

# Numericals- Supply and Demand Analysis SET 2

Principles of Economics

# Calculation

- When you calculate:
  - Price elasticity- quantity should change due to change in price of the good only- income and prices of other goods should be constant
  - Cross price elasticity- quantity should change due to change in price of another good only- income, price of the good and price of any other good considered should be constant
  - Income elasticity- quantity should change due to change in income only- price of the good and prices of other goods should be constant

# Calculation

- When we say- find the **arc elasticity** (even if direction of price or quantity change has been given)- we need to use the mid point formula.

1. The supply schedule for oranges is given below:

Price (Rs./dozen)	Quantity Supplied (1000 dozen)
6	10
7	20
8	30
9	40
10	50

What is the arc price elasticity of supply for oranges when the price increases from Rs. 7 to Rs. 8?

- Solution:
- $P_1 = 7, P_2 = 8, Q_1 = 20, Q_2 = 30$
- $\Delta Q = 10, \Delta P = 1$
- $e_{ps} = (10/1) \times [(7+8)/(20+30)]$   
 $= 10 \times (15/50) = 3$  (elastic)

2. Supply Function:  $Q_s = 500P - 1000$

Calculate price elasticity of supply at a price of Rs. 10.

Answer: 1.25 (elastic)

3. Given the demand schedule, what is the cross price elasticity between good A and B?

Product A		Product B
Price	Quantity Demanded	Price
10	100	20
10	80	40

- Solution:
- Cross price elasticity of demand = % change in demand for good A / % change in price of good B
- $P_{1B} = 20, P_{2B} = 40, Q_{1A} = 100, Q_{2A} = 80$
- $\Delta Q_A = -20, \Delta P_B = 20$
- $e_{AB} = -\frac{20}{20} \times \left[ \frac{(20+40)}{(100+80)} \right]$   
 $= -60/180 = -0.33$   
(complimentary goods)

#### 4. Compute income elasticity of demand using arc elasticity of demand.

Price	Quantity demanded	Consumer income
20	50	12000
30	40	12000
20	40	10000

- Solution:
- Income elasticity of demand= % change in quantity demanded/ % change in income
- We consider the case when income changes but price is fixed
- $I_1 = 12000, I_2 = 10000, Q_1 = 50, Q_2 = 40$
- $\Delta Q = 10, \Delta I = 2000$
- $e_i = (10/2000) \times [(12000+10000)/(50+40)]$   
 $= (10/2000) \times (22000/90) = 11/9 = 1.22$  (elastic)

5. From the following table calculate price elasticity of demand.

Price	Quantity demanded	Consumer income
20	1000	30000
18	1200	24000
16	1450	26000
12	1600	30000
20	1200	32000
12	1600	31000

- Solution:
- We consider the case when price changes but income is fixed
- $P_1 = 20, P_2 = 12, Q_1 = 1000, Q_2 = 1600$
- $\Delta Q = 600, \Delta P = -8$
- $e_p = (600/8) \times [(20+12)/(1000+1600)]$   
 $= -(600/8) \times (32/2600) = -0.923$
- (inelastic)

6. Given the following schedule, find the cross price elasticity of demand between X and Y.

Goods	Before price change		After price change	
	Price (Rs./unit)	Quantity (unit/ month)	Price (Rs./unit)	Quantity (unit/ month)
Y	5	60	4	80
X	2	25	2	15

- Solution:
- Cross price elasticity of demand= % change in demand for good X/ % change in price of good Y
- $P_{1Y}=5, P_{2Y}= 4, Q_{1X}= 25, Q_{2X}= 15$
- $\Delta Q_X= -10, \Delta P_Y= -1$
- $e_{xy} = (-10/-1) \times [5/25]$   
 $= 2$

(substitutes)

7. The following is the demand schedule of goods X and Y. Compute the cross elasticity of demand between X and Y.

Price		Quantity Demanded	
X	Y	X	Y
3.5	2.5	400	550
4	3	450	600
4.5	3.5	425	700
4.5	4	450	650

Answer: 0.42

8. In a year number of cars sold decreased by 20% during the year, prices of cars increased by 5%, per capita income declined by 2% and price of petrol increased by 10%, income elasticity of demand for cars is estimated to be +1.5 and cross price elasticity of petrol and cars is estimated to be -0.30. Find:
- a. The impact of decline in per capita income on demand for cars.
  - b. The impact of increase in price of petrol on demand for cars
  - c. If sales decline because of increase in petrol and decrease in income are 3% and 3% respectively, what is the price elasticity of demand for cars?

a)  $e_i = \% \Delta Q / \% \Delta I$

- $\% \Delta I = -2\%$
- $e_i = 1.5$
- Therefore,  $\% \Delta Q = (-2 \times 1.5)\% = -3\%$
- Therefore, decrease in per capita income caused the sales of cars to decline by 3%

b)  $e_{xy} = \% \Delta Q_x / \% \Delta P_y$

- $\Delta P_y$  (petrol) = 10%
- $e_{xy} = -0.30$
- $\% \Delta Q_x = 10 \times -0.30 = -3$
- Therefore, increase in price of petrol caused the sales of car to decline by 3%

c) Total decline in sales of cars= 20%

- Decline caused by decrease in per capita income and increase in price of petrol= 3+3= 6%
- Therefore,  $20-6= 14\%$  decline in car sales is caused by increase in price of cars
- $e_p = \% \Delta Q / \% \Delta P = -14/5 = -2.8$

9. Demand Function:  $Q_d = 250000 - 35P$

Find the price elasticity of demand between prices Rs. 2000 and Rs. 3000.

Answer: -0.538

10. Demand Function:  $P=2000 - 50Q$

At what price the demand for the good is unitary elastic?

Solution:

$$P = 2000 - 50Q$$

$$\Rightarrow Q = 40 - 0.02P$$

$$\text{Now, given, } e_p = (\partial Q / \partial P) \times (P/Q) = -1$$

$$\Rightarrow -0.02 \times [P / (40 - 0.02P)] = -1$$

$$\Rightarrow 0.02P = 40 - 0.02P$$

$$\Rightarrow 0.04P = 40$$

$$\Rightarrow P = 40 / 0.04 = 1000$$