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PRACTICE PAPER 12 (2023-24)
CHAPTER 13 STATISTICS (ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : X **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. For the following distribution:

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

the sum of lower limits of the median class and modal class is
(a) 15 (b) 25 (c) 30 (d) 35
Ans: (b) 25

Class	Frequency (f)	c.f.
0 – 5	10	10
5 – 10	15	25
10 – 15	12	37
15 – 20	20	57
20 – 25	9	66
	$N = 66$	

Since, $N = 66$, then $\frac{N}{2} = 33$
and cumulative frequency greater than or equal to 33 lies in class 10 – 15
So, median class is 10 – 15
∴ Lower limit of median class is 10
and highest frequency is 20 lie in class 15 – 20
So, modal class is 15 – 20.
∴ Lower limit of modal class is 15.
Hence, sum of lower limits of the median and modal class is 10 + 15 = 25.

2. If the difference of Mode and Median of a data is 24, then the difference of median and mean is
(a) 8 (b) 12 (c) 24 (d) 36
Ans: (b) 12
mode – median = 24 (given)
∴ mode = 24 + median
Since, mode = 3 median – 2 mean [By empirical relation]
∴ 24 + median = 3 median – 2 mean
⇒ 2 median – 2 mean = 24
⇒ median – mean = 12

3. The mean and mode of a frequency distribution are 28 and 16 respectively. The median is
(a) 22 (b) 23.5 (c) 24 (d) 24.5
Ans: (c) 24
We know that, Mode = 3 Median – 2 Mean
⇒ 3 Median = Mode + 2 Mean
⇒ 3 Median = 16 + 2 × 28 ⇒ Median = 72/3 = 24

4. The runs scored by a batsman in 35 different matches are given below:

Runs Scored	0-15	15-30	30-45	45-60	60-75	75-90
Frequency	5	7	4	8	8	3

The lower limit of the median class is

(a) 15 (b) 30 (c) 45 (d) 60

Ans: (c) 45

Runs Scored	0-15	15-30	30-45	45-60	60-75	75-90
Frequency	5	7	4	8	8	3
cf	5	12	16	24	32	35

Here, $n = 35 \Rightarrow n/2 = 17.5$

Median class is $45 - 60$

Hence, lower limit is 45

5. The median class of the following data is:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	8	10	12	22	30	18

(a) 20 – 30 (b) 30 – 40 (c) 40 – 50 (d) 50 – 60

Ans: (b) 30 – 40

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of students	8	10	12	22	30	18
cf	8	18	30	52	82	100

Here, $n = 100$ So, $\frac{n}{2} = 50$

The cumulative frequency, just greater than 50, is 52 which belongs to class 30 – 40.

So, the median class is 30 – 40.

6. For the following distribution:

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of Students	3	12	27	57	75	80

the modal class is

(a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 50 – 60

Ans: (c) 30 – 40

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of Students	3	9	15	30	18	5

Highest frequency is 30 which belong to 30 – 40. Hence, Modal class is 30 – 40

7. For the following distribution:

Class	0-5	6-11	12-17	18-23	24-29
Frequency	13	10	15	8	11

the upper limit of the median class is

(a) 18.5 (b) 20.5 (c) 25.5 (d) 17.5

Ans:

Class	**Frequency**	**Cf**
– 0.5 – 5.5	13	13
5.5 – 11.5	10	23
11.5 – 17.5	15	38
17.5 – 23.5	8	46
23.5 – 29.5	11	57

Here, $n = 57$ So, $\frac{n}{2} = 28.5$

The cumulative frequency, just greater than 28.5, is 38 which belongs to class 11.5 – 17.5.

So, the median class is 11.5 – 17.5 Its upper limit is 17.5

8. If the mean of the following distribution is 2.6, then the value of y is

Variable (x)	1	2	3	4	5
Frequency	4	5	y	1	2

(a) 3 (b) 8 (c) 13 (d) 24

Ans: (b) 8

Variable (x)	1	2	3	4	5	**Total**
Frequency (f)	4	5	y	1	2	y + 12
fx	4	10	3y	4	10	3y + 28

Here, $\sum f = y + 12$ and $\sum fx = 3y + 28$

$$Mean, \bar{x} = \frac{\sum fx}{\sum f} \Rightarrow 2.6 = \frac{3y+28}{y+12} \Rightarrow 3y + 28 = 2.6y + 31.2$$

$$\Rightarrow 0.4y = 3.2 \Rightarrow y = 8$$

In the following questions 9 and 10, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

9. Assertion (A): The arithmetic mean of the following given frequency distribution table is 13.81.

Marks	2.5 – 5.5	5.5 – 8.5	8.5 – 11.5	11.5 – 14.5	14.5 – 17.5	17.5 – 20.5
No. of Students	7	10	15	20	25	30

Reason (R): Mean = $\sum fx / \sum f$

Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

Marks	2.5 – 5.5	5.5 – 8.5	8.5 – 11.5	11.5 – 14.5	14.5 – 17.5	17.5 – 20.5
No. of Students	7	10	15	20	25	30
Class mark 'x'	4	7	10	13	16	19
Fx	28	70	150	260	400	570

Here, $\sum fx = 1478$, $\sum f = 107$

Mean = $\sum fx / \sum f = 1478 / 107 = 13.81$

10. Assertion (A): If the value of mode and mean is 60 and 66 respectively, then the value of median is 64.

Reason (R): Median = (mode + 2 mean)/2

Ans: (c) Assertion (A) is true but reason (R) is false.

$$Median = \frac{1}{3}(\text{mode} + 2mean) = \frac{1}{3}[60 + 2(66)] = \frac{1}{3} \times 192 = 64$$

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Calculate mode of the following data:

Marks	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of Students	5	10	12	6	3

Ans: Since the maximum frequency is 12 which belongs to 40 – 60, therefore modal class is 40 – 60

Here, $l = 40, f_0 = 10, f_1 = 12, f_2 = 6, h = 20$

$$Mode = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h \Rightarrow Mode = 40 + \frac{12-10}{24-10-6} \times 20 = 40 + \frac{2}{8} \times 20 = 40 + 5 = 45$$

12. Calculate median marks of the following data:

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
No. of Students	2	12	22	8	6

Ans:

Classes	**Number of students**	***c.f.***
0 – 10	2	2
10 – 20	12	14
20 – 30	22	36
30 – 40	8	44
40 – 50	6	50

$n = 50, \frac{n}{2} = \frac{50}{2} = 25$, Median Class = 20 – 30

$l = 20, f = 22, c.f. = 14, h = 10$

$$\text{Median} = l + \frac{\left(\frac{n}{2} - c.f.\right)}{f} \times h = 20 + \frac{(25-14)}{22} \times 10 = 20 + \frac{11}{22} \times 10 = 20 + 5 = 25$$

13. Calculate mode of the following data:

Marks	0 – 6	6 – 12	12 – 18	18 – 24	24 – 30
No. of Students	7	5	10	12	6

Ans:

Modal class = 18 – 24

$\therefore p = 18, f_0 = 10, f_1 = 12, f_2 = 6, h = 6$

$$\therefore \text{Mode} = \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 18 + \frac{12-10}{24-10-6} \times 6 = 18 + \frac{12}{8} = 18 + 1.5 = 19.5$$

14. Find the mean of the following distribution:

Class	3 – 5	5 – 7	7 – 9	9 – 11	11 – 13
Frequency	5	10	10	7	8

Ans:

Class	3 – 5	5 – 7	7 – 9	9 – 11	11 – 13	**Total**
Frequency 'f'	5	10	10	7	8	40
Class mark 'x'	4	6	8	10	12	
fx	20	60	80	70	96	326

$$Mean, \bar{x} = \frac{\sum fx}{\sum f} = \frac{326}{40} = 8.15$$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Daily wages of 110 workers, obtained in a survey, are tabulated below:

Daily Wages (in Rs.)	100-120	120-140	140-160	160-180	180-200	200-220	220-240
Number of Workers	10	15	20	22	18	12	13

Compute the mean daily wages and modal daily wages of these workers.

Ans:

Daily Wages (in ₹)	*Number of Workers (f_i)*	x_i	u_i	f_iu_i
100–120	10	110	–3	–30
120–140	15	130	–2	–30
140–160	20	150	–1	–20
160–180	22	170	0	0
180–200	18	190	1	18
200–220	12	210	2	24
220–240	13	230	3	39
Total	110			1

Mean daily wages

$$= 170 + \frac{1}{110} \times 20$$

$$= ₹170.19 \text{ (approx.)}$$

$$\text{Mode} = 160 + \frac{22 - 20}{44 - 20 - 18} \times 20$$

$$= ₹166.67 \text{ (approx.)}$$

16. The table below shows the salaries of 280 persons:

Salary (in thousand Rs.)	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of persons	49	133	63	15	6	7	4	2	1

Calculate the median salary of the data.

Ans:

Salary (in thousand Rs.)	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of persons	49	133	63	15	6	7	4	2	1
cf	49	182	245	260	266	273	277	279	280

Here, n = 280 ⇒ n/2 = 140

⇒ Median class is 10-15

l = 10, cf = 49, f = 133, h = 5

$$Median = l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$$

$$Median = 10 + \left(\frac{140 - 49}{133} \right) \times 5 = 10 + \frac{91 \times 5}{133} = 10 + \frac{455}{133} = 10 + 3.421 = 13.42$$

Hence, median salary is Rs. 13.42 (in thousand)

17. The arithmetic mean of the following frequency distribution is 50. Find the value of p.

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
frequency	17	p	32	24	19

Ans:

Class	x_i	Frequency f_i	f_ix_i
0 – 20	10	17	170
20 – 40	30	p	$30p$
40 – 60	50	32	1600
60 – 80	70	24	1680
80 – 100	90	19	1710
Total		$\Sigma f_i = 92 + p$	$\Sigma f_ix_i = 5160 + 30p$

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} \Rightarrow 50 = \frac{5160 + 30p}{92 + p}$$

$$\Rightarrow 50 \times 92 + 50p = 5160 + 30p$$

$$\Rightarrow 50p - 30p = 5160 - 4600$$

$$\Rightarrow 20p = 560 \Rightarrow p = \frac{560}{20} = 28$$

SECTION – D

Questions 18 carry 5 marks.

18. The median of the following data is 868. Find the values of x and y, if the total frequency is 100

Class	Frequency
800 – 820	7
820 – 840	14
840 – 860	x
860 – 880	25
880 – 900	y
900 – 920	10
920 – 940	5

Ans:

Class	Frequency	Frequency
800 – 820	7	7
820 – 840	14	21
840 – 860	x	x + 21
860 – 880	25	x + 46
880 – 900	y	x + y + 46
900 – 920	10	x + y + 56
920 – 940	5	x + y + 61

From table, we have $x + y + 61 = 100 \Rightarrow x + y = 100 - 61 \Rightarrow x + y = 39$
Here, median = 868, therefore median class is 860 – 880
So, $l = 860$, cf = x + 21, f = 25, h = 20, n/2 = 50

Now, $Median = l + \left(\frac{\frac{n}{2} - cf}{f} \times h \right) \Rightarrow 868 = 860 + \left(\frac{50 - (x+21)}{25} \times 20 \right)$

$\Rightarrow 868 - 860 = \left(\frac{50 - x - 21)}{5} \times 4 \right) \Rightarrow 8 = \frac{29 - x}{5} \times 4$

$\Rightarrow 40 = (29 - x)4 \Rightarrow 29 - x = 10 \Rightarrow x = 29 - 10 = 19$

$\Rightarrow y = 39 - 19 = 20$

OR

The distribution below gives the makes of 100 students of a class, if the median makes are 24, find the frequencies f_1 and f_2

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of students	4	6	10	f_1	25	f_2	18	5

Ans:

Class	Frequency	cf
0 – 5	4	4
5 – 10	6	10
10 – 15	10	20
15 – 20	f_1	$20 + f_1$
20 – 25	25	$45 + f_1$
25 – 30	f_2	$45 + f_1 + f_2$
30 – 35	18	$63 + f_1 + f_2$
35 – 40	5	$68 + f_1 + f_2$

Now, Median = 24 (Given)
So, median class = 20 – 25
For this class,
I = 20. h = 5, n/2 = 50, cf = $20 + f_1$, $f = 25$

We know, Median = $l + \left(\frac{\frac{n}{2} - cf}{f} \times h \right)$

$\Rightarrow 24 = 20 + \frac{50 - (20 + f_1)}{25} \times 5 \Rightarrow 4 = \frac{30 - f_1}{5} \Rightarrow 30 - f_1 = 20 \Rightarrow f_1 = 10$

Also, sum of frequencies = 100

$\Rightarrow 68 + f_1 + f_2 = 100 \quad \Rightarrow f_1 + f_2 = 32 \Rightarrow 10 + f_2 = 32 \Rightarrow f_2 = 22$

$\therefore f_1 = 10, f_2 = 22.$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in December 2019 in Wuhan, China.

During survey, the ages of 80 patients infected by COVID and admitted in the one of the City hospital were recorded and the collected data is represented in the less than cumulative frequency distribution table.

Age(in year)	Below 15	Below 25	Below 35	Below 45	Below 55	Below 65
No. of patients	6	17	38	61	75	80

Based on the above information, answer the following questions.

(a) Find the modal class interval. [1]

(b) Find the median class interval [1]

(c) Find the modal age of the patients admitted in the hospital. [2]

OR

(c) Find the median age of the patients admitted in the hospital. [2]

Ans: (a) Since the highest frequency is 23 which belongs to 35 – 45.

Therefore, modal class is 35 – 45.

Age(in yrs)	No. of patients	cf
5 – 15	6	6
15 – 25	11	17
25 – 35	21	38
35 – 45	23	61
45 – 55	14	75
55 – 65	5	80

(b) Here, n = 80 ⇒ n/2 = 80/2 = 40 which lies in 35 – 45

Therefore, medial class is 35 – 45.

(c) Here, $l = 35, f_0 = 21, f_1 = 23, f_2 = 14, h = 10$

$Mode = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h \Rightarrow Mode = 35 + \frac{23 - 21}{46 - 21 - 14} \times 10 = 35 + \frac{2}{11} \times 10 = 36.8$

OR

(c) Here, n = 80 ⇒ n/2 = 40, therefore median class is 35 – 45

So, $l = 35$, cf = 38, f = 23, h = 10

Now, $Median = l + \left(\frac{\frac{n}{2} - cf}{f} \times h \right) \Rightarrow Median = 35 + \left(\frac{40 - 38}{23} \times 10 \right)$

$\Rightarrow Median = 35 + \left(\frac{20}{23} \right) = 35 + 0.87 = 35.87$

20. Overweight and obesity may increase the risk of many health problems, including diabetes, heart disease, and certain cancers. The basic reason behind is the laziness, eating more junk foods and less physical exercise. The school management give instruction to the school to collect the weight data of each student.

During medical check of 35 students from Class X- A, there weight was recorded as follows:

Weight (in kg)	No. of Students
Less than 38	0
Less than 40	3
Less than 42	5
Less than 44	9
Less than 46	14
Less than 48	28
Less than 50	32
Less than 52	35

(a) Find the median class of the given data. (1)

(b) Find the modal class of the given data. (1)

(c) Calculate the median weight of the given data. (2)

OR

(c) Find the mean of the given data. (2)

Ans: (a)

Weight (in kg)	No. of Students	cf
Below 38	0	0
38 – 40	3	3
40 – 42	2	5
42 – 44	4	9
44 – 46	5	14
46 – 48	14	28
48 – 50	4	32
50 – 52	3	35

Here, $n = 35$ So, $\frac{n}{2} = 17.5$

The cumulative frequency, just greater than 17.5, is 28 which belongs to class 46 – 48.
So, the median class is 46 – 48.

(b) The highest frequency in the given data is 14, which belongs to class 46-48.
So, modal classis 46 – 48.

(c) Here, $l = 46$, cf = 14, f = 14, h = 6

Now, $Median = l + \left(\frac{\frac{n}{2} - cf}{f} \times h \right) \Rightarrow Median = 46 + \left(\frac{17.5 - 14}{14} \times 2 \right)$

$\Rightarrow Median = 46 + \left(\frac{3.5}{14} \times 2 \right) = 46 + 0.5 = 46.5$

OR

(c)

Weight (in kg)	Class mark 'x'	'f'	fx
38 – 40	39	3	117
40 – 42	41	2	82
42 – 44	43	4	172
44 – 46	45	5	225
46 – 48	47	14	658
48 – 50	49	4	196
50 – 52	51	3	153
Total		**35**	**1603**

$Mean, \bar{x} = \frac{\sum fx}{\sum f} = \frac{1603}{35} = 45.8$