INDEX NUMBERS

Introduction

[1] As in case of an average we study the central value of the distribution.

[2] We can study the average of the deviations of the observation from the central value.

[3] Index number is also one type of average through which we can study the average of changes in a set of variables over time.

[4] There is a specific difference between the usual average and index number.

[5] In average we can compare between two sets of variables only when they are expressed in same units and they should be of similar categories.

[6] If the series consists of dissimilar things, simple average cannot compare them, which is the limitation of an average.

[7] Index number is helpful to study the changes of some factors which cannot be measured directly.

Definition:

'Index numbers are devices for measuring differences in the magnitude of a group of related variables.   Croxton & Cowdert.

OR

Index numbers are statistical tools designed to measure the relative change in the level of variable or group of variables with respect to time, geographical location etc.

In other words these are the numbers which express the value of a variable at any given period called "**current period** "as a percentage of the value of that variable at some standard period called "**base period**".Here the variables may be

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(i) The price of a particular commodity like silver, iron or group of commodities like consumer goods, food etc.

(ii) The volume of trade, exports, imports, agricultural and industrial production, sales in departmental store.

(iii) Cost of living of persons belonging to particular income group or profession etc.

Ex: Suppose rice sells at Rs.30/kg at Nanded in 2010 as compare to Rs. 15/Kg in 2000, the index number of price in 2010 compared to 2000.

Therefore the index number of price of rice in 2010 compared to 2000 is calculated as

$$\frac{\text{Rs.}30}{\text{Rs.}15}\times 100 = 200$$

Interpretation: This means there is a net increase of 100% in the price of rice in 2010 as compared to 2000 [the base year's index number is always treated as 100]

Suppose, during the same period 2010 the rice sells at Rs. 40.00/kg in Ahmednagar. There fore, the index number of price at Nanded compared to price at Ahmednagar is $\frac{\text{Rs.}30}{\text{Rs.}40}\times 100 = 75$

Interpretation: This means there is a net decrease of 25% in the price of rice at Nanded as compared to Ahmednagar.

The above index numbers are called **'price index numbers'**.

To take another example the production of rice in 1978 in Orissa was 44, 01,780 metric tons compare to 36, 19,500 metric tons in 1971. So the index number of the quantity produced in 1978 compared to 1971 is

$$\frac{4401780}{3619500}\times 100 = 121.61$$

Interpretation: This means there is a net increase of 21.61% in production of rice in 1978 as compared to 1971.

The above index number is called **'quantity index number'**

Univariate index: An index which is calculated from a single variable is called univariate index.

Composite index: An index which is calculated from group of variables is called Composite index

Meaning of Index Number

[1] If we are to study the ups and downs in the general price level in a state, it is not possible to take any particular commodity straight forward and study its change of prices time to time and comment about the price level.

[2] There are several commodities whose prices are also changing in different modes, in course of time.

[3] In this case, what we do, we take some items which are mostly common in our daily use and study their price changes time to time.

[4] This change of price should always be with respect to a particular year, which is a year of reference termed as **base year**.

[5] The changes discussed above are related with time and location.

[6] Index numbers measure only the relative changes.

[7] Index number is a numerical value, which is the measure of relative change in price or quantity or value of a set of certain commodities of any period of time compared to another period known as **base period.**

Problems in the constructing index numbers:

Before constructing index numbers the careful thought must be given into following problems

[1] Purpose of index numbers.

An index number which is properly designed for a purpose can be most useful and powerful tool. Thus the first and the foremost problem are to determine the purpose of index numbers. If we know the purpose of the index numbers we can settle some related problems. For example if the purpose of

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index number is to measure the changes in the production of steel, the problem of selection of items is automatically settled.

[2] Selection of commodities

After defining the purpose of index numbers, select only those commodities which are related to that index. For example if the purpose of an index is to measure the cost of living of low income group we should select only those commodities or items which are consumed by persons belonging to this group and due care should be taken not to include the goods which are utilized by the middle income group or high income group i.e. the goods like cosmetics, other luxury goods like scooters, cars, refrigerators, television sets etc.

[3] Selection of base period

The period with which the comparisons of relative changes in the level of phenomenon are made is termed as **base period.** The index for this period is always taken as 100. The following are the basic criteria for the choice of the base period.

(i) The base period must be a normal period i.e. a period frees from all sorts of abnormalities or random fluctuations such as labor strikes, wars, floods, earthquakes etc.

(ii) The base period should not be too distant from the given period. Since index numbers are essential tools in business planning and economic policies the base period should not be too far from the current period. For example for deciding increase in dearness allowance at present there is no advantage in taking 1950 or 1960 as the base, the comparison should be with the preceding year after which the DA has not been increased.

(iii) Fixed base or chain base . While selecting the base a decision has to be made as to whether the base shall remain fixing or not i.e. whether we have fixed base or chain base. In the fixed base method the year to which the other years are compared is constant. On the other hand, in chain base method the

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prices of a year are linked with those of the preceding year. The chain base method gives a better picture than what is obtained by the fixed base method

How a base is selected if a normal period is not available?

Ans: Sometimes it is difficult to distinguish a year which can be taken as a normal year and hence the average of a few years may be regarded as the value corresponding to the base year.

[4] Data for index numbers

The data, usually the set of prices and of quantities consumed of the selected commodities for different periods, places etc. constitute the raw material for the construction of index numbers. The data should be collected from reliable sources such as standard trade journals, official publications etc. for example for the construction of retail price index numbers, the price quotations for the commodities should be obtained from super bazaars, departmental stores etc. and not from wholesale dealers.

[5] Selection of appropriate weights

A decision as to the choice of weights is an important aspect of the construction of index numbers. The problem arises because all items included in the construction are not of equal importance. So proper weights should be attached to them to take into account their relative importance. Thus there are two type of indices.

(i) Un-weighted indices- in which no specific weights are attached

(ii) Weighted indices- in which appropriate weights are assigned to various items.

[6] Choice of average.

Since index numbers are specialized averages, a choice of average to be used in their construction is of great importance. Usually the following averages are used.

(i) A.M

(ii) G.M

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(iii) Median

Among these averages G.M is the appropriate average to be used. But in practice G.M is not used as often as A.M because of its computational difficulties.

[7] Choice of formula.

A large variety of formulae are available to construct an index number. The problem very often is that of selecting the appropriate formula. The choice of the formula would depend not only on the purpose of the index but also on the data available.

Uses of index numbers:-

Index numbers are indispensable tools of economics and business analysis. Following are the main uses of index numbers.

[1] Index numbers are used as economic barometers:

Index number is a special type of averages which helps to measure the economic fluctuations on price level, money market, economic cycle like inflation, deflation etc. G. Simpson and F. Kafka say that index numbers are today one of the most widely used statistical devices. They are used to take the pulse of economy and they are used as indicators of inflation or deflation tendencies. So index numbers are called economic barometers.

[2] Index numbers helps in formulating suitable economic policies and planning etc.

Many of the economic and business policies are guided by index numbers. For example while deciding the increase of DA of the employees; the employer's have to depend primarily on the cost of living index. If salaries or wages are not increased according to the cost of living it leads to strikes, lock outs etc. The index numbers provide some guide lines that one can use in making decisions.

[3] They are used in studying trends and tendencies.

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Since index numbers are most widely used for measuring changes over a period of time, the time series so formed enable us to study the general trend of the phenomenon under study. For example for last 8 to 10 years we can say that imports are showing upward tendency.

[4] They are useful in forecasting future economic activity.

Index numbers are used not only in studying the past and present workings of our economy but also important in forecasting future economic activity.

[5] Index numbers measure the purchasing power of money.

The cost of living index numbers determine whether the real wages are rising or falling or remain constant. The real wages can be obtained by dividing the money wages by the corresponding price index and multiplied by 100. Real wages helps us in determining the purchasing power of money.

[6] Index numbers are used in deflating.

Index numbers are highly useful in deflating i.e. they are used to adjust the wages for cost of living changes and thus transform nominal wages into real wages, nominal income to real income, nominal sales to real sales etc. through appropriate index numbers.

Methods of constructing index numbers:

A large number of formulae have been derived for constructing index numbers. They can be

[1] Un-weighted indices

(a) Simple aggregative method

(b) Simple average of relatives.

[2] Weighted indices

(a) Weighted aggregative method

(i) Lasperey's method

(ii) Paasche's method

(iii) Fisher's ideal method

(iv) Dorbey's and Bowley's method

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(v) Marshal-Edgeworth method

(**vi)** Kelly's method

(b) Weighted average of relatives

[1] Unweighted indices:

(a) Simple aggregative method:

This is the simplest method of constructing index numbers. When this method is used to construct a price index number the total of current year prices for the various commodities in question is divided by the total of the base year prices and the quotient is multiplied by 100. Symbolically, it can be written as.

$P_{01} = \frac{\sum P_1}{\sum P_0} \times 100$;   Where,

P_0 are the base year prices

P_1 are the current year prices

P_{01} is the price index number for the current year with reference to the base year.

Problem:

Calculate the index number for 1995 taking 1991 as the base for the following data

Commodity	Unit	Prices 1991 (P_0)	Prices 1995 (P_1)
A	Kilogram	2.50	4.00
B	Dozen	5.40	7.20
C	Meter	6.00	7.00
D	Quintal	150.00	200.00
E	Liter	2.50	3.00
Total		166.40	221.20

Price index number = $P_{01} = \frac{\sum P_1}{\sum P_0} \times 100 = \frac{221.20}{166.40} \times 100 = 132.93$

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$\therefore$ There is a net increase of 32.93% in 1995 as compared to 1991.

Limitations:

There are two main limitations of this method

[1] The units used in the prices or quantity quotations have a great influence on the value of index.

[2] No considerations are given to the relative importance of the commodities.

(b) Simple average of relatives

When this method is used to construct a price index number, first of all price relatives are obtained for the various items included in the index and then the average of these relatives is obtained using any one of the averages i.e. mean or median etc.

When A.M is used for averaging the relatives the formula for computing the index is

$$P_{01} = \frac{1}{n}\sum\left(\frac{P_1}{P_0}\times 100\right)$$

When G.M is used for averaging the relatives the formula for computing the index is

$$P_{01} = \text{Antilog}\left[\frac{1}{n}\sum\log\left(\frac{P_1}{P_0}\times 100\right)\right]$$

Where n is the number of commodities and

$$\text{Price relative} = \frac{P_1}{P_0}\times 100$$

Problem:

Calculate the index number for 1995 taking 1991 as the base for the following data

Commodity	Unit	Prices 1991 (P_0)	Prices 1995 (P_1)	$\frac{P_1}{P_0}\times 100$

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A	Kilogram	50	70	$\frac{70}{50}\times 100 =$ 140
B	Dozen	40	60	150
C	Meter	80	90	112.5
D	Quintal	110	120	109.5
E	Liter	20	20	100
Total				

Price index number = $P_{01} = \frac{1}{n}\sum\left(\frac{P_1}{P_0}\times 100\right) = \frac{1}{5}\sum 612 = 122.4$

$\therefore$ **Interpretation:-** There is a net increase of 22.4% in 1995 as compared to 1991.

Merits:

[1] It is not affected by the units in which prices are quoted

[2] It gives equal importance to all the items and extreme items don't affect the index number.

[3] The index number calculated by this method satisfies the unit test.

Demerits:

[1] Since it is an unweighted average the importance of all items are assumed to be the same.

[2] The index constructed by this method doesn't satisfy all the criteria of an ideal index number.

[3] In this method one can face difficulties to choose the average to be used.

Weighted indices:

(b) Weighted aggregative method:

These indices are same as simple aggregative method. The only difference is in this method, weights are assigned to the various items included in the index.

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There are various methods of assigning weights and consequently a large number of formulae for constructing weighted index number have been designed. Some important methods are

[i] Lasperey’s method: This method is devised by Lasperey in year 1871.It is the most important of all the types of index numbers. In this method the base year quantities are taken weights. The formula for constructing Lasperey’s price index number is

Ernst Louis Étienne Laspeyres (1834-1913) , Germany

$$P_{01}^{L}=\frac{\sum p_1 q_0}{\sum p_0 q_0}\times 100$$

[ii] Paasche’s method: In this method the current year quantities are taken as weights and the formula is given by

$$P_{01}^{P}=\frac{\sum p_1 q_1}{\sum p_0 q_1}\times 100$$

Hermann Paasche (1851-1925) Germany

[iii] Fisher’s ideal method: Fishers price index number is given by the G.M of the Lasperey’s and Paasche’s index numbers. Symbolically,

Sir Ronald Aylmer Fisher (1890-1962), England

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

$$=\sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0}\times 100\,\frac{\sum p_1 q_1}{\sum p_0 q_1}\times 100}$$

$$=\sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0}\,\frac{\sum p_1 q_1}{\sum p_0 q_1}}\times 100$$

Quantity index numbers:

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[i] Lasperey's quantity index number: Base year prices are taken as weights

$$P_{01}^{L} = \frac{\sum q_1 p_0}{\sum q_0 p_0} \times 100$$

[ii] Paasche's quantity index number : Current year prices are taken as weights

$$P_{01}^{P} = \frac{\sum q_1 p_1}{\sum q_0 p_1} \times 100$$

[iii] **Fisher's ideal method:** $P_{01}^{F} = \sqrt{Q_{01}^{L} \times Q_{01}^{P}} = \sqrt{\frac{\sum q_1 p_0}{\sum q_0 p_0} \times \frac{\sum q_1 p_1}{\sum q_0 p_1}} \times 100$

Fisher's index number is called ideal index number. Why?

The Fisher's index number is called ideal index number due to the following characteristics.

(1) It is based on the G.M which is theoretically considered as the best average of constructing index numbers.

(2) It takes into account both current and base year prices as quantities.

(3) It satisfies both time reversal and factor reversal test which are suggested by Fisher.

(4) The upward bias of Lasperey's index number and downward bias of Paasche's index number are balanced to a great extent.

Example: Compute price index numbers for the following data by

[i] Lasperey's index number:

[ii] Paasche's index number :

[iii] Fisher's method:

[iv] Dorbish – Bowley method:

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Year	Commodity A		Commodity B		Commodity C	
	Price	Quantity	Price	Quantity	Price	Quantity
1980	4	50	3	10	2	5
1985	10	45	6	8	3	4

Solution:

Commodity	1980		1985					
	Price P_0	Quant q_0	Price P_1	Quant q_1	p_1q_0	p_0q_0	p_1q_1	p_0q_1
A	4	50	10	45	500	200	450	180
B	3	10	6	8	60	30	48	24
C	2	5	3	4	15	10	12	8
Total					575	240	510	212

[i] Lasperey's price index number: Base year quantity are taken as weights

$$P_{01}^{L}=\frac{\sum p_1q_0}{\sum p_0q_0}\times 100$$

$$P_{01}^{L}=\frac{575}{240}\times 100$$

$$P_{01}^{L}=239.58$$

[ii] Paasche's price index number : Current year quantity are taken as weights

$$P_{01}^{P}=\frac{\sum p_1q_1}{\sum p_0q_1}\times 100$$

$$P_{01}^{P}=\frac{510}{212}\times 100$$

$$P_{01}^{P}=240.57$$

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[iii] **Fisher's ideal method:**

$$P_{01}^{F}=\sqrt{P_{01}^{L}\times P_{01}^{P}}$$
$$P_{01}^{F}=\sqrt{239.58\times 240.57}$$
$$P_{01}^{F}=240.07$$

[iv] Dorbish – Bowley method:

$$P_{01}^{DB}=\frac{P_{01}^{L}+P_{01}^{P}}{2}$$
$$P_{01}^{DB}=\frac{239.58+240.57}{2}$$
$$P_{01}^{DB}=239.82$$

Comparison of Lasperey's and Paasche's index numbers:-

In Lasperey's index number base year quantities are taken as the weights and in Paasche's index the current year quantities are taken as weights.

From the practical point of view Lasperey's index is often proffered to Paasche's for the simple reason that Lasperey's index weights are the base year quantities and do not change from the year to the next. On the other hand Paasche's index weights are the current year quantities, and in most cases these weights are difficult to obtain and expensive.

Lasperey's index number is said to be have upward bias because it tends to over estimate the price rise, where as the Paasche's index number is said to have downward bias, because it tends to under estimate the price rise.

When the prices increase, there is usually a reduction in the consumption of those items whose prices have increased. Hence using base year weights in the Lasperey's index, we will be giving too much weight to the prices that have increased the most and the numerator will be too large. Due to similar considerations, Paasche's index number using given year weights underestimates the rise in price and hence has down ward bias.

If changes in prices and quantities between the reference period and the base period are moderate, both Lasperey's and Paasche's indices give nearly the same values.

Demerit of Paasche's index number:

Paasche's index number, because of its dependence on given year's weight, has distinct disadvantage that the weights are required to be revised and computed for each period, adding extra cost towards the collection of data.

Base shifting:

One of the most frequent operations necessary in the use of index numbers is changing the base of an index from one period to another with out recompiling the entire series. Such a change is referred to as *'base shifting'*. The reasons for shifting the base are

[1] If the previous base has become too old and is almost useless for purposes of comparison.

[2] f the comparison is to be made with another series of index numbers having different base.

The following formula must be used in this method of base shifting is

$$\text{New base Index Number} = \frac{\text{Original index number}}{\text{Index number of new base year}} \times 100$$

Numerical Examples:

The following are the index numbers of prices with 1998 as base year

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Index	100	110	120	200	400	410	400	380	370	340

Shift the base from 1998 to 2004 and recast the index numbers.

Solution:

$$\text{New base Index Number} = \frac{\text{Original index number}}{\text{Index number of new base year}} \times 100$$

Year	Index number (1998 as base)	Index number (2004 as base)	Year	Index number (1998 as base)	Index number (2004 as base)
1998	100	$\frac{100}{400}\times 100 = 25$	2003	410	$\frac{410}{400}\times 100 = 102.5$
1999	110	$\frac{110}{400}\times 100 = 27.5$	2004	400	$\frac{400}{400}\times 100 = 100$
2000	120	$\frac{120}{400}\times 100 = 30$	2005	380	$\frac{380}{400}\times 100 = 95$
2001	200	$\frac{200}{400}\times 100 = 50$	2006	370	$\frac{370}{400}\times 100 = 92.5$
2002	400	$\frac{400}{400}\times 100 = 100$	2007	340	$\frac{340}{400}\times 100 = 85$

Splicing of two series of index numbers:

The problem of combining two or more overlapping series of index numbers into one continuous series is called splicing. In other words, if we have a series of index numbers with some base year which is discontinued at some year and we have another series of index numbers with the year of discontinuation as the base, and connecting these two series to make a continuous series is called splicing.

The following formula must be used in this method of splicing

Index number after splicing

$$= \frac{\text{Index number to be spliced} \times \text{old index number of existing base}}{100}$$

Example: The index A given was started in 1993 and continued up to 2003 in which year another index B was started. Splice the index B to index A so that a continuous series of index is made

Year	1993	1994	1995	-	-	-	2002	2003	2004	2005	2006	2007
Index A	100	110	112	-	-	-	138	150	-	-	-	-
Index B	-	-	-	-	-	-	-	100	12	140	13	150

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Solution:-

Year	Index A	Index B	Index B Spliced to Index A 1993 as base
1993	**100**		
1994	**110**		
1995	**112**		
-			
-			
-			
2002	**138**		
2003	**150**	**100**	$\frac{150}{100}\times 100=150$
2004		**120**	$\frac{150}{100}\times 120=180$
2005		**140**	$\frac{150}{100}\times 140=210$
2006		**130**	$\frac{150}{100}\times 130=195$
2007		**150**	$\frac{150}{100}\times 150=225$

The spliced index now refers to 1993 as base and we can make a continuous comparison of index numbers from 1993 onwards.

In the above case it is also possible to splice the new index in such manner that a comparison could be made with 2003 as base. This would be done by multiplying the old index by the ratio, $\frac{100}{150}$. Thus the spliced index for 1993 would be $\frac{100}{150}\times 112=74.6$. This process appears to be more useful because a recent year can be kept as a base. However, much would depend upon the object.

Deflating:

Deflating means correcting or adjusting a value which has inflated. It makes allowances for the effect of price changes. When prices rise, the purchasing

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power of money declines. If the money incomes of people remain constant between two periods and prices of commodities are doubled the purchasing power of money is reduced to half. For example if there is an increase in the price of rice from Rs10/kg in the year 1980 to Rs20/kg in the year 1982. then a person can buy only half kilo of rice with Rs10. so the purchasing power of a rupee is only 50paise in 1982 as compared to 1980.

$$\text{Thus the purchasing power of money} = \frac{1}{\text{Price index}}$$

In times of rising prices the money wages should be deflated by the price index to get the figure of real wages. The real wages alone tells whether a wage earner is in better position or in worst position.

For calculating real wage, the money wages or income is divided by the corresponding price index and multiplied by 100.

$$\text{i. e. Real wages} = \frac{\text{Money wages}}{\text{Price index}} \times 100$$

$$\text{Thus Real Wage Index} = \frac{\text{Real wage of current year}}{\text{Real wage of base year}} \times 100$$

Example: The following table gives the annual income of a worker and the general Index Numbers of price during 1999-2007. Prepare Index Number to show the changes in the real income of the teacher and comment on price increase

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007
Income in Rs.	3600	4200	5000	5500	6000	6400	6800	7200	7500
Index No.	100	120	145	160	250	320	450	530	600

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Solution:-

Year	Income in Rs.	Price index No.	Real Income	Real Income Index
1999	3600	100	$\frac{3600}{100}\times 100 = 3600$	100
2000	4200	120	$\frac{4200}{120}\times 100 = 3500$	97.22
2001	5000	145	$\frac{5000}{145}\times 100 = 3448.27$	95.78
2002	5500	160	$\frac{5500}{160}\times 100 = 3437.50$	95.49
2003	6000	250	$\frac{6000}{250}\times 100 = 2400$	66.67
2004	6400	320	$\frac{6400}{320}\times 100 = 2000$	55.56
2005	6800	450	$\frac{6800}{450}\times 100 = 1511.11$	41.98
2006	7200	530	$\frac{7200}{530}\times 100 = 1358.49$	37.74
2007	7500	600	$\frac{7500}{600}\times 100 = 1250.00$	34.72

The method discussed above is frequently used to deflate individual values, value series or value indices. Its special use is in problems dealing with such diversified things as rupee sales, rupee inventories of manufacturer's, wholesaler's and retailer's income, wages and the like.

Cost of living index numbers (or) Consumer price index numbers:

The **cost of living index numbers** measures the changes in the level of prices of commodities which directly affects the cost of living of a specified group of persons at a specified place. The general index numbers fails to give an idea on cost of living of different classes of people at different places.

Different classes of people consume different types of commodities, people's consumption habit is also vary from man to man, place to place and class to class i.e. richer class, middle class and poor class. For example the cost

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of living of rickshaw pullers at BBSR is different from the rickshaw pullers at Kolkata. The consumer price index helps us in determining the effect of rise and fall in prices on different classes of consumers living in different areas.

Main steps or problems in construction of cost of living index numbers

The following are the main steps in constructing a cost of living index number.

[1] Decision about the class of people for whom the index is meant:

It is absolutely essential to decide clearly the class of people for whom the index is meant i.e. whether it relates to industrial workers, teachers, officers, labours, etc. Along with the class of people it is also necessary to decide the geographical area covered by the index, such as a city, or an industrial area or a particular locality in a city.

[2] Conducting family budget enquiry:

Once the scope of the index is clearly defined the next step is to conduct a sample family budget enquiry i.e. we select a sample of families from the class of people for whom the index is intended and scrutinize their budgets in detail. The enquiry should be conducted during a normal period i.e. a period free from economic booms or depressions. The purpose of the enquiry is to determine the amount; an average family spends on different items. The family budget enquiry gives information about the nature and quality of the commodities consumed by the people. The commodities are being classified under following heads

(i) Food

(ii) Clothing

(iii) Fuel and Lighting

(iv) House rent

(v) miscellaneous

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[3] Collecting retail prices of different commodities:

The collection of retail prices is a very important and at the same time very difficult task, because such prices may vary from lace to place, shop to shop and person to person. Price quotations should be obtained from the local markets, where the class of people reside or from super bazaars or departmental stores from which they usually make their purchases.

Uses of cost of living index numbers:

[1] Cost of living index numbers indicate whether the real wages are rising or falling. In other words they are used for calculating the real wages and to determine the change in the purchasing power of money.

$$\text{Purchasing power of money} = \frac{1}{\text{Cost of living index number}}$$

$$\text{Real Wages} = \frac{\text{Money wages}}{\text{Cost of living index umbers}} \times 100$$

[2] Cost of living indices are used for the regulation of D.A or the grant of bonus to the workers so as to enable them to meet the increased cost of living.

[3] Cost of living index numbers are used widely in wage negotiations.

[4] These index numbers also used for analyzing markets for particular kinds of goods.

Methods for construction of cost of living index numbers:

Cost of living index number can be constructed by the following formulae.

(1) Aggregate expenditure method or weighted aggregative method

(2) Family budget method or the method of weighted relatives

(1) Aggregate expenditure method or weighted aggregative method

In this method the quantities of commodities consumed by the particular group in the base year are taken as weights. The formula is given by

$$\text{Consumer price index} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

Steps:

(i) The prices of commodities for various groups for the current year is multiplied by the quantities of the base year and their aggregate expenditure of current year is obtained .i.e. $\sum p_1 q_0$

(ii) Similarly obtain $\sum p_0 q_0$

(iii) The aggregate expenditure of the current year is divided by the aggregate expenditure of the base year and the quotient is multiplied by 100.

Symbolically

$$\frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

(2) Family budget method or the method of weighted relatives

In this method cost of living index is obtained on taking the weighted average of price relatives, the weights are the values of quantities consumed in the base year i.e. $v = p_0 q_0$. Thus the consumer price index number is given by

$$\text{Consumer price index} = \frac{\sum pv}{\sum v}$$

Where,

$p = \frac{p_1}{p_o} \times 100$ for each item and $v = p_0 q_0$, value on the base year

Note: It should be noted that the answer obtained by applying the aggregate expenditure method and family budget method shall be same.

Example: Construct the consumer price index number for 2007 on the basis of 2006 from the following data using (i) the aggregate expenditure method, and (ii) the family budget method.

Commodity	Quantity consumed in 2006	Units	Price in 2006		Price in 2007	
			Rs.	Paise	Rs.	Paise
A	6 Quintals	Quintals	5	75	6	0
B	6 Quintals	Quintals	5	0	8	0

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C	1 Quintals	Quintals	6	0	9	0
D	6 Quintals	Quintals	8	0	10	0
E	4 Kg.	Kg.	2	0	1	50
F	1 Quintals	Quintals	20	0	15	0

Solution:

Commodity	Quantity consumed in 2006	Units	Price in 2006 (p_0)	Price in 2007 (p_1)	p_1q_0	p_0q_0
A	6 Quintals	Quintals	5.75	6	36	34.50
B	6 Quintals	Quintals	5	8	48	30.00
C	1 Quintals	Quintals	6	9	9	06.00
D	6 Quintals	Quintals	8	10	60	48.00
E	4 Kg.	Kg.	2	1.50	6	08.00
F	1 Quintals	Quintals	20	15	15	20.00

$$\text{Consumer Price Index } = \frac{\sum p_1q_0}{\sum p_0q_0} \times 100$$

$$\text{Consumer Price Index } = \frac{174}{146.5} \times 100$$

$$\text{Consumer Price Index } = 118.77$$

Thus, the answer is the same by both the methods. However, the reader should prefer the aggregate expenditure method because it is far more easier to apply compared to the family budget method.

Possible errors in construction of cost of living index numbers:

[1] Cost of living index numbers or its recently popular name consumer price index numbers are not accurate due to various reasons.

[2] Errors may occur in the construction because of inaccurate specification of groups for whom the index is meant.

[3] Faulty selection of representative commodities resulting out of unscientific family budget enquiries.

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[4] Inadequate and unrepresentative nature of price quotations and use of inaccurate weights

[5] Frequent changes in demand and prices of the commodity

[6] The average family might not be always a representative one.

Problems or steps in the construction of wholesale price index numbers (WPI):

Index numbers are the best indicators of the economic progress of a community, a nation and the world as a whole. Wholesale price index numbers can also be constructed for different economic activities such as Indices of Agricultural production, Indices of Industrial production, Indices of Foreign Trade etc. Besides some International organizations like the United Nations Organization, the F.A.O. of the U.N., the World Bank and International Labor Organization, there are a number of organizations in the country who publish index numbers on different aspects. These are (a) Ministry of Food and Agriculture, (b) Reserve Bank of India, (c) Central Statistical Organization, (d) Department of Commercial Intelligence and Statistics, (e) Labour Bureau, (f) Eastern Economist. The Central Statistical Organization of the Government of India publishes a Monthly Abstract of’ Statistics which contains All India index numbers of Wholesale Prices (Revised series : Base year 1981-82) both commodity-wise and also for the aggregate.

Wholesale price index numbers (Vs) consumer price index numbers:

[1] The wholesale price index number measures the change in price level in a country as a whole. For example economic advisors index numbers of wholesale prices.Where as cost of living index numbers measures the change in the cost of living of a particular class of people stationed at a particular place. In this index number we take retail price of the commodities.

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[2] The wholesale price index number and the consumer price index numbers are generally different because there is lag between the movement of wholesale prices and the retail prices.

[3] The retail prices required for the construction of consumer price index number increased much faster than the wholesale prices i.e. there might be erratic changes in the consumer price index number unlike the wholesale price index numbers.

[4]The method of constructing index numbers in general the same for wholesale prices and cost of living. The wholesale price index number is based on different weighting systems and the selection of commodities is also different as compared to cost of living index number

SENSEX and NIFTY

The Sensex is an "index". An index is basically an indicator. It gives you a general idea about whether most of the stocks have gone up or most of the stocks have gone down. The Sensex is an indicator of all the major companies of the BSE while the Nifty is an indicator of all the major companies of the NSE.

If the Sensex goes up, it means that the prices of the stocks of most of the major companies on the BSE have gone up. If the Sensex goes down, this tells you that the stock price of most of the major stocks on the BSE have gone down. Sensex represents the top stocks of the BSE, the Nifty represents the top stocks of the NSE.

Just in case you are confused, the BSE, is the Bombay Stock Exchange and the NSE is the National Stock Exchange. The BSE is situated at Bombay and the NSE is situated at Delhi. These are the major stock exchanges in the country. There are other stock exchanges like the Calcutta Stock Exchange etc. but they are not as popular as the BSE and the NSE. Most of the stock trading in the country is done though the BSE & the NSE

Numerical Examples:

[1] Suppose, in 1995 the average salary of wage earners 18 years and older in Mumbai and Aurangabad was Rs.3028 per year. In 2001, it was Rs.4165 per year. What is the index of yearly earnings of workers over age 18 in Mumbai and Aurangabad 2001 based on 1995?

Solution:

$$I = \frac{\text{Average yearly income of wage earners over 18 in 2001}}{\text{Average yearly income of wage earners over 18 in 1995}} \times 100$$

$$I = \frac{4165}{3028} \times 100$$

$$I = 137.55$$

Thus, the yearly salaries in 2001 compared to 1995 were 137.55 percent. This means that there was a 37.55 percent increase in yearly salaries during the six years from 1995 to 2001.

[2] Statistics results show that the number of farms in Maharashtra dropped from 276 548in 1996, to an estimated 246 923 in 2001. What is the index for the number of farms in 2001based on the number in 1996?

Solution:

$$I = \frac{\text{Number of farms in 2001}}{\text{Number of farms in 1996}} \times 100$$

$$I = \frac{246923}{276548} \times 100$$

$$I = 89.3$$

This indicates that the number of farms in 2001 compared with 1996 was 89.3 percent. To put it another way, the number of farms in Maharashtra decreased by 10.7 percent during the five-year period.

[3] An index can also compare one item with another. The population of Current Population of Maharashtra in 2014 was 117,853,636 and for Population of Uttar Pradesh it was 211,797,459. What is the population of Maharashtra compared Uttar Pradesh?

Solution:

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$$I = \frac{\text{Population of Maharashtra}}{\text{Population of Uttar Pradesh}} \times 100$$

$$I = \frac{117853636}{211797459} \times 100$$

$$I = 55.65$$

This indicates that the population of Maharashtra is 55.65 percent (about one half) of the population of Uttar Pradesh, or the population of Maharashtra is 44.35 percent less than the population of Uttar Pradesh.

Source: database, http://www.indiaonlinepages.com/population

Laspeyres' Price Index

[4] The prices for the six food items from following table .Also included is the number of units of each consumed by a typical family in 1995 and 2005.

	1995		2005	
Item	Price in Rs.	Quantity	Price in Rs.	Quantity
Bread white (loaf)	1	50	2	55
Eggs (dozen)	24	26	36	20
Milk (liter)	12	102	24	130
Apples 1000 gm	30	30	80	40
Orange juice, (355 ml)	4	40	10	41
Coffee	2	12	6	12

Determine a weighted price index using the Laspeyres method. Interpret the result.

Solution:

First we determine the total amount spent for the six items in the base period, 1995. To find this value we multiply the base period price for bread (Rs.1) by the base period quantity of 50. The result is Rs.50. This indicates that a total of Rs.50 was spent in the base period on bread. We continue that for all items and total the results.

	1995		2005			
Item	Price in	Quantity	Price in	Quantity	$P_0 q_0$	$P_1 q_0$

	Rs. (p_0)	(q_0)	Rs. (p_1)	(q_1)		
Bread white (loaf)	1	50	2	55	50	100
Eggs (dozen)	24	26	36	20	624	936
Milk (liter)	12	102	24	130	1224	2448
Apples 1000gm	30	30	80	40	900	2400
Orange juice, (355 ml)	4	40	10	41	160	400
Coffee	2	12	6	12	24	72
Total					**2982**	**6356**

$$P_{01}^{L} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$P_{01}^{L} = \frac{6356}{2982} \times 100$$

$$P_{01}^{L} = 213.14$$

Based on this analysis we conclude that the price of this group of items has increased 113.14 percent in the ten year period. The advantage of this method over the simple aggregate index is that the weight of each of the items is considered.

Paasche's Price Index

[5] The prices for the six food items from following table .Also included is the number of units of each consumed by a typical family in 1995 and 2005.

	1995		2005	
Item	Price in Rs.	Quantity	Price in Rs.	Quantity
Bread white (loaf)	1	50	2	55
Eggs (dozen)	24	26	36	20
Milk (litre)	12	102	24	130
Apples 1000gm	30	30	80	40
Orange juice, (355 ml)	4	40	10	41
Coffee	2	12	6	12

Determine a weighted price index using the Paasche's method. Interpret the result.

Solution:

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First we determine the total amount spent for the six items in the base period, 1995. To find this value we multiply the base period price for bread (Rs.1) by the base period quantity of 50. The result is Rs.50. This indicates that a total of Rs.50 was spent in the base period on bread. We continue that for all items and total the results.

	1995		2005			
Item	Price in Rs. (p_0)	Quantity (q_0)	Price in Rs. (p_1)	Quantity (q_1)	P_1 q_1	P_0 q_1
Bread white (loaf)	1	50	2	55	110	55
Eggs(dozen)	24	26	36	20	720	480
Milk (litre)	12	102	24	130	3120	1560
Apples 1000gm	30	30	80	40	3200	1200
Orange juice, (355 ml)	4	40	10	41	410	164
Coffee	2	12	6	12	72	24
Total					**7632**	**2483**

$$P_{01}^{P} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

$$P_{01}^{L} = \frac{7632}{2483} \times 100$$

$$P_{01}^{P} = 307.37$$

This result indicates that there has been an increase of 207.37 percent in the price of this market basket of goods between 1995 and 2005. That is, it costs 207.37 percent more to purchase these items in 2005 than it did in 1995. All things considered, because of the change in the quantities purchased between 1995 and 2005, the Paasche index is more reflective of the current situation. It should be noted that the Laspeyres index is more widely used. The Consumer Price Index, the most widely reported index, is an example of a Laspeyres index.

Fisher's Ideal Index

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[6] Calculate Laspeyre's , Paasche's and Fisher's price index number for the following data for the year 2002 taking 2001 as base year.

	2001		2002	
Item	Price in Rs.	Quantity	Price in Rs.	Quantity
A	20	8	40	6
B	50	10	60	5
C	40	15	50	10
D	20	20	20	15

Solution:

	2001		2002					
Item	Price in Rs. (P_0)	Quantity (q_0)	Price in Rs. (P_1)	Quantity (q_1)	$P_0\ q_0$	$P_1\ q_0$	$P_1\ q_1$	$P_0\ q_1$
A	20	8	40	6	160	320	240	120
B	50	10	60	5	500	600	300	250
C	40	15	50	10	600	750	500	400
D	20	20	20	15	400	400	300	300
Total					1660	2070	1340	1070

Laspeyre's Price index number

$$P_{01}^{L} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$P_{01}^{L} = \frac{2070}{1660} \times 100$$

$$P_{01}^{L} = 127.70$$

Paasche's Price index number

$$P_{01}^{P} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

$$P_{01}^{L} = \frac{1340}{1070} \times 100$$

$$P_{01}^{P} = 125.23$$

Fisher's Price index number

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

$$P_{01}^{F} = \sqrt{124.70 \times 125.23}$$

$$P_{01}^{F} = \sqrt{15616.181}$$

$$P_{01}^{F} = 124.96$$

[7] Calculate Laspeyre's , Paasche's and Fisher's price index number for the following data for the year 2000 taking 2005 as base year.

	2000		2005	
Item	Price in Rs.	Quantity	Price in Rs.	Quantity
A	10	100	12	110
B	8	50	10	60
C	25	80	30	70
D	15	60	20	80

Solution:

	2000		2005					
Item	Price in Rs. (P_0)	Quantity (q_0)	Price in Rs. (P_1)	Quantity (q_1)	$P_0\ q_0$	$P_1\ q_0$	$P_1\ q_1$	$P_0\ q_1$
A	10	100	12	110	1000	1200	1320	1100
B	8	50	10	60	400	500	600	480
C	25	80	30	70	2400	2400	2100	1750
D	15	60	20	80	1200	1200	1600	1200
Total					4300	5300	5620	4530

Laspeyre's Price index number

$$P_{01}^{L} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$P_{01}^{L} = \frac{5300}{4300} \times 100$$

$$P_{01}^{L} = 123.2$$

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Paasche's Price index number

$$P_{01}^{P} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

$$P_{01}^{P} = \frac{5620}{4530} \times 100$$

$$P_{01}^{P} = 124.10$$

Fisher's Price index number

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

$$P_{01}^{F} = \sqrt{123.2 \times 124.1}$$

$$P_{01}^{F} = \sqrt{15289.12}$$

$$P_{01}^{F} = 123.65$$

[8] With the help of following data calculate Laspeyre's, Paasche's and Fisher's price index number.

Commodity	Year 1995		Year 2005	
	Price	Quantity	Price	Quantity
A	100	8	150	6
B	25	10	45	5
C	10	15	25	10
D	20	20	26	15

Solution:

Commodity	1995		2005					
	Price (P_0)	Quantity (q_0)	Price (P_1)	Quantity (q_1)	P_0 q_0	P_1 q_0	P_1 q_1	P_0 q_1
A	100	8	150	6	800	1200	900	600
B	25	10	45	5	250	450	225	125
C	10	15	25	10	150	325	250	100

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D	20	20	26	15	400	520	390	300
Total					1600	2545	1765	1125

Laspeyre's Price index number

$$P_{01}^{L} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

$$P_{01}^{L} = \frac{2545}{1600} \times 100$$

$$P_{01}^{L} = 159.06$$

Paasche's Price index number

$$P_{01}^{P} = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

$$P_{01}^{P} = \frac{1765}{1125} \times 100$$

$$P_{01}^{P} = 156.89$$

Fisher's Price index number

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

$$P_{01}^{F} = \sqrt{159.06 \times 156.89}$$

$$P_{01}^{F} = \sqrt{24954.9234}$$

$$P_{01}^{F} = 157.97$$

[9] With the help of following data calculate Fisher's price index number.

Commodity	Year 2006		Year 2013	
	Price	Quantity	Price	Quantity
A	4	6	5	4
B	5	4	6	2
C	6	2	8	1

Solution:

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Commodity	2006		2013					
	Price (P_0)	Quantity (q_0)	Price (P_1)	Quantity (q_1)	P_0 q_0	P_1 q_0	P_1 q_1	P_0 q_1
A	4	6	5	4	24	30	20	16
B	5	4	6	2	20	24	12	10
C	6	2	8	1	12	16	8	6
Total					56	70	40	32

Fisher's Price index number

$$P_{01}^{F} = 100 \times \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1}}$$

$$P_{01}^{F} = 100 \times \sqrt{\frac{70}{56} \times \frac{40}{32}}$$

$$P_{01}^{F} = 100 \times \sqrt{1.25 \times 1.25}$$

$$P_{01}^{F} = 100 \times 1.25$$

$$P_{01}^{F} = 125$$

[10] With the help of following data calculate Fisher's price index number.

Commodity	Year 2010		Year 2013	
	Price	Quantity	Price	Quantity
A	40	16	80	12
B	100	20	120	10
C	80	30	100	20
D	40	40	40	30

Solution:

Commodity	2010		2013					
	Price (P_0)	Quantity (q_0)	Price (P_1)	Quantity (q_1)	P_0 q_0	P_1 q_0	P_1 q_1	P_0 q_1
A	40	16	80	12	640	1280	960	480
B	100	20	120	10	2000	2400	1200	1000
C	80	30	100	20	2400	3000	2000	1600

D	40	40	40	30	1600	1600	1200	1200
Total					6640	8280	5360	4280

Fisher's Price index number

$$P_{01}^{F} = 100 \times \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1}}$$

$$P_{01}^{F} = 100 \times \sqrt{\frac{8280}{6640} \times \frac{5360}{4280}}$$

$$P_{01}^{F} = 100 \times \sqrt{1.247 \times 1.252}$$

$$P_{01}^{F} = 100 \times \sqrt{1.561244}$$

$$P_{01}^{F} = 100 \times 1.249$$

$$P_{01}^{F} = 124.9$$

[11] The cost of living index number as found by taking the weighted arithmetic mean of group indices below was stated to be 210. In the record, the weight corresponding to fuel and lighting group is missing. Find the missing weight.

Group	Group Index	Weight
Food	250	40
Fuel and lighting	200	x
Clothing	180	15
House rent	150	15
Miscellaneous	205	10

Solution: we have

Cost of living index number is

$$\frac{(250 \times 40) + (200x) + (180 \times 15) + (150 \times 15) + (205 \times 10)}{40 + x + 15 + 15 + 10}$$

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$$\frac{(1000)+(200x)+(2700)+(2250)+(2050)}{80+x}$$

$$\frac{17000+200x}{80+x}$$

but index number is stated to be 210

$$210=\frac{17000+200x}{80+x}$$

$$210(80+x)=17000+200x$$
$$16800+210x=17000+200x$$
$$210x-200x=17000-16800$$
$$10x=200$$
$$x=20$$

[12] You are given the following data:

Commodity	Base year price	Current year price
A	50	70
B	20	40

The weight for the commodity A is 3. Find the weight for the commodity B if the index number as found by taking the weighted arithmetic mean of price relatives is 164.

Solutions: Let the weight for the commodity B be x. The price index number as found by taking the weighted A.M. of price relatives is

$$P_{01}=\frac{\sum\left(\frac{p_1}{p_0}\right)w_i}{\sum w_i}\times 100$$

$$P_{01} = \left\{ \frac{\left(\frac{70}{50} \times 3\right) + \left(\frac{40}{20} \times x\right)}{3 + x} \right\} \times 100$$

$$P_{01} = \left\{ \frac{\left(\frac{21}{5}\right) + (2x)}{3 + x} \right\} \times 100$$

$$P_{01} = \left\{ \frac{4.25 + (2x)}{3 + x} \right\} \times 100$$

$$P_{01} = \frac{425 + 200x}{3 + x}$$

but

$P_{01} = 164$

$$164 = \frac{425 + 200x}{3 + x}$$

$492 + 164x = 425 + 200x$

$492 - 425 = 200x - 164x$

$72 = 36x$

$x = 2$

Hence, weight for the commodity B is 2

Choose correct alternative from the following:

[1] A series of numerical figure which show the relative position is called

(a) index number (b) relative number

(c) absolute number (d) none of the above

Answer: (a) index number

[2] Index number for the base period is always taken as

(a) 200 (b) 50 (c) 1 (d) 100

Answer: (d) 100

[3] ….. play a very important part in the construction of index number

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(a) Weight (b) classes

(c) estimation (d) none of the above

Answer: (a) Weight

[4] …….is particularly suitable for the construction of index number.

(a) H.M . (b) A.M.

(c) G.M. (d) none of the above

Answer: (c) G.M.

[5] Index number show ….. change amount of change rather than absolute.

(a) relative (b) percentage

(c) both (d) none of the above

Answer: (b) percentage

[6] The …..makes index number time – reversible

(a) A.M. (b) G.M.

(c) H.M. (d) none of the above

Answer: (b) G.M.

[7] Price relative is equal to

$$(a)\frac{\text{Price in the given year}}{\text{Price in the base year}}\times 100$$

$$(b)\frac{\text{Price in the year base year}}{\text{price in the given year}}\times 100$$

$$(c)\frac{\text{Price in the given year}\times 100}{\text{Price in the base year}\times 100}$$

$$(d)\frac{\text{Price in the year base year}\times 100}{\text{price in the given year}\ \times 100}$$

Answer: [a]

[8] Index number is equal to

(a) sum of price relatives (b) average of the price relatives

(c) product of price relative (d) none of the above

Answer: [b]

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[9] The …… of group indices given the central index

(a) H.M. (b) G.M. (c) A.M. (d) None

Answer: (c) A.M.

[10] Circular test is one of the tests of

(a) index number (b) hypothesis

(c) both (d) none of the above

Answer: (a) index number

[11] ………is an extension of time reversal test

(a) factor reversal test (b) circular test

(c) both (d) none of the above

Answer: (b) circular test

[12] Weighted G.M of relative formula satisfy ……test.

(a) time reversal test (b) circular test

(c) factor reversal test (d) none of the above

Answer: (a) time reversal test

[13] Factor reversal test is satisfied by

(a) Fisher's ideal index (b) Laspeyres index

(c) Paasches index (d) none of the above

Answer: (a) Fisher's ideal index

[14] Laspeyre's formula does not satisfy

(a) Factors reversal test (b) Time reversal test

(c) circular test (d) All the about

Answer: (d) All the about

[15] A ratio or an average of ratio expressed as a percentage is called …..

(a) A relative number (b) An absolute number

(c) An index number (d) none of the above

Answer: (c) An index number

[16] The value at the base time period serves as the standard point of comparison

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(a) False (b) true

(c) relative (d) none of the above

Answer: (b) true

[17] Amn index time series is a list of …….number for two or more period of time.

(a) index (b) absolute

(c) relative (d) none of the above

Answer: (a) index

[18] Index number are often constructed from the

(a) Frequency (b) class

(c) sample (d) none of the above

Answer: (c) sample

[19] …….. is a point of reference in comparing various data describing individual behavior.

(a) sample (b) base period

(c) estimation (d) none of the above

Answer: (b) base period

[20] The ratio of price of single commodity in a given period to its price in the preceding year.

(a) Base period (b) price ratio

(c) estimation (d) none of the above

Answer: (c) estimation

[21] $\frac{\text{sum of all commodity price in the current year}}{\text{Sum of all commodity price in the base year is}} \times 100$

(a) relative price index

(b) simple aggregative price index

(c) both

(d) none of the above

Answer: (b) simple aggregative price index

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[22] Chain index is equal to

(a) $\dfrac{\text{Link relative of current year} \times \text{chain index of the current year}}{100}$

(b) $\dfrac{\text{Link relative of previous year} \times \text{chain index of the current year}}{100}$

(c) $\dfrac{\text{Link relative of current year} \times \text{chain index of the previous year}}{100}$

(d) $\dfrac{\text{Link relative of previous year} \times \text{chain index of previous year}}{100}$

Answer: [c]

[23] P_{01} is the index for time

(a) 1 on 0 (b) 0 on 1 (c) 1 on 1 (d) 0 on 0

Answer: (a) 1 on 0

[24] P_{10} is the index for time

(a) 1 on 0 (b) 0 on 1 (c) 1 on 1 (d) 0 on 0

Answer: (b) 0 on 1

[25] When the product of price index And the quantity index is equal to the corresponding value index then the test that holds is

(a) Unit Test (b) Time Reversal Test

(c) Factor Reversal Test (d) none holds

Answer: (c) Factor Reversal Test

[26] The formula should be independent of the unit in which or for which price and quantities are quoted in

(a) Unit Test (b) Time Reversal Test

(c) Factor Reversal Test (d) none of the above

Answer: (a) Unit Test

[27] Laspeyres method and Paasches method do not satisfy

(a) Unit Test (b) Time Reversal Test

(c) Factor Reversal Test (d) b & c

Answer: (d) b & c

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