FYJC - MATHEMATICS & STATISTICS

PAPER - II

INDEX NUMBERS

Compiled & Conducted @ JKSC

INDEX NUMBERS

NOTATION AND TERMINOLOGY USED IN THIS CHAPTER

p_0 : price of commodity in the base year

p_1 : price of commodity in the current year

q_0 : quantity of a commodity consumed during the base year

q_1 : quantity of a commodity consumed during the current year

v_0 : value spent on a commodity during the base year $= p_0.q_0$

v_1 : value spent on a commodity during the current year $= p_1.q_1$

i : price relative $i = (p_1/ p_0) \times 100$

P_{01}: Price Index Number Q_{01} : Quantity Index Number

FORMULAES

Index Numbers Using **SIMPLE AGGREGATE METHOD :**

Price Index Number : $P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$

Quantity Index Number : $Q_{01} = \frac{\Sigma q_1}{\Sigma q_0} \times 100$

Value Index Number : $V_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0} \times 100$

WEIGHTED AGGREGATE PRICE INDEX NUMBERS:

Weighted Aggregate method : $P_{01} = \frac{\Sigma p_1 w}{\Sigma p_0 w} \times 100$

in most of the cases , quantities are taken as weights

Laspeyre's Index Number : $P_{01}(L) = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$

Paasche's Index Number : $P_{01}(P) = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$

Marshall & Edgeworth Index Number: $P_{01}(ME) = \frac{\Sigma p_1 q_0 + \Sigma p_1 q_1}{\Sigma p_0 q_0 + \Sigma p_0 q_1} \times 100$

(in this method , arithmetic average of base year & current year quantities are taken as weights)

Walsch's Index Number : $P_{01}(W) = \frac{\Sigma p_1 \sqrt{q_0.q_1}}{\Sigma p_0 \sqrt{q_0.q_1}} \times 100$

(in this method , Geometric average of base year & current year quantities are taken as weights)

Fisher's Index Number : $P_{01}(F) = \sqrt{P_{01}(L) \times P_{01}(P)}$

(geometric mean of Laspeyre's & Paasche's Index number)

Dorbish – Bowley Index Number : $P_{01}(DB) = \frac{P_{01}(L) + P_{01}(P)}{2}$

(arithmetic mean of Laspeyre's & Paasche's Index number)

Price Index Number using SIMPLE AGGREGATE METHOD

Q SET – 1

Q1

01.

Commodity	P	Q	R	S	T	
Price in 1995	10	25	14	20	30	Use 1995 as the base year
Price in 2000	32	40	20	45	70	**ans : 209.1**

02.

Commodity	P	Q	R	S	T	
Price in 1998	32	40	54	80	110	Use 1998 as the base year
Price in 2002	110	75	60	125	134	**ans : 159.5**

03.

Commodity	P	Q	R	S	T
Base year price	10	8	12	24	18
Current year price	14	10	x	28	22

Find x if the Price Index Number by Simple Aggregate Method is 125 **ans : x = 16**

04.

Commodity	P	Q	R	S	T
Base year price	20	12	22	23	13
Current year price	30	x	38	51	19

Find x if the Price Index Number by Simple Aggregate Method is 200 **ans : x = 42**

05. Find y if the Price Index Number by Simple Aggregate Method is 120

Commodity	P	Q	R	S
Price in 1997	90	y	90	30
Price in 1998	95	60	110	35

ans : y = 40

Quantity Index number using SIMPLE AGGREGATE METHOD

06. Find Quantity Index Numbers

q_0	170	130	100	195	205
q_1	90	70	75	150	95

ans : Q_{01} = 60

07. Find Quantity Index numbers

Quantity in 1980	100	170	210	90	50
Quantity in 1985	130	200	250	110	150

ans : Q_{01}=135.5

08.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
P	10	4	60	7
Q	20	3	70	6
R	30	5	80	8
S	40	8	90	9
T	50	2	100	10

Calculate Value Index Number

ans : V_{01} = 491.04

09.

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	30	13	40	15
B	40	15	70	20
C	10	12	60	22
D	50	10	90	18
E	20	14	100	16

Find Value index number

ans : V_{01} = 346.03

Q SET – 2

Q2: WEIGHTED AGGREGATE PRICE INDEX NUMBERS

LASPEYRE'S , PAASCHE'S & MARSHALL – EDGEWORTH'S PRICE INDEX NUMBERS

01. for the following data , find the value of x if the Laspeyre's price index number is equal to Paasche's price index number

Commodity	1960		1965	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1 .
A	1	10	2	5
B	1	5	x	2

ans : x = 2

02. for the following data , find the value of x if the Laspeyre's price index number is equal to Paasche's price index number

Commodity	1960		1965	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1 .
A	3	x	2	5
B	4	6	3	5

ans : x = 6

03. for the following data , find the value of x if the Laspeyre's price index number is equal to Paasche's price index number

Commodity	1960		1965	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1 .
A	2	10	2	5
B	2	5	x	2

ans : x = 2

04. if $\Sigma p_0q_0 = 140$, $\Sigma p_0q_1 = 200$, $\Sigma p_1q_0 = 350$, $\Sigma p_1q_1 = 460$. Find Laspeyre's , Paasche's and Marshall – Edgeworth's Price Index numbers

ans : P_{01}(L) = 250 , P_{01}(P) = 230 , P_{01}(M-E) = 238.2

05. if $\Sigma p_0q_0 = 120$, $\Sigma p_0q_1 = 200$, $\Sigma p_1q_1 = 300$ and P_{01}(L) = 150 . Find P_{01}(M-E)

ans : P_{01}(M-E) = 150

06. if $\Sigma p_0q_0 = 180$, $\Sigma p_1q_0 = 200$, $\Sigma p_1q_1 = 280$ & P_{01}(M-E) = 150 . Find P_{01}(P)

ans : P_{01}(P) = 200

07. if $\Sigma p_0q_0 = 220$, $\Sigma p_0q_1 = 380$, $\Sigma p_1q_1 = 350$ & P_{01}(M-E) = 150 . Find P_{01}(L)

ans : P_{01}(P) = 250

08.

Commodity	Base Year		Current Year	
	Price p_o	Quantity q_o	Price p_1	Quantity q_1 .
A	2	20	10	22
B	4	12	12	10
C	8	10	15	20
D	6	15	9	30

ans : P_{01} (L) = 243.9

P_{01} (P) = 214.6

09.

Commodity	Base Year		Current Year	
	Price p_o	Quantity q_o	Price p_1	Quantity q_1 .
A	8	20	11	5
B	7	10	12	10
C	3	30	5	20
D	2	50	4	15

ans : P_{01} (L) = 164.3

P_{01} (P) = 167.5

10.

Commodity	Base Year		Current Year	
	Price p_o	Quantity q_o	Price p_1	Quantity q_1 .
A	10	12	40	3
B	20	2	25	8
C	30	3	50	27
D	60	9	90	36

ans : P_{01} (L) = 188.7

P_{01} (P) = 153.9

P_{01} (DB) = 171.3

11. Calculate Dorbish Bowleys & Fisher's Price Index number

Commodity	Base Year		Current Year	
	Price	Quantity	Price	Quantity
P	22	10	25	30
Q	34	12	35	40
R	28	15	25	25
S	26	14	25	10
T	30	11	35	10

P_{01} (L) = 102.2
P_{01} (L) = 102.9
P_{01} (F) = 102.5
P_{01} (DB) = 102.55

Q3. FISHER'S & DROBISH – BOWLEY'S PRICE INDEX NUMBERS

Q SET - 3

01. If $P_{01}(L) = 225$, $P_{01}(P) = 144$, calculate $P_{01}(F)$ and $P_{01}(D\text{-}B)$

ans : P_{01} (F) = 180 ; P_{01} (D-B) = 184.50

02. If $P_{01}(L) = 90$, $P_{01}(P) = 40$, calculate $P_{01}(F)$ and $P_{01}(D\text{-}B)$

ans : P_{01} (F) = 60 ; P_{01} (D-B) = 65

03. Given that the Laspeyre's and Paasche's Price index numbers are 25 and 16 respectively , find the values of Drobish – Bowley's and Fisher's Price Index number .

ans : P_{01} (F) = 20 ; P_{01} (D-B) = 20.5

04. Given that Laspeyre's and Drobish - Bowley's Price index numbers are 150.2 and 152.8 respectively . Find the Paasche's Price Index number

ans : P_{01} (P) = 155.4

05. Given that Laspeyre's and Drobish - Bowley's Price index numbers are 160.32 and 164.18 respectively . Find the Paasche's Price Index number **ans : P_{01} (P) = 168.04**

06. If Laspeyre's Price Index number is four times the Paasche's Price Index number then find the relation between Drobish – Bowley's and Fisher's Price Index Numbers .

ans : P_{01} (D-B) = 5/4 P_{01} (F)

Q4: WALSCH'S PRICE INDEX NUMBERS

Q SET - 4

01.

Commodity	Base Year		Current Year	
	Price p_o	Quantity q_o	Price p_1	Quantity q_1 .
A	10	12	40	3
B	20	2	25	8
C	30	3	50	27
D	60	9	90	36

ans : P_{01} (W) = 161.7

02.

Commodity	Base Year		Current Year	
	Price p_o	Quantity q_o	Price p_1	Quantity q_1 .
A	4	16	3	9
B	6	16	2	4
C	8	28	7	7

ans : P_{01} (W) = 72.11

03. Find x if the Walsch's Price Index number for the given data is 150

Commodity	Base Year		Current Year	
	Price p_o	Quantity q_o	Price p_1	Quantity q_1 .
A	5	3	10	3
B	x	4	16	9
C	15	5	23	5
D	20	2	26	8

ans : x = 10

COST OF LIVING INDEX NUMBER (CLI)

Q SET - 5

1.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
I	70	90	100	60	80
w	5	3	2	4	6

ans : CLI = 77

2.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
I	120	100	140	160	150
w	3	6	5	2	4

ans : CLI = 129

3.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
I	78	80	110	60	90
w	5	3	4	2	6

ans : CLI = 86.5

4.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
$I_{(2000)}$	400	300	150	120	100
w	3	3	4	5	2

ans : CLI = 205.88

5.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
I	410	150	343	248	285
w	45	15	12	8	20

ans : CLI = 325

6.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
I	180	120	160	300	200
w	4	5	3	y	2

Cost of living index = 200 . Find y

ans : 6

7.

Group	Food	Clothes	Fuel and Lighting	House Rent	Misc.
I	100	125	174	x	90
w	13	12	10	8	7

Cost of living index = 121 Find x

ans : 110

8. Find the cost of Living Index number taking 2001 as base year

Group	Price (2001)	Price (2006)	Weight
A	15	36	60
B	48	96	5
C	30	90	10
D	60	180	15
E	45	90	10

ans : 249

9. Find the Cost of living Index number using FAMILY BUDGET METHOD

Also obtain expenditure of a person in the year 1998 if his expenditure in the year 1995 was ₹ 800

Group	Price (1995)	Price (1998)	Weight
Food	8	24	6
Clothing	18	36	12
Fuel & Light	20	40	8
House Rent	15	30	4
Miscellaneous	10	22	10

ans : 220 , 1760

10. Find the Cost of living Index number using FAMILY BUDGET METHOD

Also obtain expenditure of a person in the year 2008 if his expenditure in the year 2007 was ₹ 10,000

Group	Price (2007)	Price (2008)	Weight
Food	12	60	25
Clothing	10	45	20
Fuel & Light	20	35	15
House Rent	25	20	30
Miscellaneous	16	48	10

ans : 295.25 , 29,525

REAL INCOME

Q SET - 6

$$\text{REAL INCOME} = \frac{\text{INCOME}}{\text{CLI}} \times 100$$

01. The cost of living Index number for the years 2002 and 2006 are 120 and 220 respectively . A person earns ₹ 10800 per month in the year 2002 . What should be his earnings per month in the year 2006 , so as to maintain his former (i.e. of the year 2002) standard of living

ans : ₹ 19,800

02. The cost of living Index number for the years 1996 and 1999 are 140 and 200 respectively . A person earns ₹ 11,200 per month in the year 1996 . What should be his earnings per month in the year 1999 , so as to maintain his former (i.e. of the year 1996) standard of living

ans : ₹ 16,000

03. The cost of living Index number for the years 2001 and 2003 are 150 and 210 respectively . A person earns ₹ 13,500 per month in the year 2001 . What should be his earnings per month in the year 2003 , so as to maintain his former (i.e. of the year 2001) standard of living

ans : ₹ 18,900

SOLUTION SET

SOLUTION TO Q SET – 1

INDEX NOS USING SIMPLE AGGREGATE METHOD

Q1

03.

Commodity	P	Q	R	S	T	
Price in 1995	10	25	14	20	30	Use 1995 as the base year
Price in 2000	32	40	20	45	70	

SOLN : $\Sigma p_0 = 99$, $\Sigma p_1 = 207$

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$$

$$= \frac{207}{99} \times 100 = 209.1$$

04.

Commodity	P	Q	R	S	T	
Price in 1998	32	40	54	80	110	Use 1998 as the base year
Price in 2002	110	75	60	125	134	

SOLN : $\Sigma p_0 = 336$, $\Sigma p_1 = 504$

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$$

$$= \frac{504}{316} \times 100$$

$$= 159.5$$

LOG CALC

2.7024
−2.4997
AL(0.2027)
1.595

03.

Commodity	P	Q	R	S	T
Base year price	10	8	12	24	18
Current year price	14	10	x	28	22

Find x if the Price Index Number by Simple Aggregate Method is 125

SOLN : $\Sigma p_0 = 72$, $\Sigma p_1 = 74 + x$

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$$

$$125 = \frac{74 + x}{72} \times 100$$

$$\overset{5}{\cancel{125}} \times 72 \;/\; \cancel{100}_{\,4} = 74 + x$$

$$90 = 74 + x$$

$$x = 16$$

04.

Commodity	P	Q	R	S	T
Base year price	20	12	22	23	13
Current year price	30	x	38	51	19

Find x if the Price Index Number by Simple Aggregate Method is 200

SOLN : $\Sigma p_0 = 90$, $\Sigma p_1 = 138 + x$

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$$

$$200 = \frac{138+x}{90} \times 100$$

$$\frac{{}^{2}\cancel{200} \times 90}{\cancel{100}} = 138 + x$$

$$180 = 138 + x$$

$$x = 42$$

05. Find y if the Price Index Number by Simple Aggregate Method is 120

Commodity	P	Q	R	S
Price in 1997	90	y	90	30
Price in 1998	95	60	110	35

SOLN : $\Sigma p_0 = 210+y$, $\Sigma p_1 = 300$

$$P_{01} = \frac{\Sigma p_1}{\Sigma p_0} \times 100$$

$$120 = \frac{300}{210+y} \times 100$$

$$210 + y = \frac{300 \times 100}{120}$$

$$210 + y = 250$$

$$y = 40$$

06. Find Quantity Index Numbers

q_0	170	130	100	195	205
q_1	90	70	75	150	95

SOLN : $\Sigma q_0 = 800$, $\Sigma q_1 = 480$

$$Q_{01} = \frac{\Sigma q_1}{\Sigma q_0} \times 100$$

$$= \frac{480}{600} \times 100 = 80$$

07. Find Quantity Index numbers

Quantity in 1980	100	170	210	90	50
Quantity in 1985	130	200	250	110	150

ans : Q_{01}=135.5

SOLN : $\Sigma q_0 = 620$, $\Sigma q_1 = 840$

$$Q_{01} = \frac{\Sigma q_1}{\Sigma q_0} \times 100$$

$$= \frac{840}{620} \times 100 = 135.5$$

08. Find Value Index numbers

p_0	q_0	p_1	q_1	p_0q_0	p_1q_1
10	4	60	7	40	420
20	3	70	6	60	420
30	5	80	8	150	640
40	8	90	9	320	810
50	2	100	10	100	1000
				670	3290
				Σp_0q_0	Σp_1q_1

$$V_{01} = \frac{\Sigma p_1q_1}{\Sigma p_0q_0} \times 100$$

$$= \frac{3290}{670} \times 100$$

$$= 491$$

LOG CALC
3.5172
−2.8261
AL(0.6911)
4.910

09. Find Value Index numbers

p_0	q_0	p_1	q_1	p_0q_0	p_1q_1
30	13	40	15	390	600
40	15	70	20	600	1400
10	12	60	22	120	1320
50	10	90	18	500	1620
20	14	100	16	280	1600
				1890	6540
				Σp_0q_0	Σp_1q_1

$$V_{01} = \frac{\Sigma p_1q_1}{\Sigma p_0q_0} \times 100$$

$$= \frac{6540}{1890} \times 100$$

$$= 346$$

LOG CALC
3.8156
−3.2765
AL(0.5391)
3.460

LASPEYRE'S & PAASCHE'S PRICE INDEX NOS

SOLUTION TO Q SET - 2

01.

Commodity	1960		1965	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1 .
A	1	10	2	5
B	1	5	x	2

find x if given that Laspeyre's price index no. is equal to Paasche's price indec number

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
1	10	2	5	20	10	10	5
1	5	x	2	5x	2x	5	2
				20 + 5x	10 + 2x	15	7

$P_{01}(L) = P_{01}(P)$

$$\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \cancel{100} = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times \cancel{100}$$

$$\frac{20 + 5x}{15} = \frac{10 + 2x}{7}$$

$$140 + 35x = 150 + 30x$$

$$5x = 10 \qquad \mathbf{x = 2}$$

02.

Commodity	1960		1965	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1 .
A	3	x	2	5
B	4	6	3	5

find x if given that Laspeyre's price index no. is equal to Paasche's price indec number

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
3	x	2	5	2x	10	3x	15
4	6	3	5	18	15	24	20
				2x + 18	25	3x+24	35

$P_{01}(L) = P_{01}(P)$

$$\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \cancel{100} = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times \cancel{100}$$

$$\frac{2x + 18}{3x + 24} = \frac{\cancel{25}\ 5}{\cancel{35}\ 7}$$

$$14x + 126 = 15x + 120 \qquad \therefore \mathbf{x = 6}$$

03.

Commodity	1960		1965	
	Price p_0	Quantity q_0	Price p_1	Quantity q_1 .
A	2	10	2	5
B	2	5	x	2

find x if given that Laspeyre's price index no. is equal to Paasche's price indec number

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
2	10	2	5	20	10	20	10
2	5	x	2	5x	2x	10	4
				20 + 5x	10 + 2x	30	14

$P_{01}(L) = P_{01}(P)$

$$\frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times \cancel{100} = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times \cancel{100}$$

$$\frac{20 + 5x}{\cancel{30}\ 15} = \frac{10 + 2x}{\cancel{14}\ 7}$$

$$140 + 35x = 150 + 30x$$

$$5x = 10 \qquad \mathbf{x = 2}$$

MARSHALL - EDGEWORTH'S PRICE INDEX NO.

04.

$\Sigma p_0q_0 = 140$, $\Sigma p_0q_1 = 200$, $\Sigma p_1q_0 = 350$, $\Sigma p_1q_1 = 460$. Find Laspeyre's , Paasche's and Marshall – Edgeworth's Price Index numbers

$$\mathbf{P_{01}(L)} = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100$$

$$= \frac{350}{140} \times 100$$

$$= \frac{5}{2} \times 100$$

$$= 250$$

$$\mathbf{P_{01}(P)} = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100$$

$$= \frac{460}{200} \times 100$$

$$= 230$$

$$\mathbf{P_{01}(ME)} = \frac{\Sigma p_1q_0 + \Sigma p_1q_1}{\Sigma p_0q_0 + \Sigma p_0q_1} \times 100$$

$$= \frac{350 + 460}{140 + 200} \times 100$$

$$= \frac{810}{340} \times 100$$

$$= \frac{81}{34} \times 100$$

$$= 238.2$$

05.

if $\Sigma p_0q_0 = 120$, $\Sigma p_0q_1 = 200$, $\Sigma p_1q_1 = 300$

and $P_{01}(L) = 150$. Find $P_{01}(M\text{-}E)$

$$\mathbf{P_{01}(L)} = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100$$

$$150 = \frac{\Sigma p_1q_0}{120} \times 100$$

$$\Sigma p_1q_0 = \frac{150 \times 120}{100} = 180$$

$$\mathbf{P_{01}(ME)} = \frac{\Sigma p_1q_0 + \Sigma p_1q_1}{\Sigma p_0q_0 + \Sigma p_0q_1} \times 100$$

$$= \frac{180 + 300}{120 + 200} \times 100$$

$$= \frac{480}{320} \times 100$$

$$= \frac{3}{2} \times 100$$

$$= 150$$

06.

if $\Sigma p_0q_0 = 180$, $\Sigma p_1q_0 = 200$, $\Sigma p_1q_1 = 280$ &

$P_{01}(M\text{-}E) = 150$. Find $P_{01}(P)$

$$\mathbf{P_{01}(ME)} = \frac{\Sigma p_1q_0 + \Sigma p_1q_1}{\Sigma p_0q_0 + \Sigma p_0q_1} \times 100$$

$$150 = \frac{200 + 280}{180 + \Sigma p_0q_1} \times 100$$

$$180 + \Sigma p_0q_1 = \frac{480 \times 100}{150}$$

$$180 + \Sigma p_0q_1 = 320$$

$$\Sigma p_0q_1 = 140$$

$$\mathbf{P_{01}(P)} = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100$$

$$= \frac{280}{140} \times 100$$

$$= 200$$

07.

if $\Sigma p_0q_0 = 220$, $\Sigma p_0q_1 = 380$, $\Sigma p_1q_1 = 350$ &

$P_{01}(M\text{-}E) = 150$. Find $P_{01}(L)$

$$\mathbf{P_{01}(ME)} = \frac{\Sigma p_1q_0 + \Sigma p_1q_1}{\Sigma p_0q_0 + \Sigma p_0q_1} \times 100$$

$$150 = \frac{\Sigma p_1q_0 + 350}{220 + 380} \times 100$$

$$150 = \frac{\Sigma p_1q_0 + 350}{600} \times 100$$

$$\Sigma p_1q_0 + 350 = 900$$

$$\Sigma p_1q_0 = 550$$

$$\mathbf{P_{01}(L)} = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100$$

$$= \frac{550}{220} \times 100$$

$$= \frac{5}{2} \times 100$$

$$= 250$$

08.

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
2	20	10	22	200	220	40	44
4	12	12	10	144	120	48	40
8	10	15	20	150	300	80	160
6	15	9	30	135	270	90	180
				629	910	258	424
				Σp_1q_0	Σp_1q_1	Σp_0q_0	Σp_0q_1

$$P_{01}(L) = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100$$

$$= \frac{629}{258} \times 100$$

$$= 243.9$$

LOG CALC

2.7987
−2.4116
AL(0.3871)
2.439

$$P_{01}(P) = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100$$

$$= \frac{910}{424} \times 100$$

$$= 214.6$$

LOG CALC

2.9590
−2.6274
AL(0.3316)
2.146

09.

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
8	20	11	5	220	55	160	40
7	10	12	10	120	120	70	70
3	30	5	20	150	100	90	60
2	50	4	15	200	60	100	30
				690	335	420	200
				Σp_1q_0	Σp_1q_1	Σp_0q_0	Σp_0q_1

$$P_{01}(L) = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100$$

$$= \frac{690}{420} \times 100$$

$$= 164.3$$

$$P_{01}(P) = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100$$

$$= \frac{335}{200} \times 100$$

$$= 167.5$$

$$P_{01}(ME) = \frac{\Sigma p_1q_0 + \Sigma p_1q_1}{\Sigma p_0q_0 + \Sigma p_0q_1} \times 100 = \frac{690 + 335}{420 + 200} \times 100 = \frac{1025}{620} \times 100$$

$$= 1.653$$

LOG CALC

3.0107
−2.7924
AL(0.2183)
1.653

10.

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
10	12	40	3	480	120	120	30
20	2	25	8	50	200	40	160
30	3	50	27	150	1350	90	810
60	9	90	36	810	3240	540	2160
				1490	4910	790	3190
				Σp_1q_0	Σp_1q_1	Σp_0q_0	Σp_0q_1

$$P_{01}(L) = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100 = \frac{1490}{790} \times 100 = 188.7$$

LOG CALC

3.1732
−2.8976
AL(0.2756)
1.887

$$P_{01}(P) = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100 = \frac{4910}{3190} \times 100 = 153.9$$

LOG CALC

3.6911
−3.5038
AL(0.1873)
1.539

$$P_{01}(DB) = \frac{P01(L) + P01(P)}{2} = \frac{188.7 + 153.9}{2} = 171.3$$

11.

p_0	q_0	p_1	q_1	p_1q_0	p_1q_1	p_0q_0	p_0q_1
22	10	25	30	250	750	220	660
34	12	35	40	420	1400	408	1360
28	15	25	25	375	625	420	700
26	14	25	10	350	250	364	260
30	11	35	10	385	350	330	300
				1780	3375	1742	3280
				Σp_1q_0	Σp_1q_1	Σp_0q_0	Σp_0q_1

$$P_{01}(L) = \frac{\Sigma p_1q_0}{\Sigma p_0q_0} \times 100 = \frac{1780}{1742} \times 100 = 102.2$$

LOG CALC

3.2504
−3.2410
AL(0.0094)
1.022

$$P_{01}(P) = \frac{\Sigma p_1q_1}{\Sigma p_0q_1} \times 100 = \frac{3375}{3280} \times 100 = 102.9$$

LOG CALC

3.5282
−3.5159
AL(0.0123)
1.029

$$P_{01}(F) = P01(L) \times P01(P) = 102.2 \times 102.9 = 102.5$$

$\frac{1}{2}$ [log 102.2 + log 102.9] = $\frac{1}{2}$ (2.0094 + 2.0123)
= AL(2.0109) = 102.5

$$P_{01}(DB) = \frac{P01(L) + P01(P)}{2} = \frac{102.2 + 102.9}{2} = 102.55$$

SOLUTION TO Q SET - 3

FISHER'S & DROBISH BOWLEY'S PRICE INDEX NOS.

01. If $P_{01}(L) = 225$, $P_{01}(P) = 144$, calculate $P_{01}(F)$ and $P_{01}(D\text{-}B)$

$P_{01}(L) = 225$, $P_{01}(P) = 144$

$$P_{01}(D-B) = \frac{P_{01}(L) + P_{01}(P)}{2}$$

$$= \frac{225 + 144}{2}$$

$$= \frac{369}{2} = 184.5$$

$$P_{01}(F) = \sqrt{P_{01}(L) \times P_{01}(P)}$$

$$= \sqrt{225 \times 144}$$

$$= 15 \times 12 = 180$$

02. If $P_{01}(L) = 90$, $P_{01}(P) = 40$, calculate $P_{01}(F)$ and $P_{01}(D\text{-}B)$

If $P_{01}(L) = 90$, $P_{01}(P) = 40$

$$P_{01}(D-B) = \frac{P_{01}(L) + P_{01}(P)}{2}$$

$$= \frac{90 + 40}{2}$$

$$= \frac{130}{2} = 65$$

$$P_{01}(F) = \sqrt{P_{01}(L) \times P_{01}(P)}$$

$$= \sqrt{90 \times 40}$$

$$= \sqrt{3600} = 60$$

03. Given that the Laspeyre's and Paasche's Price index numbers are 25 and 16 respectively , find the values of Drobish – Bowley's and Fisher's Price Index number

If $P_{01}(L) = 25$, $P_{01}(P) = 16$

$$P_{01}(D-B) = \frac{P_{01}(L) + P_{01}(P)}{2}$$

$$= \frac{25 + 16}{2}$$

$$= \frac{41}{2} = 20.5$$

$$P_{01}(F) = \sqrt{P_{01}(L) \times P_{01}(P)}$$

$$= \sqrt{25 \times 16}$$

$$= 5 \times 4 = 20$$

04.

Given that Laspeyre's and Drobish - Bowley's Price index numbers are 150.2 and 152.8 respectively . Find the Paasche's Price Index number

$$P_{01}(D-B) = \frac{P_{01}(L) + P_{01}(P)}{2}$$

$$152.8 = \frac{150.2 + P_{01}(P)}{2}$$

$$305.6 = 150.2 + P_{01}(P)$$

$$P_{01}(P) = 305.6 - 150.2$$

$$= 155.4$$

05.

Given that Laspeyre's and Drobish - Bowley's Price index numbers are 160.32 and 164.18 respectively . Find the Paasche's Price Index number

If $P_{01}(L) = 160.32$, $P_{01}(D-B) = 164.18$

$$P_{01(D-B)} = \frac{P_{01(L)} + P_{01(P)}}{2}$$

$$164.18 = \frac{160.32 + P_{01(P)}}{2}$$

$$328.36 = 160.32 + P_{01(P)}$$

$$P_{01(P)} = 328.36 - 160.32$$

$$= 168.04$$

06.

If Laspeyre's Price Index number is four times the Paasche's Price Index number then find the relation between Drobish – Bowley's and Fisher's Price Index Numbers

$P_{01}(L) = 4\, P_{01(P)}$

$$P_{01(D-B)} = \frac{P_{01(L)} + P_{01(P)}}{2}$$

$$= \frac{4P_{01(P)} + P_{01(P)}}{2}$$

$$= \frac{5P_{01(P)}}{2}$$

$$P_{01(F)} = \sqrt{P_{01(L)} \times P_{01(P)}}$$

$$= \sqrt{4P_{01(P)} \times P_{01(P)}}$$

$$= 2P_{01(P)}$$

$$\frac{P_{01(D-B)}}{P_{01(F)}} = \frac{\frac{5P_{01(P)}}{2}}{2P_{01(P)}}$$

$$\frac{P_{01(D-B)}}{P_{01(F)}} = \frac{5}{4}$$

$$P_{01(D-B)} = \frac{5}{4} P_{01(F)}$$

WALSCH PRICE INDEX NO.

SOLUTION TO Q SET - 4

01.

p_o	q_o	p_1	q_1	$\sqrt{q_0q_1}$	$p_1.\sqrt{q_oq_1}$	$p_o\sqrt{q_0q_1}$
10	12	40	3	6	240	60
20	2	25	8	4	100	80
30	3	50	27	9	450	270
60	9	90	36	18	1620	1080
					2410	1490

$$P_{01(W)} = \frac{\Sigma p_1.\sqrt{q_oq_1}}{\Sigma p_o\sqrt{q_0q_1}} \times 100 = \frac{2410}{1490} \times 100 = 161.7$$

02.

p_o	q_o	p_1	q_1	$\sqrt{q_0q_1}$	$p_1.\sqrt{q_oq_1}$	$p_o\sqrt{q_0q_1}$
4	16	3	9	12	36	48
6	16	2	4	8	16	48
8	28	7	7	14	98	112
					150	208

$$P_{01(W)} = \frac{\Sigma p_1.\sqrt{q_oq_1}}{\Sigma p_o\sqrt{q_0q_1}} \times 100 = \frac{150}{208} \times 100 = 72.11$$

03. GIVEN : $P_{01(W)} = 150$

p_o	q_o	p_1	q_1	$\sqrt{q_0q_1}$	$p_1.\sqrt{q_oq_1}$	$p_o\sqrt{q_0q_1}$
5	3	10	3	3	30	15
x	4	16	9	6	96	6x
15	5	23	5	5	115	75
20	2	26	8	4	104	80
					345	170 + 6x

$$P_{01(W)} = \frac{\Sigma p_1.\sqrt{q_oq_1}}{\Sigma p_o\sqrt{q_0q_1}} \times 100$$

$$150 = \frac{345}{170 + 6x} \times 100$$

$$170 + 6x = \frac{345}{150} \times 100$$

$$170 + 6x = 230$$

$$6x = 60 \quad \therefore x = 10$$

SOLUTION TO Q SET - 5

01.

Group	I	w	IW
Food	70	5	350
Clothes	90	3	270
Fuel & Light	100	2	200
House Rent	60	4	240
Misc.	80	6	480
		20	1540

$$\textbf{CLI} = \frac{\sum IW}{\sum W} = \frac{1540}{20} = 77$$

02.

Group	I	w	IW
Food	120	3	360
Clothes	100	6	600
Fuel & Light	140	5	700
House Rent	160	2	320
Misc.	150	4	600
		20	2580

$$\textbf{CLI} = \frac{\sum IW}{\sum W} = \frac{2580}{20} = 129$$

03.

Group	I	w	IW
Food	78	5	390
Clothes	80	3	240
Fuel & Light	110	4	440
House Rent	60	2	120
Misc.	90	6	540
		20	1730

$$\textbf{CLI} = \frac{\sum IW}{\sum W} = \frac{1730}{20} = 86.5$$

04.

Group	I	w	IW
Food	400	3	1200
Clothes	300	3	900
Fuel & Light	150	4	600
House Rent	120	5	600
Misc.	100	2	200
		17	3500

$$\textbf{CLI} = \frac{\sum IW}{\sum W} = \frac{3500}{17} = 205.88$$

COST OF LIVING INDEX NUMBER (CLI)

05.

Group	I	w	IW
Food	410	45	18450
Clothes	150	15	2250
Fuel & Light	343	12	4116
House Rent	248	8	1984
Misc.	285	20	5700
		100	32500

$$\textbf{CLI} = \frac{\sum IW}{\sum W} = \frac{32500}{100} = 325$$

06.

Group	I	w	IW
Food	180	4	720
Clothes	120	5	600
Fuel & Light	160	3	480
House Rent	300	y	300y
Misc.	200	2	400
		14+y	2200+300y

$$\textbf{CLI} = \frac{\sum IW}{\sum W}$$

$$200 = \frac{2200 + 300y}{14 + y}$$

$$2800 + 200y = 2200 + 300y \qquad \therefore y = 6$$

07.

Group	I	w	IW
Food	100	13	1300
Clothes	125	12	1500
Fuel & Light	174	10	1740
House Rent	x	8	8x
Misc.	90	7	630
		50	5170 + 8x

$$\textbf{CLI} = \frac{\sum IW}{\sum W}$$

$$121 = \frac{5170 + 8x}{50}$$

$$6050 = 5170 + 8x$$

$$880 = 8x$$

$$\therefore x = 110$$

08. Find the cost of Living Index number taking 2001 as base year

Group	p_0	p_1	w	$I = \frac{p_1}{P_0} \times 100$	Iw
A	15	36	60	$\frac{36}{15} \times 100 = 240$	14400
B	48	96	5	$\frac{96}{48} \times 100 = 200$	1000
C	30	90	10	$\frac{90}{30} \times 100 = 300$	3000
D	60	180	15	$\frac{180}{60} \times 100 = 300$	4500
E	45	90	10	$\frac{90}{45} \times 100 = 200$	2000
			$\Sigma w = 100$		$\Sigma Iw = 24900$

$$CLI = \frac{\Sigma Iw}{\Sigma w} = \frac{24900}{100} = 249$$

09. Find the cost of Living Index number

Group	p_0	p_1	w	$I = \frac{p_1}{P_0} \times 100$	Iw
Food	8	24	6	$\frac{24}{8} \times 100 = 300$	1800
Clothing	18	36	12	$\frac{36}{18} \times 100 = 200$	2400
Fuel & Light	20	40	8	$\frac{40}{20} \times 100 = 200$	1600
House Rent	15	30	4	$\frac{30}{15} \times 100 = 200$	800
Misc	10	22	10	$\frac{22}{10} \times 100 = 220$	2200
			$\Sigma w = 40$		$\Sigma Iw = 8800$

$$CLI = \frac{\Sigma Iw}{\Sigma w} = \frac{8800}{40} = 220$$

In 1995 ; CLI = 100 ; Expenditure = 800/-

In 1998 ; CLI = 220 ; Expenditure = $\frac{800 \times 220}{100}$ = 1760/-

10. Find the cost of Living Index number

Group	p_0	p_1	w	$I = \frac{p_1}{P_0} \times 100$	Iw
Food	12	60	25	$\frac{60}{12} \times 100 = 500$	12500
Clothing	10	45	20	$\frac{45}{10} \times 100 = 450$	9000
Fuel & Light	20	35	15	$\frac{35}{20} \times 100 = 175$	2625
House Rent	25	20	30	$\frac{20}{25} \times 100 = 80$	2400
Misc	16	48	10	$\frac{48}{16} \times 100 = 300$	3000
		$\Sigma w = 100$			$\Sigma Iw = 29525$

$$CLI = \frac{\Sigma Iw}{\Sigma w} = \frac{29525}{100} = 295.25$$

In 2007 ; CLI = 100 ; Expenditure = 10,000/-

In 2008 ; CLI = 295.25 ; Expenditure = $\frac{295.25 \times 10000}{100}$ = ₹ 29,525/-

SOLUTION TO Q SET - 6

01.

The cost of living Index number for the years 2002 and 2006 are 120 and 220 respectively . A person earns ₹ 10800 per month in the year 2002 . What should be his earnings per month in the year 2006 , so as to maintain his former (i.e. of the year 2002) standard of living

REAL INCOME

Year	2002	2006
CLI	120	220
Income	₹ 10800	?

2002

$$\text{Real income} = \frac{\text{Income}}{\text{CLI}} \times 100$$

$$= \frac{10800}{120} \times 100$$

$$= ₹\ 9000$$

2006

$$\text{Real Income} = \frac{\text{Income}}{\text{CLI}} \times 100$$

$$9000 = \frac{\text{Income}}{220} \times 100$$

$$\text{Income} = \frac{9000 \times 220}{100}$$

$$= ₹\ 19,800$$

02.

The cost of living Index number for the years 1996 and 1999 are 140 and 200 respectively . A person earns ₹ 11,200 per month in the year 1996 . What should be his earnings per month in the year 1999 , so as to maintain his former (i.e. of the year 1996) standard of living

Year	1996	1999
CLI	140	200
Income	₹ 11200	?

1996

$$\text{Real income} = \frac{\text{Income}}{\text{CLI}} \times 100$$

$$= \frac{11200}{140} \times 100$$

$$= ₹\ 8000$$

1999

$$\text{Real Income} = \frac{\text{Income}}{\text{CLI}} \times 100$$

$$8000 = \frac{\text{Income}}{200} \times 100$$

$$\text{Income} = \frac{8000 \times 200}{100}$$

$$= ₹\ 16{,}000$$

03.

The cost of living Index number for the years 2001 and 2003 are 150 and 210 respectively . A person earns ₹ 13,500 per month in the year 2001 . What should be his earnings per month in the year 2003 , so as to maintain his former (i.e. of the year 2001) standard of living

Year	2001	2003
CLI	150	210
Income	₹ 13500	?

2001

$$\text{Real income} = \frac{\text{Income}}{\text{CLI}} \times 100$$

$$= \frac{13500}{150} \times 100$$

$$= ₹\ 9000$$

2003

$$\text{Real Income} = \frac{\text{Income}}{\text{CLI}} \times 100$$

$$9000 = \frac{\text{Income}}{210} \times 100$$

$$\text{Income} = \frac{9000 \times 210}{100}$$

$$= ₹\ 18{,}900$$

Compiled & Conducted @ JKSC