Demand Analysis

1. Question: Demand (Q) is Q - 110 =   - 4P, where P is Price. What is price elasticity at   P=Rs. 5? Comment on the result.

Solution:
Given: Q - 110 =   - 4P

Or, Q = 110 - 4P

When P=5,

Q = 110- 4x 5 = 90

Further, dQ/dP = -4

Price elasticity of demand (e_p)= $\dfrac{dQ}{dP} * \dfrac{P}{Q}$

or, e_p (at   p=5   )= $-4 * \dfrac{5}{9}$

or, e_p (at p=5) = - 2/9

Here, $\lfloor e_P \rfloor = \lfloor -2/9 \rfloor = \dfrac{2}{9}$ lies between 0 and 1. Hence price demand is inelastic.

2. Question: The accompanying table shows the price and monthly quantity sold of Arrow T-shirts in the town   according to the average income of the city newly employed youth.

Price of T-shirt (Rs)	Quantity of T-shirts demanded when the average income of newly employed youth is Rs. 20,000	Quantity of T-shirts demanded when the average income of newly employed youth is Rs, 30,000
400	3,000	5,000
5 00	2,400	4,200
6 00	1,600	3,000
700	800	1,800

 a. Calculate the price elasticity of demand when the price of a T-shirt rises from Rs. 500 to Rs.600 and the average income is Rs. 20,000. Also calculate it when the average income is Rs. 30,000.

b. Calculate the income elasticity of demand when the price of a T-shirt is Rs. 400 and the average income increases from Rs. 20,000 to Rs. 30,000. Also calculate it when the price is Rs.700.

    a. **When Income is Rs. 20,000**

Initial Price (P_1) = Rs. 500

Initial Demand (Q_1) = 2400

Final price (P_2) = Rs 600

Final Demand (Q_2) = 1,600

Price Elasticity (e_p)

e_p = **Proportionate change in quantity demanded ÷ proportionate change in price**

$$\text{Or,} \quad e_{p=} \frac{dQ}{dP} * \frac{P}{Q}$$

$$\text{or,} \quad e_P = \left(\frac{1600-2400}{600-500}\right) * \left(\frac{500}{2400}\right)$$

$$e_P = \text{-1.66}$$

Here, $\lfloor e_P \rfloor = \lfloor -1.66 \rfloor = 1.66$ lies between 1 and ∞. Hence price demand is elastic.

Similarly calculate e_p, when income is Rs. 30000

    b. **When price is** Rs. 400.

    c.

        Initial Income (Y_1) = Rs. 20000

        Initial Demand (Q_1) = 3000

        Final Income (Y_2) = Rs 30000

        Final Demand (Q_2) = 5000

        Income Elasticity (e_Y)

e_y = Proportionate change in quantity demanded ÷ proportionate change in income of consumers

or, $e_{y=} \frac{dQ}{dY} * \frac{Y}{Q}$

or, $e_Y = \left(\frac{5000-3000}{3000-2000}\right) * \left(\frac{2000}{3000}\right)$

$e_y = 1.33$

Here, $e_y = 1.33$ lies between 1 and ∞. Hence income demand is elastic.

Similarly calculate e_y when price is Rs.700

3. Question: The accompanying table lists the cross-price elasticities of demand for several goods, where the percent quantity change is measured for the first good of the pair, and the percent price change is measured for the second good.

Goods	Cross-price elasticities of demand
Air-conditioning units and kilowatts of electricity	-0.34
Coke and Pepsi	+0.63
High-fuel-consuming long distance traveling car and diesel	-0.28
Domino's Pizza and Jasuben's Pizza in Law Garden	+0.82
Butter and Ghee	+1.54

a. Explain the sign of each of the cross-price elasticities. What does it imply about the relationship between the two goods in question?

b. Compare the absolute values of the cross-price elasticities and explain their magnitudes. For example, why is the cross-price elasticity of Domino's Pizza and Jasuben's Pizza less than the cross-price elasticity of Butter and Ghee ?
c. Use the information in the table to calculate how a 5% increase in the price of Pepsi affects the quantity of Coke demanded.
d. Use the information in the table to calculate how a 10% decrease in the price of diesel affects the quantity of long-distance diesel car demanded.

Solution:
a. A negative cross-price elasticity of demand implies that the two goods are complements.
 So air-conditioning units and kilowatts of electricity are gross complements, as are sport-utility vehicles and gasoline.

A positive cross-price elasticity of demand implies that the two goods are gross substitutes. So Coke and Pepsi are gross substitutes, as are McDonald's and Burger King burgers as well as butter and margarine.

b. The larger (and positive) the cross-price elasticity of demand is, the more closely the two goods are gross substitutes. Since the cross-price elasticity of butter and ghee is larger than the cross-price elasticity of McDonald's Pizza and Jasben's Pizza, butter and ghee   are closer gross substitutes than are McDonald's Pizza and Jasben's Pizza.

Similarly, the greater (and negative) the cross-price elasticity of demand is, the more strongly the two goods are gross complements.

c. A cross-price elasticity of 0.63 implies that a 1% increase in the price of Pepsi would increase the quantity of Coke demanded by 0.63%.

Therefore, a 5% increase in the price of Pepsi would increase the quantity of Coke demanded by five times as much, that is, by 5 × 0.63% = 3.15%.

d. A cross-price elasticity of −0.28 implies that a 1% fall in the price of gasoline would increase the quantity of long distance diesel car by demanded by 0.28%. Therefore, a 10% fall in the price of gasoline would increase the quantity of demanded of long distance diesel car by 10 times as much, that is, by 10 × 0.28% = 2.8%.

5. **Question: The price elasticity of demand for wheat is unit elastic. A household of 8 individuals demands 40 kgs of wheat at price 25 per kg. On what price the household will demand 36 kgs of wheat?**

Solution:
Here,
Initial Price (P₁) = Rs. 25 per kg of wheat

Initial Demand (Q₁) = 40 kg

Final price (P₂) =?

Final Demand (Q₂) = 36 kg

Further,   Price elasticity is unity.

i.e $e_P = -1$

Or, $\dfrac{dQ}{dP} * \dfrac{P}{Q} = -1$ (as, in normal situation , demand varies inversely with orice)

, or, $\dfrac{36-40}{P_2-25} * \dfrac{25}{40}$ = -1

Or, $P_2 = 27.5$

Hence, at price Rs 27.5 the household will demand 36 kgs of wheat.

6. **FlipKart offers a 10% discount on every book it sells.**

Volume of sales before the 10% discount	
	1.55 million
Volume of sales after the 10% discount	1.65 million

Calculate price elasticity of demand.

Solution:

Given
Initial Demand (Q1) = 1.55 million

Final price (P2) =1.55 million

Change in price = - 10 %

e_p = **Proportionate change in quantity demanded ÷ proportionate change in price**

Or, $e_{p=} \dfrac{dQ}{Q} \div \dfrac{dP}{Qp}$

$e_p = \left(\dfrac{1.65-1.55}{1.55} \right) \% \div (-10\%)$

e_p = **-** 0.0065

7. **Question:** Amazon.com, the online bookseller, wants to increase its total revenue. One strategy is to offer a 10% discount on every book it sells. Amazon.com knows that its customers can be divided into two

distinct groups according to their likely responses to the discount. The accompanying table shows how the two groups respond to the discount.

	Group A (sales per week)	Group B (sales per week)
Volume of sales before the 10% discount	1.55 million	1.55 million
Volume of sales after the 10% discount	1.65 million	1.70 million

a. Compare the price elasticities of demand for group A and group B.

b. Suppose Amazon.com knows which group each customer belongs to when he logs on and can choose whether or not to offer the 10% discount. If Amazon.com wants to increase its total revenue, should discounts be offered to group A or to group B, to neither group, or to both groups?

8. **Question: The price elasticity of product X is twice that of Y. If price of X decreases by 5% and that of Y increases by 5% find out the quantity demanded (increase or decrease) for X and Y.**

Solution:

Given,

Price elasticity of product X= 2 Price elasticity of product Y

Price elasticity of product X= 2 Price elasticity of product Y

(Price elasticity of product Y) ÷(Price elasticity of product X) = 1 ÷ 2

Hence, Price elasticity of product Y = -1

Or, $\left(\dfrac{Percentaage\ change\ in\ quantity\ demanded\ of\ Y}{percentage\ change\ in\ price\ of\ Y} \right) = -1$

or, $\left(\dfrac{Percentaage\ change\ in\ quantity\ demanded\ of\ Y}{5\%} \right) = -1$

Hence, $Percentaage\ change\ in\ quantity\ demanded\ of\ Y\ =\ $ -5%

Hence, quantity demanded will fall by 5 %

Therefore,

Price elasticity of product X = 2

$$or, \frac{percentage\ change\ in\ quantity\ demanded\ of\ X}{percentage\ change\ in\ price\ of\ X} = -\ 2$$

$$Or, \frac{percentage\ change\ in\ quantity\ demanded\ of\ X}{-5\%} = -2$$

$$Or, percentage\ change\ in\ quantity\ demanded\ of\ X = 10\ \%$$

Hence quantity demanded will increase by 10 percent.