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CORE CONCEPT OF

BUSINESS MATHMATICS & STATISTICS

1. Illustrate the Index Number.
2. Briefly describe the characteristics of index number.
3. What do you mean by purpose of index number?

Example-19: Compute Laspeyre's, Paasche's, Marshall-Edgeworth's, Dorbish Bowley's, Fisher's Ideal Index Number. Also satisfy the test from the following data:

	Base Year		Current Year	
Items	**Price(Rs.)**	**Quantity**	**Price(Rs.)**	**Quantity**
A	10	30	12	50
B	8	15	10	25
C	6	20	6	30
D	4	10	6	20

Solution-19: Construction of Price Index Number

	Base Year		Current Year		p_0q_0	p_0q_1	p_1q_0	p_1q_1
Items	p_0	q_0	q_0	q_1				
A	10	30	12	50	300	500	360	600
B	8	15	10	25	120	200	150	250
C	6	20	6	30	120	180	120	180
D	4	10	6	20	40	80	60	120
					580	960	690	1150

1) Laspeyre's Method: $(P_{01}) = \left[\frac{\Sigma P1q0}{\Sigma Poq0} * 100\right]$

$(P_{01}) = \left[\frac{690}{580} * 100\right]$ = 1.1896*100= **118.96**

2) **Paasche's Method:** $(P_{01}) = \left[\frac{\Sigma P1q1}{\Sigma Poq1} * 100\right]$

$(P_{01}) = \left[\frac{1150}{960} * 100\right] = 1.1979 =$ **119.79**

3) **Marshall-Edge worth's Method:** $(P_{01}) = \left[\frac{\Sigma P1q0 + \Sigma p1q1}{\Sigma Poq0 + \Sigma P0q1} * 100\right]$

$(P_{01}) = \left[\frac{690+1150}{580+960} * 100\right]$

$(P_{01}) = \left[\frac{1840}{1540} * 100\right] = 1.1948 =$ **119.48**

4) **Dorbish & Bowley's Method-** $(P_{01}) = \left[\frac{\Sigma P1q0}{\Sigma Poq0} + \frac{\Sigma P1q1}{\Sigma Poq1}\right] * 100/2$

$(P_{01}) = \left[\frac{690}{580} + \frac{1150}{960}\right] * 50$

$(P_{01}) = [1.1896+1.1979]*50$

$(P_{01}) =$ **[2.3875]*50= 119.375**

5) **Fisher's Index Number =** $(P_{01}) = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq0} * \frac{\Sigma P1q1}{\Sigma Poq1}} * 100$

$(P_{01}) = \sqrt{\frac{690}{580} * \frac{1150}{960}} * 100$

$(P_{01}) = \sqrt{1.1896 * 1.1979} * 100$

$(P_{01}) = \sqrt{1.4243031} * 100$

$(P_{01}) =$ **1.1934*100=119.34**

Reversibility Tests-

1) **Time Reversibility test**.

$$P_{01} * P_{10} = 1$$

Fisher's ideal index number satisfies this test as explained below:

$(P_{01}) = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq0} * \frac{\Sigma P1q1}{\Sigma Poq1}} * 100$ or $(P_{10}) = \sqrt{\frac{\Sigma P0q0}{\Sigma P1q0} * \frac{\Sigma P0q1}{\Sigma P1q1}} * 100$

Thus, $P_{01} \times P_{10} = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq0} * \frac{\Sigma P1q1}{\Sigma Poq1} * \frac{\Sigma P0q0}{\Sigma P1q0} * \frac{\Sigma P0q1}{\Sigma P1q1}}$

$P_{01} \times P_{10} = \sqrt{\frac{690}{580} * \frac{1180}{960} * \frac{580}{690} * \frac{960}{1180}} = \sqrt{1}$

$P_{01} \times P_{10} = 1$

2) **Factor Reversibility Test-** $P_{01} * Q_{01} = \frac{\Sigma P1q1}{\Sigma Poq0}$

Fisher's formula satisfies also this test as explained below:

$(P_{01}) = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq0} * \frac{\Sigma P1q1}{\Sigma Poq1}} * 100$ $Q_{01} = \sqrt{\frac{\Sigma q1p0}{\Sigma qop0} * \frac{\Sigma q1p1}{\Sigma qop1}} * 100$

$$\mathbf{P_{01}*Q_{01}} = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq\,0} * \frac{\Sigma P1q1}{\Sigma Poq\,1} * \frac{\Sigma q1p0}{\Sigma q0p0} * \frac{\Sigma q1p1}{\Sigma q0p1}}$$

$$\mathbf{P_{01}*Q_{01}} = \sqrt{\frac{690}{580} * \frac{1150}{960} * \frac{960}{580} * \frac{1150}{690}}$$

$$\mathbf{P_{01}*Q_{01}} = \sqrt{\frac{1150}{580} * \frac{1150}{580}}$$

$$\mathbf{P_{01}*Q_{01}} = \frac{\mathbf{1150}}{\mathbf{580}} \mathbf{= 1.983}$$