CA FOUNDATION

QUANTITATIVE APTITUDE

INDEX NUMBER

2 marks

॥ संकट मोचन SERIES ॥

Index Numbers

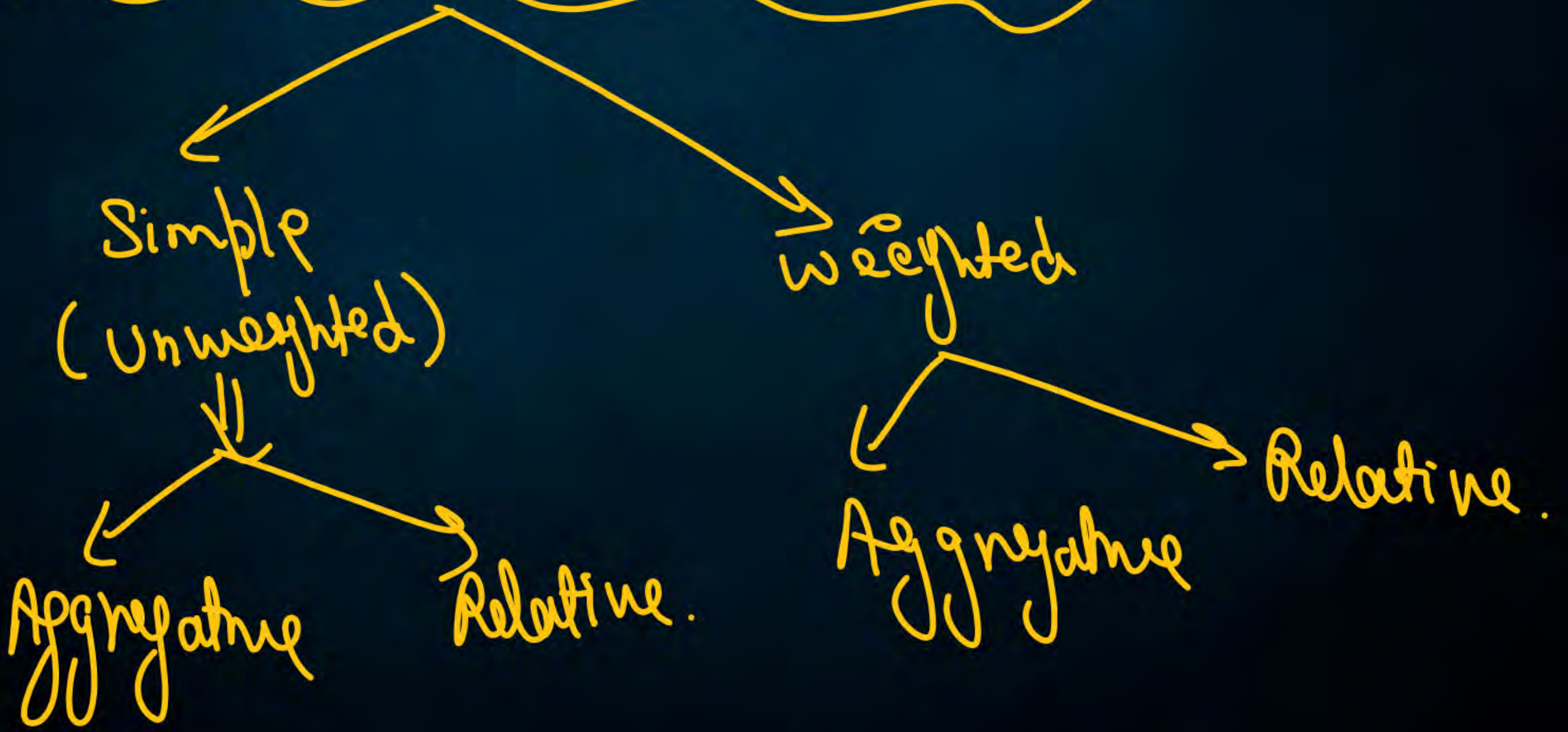
% changes in variable

→ Price
→ Quantity

%

Method of evaluating changes in a variable
With respect to geographical location, time,
and other features

Methods Of Constructing Price Index Numbers



Simple Aggregative Method

$$P_{01} = \frac{\Sigma P_1}{\Sigma P_0} \times 100$$

P_{01}: Base year, Current year

	P_0	P_1
	2010	2020
X	100	160
Y	120	180
Z	105	140
	325	480

$$P_{01} = \frac{480}{325} \times 100 = 147.69$$

Simple Relative method

AM.

GM

$$P_{01} = \frac{\sum \left(\frac{P_1}{P_0} \times 100\right)}{N}$$

$$P_{01} = AL\left[\frac{\sum \log\left(\frac{P_1}{P_0} \times 100\right)}{N}\right]$$

Q

P_0	P_1
12	36
15	60
18	36

$\frac{P_1}{P_0} \times 100$
$\frac{36}{12} \times 100 = 300$
$\frac{60}{15} \times 100 = 400$
$\frac{36}{18} \times 100 = 200$
900

$$P_{01}(AM) = \frac{\Sigma\left(\frac{P_1}{P_0} \times 100\right)}{N} = \frac{900}{3} = 300$$

Weighted Aggregative method

Laspeyre

$$P_{01} = \frac{\Sigma P_1 Q_0}{\Sigma P_0 Q_0} \times 100$$

Paasches

$$P_{01} = \frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1} \times 100$$

Fisher

$$P_{01} = \sqrt{L \times P}$$

$$P_{01} = \sqrt{\frac{\Sigma P_1 Q_0}{\Sigma P_0 Q_0} \times \frac{\Sigma P_1 Q_1}{\Sigma P_0 Q_1}} \times 100$$

Dorbish & Bowley

$$P_{01} = \frac{L + P}{2}$$

Marshal Edgeworth

$$P_{01} = \frac{\Sigma P_1 \left(\frac{Q_0 + Q_1}{2}\right)}{\Sigma P_0 \left(\frac{Q_0 + Q_1}{2}\right)} \times 100$$

Weighted Relative method

Am

$$P_{01} = \frac{\sum W_i \left(\frac{P_1}{P_0} \times 100\right)}{\sum W_i}$$

GM

$$P_{01} = AL\left[\frac{\sum W \log\left(\frac{P_1}{P_0} \times 100\right)}{\sum W}\right]$$

Commodity	Base Year Price	Current Year Price (2023)
A	50	60
B	30	35
C	20	25

What is the index number for the year 2023 using the Simple Aggregate Method?

A) 105.00

B) 110.00

C) 115.00

D) 120.00

Commodity	Base Year Price	Current Year Price (2023)
X	80	90
Y	60	75
Z	40	50

What is the overall price index for the year 2023 using the Simple Relative Method?

A) 105.00

B) 110.00

C) 115.00

D) 120.00

Commodity	Base Year Price	Current Year Price (2023)	Weight
X	80	90	3
Y	60	75	2
Z	40	50	5

What is the overall price index for the year 2023 using the Weighted Relative Method?

A) 108.33

B) 110.00

C) 115.00

D) 120.00

P_0	P_1	w_i	$w_i\left(\frac{P_1}{P_0}\times 100\right)$
80	90	3	3375
60	75	2	250.0
40	50	5	625.0
		10	1212.5

$$P_{01} = \frac{\Sigma w_i\left(\frac{P_1}{P_0}\times 100\right)}{\Sigma w_i}$$

$$= \frac{1212.5}{10}$$

$$= 121.25$$

Index Numbers are expressed as

(a) Squares

(b) Ratio

(c) Percentages

(d) Combinations

_____ play a very important part in the construction of index numbers.

a) weights b) classes c) estimations d) none

If Laspeyre's Index is 119 and Paasche's Index is 112. Then Fisher's index number will be:

(a) 113.99
(b) 115.45
(c) 115.89
(d) 151.98

$L = 119$

$P = 112$

$$F = \sqrt{L \times P}$$

$$= \sqrt{119 \times 112}$$

$$= 115.44$$

Index numbers are not helpful in

(a) Framing economics policies

(b) Revealing trend

(c) Forecasting

(d) Identifying errors

Quantity Index (Volume Index)

Quantity index numbers measure the change in the quantity or volume of goods sold, consumed or produced during a given time period

Production
Consumption

$\Downarrow$

$Q_{01} = ?$

Method

Simple

Aggregate

$$Q_{01} = \frac{\Sigma Q_1}{\Sigma Q_0} \times 100$$

Relative

$$Q_{01} = \frac{\Sigma \left(\frac{Q_1}{Q_0} \times 100 \right)}{N}$$

Weighted

Aggregate

$$Q_{01}(L) = \frac{\Sigma P_0 Q_1}{\Sigma P_0 Q_0} \times 100$$

$$Q_{01}(P) = \frac{\Sigma P_1 Q_1}{\Sigma P_1 Q_0} \times 100$$

$$Q_{01}(f) = \sqrt{L \times P}$$

Relative

$$Q_{01} = \frac{\Sigma W \left(\frac{Q_1}{Q_0} \times 100 \right)}{\Sigma W}$$

Value Index

The value index number compares the value of a commodity in the current year, with its value in the base year

$$V_{01} = \frac{\Sigma P_1 q_1}{\Sigma P_0 q_0} \times 100$$

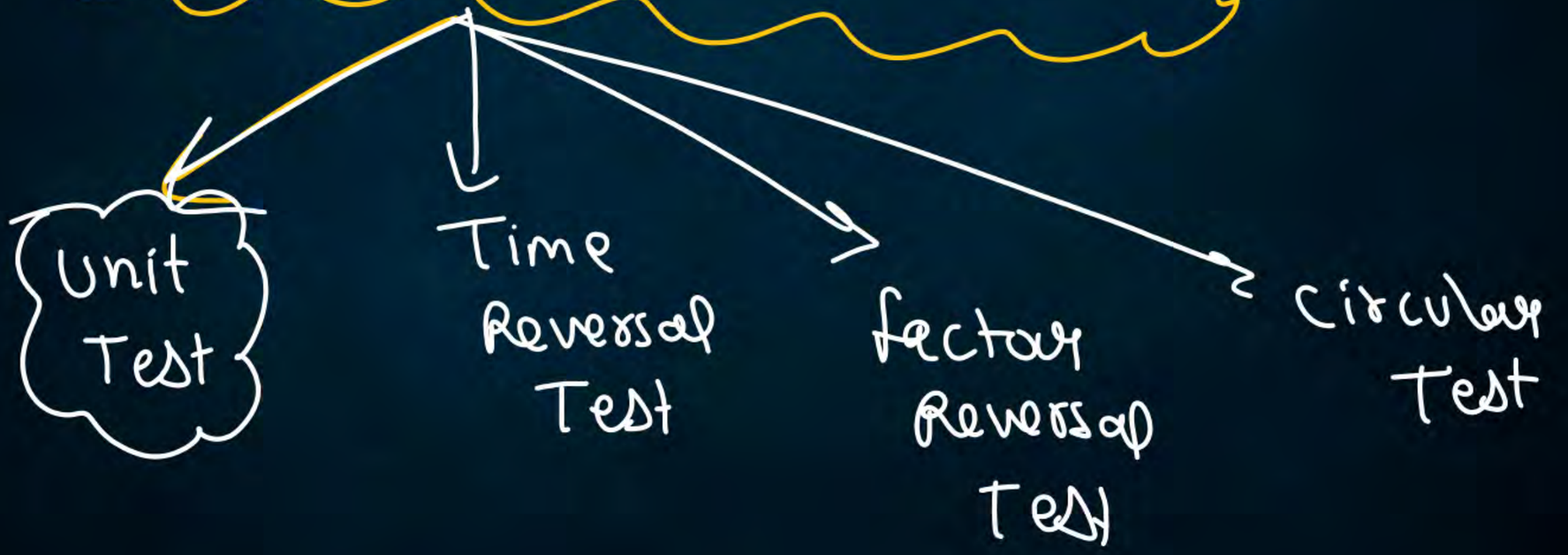
Σ 5
15 Pen
⇓
Value = 75

	2004		2020			
	p_0	q_0	p_1	q_1	p_0q_0	p_1q_1
A	2	10	6	12	20	72
B	3	12	5	15	36	75
C	5	6	8	5	30	40
					86	187

$$V_{01} = \frac{187}{86} \times 100$$

$$= 217.44\%$$

Test of Adequacy of Index Numbers



1)Unit Test

A unit test in index numbers is a test that ensures that an index number formula doesn't change the value of the index number even if the units of price or quantities change

-All methods satisfy this test
Except Simple aggregative method does

	P_0	P_1
A	2	4
B	3	6
C	5	12

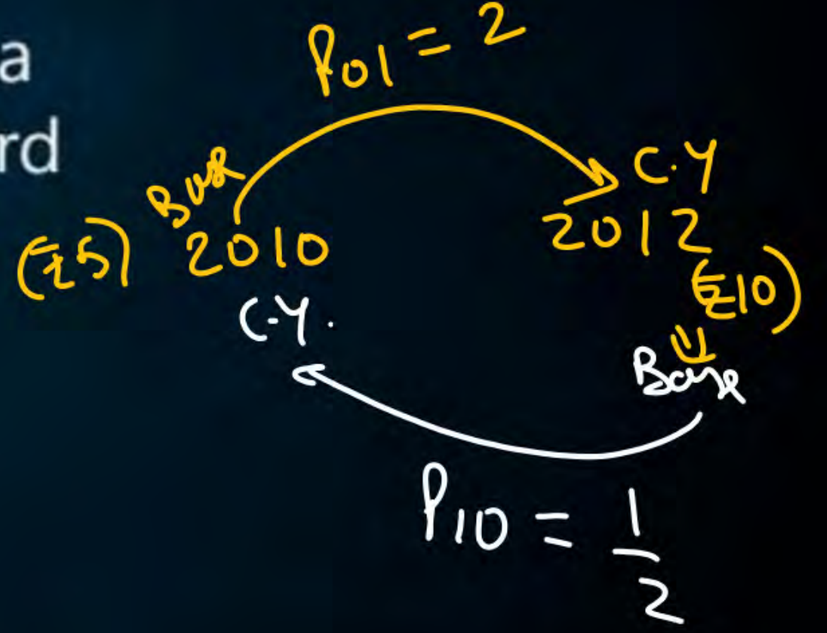
$$P_{01} = \frac{22}{10} \times 100 = 220\%$$

	P_0	P_1
A	2	4
B	6	12
C	20	48

$$P_{01} = \frac{64}{28} \times 100 = 228.57$$

2) Time Reversal Test

Time reversal test is a test to determine whether a given method will work both ways in time, forward and backward



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

This test is satisfied By

- Fisher's Method
- Simple Geometric Mean price Relative
- Weighted Geometric Of Price Relative
- Marshal Edgeworth

3) Factor Reversal Test

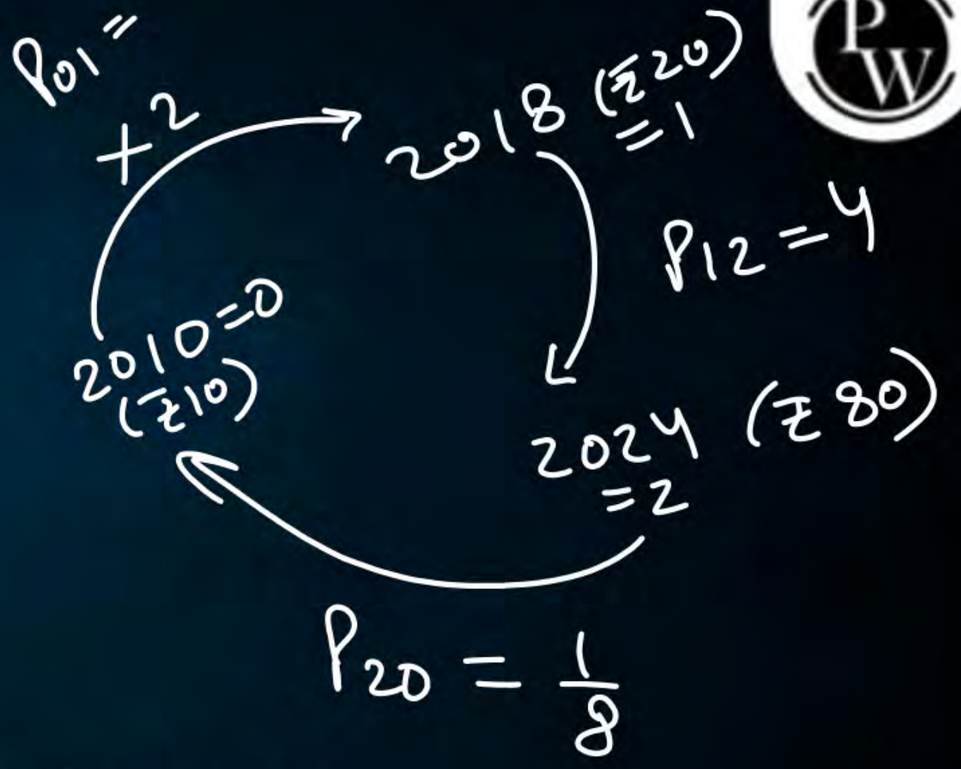
According to this test the product of a price index and the quantity index should be equal to the corresponding value index

$$P_{01} \times Q_{01} = V_{01}$$ or $$P_{01} \times Q_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_0}$$

This test is satisfied By

- Fisher's Method

4)Circular Test



This is the extension of Time reversal

$$P_{01} \times P_{12} \times P_{20} = 1$$

- Circular Test is met by simple geometric mean of price relatives &
- weighted aggregative with fixed weights.

THANK
YOU