

# Statistics for Economics Chapter 1 Introduction CBSE

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### Introduction Statistics for Economics Chapter 1 CBSE NCERT SOLUTIONS Class 11 Economics <http://freehomedelivery.net/>

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#### Exercises

#### 1. Mark the following statements as true or false.

- (i) Statistics can only deal with quantitative data.  
▶ False
- (ii) Statistics solves economic problems.  
▶ True
- (iii) Statistics is of no use to Economics without data.  
▶ True

#### 2. Make a list of activities that constitute the ordinary business of life. Are these economic activities?

#### Answer

The activities that constitute the ordinary business of life are:

- Buying of goods and services.
- Rendering services to a company by employees and workers.
- Selling of goods and services.

Yes, the above mentioned activities are regarded as economic activities as it involve the exchange of money to earn livelihood.

#### 3. 'The Government and policy makers use statistical data to formulate suitable policies of economic development'. Illustrate with two examples.

#### Answer

The statistical data is important for Government and policy makers to formulate suitable policies of economic development. It not only helps in analysing and evaluate the outcomes of the past policies but also assist them to take corrective measures and to formulate new policies accordingly. It is clear from examples -

- (i) It can be ascertained easily by using statistical techniques whether the policy of family planning is effective in checking the problem of rapidly growing population.
- (ii) In preparing annual government budget, previous data of government expenditures and government revenues are taken into consideration for estimating the allocation of funds among various projects.

4. "You have unlimited wants and limited resources to satisfy them." Explain by giving two examples.

**Answer**

Every individual has unlimited wants but the resources for satisfying the wants are limited. Scarcity is the root of all economic problems. Had there been no scarcity, there would have been no economic problem. This can be understood by examples -

- (i) A child's pocket money is limited so he/she has to choose only those things that you want the most. You can't purchase almost all the things you want.
- (ii) A land available should be put in use either in agricultural or industrial. We can't use the same land for both activities.

5. How will you choose the wants to be satisfied?

**Answer**

Any individual fulfills his/her wants according to his/her needs, satisfactions and priority attached to different wants. Moreover, the choice of want also depends on the need of the hour and availability of the goods and also on the availability of means (money) to purchase that want.

6. What are your reasons for studying Economics?

**Answer**

The reasons for studying economics are:

→ To study the Theory of consumption: We want to know how the consumer decides, given his income and many alternative goods to choose from, what to buy when he knows the prices.

→ To study the Theory of Production: We also want to know how the producer, similarly, chooses what to produce for the market when he knows the costs and prices.

→ To study the Theory of Distribution: We want to know how the national income or the total income arising from what has been produced in the country is distributed through wages (and salaries), profits and interest.

→ The study of economics also helps us to understand and analyse the root cause of basic problems faced by an economy like, poverty, unemployment, income disparity, etc. and helps to take various corrective measures.

7. Statistical methods are no substitute for common sense. Comment.

**Answer**

This is true that Statistical methods are no substitute for common sense. Statistical data should not be believed blindly as it can be misinterpreted or misused. The statistical data may involve personal bias or may undergo manipulations. Also, statistical data and methods fail to reveal the errors committed by an investigator while surveying and collecting data. This can be understood by a story. It is said that a family of four persons (husband, wife and two children) once set out to cross a river. The father knew the average depth of the river. So he calculated the average height of his family members. Since the average height of his family members was greater than the average depth of the river, he thought they could cross safely. Consequently some members of the family (children)

drowned while crossing the river. Thus, the common sense must be used while applying statistical methods.

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### **Collection of Data Statistics for Economics Chapter 2 CBSE NCERT SOLUTIONS Class 11 Economics <http://freehomedelivery.net/>**

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#### **Exercises**

**1. Frame at least four appropriate multiple-choice options for following questions:**

(i) Which of the following is the most important when you buy a new dress?

#### **Answer**

- (a) Colour
- (b) Price
- (c) Brand
- (d) Quality of cloth

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(ii) How often do you use computers?

#### **Answer**

- (a) Every day
- (b) 6 times a week
- (c) 4 times a week
- (d) 2 times a week

(iii) Which of the following newspaper/s do you read regularly?

**Answer**

- (a) The Times o India
- (b) The Hindu
- (c) Indian Express
- (d) Any other

(iv) Rise in the price of petrol is justified.

**Answer**

- (a) Yes
- (b) No
- (c) Don't Know
- (d) None of the above

(v) What is the monthly income of y our family?

**Answer**

- (a) Less than Rs 10,000
- (b) Rs 10,000 to Rs 20,000
- (c) Rs 20,000 to Rs 30,000
- (d) More than Rs 30,000

2. Frame fivetwo-way questions (with 'Yes' or 'No').

**Answer**

- (i) Do you own car?
- (ii) Do you smoke?
- (iii) Do you own two-wheeler?
- (iv) Have you visited any foreign country?
- (v) Are you satisfied with y our present income?

3.

(i) There are many sources of data (true/false).

► False

(ii) Telephone survey is the most suitable method of collecting data, when the population is literate and spread over a large area (true/false).

► False

(iii) Data collected by investigator is called the secondary data (true/false).

► False

(iv) There is a certain bias involved in the non-random selection of samples (true/false).

► True

(v) Non-sampling errors can be minimised by taking large samples (true/false).

► False

**4. What do you think about the following questions. Do you find any problem with these questions? If yes, how?**

(i) How far do you live from the closest market?

**Answer**

The question is not clear. The question can't clarify how to show distance.

(ii) If plastic bags are only 5 percent of our garbage, should it be banned?

**Answer**

The question is too long which discourages people to answer also it gives a clue about how the respondent should answer..

(iii) Wouldn't you be opposed to increase in price of petrol?

**Answer**

The question contains two negatives which creates confusion to the respondents and may lead to biased response.

(iv) (a) Do you agree with the use of chemical fertilisers?

(b) Do you use fertilisers in your fields?

(c) What is the yield per hectare in your field?

**Answer**

The order of question is incorrect. First, general questions should be asked then specific. The correct order should be:

(i) What is the yield per hectare in your field?

(ii) Do you use fertilisers in your fields?

(iii) Do you agree with the use of chemical fertilisers?

**5. You want to research on the popularity of Vegetable Atta Noodles among children. Design a suitable questionnaire for collecting this information.**

**Answer**

QUESTIONNAIRE

Name: .....

Age: .....

Sex:  Male  Female

1. Do you eat Noodles?

Yes  No

2. Do you like Vegetable Atta Noodles more than other snacks?

Yes  No

3. How many packets do you consume in one month?

Less than 2  Less than 5  More than 5

4. Do you prefer Atta noodles over Maida noodles?

Yes  No

5. Which vegetable according to you should be added in present Atta noodles?

.....

6. When do you prefer to have Vegetable Atta Noodles?

Breakfast  Lunch  Evening Snacks  Dinner

7. Do your parents accompany you while having noodles?

Yes  No

6. In a village of 200 farms, a study was conducted to find the cropping pattern. Out of the 50 farms surveyed, 50% grew only wheat. Identify the population and the sample here.

**Answer**

Population or the Universe in statistics means totality of the items under study. So, the population here is 200 farms.

Sample refers to a group or section of the population from which information is to be obtained. Out of 200 farms, only 50 farms are selected for survey. Therefore, the sample population is 50 farms.

7. Give two examples each of sample, population and variable.

**Answer**

Example 1: A study was conducted to know the average income of people in a village. The total number of person was 750. Out of these, 70 villagers selected and their average income was recorded. So, in this example:

(i) Population is the number of total villagers which is equal to 750.

(ii) Sample is the 70 villagers whose average income was recorded.

(iii) Variable under study is the income of the villagers.

Example 2: In order to study the to record the level of sugar in the blood, blood sample of 1000 people was taken from 10,000 people. So, in this example

- (i) Population is the total number of people i.e., 10,000.
- (ii) Sample is the 1000 people.
- (iii) Variable is the sugar level.

8. Which of the following methods give better results and why?

- (a) Census
- (b) Sample

**Answer**

Sample Method gives better results than the Census Method as:

- Less time consuming: It requires a lot of time to conduct census as every record have to obtain while sample can be done in lesser time.
- Economically feasible: The cost of approaching each individual unit for interrogation and collection of data is comparatively lower due to small size of sample.
- Accuracy - Although census method provides more accurate and reliable results as compared to the sample method but in the sample method the errors can be easily located and rectified in the sampling methods due to the smaller number of items.
- Lesser Non-sampling Errors- The probability of Non-sampling Errors is also low as the sample size is smaller as compared to that of the Census Method.

9. Which of the following errors is more serious and why?

- (a) Sampling error
- (b) Non-Sampling error

**Answer**

Non-sampling errors are more serious than sampling errors because a sampling error can be minimised by taking a larger sample. It is difficult to minimise non-sampling error, even by taking a large sample as it use of faulty means of collection of data.

10. Suppose there are 10 students in your class. You want to select three out of them. How many samples are possible?

**Answer**

We have to use combinations to determine the number of samples which are possible. The formula for the number of such combination is

$${}^n C_r = \frac{n!}{(n-r)!r!}$$

where  $n! = n(n-1)(n-2)(n-3).....(3)(2)(1)$

(Note:  $0! = 1$ )

Therefore the answer will be  ${}^{10}C_3 = \frac{(10 \times 9 \times 8)}{(3 \times 2 \times 1)} = \frac{720}{6} = 120$

Number of samples possible = 120

11. Discuss how you would use the lottery method to select 3 students out of 10 in your class?

**Answer**

Make ten paper slips with name of each student of equal size. Now, there are ten cards available. Mix them well. Now draw three slips at random without replacement one by one. By this method we can select three students.

12. Does the lottery method always give you a random sample? Explain.

**Answer**

Yes, the lottery method always gives a random sample if it is used in the proper manner without any bias. In a random sample, each individual unit has an equal chance of getting selected. Similarly, in a lottery method, each individual unit is selected at random from the population and thereby has equal opportunity of getting selected.

13. Explain the procedure of selecting a random sample of 3 students out of 10 in your class, by using random number tables.

**Answer**

For selecting a random sample of 3 students out of 10 by random number tables we consult one digit random numbers and we will skip random numbers greater than value 10 as it is the largest serial number. We have other 9 one digit numbers. Thus, the 3 selected students out of 10 are with serial numbers 5, 9, 2.

14. Do samples provide better results than surveys? Give reasons for your answer.

**Answer**

Samples provide better results than surveys because

→ A sample can provide reasonably reliable and accurate information at a lower cost and shorter time.

→ As samples are smaller than population, more detailed information can be collected by conducting intensive enquiries.

→ Samples need a smaller team of enumerators, it is easier to train them and supervise their work more effectively.

# Statistics for Economics Chapter 3 Organisation of Data CBSE NCERT SOLUTIONS Class 11 Economics <http://freehomedelivery.net/>

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## Exercises

### 1. Which of the following alternatives is true?

(i) The class midpoint is equal to:

- (a) The average of the upper class limit and the lower class limit
- (b) The product of upper class limit and the lower class limit
- (c) The ratio of the upper class limit and the lower class limit
- (d) None of the above

► (a) The average of the upper class limit and the lower class limit.

(ii) The frequency distribution of two variables is known as

- (a) Univariate Distribution
- (b) Bivariate Distribution
- (c) Multivariate Distribution
- (d) None of the above

► (b) Bivariate Distribution

(iii) Statistical calculations in classified data are based on

- (a) the actual values of observations
- (b) the upper class limits
- (c) the lower class limits
- (d) the class midpoints

► (d) the class midpoints

(iv) Under Exclusive method,

- (a) the upper class limit of a class is excluded in the class interval
- (b) the upper class limit of a class is included in the class interval
- (c) the lower class limit of a class is excluded in the class interval
- (d) the lower class limit of a class is included in the class interval

► (a) the upper class limit of a class is excluded in the class interval

- (v) Range is the
- (a) difference between the largest and the smallest observations
  - (b) difference between the smallest and the largest observations
  - (c) average of the largest and the smallest observations
  - (d) ratio of the largest to the smallest observation
- (a) difference between the largest and the smallest observations

2. Can there be any advantage in classifying things? Explain with an example from your daily life.

**Answer**

Yes, there are many advantages of classifying things. These are:  
 → It saves our time and energy by making easy to locate a specific data.  
 → It facilitates the analysis, tabulation and interpretation.  
 → It makes data comparable.  
 → It is also easy to summarise.  
 For example: We make specific notebook for each subject.

3. What is a variable? Distinguish between a discrete and a continuous variable.

**Answer**

A characteristic, number, or quantity whose value changes overtime is called variable. For example: weight, income etc. It can be either discrete or continuous.

Discrete Variable	Continuous Variable
<ul style="list-style-type: none"> <li>• A variable that takes only whole number as its value is called discrete variable.</li> <li>• These variables increase in jumps or in complete numbers.</li> <li>• For example- Number of people in a family, number of students in a class, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• A variable that can take any value, within a reasonable limit is called a continuous variable.</li> <li>• These variables assume a range of values or increase in fractions and not in jumps.</li> <li>• For example- age, height, weight, etc.</li> </ul>

4. Explain the 'exclusive' and 'inclusive' methods used in classification of data.

**Answer**

**Exclusive method:** The classes, by this method, are formed in such a way that the upper class limit of one class equals the lower class limit of the next class for example, 0-10, 10-20, and so on . Thus, the continuity of the data is maintained. The upper class limit is excluded but the lower class limit of a class is included in the interval. This method is most appropriate for data of continuous variables.

**Inclusive method:** This method does not exclude the upper class limit in a class interval. It includes the upper class in a class. Thus both class limits are parts of the class interval for example, 1-5, 6-10, 11-15 and so on. The interval 1-5 includes both the limits i.e. 1 and 5.

5. Use the data in Table 3.2 that relate to monthly household expenditure (in Rs) on food of 50 households and obtain the range of monthly household expenditure on food.

TABLE 3.2

**Monthly Household Expenditure (in Rupees) on Food of 50 Households**

1904	1559	3473	1735	2760
2041	1612	1753	1855	4439
5090	1085	1823	2346	1523
1211	1360	1110	2152	1183
1218	1315	1105	2628	2712
4248	1812	1264	1183	1171
1007	1180	1953	1137	2048
2025	1583	1324	2621	3676
1397	1832	1962	2177	2575
1293	1365	1146	3222	1396

(i) Obtain the range of monthly household expenditure on food.

**Answer**

Range = Highest Value - Lowest Value

Highest Value = 5090

Lowest Value = 1007

So, Range =  $5090 - 1007 = 4083$

(ii) Divide the range into appropriate number of class intervals and obtain the frequency distribution of expenditure.

**Answer**

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Class Intervals	Tally Marks	Frequency
1000 – 1500		20
1500 – 2000		13
2000 – 2500		06
2500 – 3000		05
3000 – 3500		02
3500 – 4000		01
4000 – 4500		02
4500 – 5000	-	00
5000 – 5500		01
		50

(iii) Find the number of households whose monthly expenditure on food is

(a) less than Rs 2000

(b) more than Rs 3000

(c) between Rs 1500 and Rs 2500

**Answer**

(a) Number of households whose monthly expenditure on food is less than Rs 2000

$$= 20 + 13 = 33$$

(b) Number of households whose monthly expenditure on food is more than Rs 3000

$$= 2+1+2+0+1 = 6$$

(c) Number of households whose monthly expenditure on food is between Rs 1500 and Rs 2500

$$= 13 + 6 = 19$$

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6. In a city 45 families were surveyed for the number of domestic appliances they used. Prepare a frequency array based on their replies as recorded below.

1 3 2 2 2 2 1 2 1 2 2 3 3 3 3  
3 3 2 3 2 2 6 1 6 2 1 5 1 5 3  
2 4 2 7 4 2 4 3 4 2 0 3 1 4 3

**Answer**

No. of Domestic Appliances	No. of Households
0	1
1	7
2	15
3	12
4	5
5	2
6	2
7	1
Total	45

7. What is 'loss of information' in classified data?

**Answer**

The classified data summarises the raw data making it concise and comprehensible, it does not show the details that are found in raw data. Once the data are grouped into classes, an individual observation has no significance in further statistical calculations. Further, the statistical calculations are based on the values of the class marks, ignoring the exact observations of the data leading to the problem of loss of information.

8. Do you agree that classified data is better than raw data?

**Answer**

The raw data are usually large and fragmented, it is very difficult to draw any meaningful conclusion from them. Classification makes the raw data comprehensible by surprising them into groups. When facts of similar characteristics are placed in the same class, it enables one to locate them easily, make comparison, and draw inferences without any difficulty. Therefore, classified data is better than raw data.

9. Distinguish between Univariate and Bivariate frequency distribution.

**Answer**

The frequency distribution of a single variable is called a Univariate Distribution. Income of people, marks scored by students, etc. are examples of Univariate Distribution.

The frequency distribution of two variables is called Bivariate distribution. Sales and advertisement expenditure, weight and height of individuals, etc. are examples of Bivariate distribution.

10. Prepare a frequency distribution by inclusive method taking class interval of 7 from the following data:

28 17 15 22 29 21 23 27 18 12 7 2 9 4 6  
 1 8 3 10 5 20 16 12 8 4 33 27 21 15 9  
 3 36 27 18 9 2 4 6 32 31 29 18 14 13  
 15 11 9 7 1 5 37 32 28 26 24 20 19 25  
 19 20

**Answer**

Class Interval	Tally Marks	Frequency
0 – 7	      	15
8 – 15	      	15
16 – 23	           	14
24 – 31	      	11
32 – 39	 	05
Total		60

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**Exercises**

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**Answer the following questions, 1 to 10, choosing the correct answer**

1. Bar diagram is a  
 (i) one-dimensional diagram  
 (ii) two-dimensional diagram  
 (iii) diagram with no dimension  
 (iv) none of the above

► (i) one-dimensional diagram

2. Data represented through a histogram can help in finding graphically the

- (i) mean
- (ii) mode
- (iii) median
- (iv) all the above

▶ (ii) mode

3. Ogives can be helpful in locating graphically the

- (i) mode
- (ii) mean
- (iii) median
- (iv) none of the above

▶ (iii) median

4. Data represented through arithmetic line graph help in understanding

- (i) long-term trend
- (ii) cyclicity in data
- (iii) seasonality in data
- (iv) all the above

▶ (i) long-term trend

5. Width of bars in a bar diagram need not be equal (True/False).

▶ False. Width of bars in a bar diagram need to be equal. **WE ARE WITH YOU.....**

6. Width of rectangles in a histogram should essentially be equal (True/False).

▶ False. Width of rectangles in a histogram may or may not be equal.

7. Histogram can only be formed with continuous classification of data (True/False).

▶ True

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8. Histogram and column diagram are the same method of presentation of data (True/False).

▶ False. Histogram and column diagram are the different method of presentation of data.

9. Mode of a frequency distribution can be known graphically with the help of histogram (True/False).

► True

10. Median of a frequency distribution cannot be known from the ogives (True/False).

► False. Median of a frequency distribution can be known from the ogives.

11. What kinds of diagrams are more effective in representing the following?

- (i) Monthly rainfall in a year
- (ii) Composition of the population of Delhi by religion
- (iii) Components of cost in a factory

### Answer

(i) Monthly rainfall in a year - simple bar diagram as only one variable i.e. monthly rainfall is to be present and compared visually.

(ii) Composition of the population of Delhi by religion - Simple bar diagram Plotting different religion on the x-axis and the number of people on the y-axis, one can easily compare the number of the population religion-wise.

(iii) Components of cost in a factory - Pie chart as entire circle represents the total cost and various components of costs are shown by different portions of the circle.

12. Suppose you want to emphasise the increase in the share of urban non-workers and lower level of urbanisation in India as shown in Example 4.2. How would you do it in the tabular form?

### Answer

Urban non workers	Rural Non Workers	Total Non workers
19 crores	42 crores	62 crores

The number of rural non-workers is greater than urban non-workers. The higher number of rural non-workers indicates lower level of urbanisation in India according to 2001 Census data.

13. How does the procedure of drawing a histogram differ when class intervals are unequal in comparison to equal class intervals in a frequency table?

### Answer

When the class intervals are equal then by normal method we can make histogram which has equal width of rectangle. When the class intervals are unequal, heights of rectangles are to be adjusted to yield comparable measurements by using frequency density (class frequency divided by width of the class interval) instead of absolute frequency.

14. The Indian Sugar Mills Association reported that, 'Sugar production during the first fortnight of December 2001 was about 3,87,000 tonnes, as against 3,78,000 tonnes during the same fortnight last year (2000). The off-take of sugar from factories during the first fortnight of December 2001 was 2,83,000 tonnes for internal consumption and 41,000 tonnes for exports as against 1,54,000 tonnes for internal consumption and nil for exports during the same fortnight last season.'

(i) Present the data in tabular form.

(ii) Suppose you were to present these data in diagrammatic form which of the diagrams would you use and why?

(iii) Present these data diagrammatically.

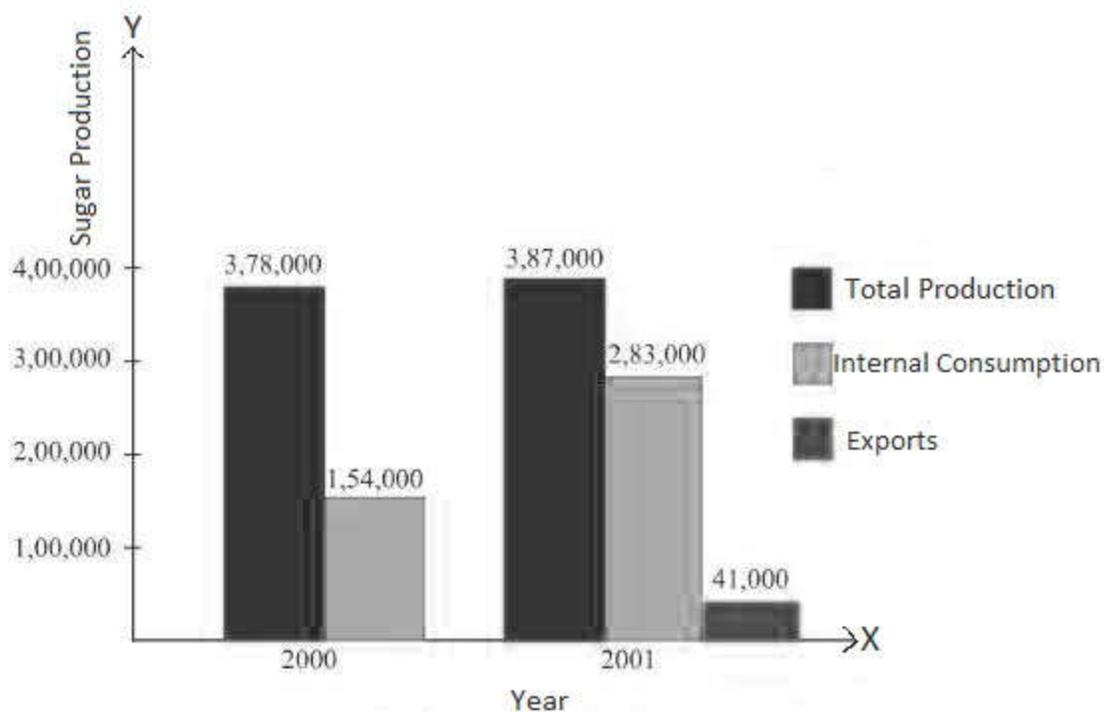
### Answer

(i)

<b>Sugar Production in India</b>			
<b>Date</b>	<b>Total Production (tonnes)</b>	<b>Internal Consumption (tonnes)</b>	<b>Export of sugar (tonnes)</b>
December, 2000	3,78,000	1,54,000	-
December, 2001	3,87,000	2,83,000	41,000

(ii) To present these data in diagrammatic form we can use multiple bar diagram because these are effective in comparing two or more sets of data.

(iii)

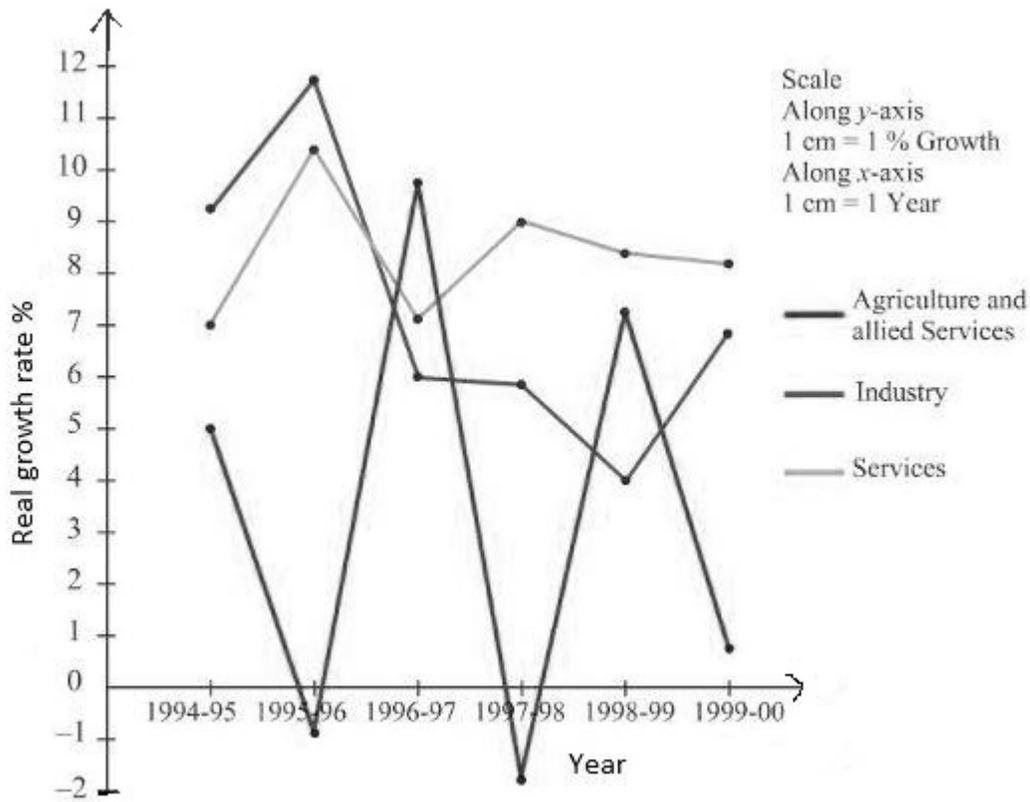


15. The following table shows the estimated sectoral real growth rates (percentage change over the previous year) in GDP at factor cost.

Year (1)	Agriculture and allied sectors (2)	Industry (3)	Services (4)
1994-95	5.0	9.2	7.0
1995-96	-0.9	11.8	10.3
1996-97	9.6	6.0	7.1
1997-98	-1.9	5.9	9.0
1998-99	7.2	4.0	8.3
1999-2000	0.8	6.9	8.2

Represent the data as multiple time series graphs.

**Answer**



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# Statistics for Economics Chapter 5 Measures of Central Tendency CBSE NCERT SOLUTIONS Class 11 Economics

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### Exercises

#### 1. Which average would be suitable in the following cases?

- (i) Average size of readymade garments.
  - ▶ Mode
- (ii) Average intelligence of students in a class.
  - ▶ Median
- (iii) Average production in a factory per shift.
  - ▶ Arithmetic average
- (iv) Average wages in an industrial concern.
  - ▶ Arithmetic average
- (v) When the sum of absolute deviations from average is least.
  - ▶ Median
- (vi) When quantities of the variable are in ratios.
  - ▶ Arithmetic average
- (vii) In case of open-ended frequency distribution.
  - ▶ Median

#### 2. Indicate the most appropriate alternative from the multiple choices provided against each question.

- (i) The most suitable average for qualitative measurement is
  - (a) arithmetic mean
  - (b) median
  - (c) mode
  - (d) geometric mean
  - (e) none of the above
  - ▶ (b) median

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- (ii) Which average is affected most by the presence of extreme items?
  - (a) median
  - (b) mode

- (c) arithmetic mean
- (d) none of the above

▶ (c) arithmetic mean

(iii) The algebraic sum of deviation of a set of  $n$  values from A.M. is

- (a)  $n$
- (b) 0
- (c) 1
- (d) none of the above

▶ (b) 0

**3. Comment whether the following statements are true or false.**

(i) The sum of deviation of items from median is zero.

▶ False

(ii) An average alone is not enough to compare series.

▶ True

(iii) Arithmetic mean is a positional value.

▶ False

(iv) Upper quartile is the lowest value of top 25% of items.

▶ True

(v) Median is unduly affected by extreme observations.

▶ False

4. If the arithmetic mean of the data given below is 28, find (a) the missing frequency, and (b) the median of the series:

Profit per retail shop (in Rs)	0-10	10-20	20-30	30-40	40-50	50-60
Number of retail shops	12	18	27	-	17	6

**Answer**

(a) Let the missing frequency be  $x$   
Arithmetic mean = 28 (given)

Profit per retail shop (in Rs)	No. of retail shops	Mid Value	
Class Interval	Frequency ( $f$ )	( $m$ )	$fm$
0-10	12	5	60
10-20	18	15	270
20-30	27	25	675
30-40	$x$	35	$35x$
40-50	17	45	765
50-60	6	55	330
	$\Sigma f = 80 + x$		$\Sigma fx = 2100 + 35x$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\Rightarrow 28 = \frac{2100 + 35x}{80 + x}$$

$$\Rightarrow 2240 + 28x = 2100 + 35x$$

$$\Rightarrow 2240 - 2100 = 35x - 28x$$

$$\Rightarrow 140 = 7x$$

$$\Rightarrow x = \frac{140}{7} = 20$$

Missing frequency = 20

(b)

Class Interval	Frequency ( $f$ )	Cumulative frequency ( $CF$ )
0-10	12	12
10-20	18	30
20-30	27	57
30-40	$x$	77
40-50	17	94
50-60	6	100
Total	$\Sigma f = 100$	

Median = Size of  $(N/2)$ th item

$$= 100/2 = 50\text{th item}$$

It lies in class 20-30.

$$\begin{aligned}
 \text{Median} &= L + \frac{\frac{N}{2} - CF}{f} \times i \\
 &= 20 + \frac{\frac{100}{2} - 30}{27} \times 10 \\
 &= 20 + \frac{50 - 30}{27} \times 10 \\
 &= 20 + \frac{20}{27} \times 10 \\
 &= 27.407
 \end{aligned}$$

5. The following table gives the daily income of ten workers in a factory. Find the arithmetic mean.

Workers	A	B	C	D	E	F	G	H	I	J
Daily Income (in Rs)	120	150	180	200	250	300	220	350	370	260

**Answer**

Workers	Daily Income (in Rs) $X$
A	120
B	150
C	180
D	200
E	250
F	300
G	220
H	350
I	370
J	260
Total	$\Sigma X = 2400$

$$N = 10$$

$$\text{Arithmetic Mean} = \frac{\Sigma X}{N}$$

$$= \frac{2400}{10}$$

$$= 240$$

$$\text{Arithmetic Mean} = 240$$

6. Following information pertains to the daily income of 150 families. Calculate the arithmetic mean.

Income (in Rs)	Number of families
More than 75	150

More than 85	140
More than 95	115
More than 105	95
More than 115	70
More than 125	60
More than 135	40
More than 145	25

**Answer**

Income	No. of families Frequency ( <i>f</i> )	Mid Class ( <i>x</i> )	<i>fx</i>
75-85	10	80	800
85-95	25	90	2250
95-105	20	100	2000
105-115	25	110	2750
115-125	10	120	1200
125-135	20	130	2600
135-145	15	140	2100
145-155	25	150	3750
	150		17450

$$\begin{aligned} \text{Arithmetic Mean} &= \frac{\sum fx}{\sum f} \\ &= \frac{17450}{150} \\ &= 116.33 \end{aligned}$$

7. The size of land holdings of 380 families in a village is given below. Find the median size of land holdings.

Size of Land Holdings (in acres)	Less than 100	100-200	200-300	300-400	400 and above
Number of families	40	89	148	64	39

**Answer**

Size of Land Holdings Class Interval	Number of families ( <i>f</i> )	Cumulative frequency ( <i>CF</i> )
0-100	40	40
100-200	89	129
200-300	148	277

300-400	64	341
400-500	39	380
Total	$\Sigma f = 380$	

$$\Sigma f = N = 380$$

Median = Size of  $(N/2)$ th item

$$= 380/2 = 190\text{th item}$$

It lies in class 200-300.

$$\begin{aligned} \text{Median} &= L + \frac{\frac{N}{2} - CF}{f} \times i \\ &= 200 + \frac{190 - 129}{148} \times 100 \\ &= 200 + \frac{61}{148} \times 100 \\ &= 200 + 41.22 \\ &= 241.22 \end{aligned}$$

Median size of land holdings = 241.22 acres

8. The following series relates to the daily income of workers employed in a firm. Compute (a) highest income of lowest 50% workers (b) minimum income earned by the top 25% workers and (c) maximum income earned by lowest 25% workers.

Daily Income (in Rs)	10-14	15-19	20-24	25-29	30-34	35-39
Number of workers	5	10	15	20	10	5

(Hint: Compute median, lower quartile and upper quartile.)

**Answer**

Daily Income (in Rs) Class Interval	No of workers ( $f$ )	Cumulative frequency ( $CF$ )
9.5-14.5	5	5
14.5-19.5	10	15
19.5-24.5	15	30
24.5-29.5	20	50
29.5-34.5	10	60
34.5-39.5	5	65
Total	$\Sigma f = 65$	

$$(a) \Sigma f = N = 65$$

Median = Size of  $(N/2)$ th item

$$= 65/2 = 32.5\text{th item}$$

It lies in class 24.5-29.5.

$$\begin{aligned}\text{Median} &= L + \frac{\frac{N}{2} - CF}{f} \times i \\ &= 24.5 + \frac{32.5 - 30}{20} \times 5 \\ &= 24.5 + \frac{2.5}{20} \times 5 \\ &= 25.125\end{aligned}$$

Highest income of lowest 50% workers = Rs 25.12

(b) First, we need to find  $Q_1$

Class interval of  $Q_1 = (N/4)$ th items

$= (65/4)$ th items = 16.25th item

It lies in class 19.5-24.5.

$$\begin{aligned}Q_1 &= L + \frac{\frac{N}{4} - CF}{f} \times i \\ &= 19.5 + \frac{16.25 - 15}{15} \times 5 \\ &= 19.5 + \frac{1.25}{15} \times 5 \\ &= \text{Rs } 19.92\end{aligned}$$

Minimum income earned by the top 25% workers = Rs 19.92

(c) First, we need to find  $Q_3$

Class interval of  $Q_3 = 3(N/4)$ th items

$= 3(65/4)$ th items =  $3 \times 16.25$ th item

$= 48.75$ th item

It lies in class 24.5-29.5.

$$\begin{aligned}Q_3 &= L + \frac{\frac{3N}{4} - CF}{f} \times i \\ &= 24.5 + \frac{\frac{3 \times 65}{4} - 30}{20} \times 5 \\ &= 24.5 + \frac{\frac{195}{4} - 30}{20} \times 5 \\ &= 24.5 + \frac{48.75 - 30}{20} \times 5 \\ &= \text{Rs } 29.19\end{aligned}$$

Maximum income earned by lowest 25% workers = Rs 29.19

9. The following table gives production yield in kg. per hectare of wheat of 150 farms in a village. Calculate the mean, median and mode values.

Production yield (kg per hectare)	50-53	53-56	56-59	59-62	62-65	65-68	68-71	71-74	74-77
Number of workers	3	8	14	30	36	28	16	10	5

**Answer**

Production Yield (kg per hectare)	No. of farms Frequency ( <i>f</i> )	Mid Class ( <i>x</i> )	<i>fx</i>	Cumulative frequency ( <i>CF</i> )
50-53	3	51.5	154.5	3
53-56	8	54.5	436	11
56-59	14	57.5	805	25
59-62	30	60.5	1815	55
62-65	36	63.5	2286	91
65-68	28	66.5	1862	119
68-71	16	69.5	1112	135
71-74	10	72.5	725	145
74-77	5	75.5	377.5	150
	$\Sigma f = 150$		$\Sigma fx = 9573$	

Mean =  $\Sigma fx / \Sigma f = 9573 / 150 = 63.82$  hectare

$$\begin{aligned} \text{Median} &= L + \frac{\frac{N}{2} - CF}{f} \times i \\ &= 62 + \frac{75 - 55}{36} \times 3 \\ &= 62 + \frac{20}{12} = \frac{191}{3} \\ &= 63.667 \end{aligned}$$

Modal Class = 62-65

$$\begin{aligned} \text{Mode} &= L + \frac{d_1}{d_1 + d_2} \times i \\ &= 62 + \frac{6}{6 + 8} \times 3 \\ &= 62 + \frac{9}{7} = \frac{443}{7} \\ &= 63.286 \end{aligned}$$

