CBSE Test Paper 02

CH-14 Statistics

1. For drawing a frequency polygon of a continuous frequency distribution, we plot the points whose ordinates are the frequency of respective classes and abscissa are respectively

   a. class marks of the classes

   b. upper limits of preceding classes

   c. lower limits of the classes

   d. upper limits of the classes

2. If $\bar{x}$ is the mean of $x_1, x_2, \ldots, x_n$ then for a $\neq 0$, the mean of $ax_1, ax_2, \ldots, ax_n$, $\frac{x_1}{a}, \frac{x_2}{a}, \ldots, \frac{x_n}{a}$ is

   a. $\frac{\left(a+\frac{1}{a}\right)\bar{x}}{2n}$

   b. $\left(a + \frac{1}{a}\right)\frac{\bar{x}}{2}$

   c. $\left(a + \frac{1}{a}\right)\frac{\bar{x}}{n}$

   d. $\left(a + \frac{1}{a}\right)\bar{x}$

3. Class size of a distribution having 28, 34, 40, 46 and 52 as its class marks is

   a. 6

   b. 5

   c. 4

   d. 3

4. A data is such that its maximum value is 75 and range is 20, then the minimum value is

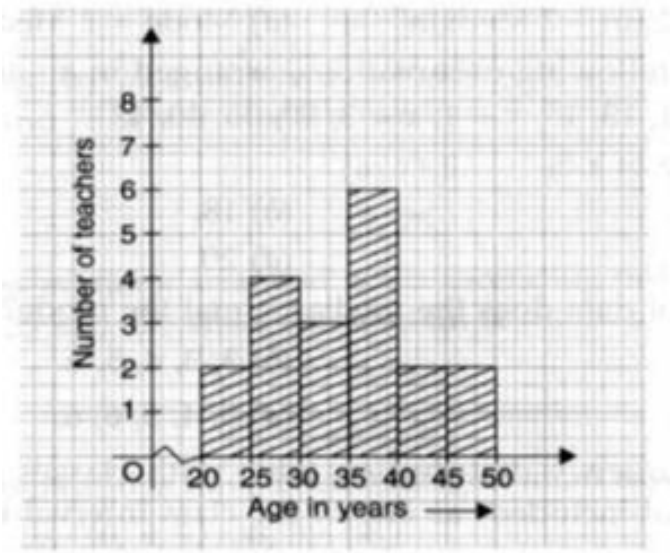
a. 95

b. 20

c. 75

d. 55

5. The graph given below shows the frequency distribution of the age of 22 teachers in a school. The number of teachers whose age is less than 40 years is



a. 17

b. 16

c. 15

d. 14

6. Fill in the blanks:

The mean of 12 observations is 24. If each observation is divided by 3, then new mean is_____.

7. Fill in the blanks:

Let $\overline{x}$ is the arithmetic mean of n observations $x_1, x_2, x_3, \ldots . x_n$, then if each observation is increased by p, then mean of new observations is_____.

8. If the mean of five observations x, x + 2, x + 4, x + 6, x + 8 is 11, find the mean of first three observations.

9. Mean of 20 observation is 17. If the observation, observation 40 is replaced by 12, find the new mean.

10. Find the mean of the following marks of 20 students on a screening test.(out of 100)76, 44, 45, 87, 71, 72, 82, 83, 41, 32, 75, 32, 46, 78, 17, 70, 84, 12, 77, 74

11. The median of the following observations arranged in ascending order is 40. find x
15, 12, 11, 14, x + 2, x + 4, 32, 30, 41, 35

12. Find the mode of 14, 25, 14, 28, 18, 17, 18, 14, 23, 22, 14, 18

13. The mean of 10 numbers is 20. If 8 is subtracted from every number, what will be the mew mean?

14. The weights (in kg) of 15 students are : 31, 35, 27, 29, 32, 43, 37, 41, 34, 28, 36, 44, 45, 42, 30. Find the median. If the weight 44 kg is replaced by 46 kg and 27 kg by 25 kg, find the new median.

15. Draw a histogram with frequency polygon for the following data:

class interval	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54
frequency	5	15	23	20	10	7

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Solution

1. (a) class marks of the classes

   Explanation: Frequency polygon is the line graph plotted with class marks on x-axis & frequency of the class on y-axis.

2. (b) $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{2}$

   Explanation:

   mean of $ax_1, ax_2, \ldots, ax_n$, is $a\overline{x}$

   mean of $\frac{x_1}{a}, \frac{x_2}{a}, \ldots, \frac{x_n}{a}$ is $\frac{1}{a}\overline{x}$

   so the their mean is $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{2}$

3. (a) 6

   Explanation: class size is the difference between two consecutive values of the class mark.

   Here, the difference between two consecutive class mark is 6

   i.e $34-28=6$

4. (d)55

   Explanation: Difference between the maximum & minimum value to the observations is called as range.

   Let, minimum value be 'x'

   75-x=20

   So, x=55

5. (c) 15

   Explanation: Add the values corresponding to the height of the bar before 40.

6 + 3 + 4 + 2 = 15

6. 8

7. ($\overline{x}$ + p)

8. 11 = $\frac{x+(x+2)+(x+4)+(x+6)+(x+8)}{5}$

$\Rightarrow$ 55 = 5x + 20

$\Rightarrow$ 5x = 35 $\Rightarrow$ x = 7

Now, mean of first three observations

= $\frac{x+(x+2)+(x+4)}{3}$ = $\frac{3x+6}{3}$ = x + 2 = 7 + 2 = 9 [$\because$ x = 7]

9. Since mean of 20 observations is 17

Sum of the 20 observations = 17 $\times$ 20 = 340

New sum of 20 observations = 340 - 40 + 12 = 312

New mean = 312/20 = 15.6

10. Total number of interval =

76+44+45+87+71+72+82+83+41+32+75+32+46+78+17+70+84+12+77+74 = 1198

Mean = $\frac{1198}{20}$ = 59.9

11. No. of observation = 10 which is even –

$\therefore$ Median is the average of $\left(\frac{n}{2}\right)^{th}$ & $\left(\frac{n}{2}+1\right)^{th}$ observations

i.e. 5th observation = x + 2

& 6th observation = x + 4

$\therefore Median = \frac{(x+2)+(x+4)}{2}$

$40 = \frac{2x+6}{2}$

$40 \times 2 = 2x + 6$

$80 = 2(x + 3)$

$\frac{80}{2} = x + 3$

$40 = x + 3$

$40 - 3 = x$

$\therefore$ x=37

12. The given data is 14, 25, 14, 28, 18, 17, 18, 14, 23, 22, 14, 18

Arranging the data in ascending order, we have 14, 14, 14, 14, 17, 18, 18, 18, 22, 23, 25, 28

Here, 14 occurs most frequently (4 times)

$\therefore$ Mode = 14.

13. $Let\ \mathrm{x}_1,\ \mathrm{x}_2, \ldots . x_{10}$ be 10 numbers with their mean equal to 20.

Then, $\bar{X} = \frac{1}{n}(\sum x_i)$

$20 = \frac{x_1 + x_2 + \ldots\ldots + x_{10}}{10}$

$\Rightarrow 200 = \mathrm{x}_1 + x_2 + \ldots\ldots + x_{10}$ ...(i)

New numbers are $\mathrm{x}_1 - 5,\ \mathrm{x}_2 - 5, \ldots\ldots . x_{10} - 5.$

Let $\bar{X}$ be the mean of new number.

$\bar{X} = \frac{(x_1 - 5) + (x_2 - 5) + \ldots\ldots + (x_{10} - 5)}{10}$

$\bar{X} = \frac{(x_1 + x_2 + \ldots\ldots + x_{10}) - 5 \times 10}{10}$ ...(i)

$= \frac{200 - 50}{10} = 15$

14. 31, 35, 27, 29, 32, 43, 37, 41, 34, 28, 36, 44, 45, 42, 30

Arrange in increasing order

27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 41, 42, 43, 44, 45

n = 15(odd)

$\therefore$ Median = $\left(\frac{n+1}{2}\right)$ th value

= $\left(\frac{15+1}{2}\right)$ the value

= 8th value

= 35 kg

If the weight 44 kg is replaced by 46 kg and 27 kg by 25 kg

Then, new values are 25, 28, 29, 30, 31, 32, 34, 35, 36, 37, 41, 42, 43, 45, 46

n = 15(odd)

$\therefore$ New median = $\left(\frac{n+1}{2}\right)$ th value

= $\left(\frac{15+1}{2}\right)$ th value

= 8th value

= 35 kg

15. The given frequency distribution is not continuous. So we shall first convert it into a

continuous frequency distribution.

The difference between the lower limit of a class and the upper limit of the preceding class is 1 i.e. h=1.

To convert the given frequency distribution into continuous frequency distribution, we subtract $\frac{h}{2}$ from lower limit and Add $\frac{h}{2}$ to upper limit $\therefore$ $\frac{h}{2}$ = 0.5 limit.

class interval	24.5 - 29.5	29.5 - 34.5	34.5 - 39.5	39.5 - 44.5	44.5 - 49.5	49.5 - 54.5
frequency	5	15	23	20	10	7