

ELASTICITY OF DEMAND

LAW OF DEMAND

- *Law of demand* states that if price of commodity increases quantity demanded will fall and if price of commodity falls quantity will increase.
- *Law of demand* indicates only direction of change in quantity demanded in response to change in price but *ELASTICITY OF DEMAND* states with how much or to what extent the quantity demanded will change in response to change in price.

Elasticity – the concept

- If price rises by 10% - what happens to demand?
- We know demand will fall
- By more than 10%?
- By less than 10%?
- **Elasticity measures the extent to which demand will change**

The Law of Demand simply explains the inverse relationship between Price and Demand. In other words it tells us the ***direction of change in Price and Quantity demanded***.

In order to understand the ***quantitative changes in Price and Demand***, we need to study the concept of Elasticity of Demand.

Elasticity is an index of reaction.

There are 3 types of Elasticity of Demand

1. Price Elasticity of Demand
2. Income Elasticity of Demand
3. Cross Elasticity of Demand

Price Elasticity of Demand

It is generally defined as the responsiveness of demand to a given change in price of a commodity. Price Elasticity of Demand is a ratio of two pure numbers, the numerator is the percentage in quantity demanded and the denominator is the percentage change in price of the commodity

PRICE ELASTICITY OF DEMAND

DEFINITION:

The **Elasticity of Demand** measures the percentage change in quantity demanded for a percentage change in the price.

PRICE ELASTICITY OF DEMAND (cont.)

FORMULA:

$$\epsilon_d = \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Price}}$$

$$\epsilon_d = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1}$$

Q1= Original or Old Demand

Q2= New Demand

P1= Old Price

P2= New Price

Examples

- Assume
 - The price of X falls by 2% and the quantity demanded increases by 6%
 - Then the price elasticity of demand for X is

$$\frac{6}{-2} = -3$$

Computing the Price Elasticity of Demand

Example: If the price of an ice cream cone increases from \$2.00 to \$2.20 and the amount you buy falls from 10 to 8 cones then your elasticity of demand would be calculated as:

$$\frac{8 - 10}{10} \times \frac{2}{2.20 - 2} = 2$$

Computing the Price Elasticity of Demand

If the price of LUX Soap decreases from Rs.40.00 to Rs.25.00 and the amount you buy rises from 10 to 20 soaps then your elasticity of demand would be calculated as:

$$\frac{20 - 10}{10} \times \frac{40}{25 - 40} = 2.6$$

Computing the Price Elasticity of Demand

If the price of Movie ticket decreases from Rs.100.00 to Rs.80.00 and the amount you buy rises from 2 to 4 tickets then your elasticity of demand would be calculated as:

$$\frac{4 - 2}{2} \times \frac{100}{80 - 100} = 5$$


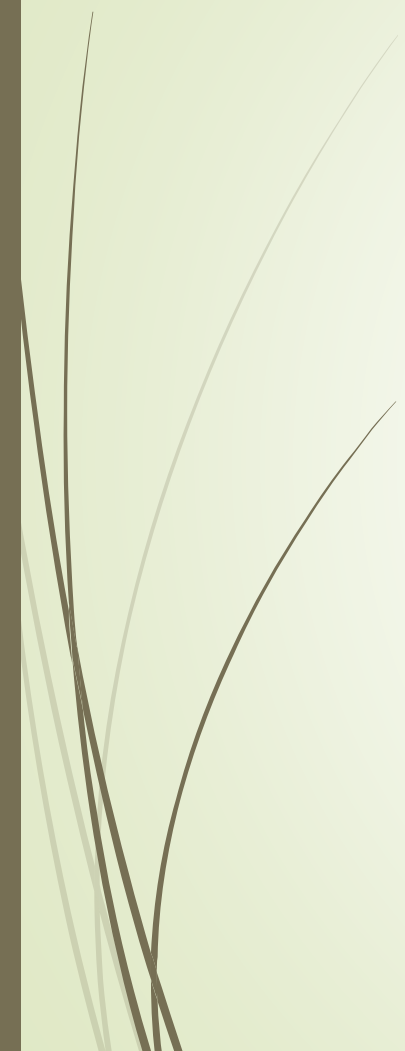
Table-2: Demand Schedule

Price per unit (₹)	Quantity Demanded(units)
60	100
70	90

$E_d =$

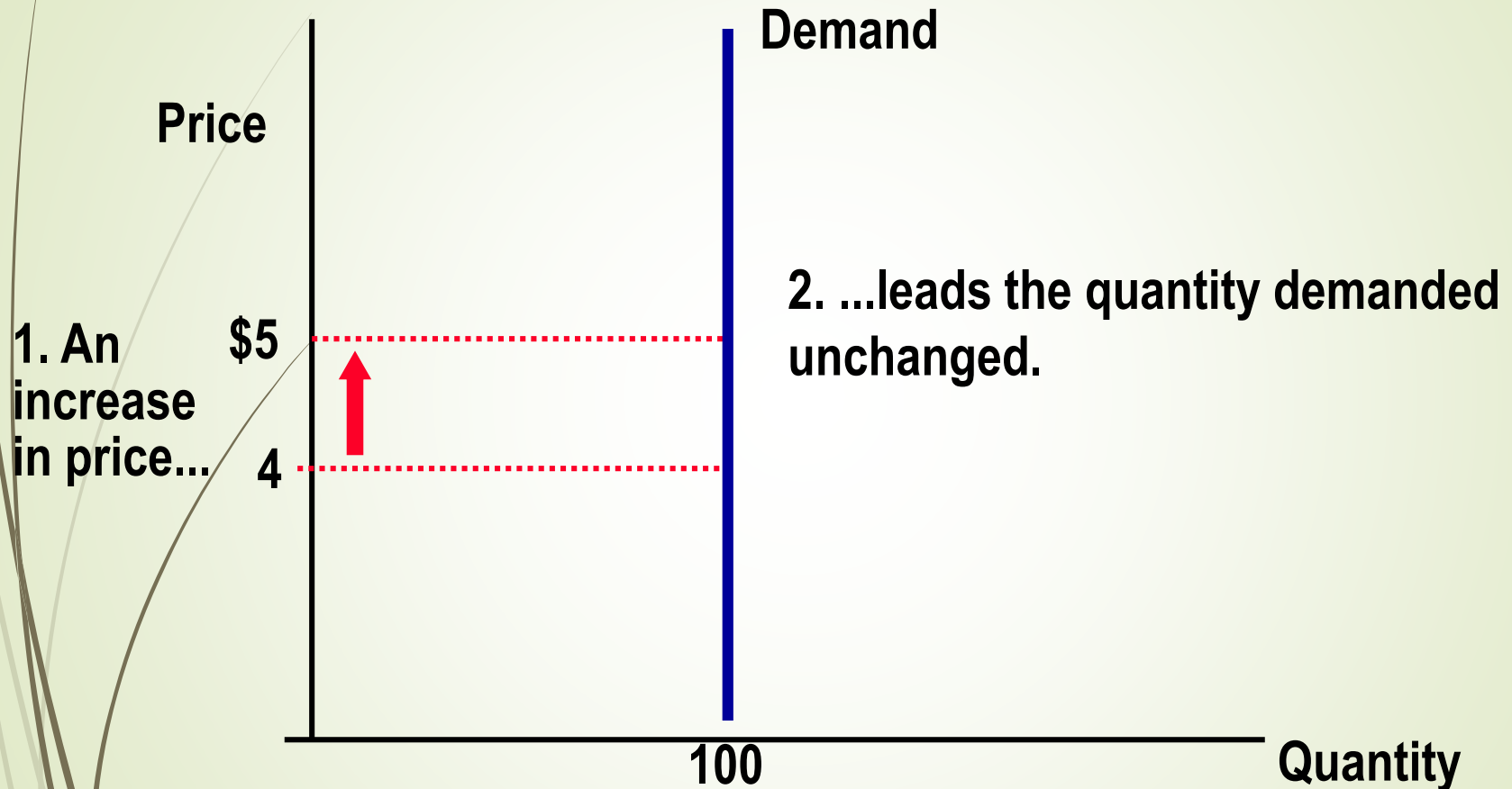
Types of price elasticity of demand



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- ➡ A perfectly inelastic demand is one when there is **no change in the demand of a product with whatever changes in its price.**
 - ➡ $E_d = 0$

Perfectly Inelastic Demand

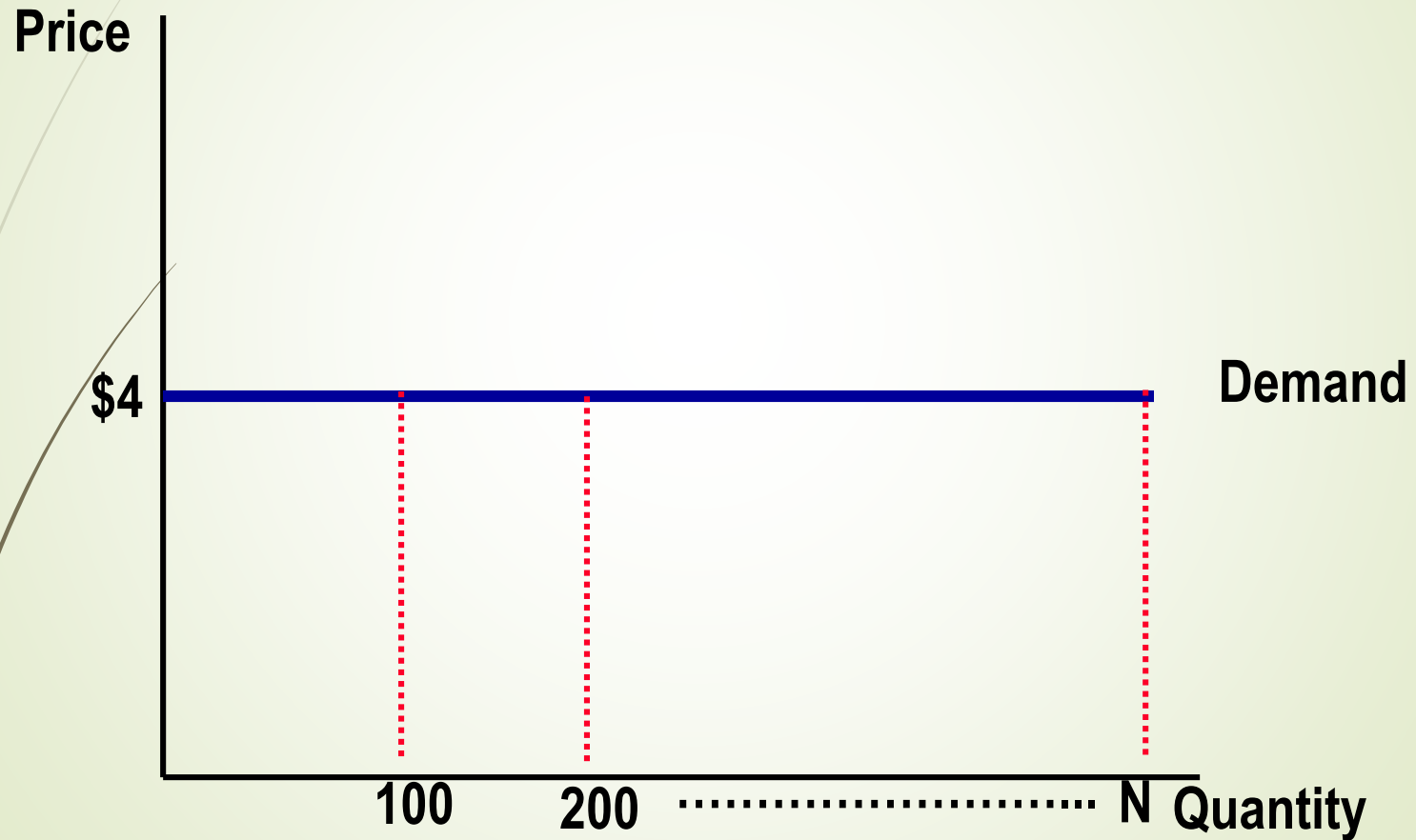
- Elasticity equals 0



Perfectly elastic demand

When there is no change in price of a product causes a **infinite change** in its demand, it is said to be perfectly elastic demand.
 $E_d = \text{Infinity}$

Perfectly Elastic Demand

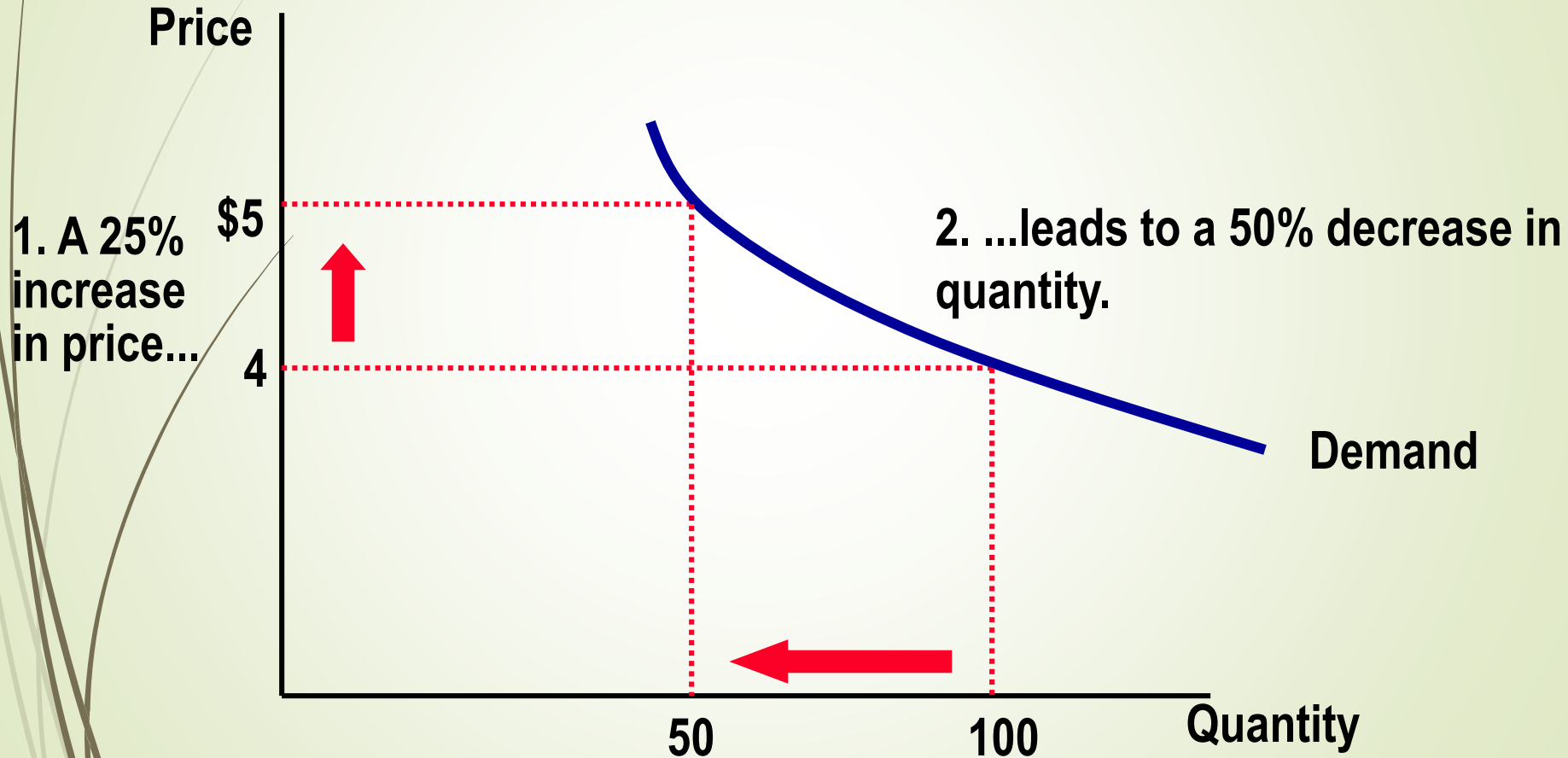


Relatively elastic demand

Relatively elastic demand refers to the demand when the proportionate change in demand is **greater than** the proportionate change in price of a product

$$E_d > 1$$

Elastic Demand

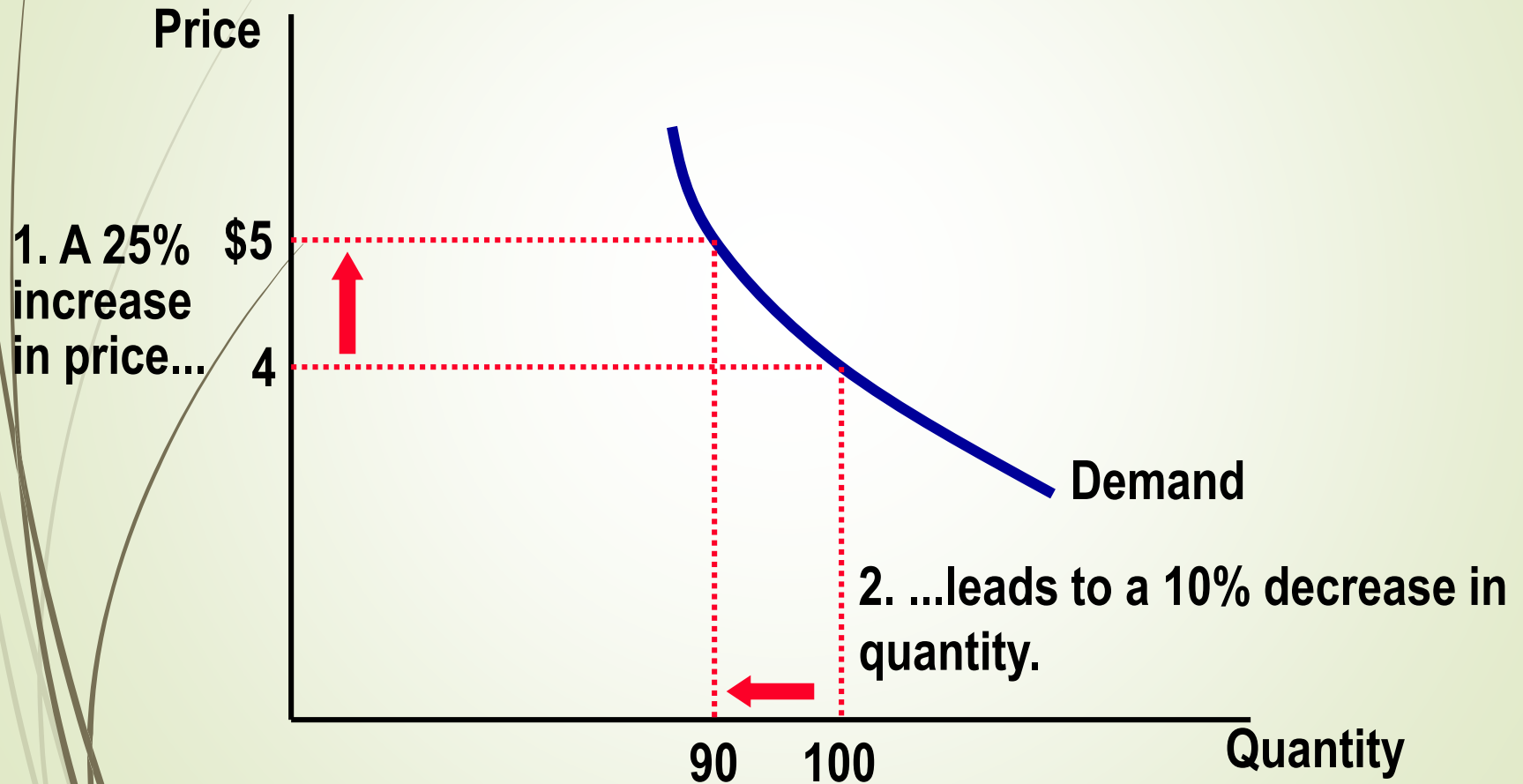


Relatively inelastic demand

Relatively inelastic demand is one when the **percentage change in demand is less than the percentage change in the price of a product.**

$$E_d < 1$$

Relatively Inelastic Demand





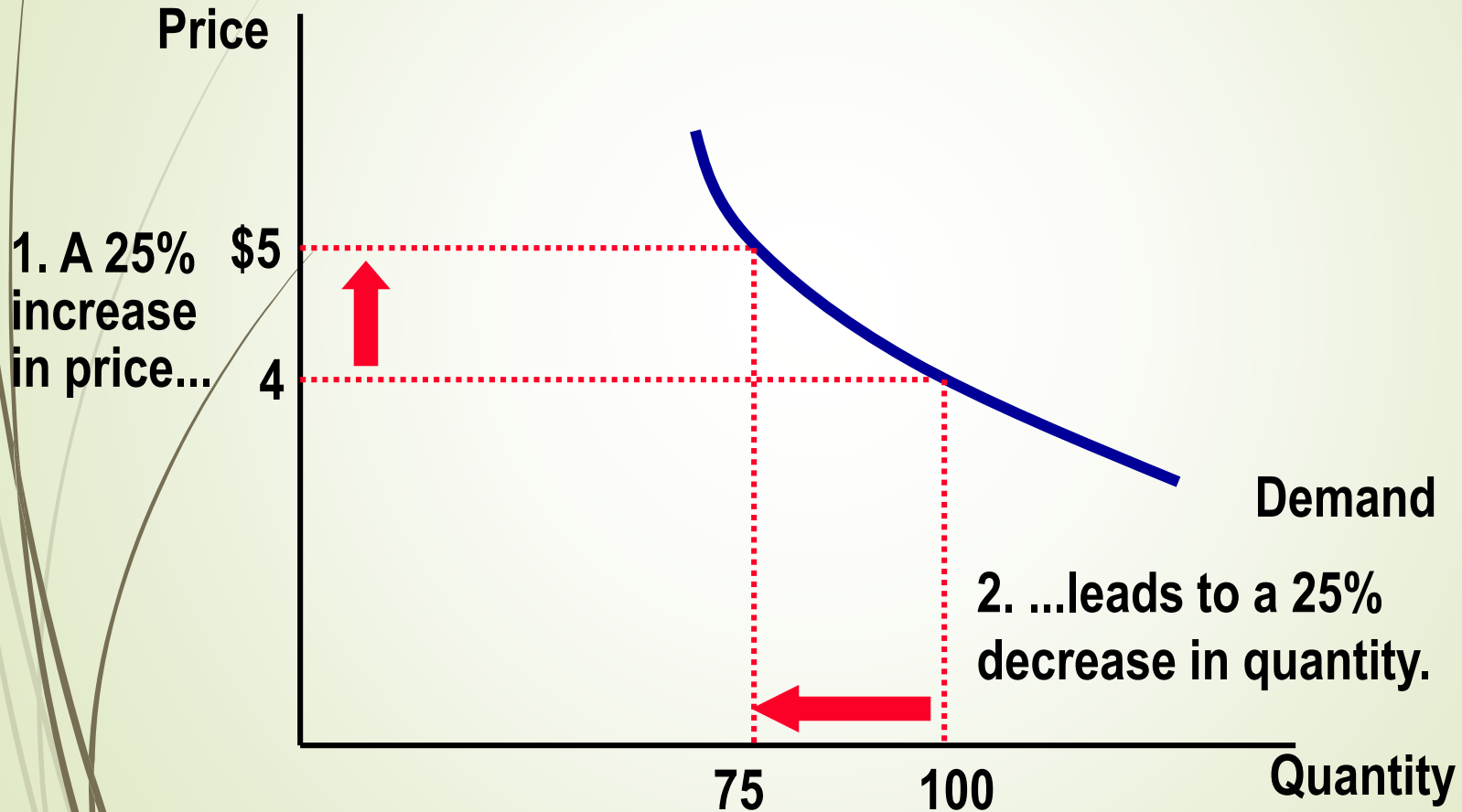
Unitary elastic demand

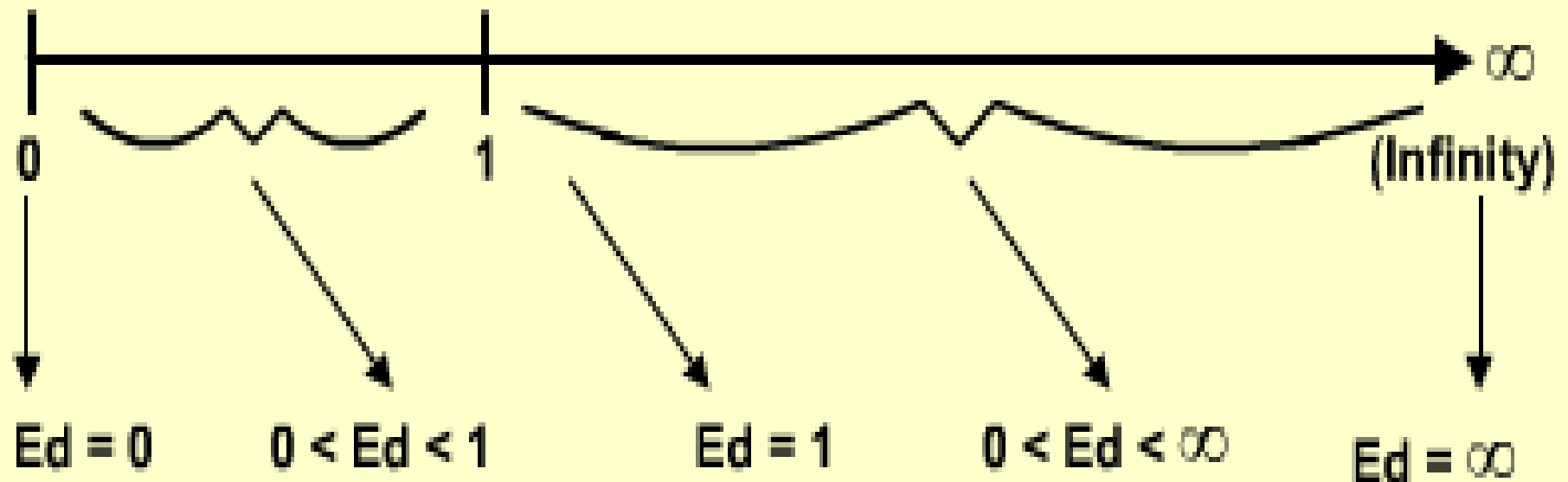
When the proportionate change in demand is **equal** to change in the price of the product

$$E_d = 1$$

Unit Elastic Demand

- Elasticity equals 1





Perfectly
Inelastic

Inelastic
Demand

Unitary
Elasticity

Elastic
Demand

Perfectly
Elastic

$$\% \Delta Q_d = 0$$

$$\% \Delta Q_d < \% \Delta Q_P$$

$$\% \Delta Q_d = \% \Delta Q_P$$

$$\% \Delta Q_d > \% \Delta Q_P$$

$$\% \Delta Q_d = \infty$$

Whatever
the change
in price

Whatever
the change
in price



Example

- ➡ Price of pens decreases from Rs. 2 to Rs.1 then the demand for pens increase from 40 pens to 50 pens.
- ➡ **Ans: 0.5**
- ➡ **It means Relatively inelastic**

Income Elasticity of Demand

Income Elasticity of Demand

- The income is the other factor that influences the demand for a product.
- Hence, the degree of responsiveness of a change in demand for a product due to the change in the income is known as income elasticity of demand.

INCOME ELASTICITY OF DEMAND (cont.)

FORMULA:

$$\epsilon_Y = \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Income}}$$

$$\epsilon_Y = \frac{Q_2 - Q_1}{Q_1} \times \frac{Y_1}{Y_2 - Y_1}$$

Q1= Original or Old Demand


Q2= New Demand

Y1= Original or Old Income

Y2= New Income

Income Elasticity of Demand

- Income elasticity (**in absolute sense**) can be:
 - 1) Greater than 1 (normal good, income elastic)
 - **luxury goods** - ocean cruises, jewelry
 - 2) Between zero and 1 (normal good, income inelastic)
 - **necessities** - food, clothing
 - 3) Less than zero (**inferior good**)
 - potatoes, rice

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- Let's say the economy is booming and everyone's income rises by 400%. Because people have extra money, the quantity of Ferraris demanded increases by 15%.
 - **Income Elasticity = 15% / 400% = 0.0375**

Calculate the income elasticity of demand for X when the income of consumers increases from 200 to 400. then demand increases from 100 to 150 ,What type of product is X

$$\frac{150 - 100}{100} \times \frac{200}{400 - 200} = 0.5$$

Calculate the income elasticity of demand for X when the income of consumers decreases from 500 to 400. then demand increases from 100 to 120 ,What type of product is Z

$$\frac{120 - 100}{100} \times \frac{500}{400 - 500} = -1$$

Cross Elasticity of Demand

Cross Elasticity of Demand

- The cross elasticity of demand refers to the change in quantity demanded for one commodity as a result of the change in the price of another commodity.
- This type of elasticity usually arises in the case of the interrelated goods such as substitutes and complementary goods.

CROSS ELASTICITY OF DEMAND

FORMULA:

$$\epsilon_X = \frac{\% \Delta \text{Quantity Demanded of good X}}{\% \Delta \text{Price of good Y}}$$

$$\epsilon_X = \frac{Q_{X2} - Q_{X1}}{Q_{X1}} \times \frac{P_{Y1}}{P_{Y2} - P_{Y1}}$$

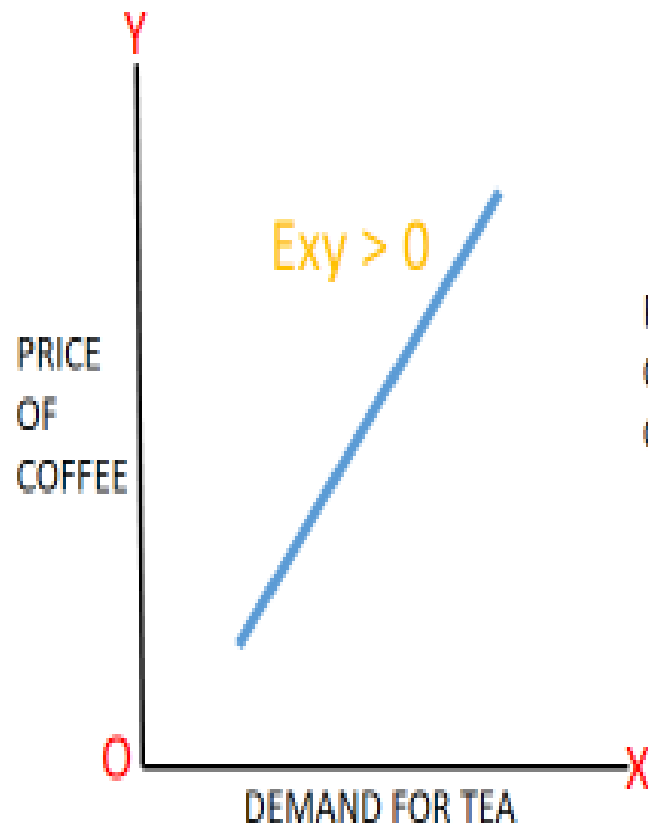
Q_{X1} = Old Demand of X good
 Q_{X2} = New Demand of X good
 P_{Y1} = Old Price of Y good
 P_{Y2} = New Price of Y good

Understanding the Coefficient of Cross Price Elasticity

The stronger the relationship between two products, the higher is the co-efficient of cross-price elasticity of demand

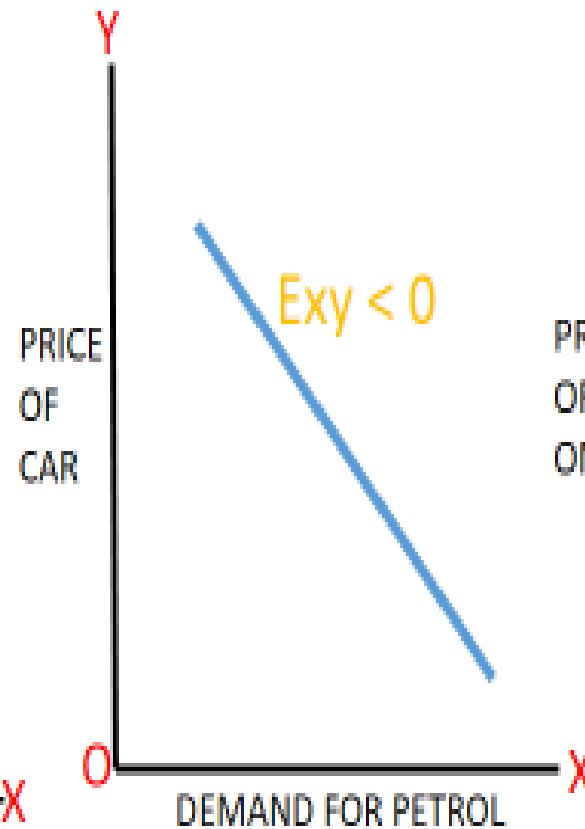
- **Substitutes:**
 - **Close substitutes** have a strongly **positive** cross price elasticity of demand i.e. a small change in relative price causes a big switch in consumer demand
- **Complements:**
 - When there is a strong complementary relationship, the cross elasticity will be highly **negative**.
 - An example might be games consoles and software games
- **Unrelated products:**
 - Unrelated products have **zero** cross elasticity e.g. the effect of changes in taxi fares on the market demand for cheese!

SUBSTITUTE GOODS



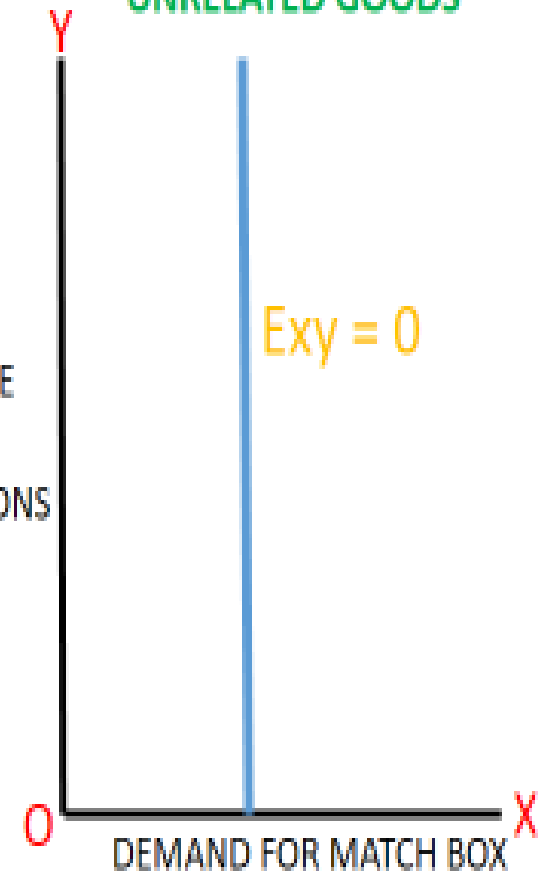
Cross Elasticity in case of
Substitutes
Is **POSITIVE**

COMPLEMENTARY GOODS



Cross Elasticity in case of
Complementary goods
Is **NEGATIVE**

UNRELATED GOODS



Cross Elasticity in case of
Unrelated goods
Is **ZERO**

Computing the Cross Elasticity of Demand



Example: If the price of X cone increases from Rs. 10 to 50 and the amount demand of Y falls from 10 to 8 then what is your cross elasticity of demand, what is the nature of X and Y :

$$\frac{8 - 10}{10} \times \frac{10}{50 - 10} = -0.05$$

Computing the Price Elasticity of Demand

If the price of Z decreases from Rs. 100 to Rs.80 and the amount of demand of P falls from 25 to 10 units then what is your cross elasticity of demand, what is the nature of Z and P :

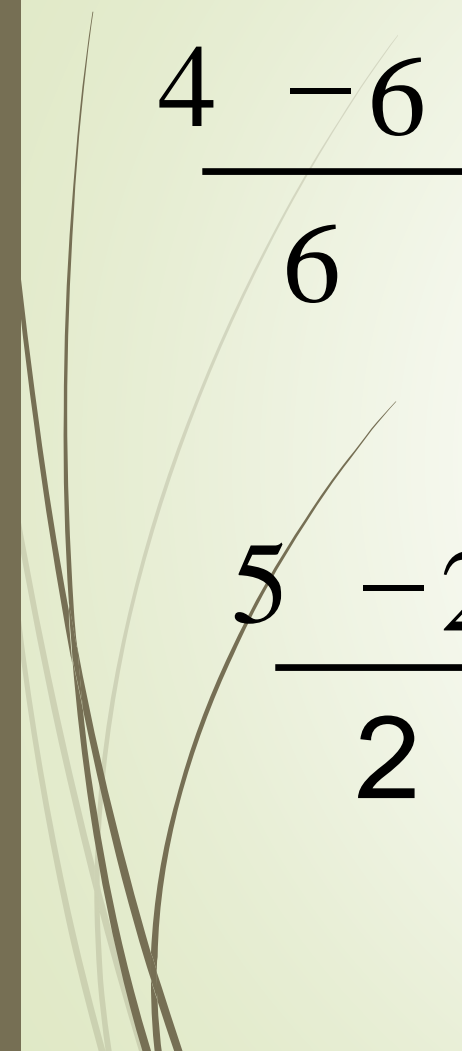

$$\frac{10-25}{25} \times \frac{100}{80-100} = 3$$



Price of Computer	Quantity Demanded
40000	8
48000	6
50000	5
54000	4
60000	2

1) Calculate the elasticity, when price of computer increases from 48000 to 54000

2) Calculate the elasticity, when price of computer decreases from 60000 to 50000


$$\frac{4 - 6}{6} X \frac{480000}{54000 - 48000} = 2.6$$

$$\frac{5 - 2}{2} X \frac{60000}{54000 - 48000} = 9$$

- 
- Consider change in demand of a commodity as 20% when price changes by 40%. Calculate elasticity.

FORMULA:

$$\epsilon_Y = \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Price}}$$

- 20/40

- 0.5

- ▶ The price of a small engineering component decreases from Rs.6 to Rs. 4 and quantity demanded increases from 10 units to 15 units. Calculate elasticity.

$$\epsilon_d = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1}$$

$$\frac{15 - 10}{10} \times \frac{6}{4 - 6}$$
$$= 1.5$$

- When income of a consumer increases by 30% demand also increases by 30%. What is the elasticity of demand?

FORMULA:


$$\epsilon_Y = \frac{\% \Delta \text{Quantity Demanded}}{\% \Delta \text{Income}}$$

- 30/30

- = 1

- Quantity demanded of an engineering component X increases from 800 to 1200 units, due to increase in price of another Component Y in the market increases from Rs.2300 to Rs.2700. calculate elasticity.

$$\frac{Q_{x2} - Q_{x1}}{Q_{x1}} \times \frac{P_{y1}}{P_{y2} - P_{y1}}$$
$$\frac{1200 - 800}{800} \times \frac{2300}{2700 - 2300}$$
$$= 2.87$$



commodity	Original Price (Rs.)	New Price (Rs.)	Original demand (Kg)	New demand (Kg)
A	10	11	50	45
B	2	1.2	10	18
C	90	92	40	35
D	5	6	25	22

- Find elasticity of demand for each commodity.
- Show that each commodity obeys the law of demand.
- Which commodity has the greatest elasticity, and which the least?

➔ For A

$$\epsilon_d = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1}$$

$$\frac{45 - 50}{50} \times \frac{10}{11 - 10}$$
$$= 1$$

For B

$$\epsilon_d = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1}$$

$$\frac{18 - 10}{10} \times \frac{2}{1.2 - 2}$$
$$= 2$$

➡ For C

$$\epsilon_d = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1}$$

$$\frac{35 - 40}{40} \times \frac{90}{92 - 90}$$

$$= 5.6$$

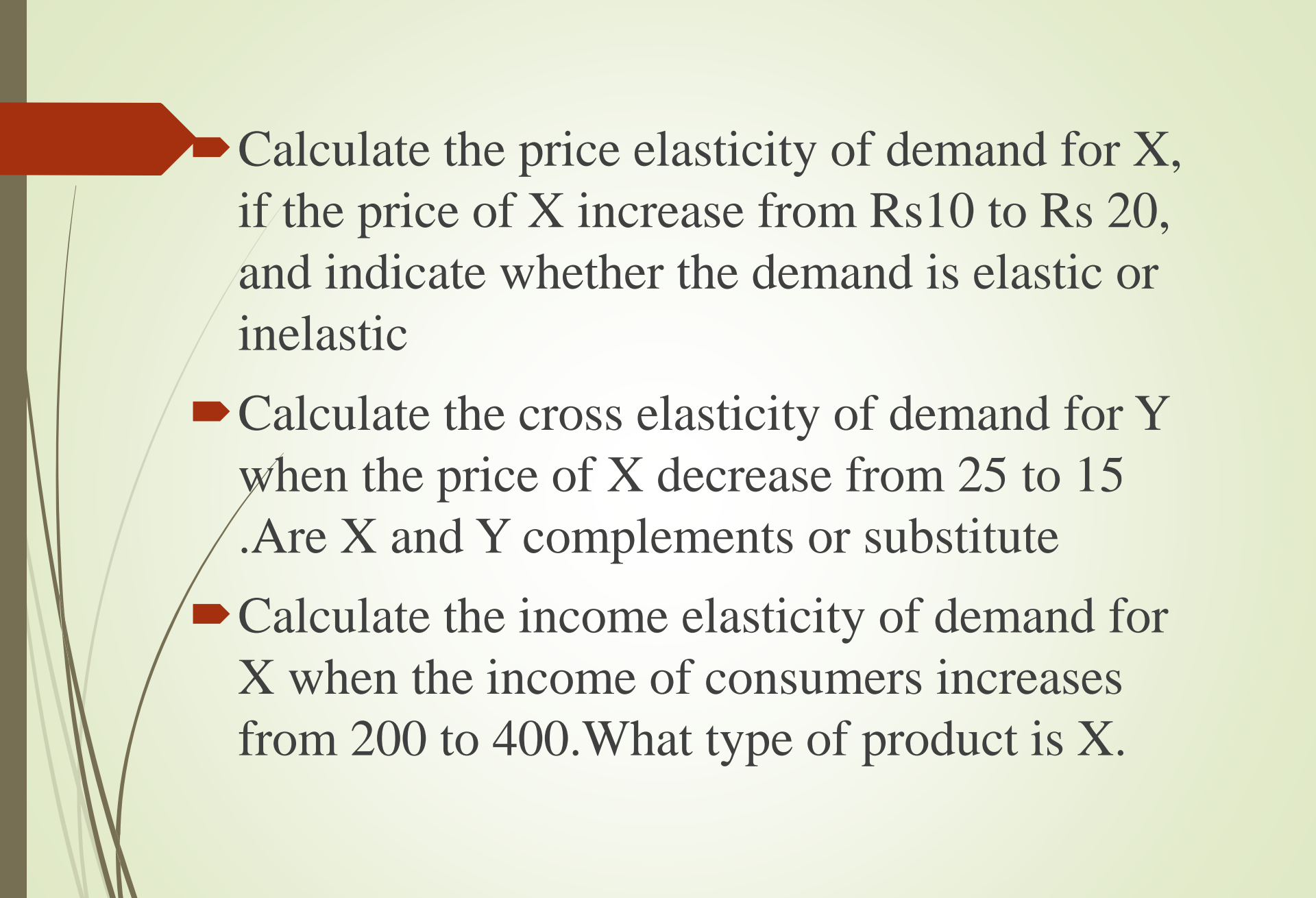
➡ For D


$$\epsilon_d = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1}$$

$$\frac{22 - 25}{25} \times \frac{5}{6 - 5}$$

$$= 0.6$$

Price of X	Demand for X	Demand for Y	Income
25	10	5	100
20	20	10	200
15	30	15	300
10	40	20	400

- 
- ➡ Calculate the price elasticity of demand for X, if the price of X increase from Rs10 to Rs 20, and indicate whether the demand is elastic or inelastic
 - ➡ Calculate the cross elasticity of demand for Y when the price of X decrease from 25 to 15 .Are X and Y complements or substitute
 - ➡ Calculate the income elasticity of demand for X when the income of consumers increases from 200 to 400.What type of product is X.


$$\frac{20 - 40}{40} \times \frac{10}{20 - 10}$$

$$E_p = 20/40 \times 10/10$$

$$E_p = 0.5$$

Inelastic demand


$$Q_{y2} - Q_{y1}$$

$$\frac{\quad}{Q_{y1}}$$

$$\times$$

$$P_{x1}$$

$$\frac{\quad}{P_{x2} - P_{x1}}$$

$$15 - 5$$

$$\frac{\quad}{5}$$

$$\times$$

$$25$$

$$\frac{\quad}{15 - 25}$$


$$5$$

$$15 - 25$$

$$E_p = 10/5 \times 25/-10$$

$$E_p = 2 \times -2.5$$

$$E_p = -5 \text{ (Complementary Goods)}$$


$$\frac{Q_2 - Q_1}{Q_1} \times \frac{Y_1}{Y_2 - Y_1}$$

$$\frac{40 - 20}{20} \times \frac{200}{400 - 200}$$

- $E_p = 20 / 20 \times 200 / 200$
- $E_p = 1$
- Since its equal to 1 and positive , so A is Normal good