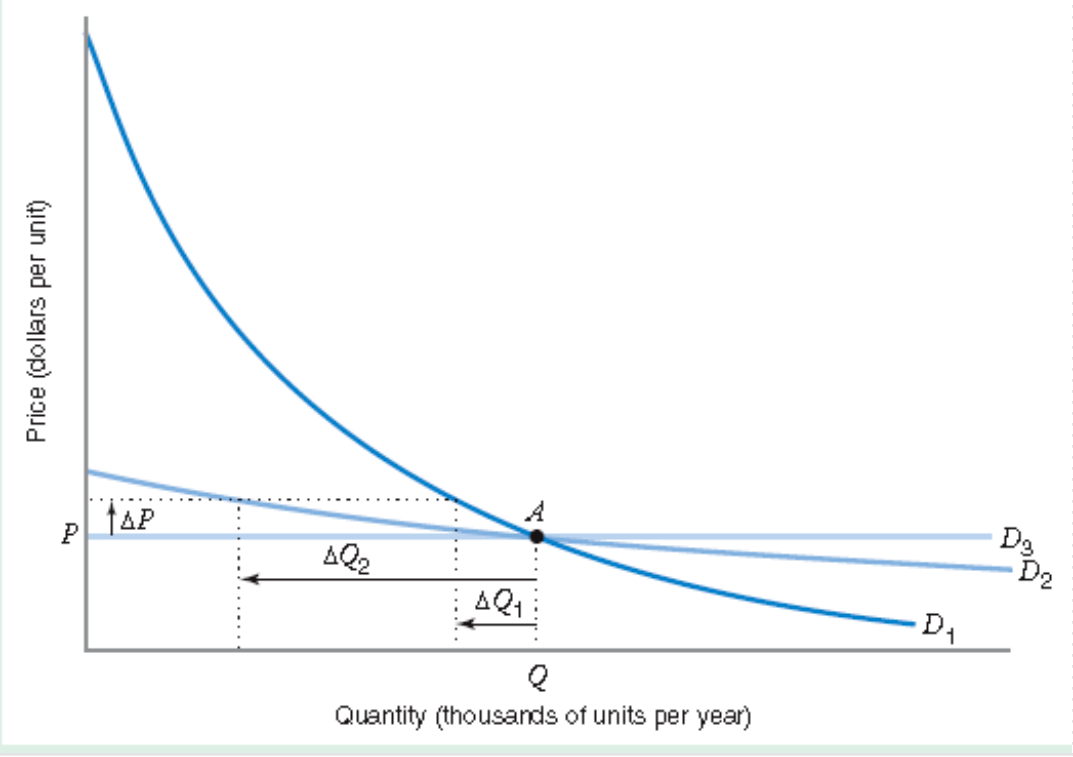
Example


$Q = a - bP$
or
$P = \frac{a}{b} - \frac{Q}{b}$
$\frac{a}{b}$
$\varepsilon_{Q,P} = -\infty$
$\varepsilon_{Q,P}$ between $-\infty$ and -1
Elastic region
$\frac{a}{2b}$
$\varepsilon_{Q,P} = -1$
M
$\varepsilon_{Q,P}$ between -1 and 0
Inelastic region
D
$\varepsilon_{Q,P} = 0$
Price (dollars per unit)
0
$\frac{a}{2}$
a
Quantity (units per year)

Example

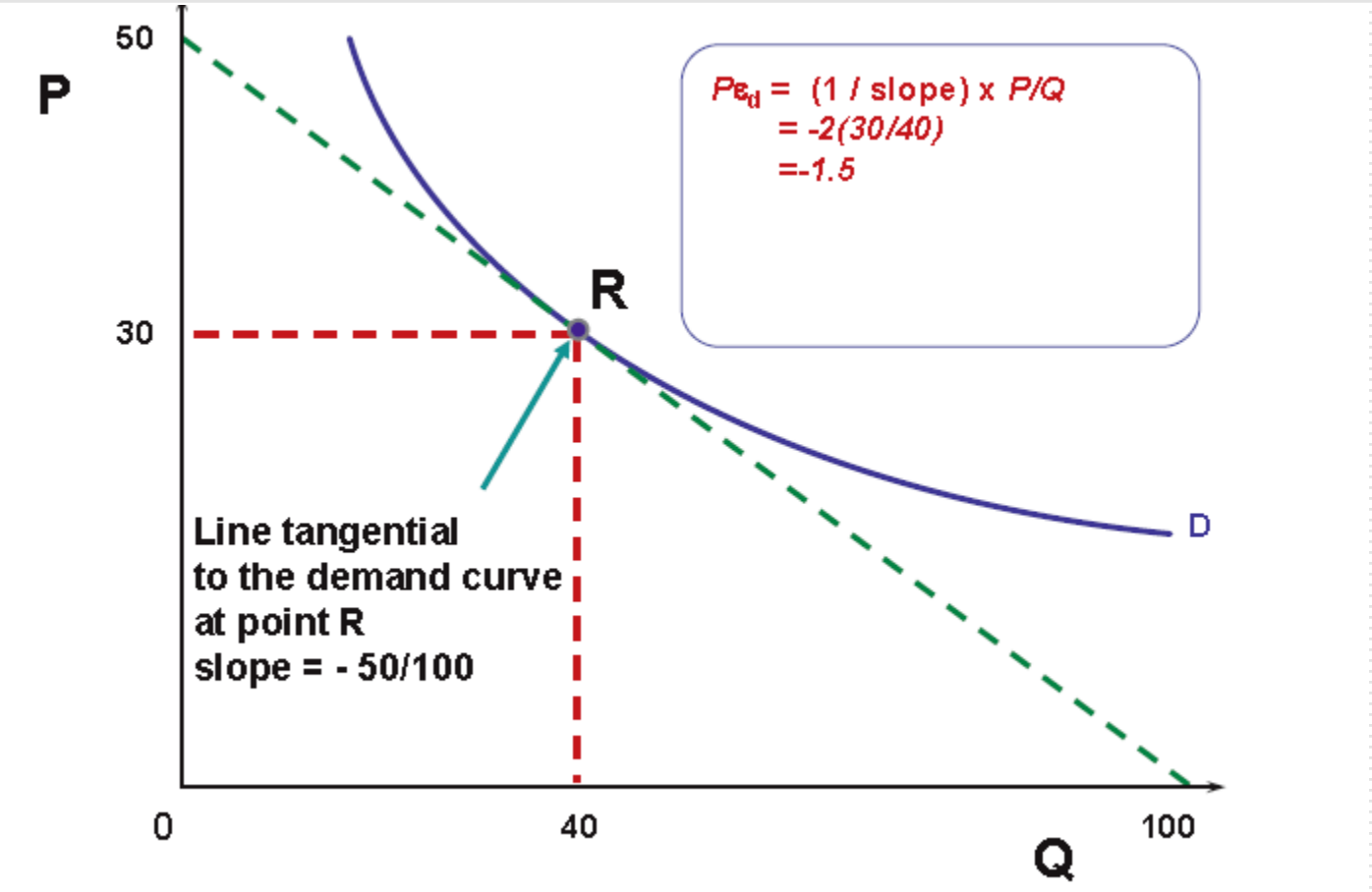
$$\epsilon_{Q,P} = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$$

Comparing the price-elasticity of demand on different demand curves



Example

$$\epsilon_{Q,P} = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$$



4. Price Elasticity of Demand

Value of $\epsilon_{Q,P}$	Classification	Meaning
	Perfectly inelastic demand	Quantity demanded is completely insensitive to price.
	Inelastic demand	Quantity demanded is relatively insensitive to price.
	Unitary elastic demand	Percentage increase in quantity demanded is equal to percentage decrease in price.
	Elastic demand	Quantity demanded is relatively sensitive to price.
	Perfectly elastic demand	Any increase in price results in quantity demanded decreasing to zero, and any decrease in price results in quantity demanded increasing to infinity.

4. Price Elasticity of Demand (intuition)

- When demand is elastic, increase in q offsets the fall in price, increasing revenue.

- When demand is inelastic, increase in p offsets the fall in q, increasing revenue.

- When demand is unit-elastic, revenue is maximum.

Note: Revenue = Consumer Expenditure = P*Q

4. Price Elasticity of Demand

Price Elasticity of Demand for Selected Products, Chicago, 1990s

Category	Estimated $\varepsilon_{Q,P}$
Soft Drinks	-3.18
Canned Seafood	-1.79
Canned Soup	-1.62
Cookies	-1.6
Breakfast Cereal	-0.2
Toilet Paper	-2.42
Laundry Detergent	-1.58
Toothpaste	-0.45
Snack Crackers	-0.86
Cigarretes	-0.10
Paper Towels	-0.05
Dish Detergent	-0.74
Fabric Softener	-0.73

4. More Elasticities

* **Income Elasticity of demand** is the percentage change in quantity demanded, brought about by a 1 percent change in income

$$\varepsilon_{Q,I} = \frac{\%\ \text{change in quantity}}{\%\ \text{change in income}} = \frac{\frac{\Delta Q}{Q} * 100\%}{\frac{\Delta I}{I} * 100\%}$$

$$\varepsilon_{Q,I} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta I}{I}} = \frac{\Delta Q}{\Delta I}\frac{I}{Q}$$

4. More Elasticities

*** Cross-Price Elasticity of demand** is the percentage change in quantity of good i demanded, brought about by a 1 percent change of the price of good j.

$$\varepsilon_{Q,I} = \frac{\frac{\Delta Q_i}{Q_i}}{\frac{\Delta P_j}{P_j}} = \frac{\Delta Q_i}{\Delta P_j}\frac{P_j}{Q_i}$$

> 0 then…

< 0 then…