CHAPTER-14

Statistics

Task-1: Newspaper Activity

Topic	Statistics
Nature of Task	Warm-up / Pre-content
Content Coverage	Introduction of Statistics
Learning Objective	To recall the meaning of the term statistics and the need of collection of data, survey and statistical analysis.
Task	Group Discussion
Execution of Task	Teacher can discuss some situational examples where the survey and statistical analysis is required e.g. census, impact of its analysis on planning, market survey conducted by companies to enhance their sales or to improve the quality of products. Teacher can distribute few magazines or newspapers to the students and ask them to identify atleast one situation by each student where the data collection is required.
Duration	1 Period
Criteria for Assessment	No grading or marking is required in this case. The task is to gear up the students for study of statistics.
Follow up	Teacher must motivate the students to identify such situations.

Task-2: Worksheet-1

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Topic	Statistics
Nature of Task	Content Oriented
Content Coverage	Collection of data, Presentation of data, Graphical Representation of Data
Learning Objective	To develop the skill of representing data graphically as bargraph histogram of uniform width, histogram of varying width, frequency polygon.
Execution of Task	Teacher may give a 30 minutes worksheet to assess the skills developed by the students to draw the appropriate graph of given data and the basic conceptual knowledge.
Duration	1 Period
Criteria for Assessment	According to the weightage of the marks the assessment will be done.
Follow up	Teacher must discuss the worksheet in the class specially, the incorrect responses in order to modify everyone's understanding. More problems of the same kind may be given as home assignment.

Worksheet-1

Time : 15 Minutes

1. The marks of 30 students in a Mathematics Test are given below :

   62, 29, 36, 41, 52, 21, 50, 75, 78, 16, 20, 35, 46, 24, 57, 65, 82, 16, 25, 30, 42, 24, 18, 32, 36, 57, 75, 16, 30, 58

   (*i*)   Arrange these marks in a grouped distibution, where one of the groups is 35-45.

   (*ii*)   How many students have scored below 55 ?

   (*iii*)   How many have scored above 75 ?

   (*iv*)   Write the class-size of the distribution.
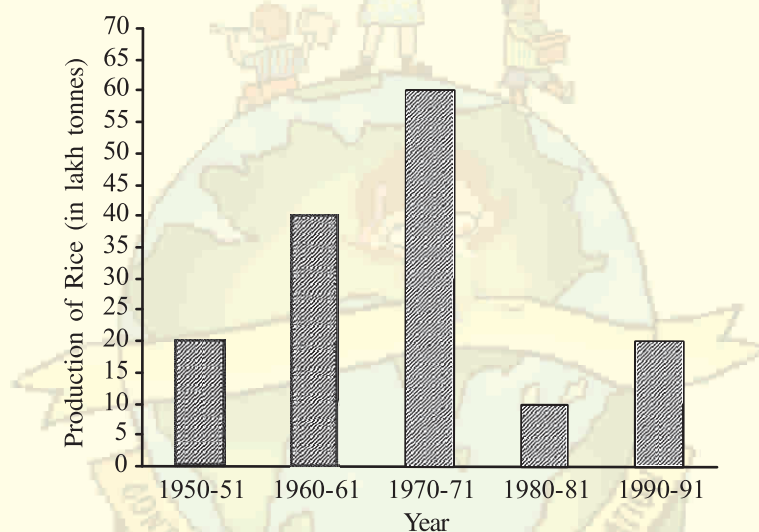
Bar graph of the production of rice crop in India in different years.

Read the bar graph and answer the following questions.

(*i*)   What was the crop-production in 1980-81 ?

(*ii*)   In which year, the crop-production was maximum ?

(*iii*)   Write the difference between maximum and minimum production.

2. Draw a histogram to represent the following data

C.I.	10-15	15-20	20-25	25-60	30-35
Frequency	5	6	9	8	2

Task-3: Worksheet-2

Topic	Statistics
Nature of Task	Content Oriented
Content Coverage	Measure of Central Tendency
Learning Objective	To learn about measure of central tendency i.e. mean, median, mode for raw/discrete data and to apply the knowledge in solving the problems.
Execution of Task	Teacher may give a 30 minutes worksheet to assess the skills developed by the students to draw the appropriate graph of given data and the basic conceptual knowledge.
Duration	1 Period
Criteria for Assessment	According to the weightage of the marks the assessment will be done.
Follow up	After checking the sheets a formula reference sheet along with problems can be given to students, to give them more practice.

Worksheet-2

Time : 15 Minutes

1.   If mean of 8 observations is 25, find the sum of all observations.

2.   Complete the table.

x	f	$f \times x$
6	4	___
12	___	36
___	8	72
8	7	___
10	___	20
___	6	66
$\sum f$ =		$\sum fx$ =

Now, find the mean of this data.

3.   Find the median of following observations

7, 4, 2, 5, 1, 4, 0, 10, 3, 8.

Follow up: Pratice Worksheet

1. Find the true class limits of the first two classes of the distibution 1–9, 10–19, 20–29, ...

2. The following are the marks obtained by 20 students in a class-test :
    40, 22, 36, 27, 30, 12, 15, 20, 25, 31, 34, 36, 39, 41, 43, 48, 46, 36, 37, 40
    Arrange the above data in frequency distribution with equal classes, one of them being (0–10), 10 not included.

3. The electricity bills of twenty house holds in a locality are as follows :

    370, 410, 520, 270, 810, 715, 1080, 712, 802, 775, 310, 375, 412, 420, 370, 218, 240, 250, 610, 570. Construct a frequency distribution table with class size 100.

4. The enrolment in classes VI to X of a school is given below :

Class :	VI	VII	VIII	IX	X
Enrolment :	70	65	60	45	35

    Draw a bar chart to depict the data.

5. Draw a histogram and a frequency polygon for the following data :

Marks	10-20	20-30	30-40	40-50	50-60
No. of students	8	12	15	9	6

6. Draw a histogram for the following data :

Classes	10-15	15-20	20-30	30-50	50-80
Frequency	6	10	10	8	18

7. Find the mean of the following data :
    153, 140, 148, 150, 154, 142, 146, 147

8. The mean of the following data is 37. Find x
    28, 35, 25, 32, x, 40, 45, 50

9. If the mean of n observation $2x_1$, $2x_2$, ..., $2x_n$ is $2\bar{x}$, show that $\sum_{i=1}^{n}(x_i - 2\bar{x}) = 0$

10. The mean of 20 observations is 25. If each observation is multiplied by 2, then find the mean of new observations.

11. The means of two groups of 15 and 20 observations are 20 and 25 respectively. Find the mean of all the 35 observations.

12. If the mode of the following data is 14, find the value of x
    10, 12, 14, 15, 16, 14, 15, 14, 15, x, 16, 14, 16

13. The median of the observations, arranged in increasing order is 26. Find the value of x.

    10, 17, 22, $x + 2$, $x + 4$, 30, 36, 40

Task-4: Remedial Worksheet

I.   Formulae Reference Sheet

1. **For Raw Data** Mean, $\bar{x} = \dfrac{\text{Sum of all observations}}{\text{Total number of observations}}$

2. **For Ungrouped Frequency Distribution**

   Mean $= \dfrac{\displaystyle\sum_{i-1}^{n} f_i x_i}{\displaystyle\sum_{i-1}^{n} f_i}$

3. Median : (The value of the middle-most observations)

   Two cases

If n is odd	If n is even
Median = value of	Median = mean of value of
$\left(\dfrac{n+1}{2}\right)^{th}$ observations	$\left(\dfrac{n}{2}\right)^{th}$ & $\left(\dfrac{n}{2}+1\right)^{th}$ observations

4. Mode : It is the most frequently occurring observation.

II.   Practice Questions

Q.1. The heights (in cm) of 9 students of a class are as follows :

155   160   145   149   150   147   152   144   148

Find the median of the data.

Sol. **Step 1.** Arrange the given observations in ascending order.

144   145   147   148   149   150   152   155   160

Since $n = 9$ is odd

$\therefore$ Median $=$ Value of $\left(\dfrac{n}{2}+1\right)^{th}$ observations

$=$ Value of $\left(\dfrac{9+1}{2}\right)^{th}$ observations

$=$ Value of 5th observation

$=$ 149

Median height $=$ 149 cm.

Q.2. In a mathematics test 15 students appeared. Their marks (out of 100) are recorded as under :

41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60

Find the median marks.

Sol. **Step 1.**   Arrange the given data in descending / ascending order

      Step 2. n = _____ (odd)

      Step 3.   Median =   Value of $\left(\dfrac{n+1}{2}\right)^{th}$ observation

               = _____

               = _____

               = _____

Q.3. The following observations have been arranged in ascending order. If the median of the data is 63, find the value of x.

29, 32, 48, 50, x, x + 2, 72, 78, 84, 95

      Sol. **Step 1.** Observations are already arranged in ascending order

          Step 2. Note that the number of observations is even (n = 10)

          Step 3. Use formula for even case

          Step 3.   Median =   Value of $\left(\dfrac{n}{2}\right)^{th}$ & $\left(\dfrac{n+1}{2}\right)^{th}$ observation

          $\Rightarrow$ $63 = \dfrac{5^{th} \text{ observations} + 6^{th} \text{ observations}}{2}$

          $\Rightarrow$ $63 = $ _____

                   $= $ _____

                   $= $ _____

Task-5: MCQ Worksheet

Topic	Statistics
Nature of task	Post Content
Content Coverage	All Concepts Learn in Statistics
Learning Objective	To evaluate the understanding of all the concepts learnt in the chapter and the skill to apply them.
Execution of Task	Teacher may give a 15 minutes MCQ worksheet to the students.
Duration	1 Period
Criteria for Assessment	For each correct response 1 mark to be awarded and for incorrect response no marks.
Follow up	After checking the sheets questions can be discussed and another opportunity in the form of oral assessment can be given in order to improve the response. Oral assessment to be done individually.

MCQ Worksheet

1.   The range of the data 14, 27, 29, 61, 45, 15, 9, 18 is

   A.   61   B.   52   C.   47   D.   53

2.   The class mark of the class 120-150 is

   A.   120   B.   130   C.   135   D.   150

3.   The class mark of a class is 10 and its class width is 6. The lower limit of the class is

   A.   5   B.   7   C.   8   D.   10

4.   In a frequency distribution, the class-width is 4 and the lower limit of first class is 10. If there are six classes, the upper limit of last class is

   A.   22   B.   26   C.   30   D.   34

5.   The class marks of a distribution are 15, 20, 25, ..., 45. The class corresponding to 45 is

   A.   12.5 – 17.5   B.   22.5 – 27.5   C.   42.5 – 47.5   D.   None of these

6.   The number of students in which two classes are equal.
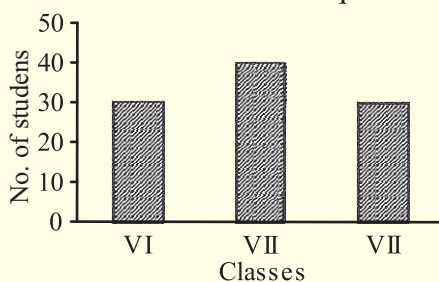
   A.   VI and VIII   B.   VI and VII   C.   VII and VIII   D.   None

7. The mean of first five prime numbers is

A. 5.0   B. 4.5   C. 5.6   D. 6.5

8. The mean of first ten multiples of 7 is

A. 35.0   B. 36.5   C. 38.5   D. 39.2

9. The mean of $x + 3$, $x - 2$, $x + 5$, $x + 7$ and $x + 72$ is

A. $x + 5$ B. $x + 2$ C. $x + 3$ D. $x + 7$

10. If the mean of n observations x_1, x_2, x_3, ..., x_n is $\bar{x}$ then $\sum_{l-1}^{n} x_i - \bar{x}$ is

A. 1   B. -1 C. zero   D. can not be found

11. The mean of 10 observation is 42. If each observation in the data is decreased by 12, the new mean of the data is

A. 12   B. 15   C. 30   D. 54

12. The the mean of 10 numbers is 15 and that of another 20 number is 24 then the mean of all 30 observations is

A. 20   B. 15   C. 21   D. 24

13. The median of 10, 12, 14, 16, 18, 20 is

A. 12   B. 14   C. 15   D. 16

14. If the median of 12, 13, 16, $x + 2$, $x + 4$, 28, 30, 32 is 23, when $x + 2$, $x + 4$ lie between 16 and 30, then the value of x is

A. 18   B. 19   C. 20   D. 22

15. If the mode of 12, 16, 19, 16, x, 12, 16, 19, 12 is 16, then the value of x is

A. 12   B. 16   C. 19   D. 18

16. The mean of the following data is

x_i	5	10	15	20	25
f_i	3	5	8	3	1

A. 12   B. 13   C. 13.5   D. 13.6

Follow up : Oral Assessment Sheet

1.   The mid-point of a class is called _____.

2.   Data collected by the experimenter himself is called _____ data.

3.   The difference between maximum and minimum observations in the data is called _____.

4.   Cumulative frequency of a class is the sum total of all frequencies _____ that class.

5.   Are the class-limits and true class limits different? If yes, explain the difference.

6.   The sum total of all observations divided by their number is called _____ of the data.

7.   The mode of a group of observations is that value of the variable which has _____ frequency.

8.   The _____ is the middle most observation in the data, when they are arranged in increasing / decreasing order.

9. $\bar{x}$, the mean of n observation x_1, x_2, ..., x , is given by _____.

10.   The mean of first ten natural numbers is _____.

11.   The median of first 9 natural numbers is _____.

12.   If each observation in the data is increased by 'a', then their _____ is also increased by 'a'.

13.   The sum of deviations of the data (observations) from the mean is _____.