PRACTICE QUESTIONS (STATISTICS)
CLASS: X : MATHEMATICS

1. 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:

$\because$ Maximum frequency = 12

$\therefore$ Modal class = 40 – 60

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

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 40 + \frac{12 - 10}{2 \times 12 - 10 - 6} \times 20 = 40 + \frac{2}{8} \times 20 = 45$$

2. 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

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

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

3. 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

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

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

4. Calculate median marks of the following data:

Class intervals	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120	120 – 140	140 – 160
Frequency	12	18	23	15	12	12	8

Ans:

Classes	f	$c.f.$
20 – 40	12	12
40 – 60	18	30
60 – 80	23	53
80 – 100	15	68
100 – 120	12	80
120 – 140	12	92
140 – 160	8	100
Total	100	

$n = 100 \Rightarrow \frac{n}{2} = 50$

$\therefore$ Median class = 60 – 80

$l = 60$, $c.f. = 30$, $f = 23$, $h = 20$

$$\text{Median} = l + \frac{\frac{n}{2} - c.f.}{f} \times h$$

$$= 60 + \frac{50 - 30}{23} \times 20 = 77.39$$

5. The data on number of patients attending a hospital in a month are given below. Find the average number of patients attending the hospital in a day.

No. of patients	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of days	2	6	9	7	4	2

Ans:

Number of patients	x_i	Number of days attending hospital f_i	$d_i = x_i - a$	$f_i d_i$
0 – 10	5	2	–20	–40
10 – 20	15	6	–10	–60
20 – 30	25	9	0	0
30 – 40	35	7	10	70
40 – 50	45	4	20	80
50 – 60	55	2	30	60
Total		$\Sigma f_i = 30$		$\Sigma f_i d_i = 110$

$$\text{Mean} = a + \frac{\Sigma f_i d_i}{\Sigma f_i} = 25 + \frac{110}{30} = 25 + 3.666 = 25 + 3.67 = 28.67$$

6. 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	$f_i x_i$
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		$\Sigma f_i = 92 + p$	$\Sigma f_i x_i = 5160 + 30p$

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

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

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

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

7. Find the mean of the following frequency distribution:

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
frequency	4	4	7	10	12	8	5

Ans:

C. I.	Class mark (x_i)	f_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
0 – 10	5	4	–3	–12
10 – 20	15	4	–2	–8
20 – 30	25	7	–1	–7
30 – 40	35	10	0	0
40 – 50	45	12	1	12
50 – 60	55	8	2	16
60 – 70	65	5	3	15
Total		$\Sigma f_i = 50$		$\Sigma f_i u_i = 16$

$$\text{Mean} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 35 + \frac{16}{50} \times 10 = 35 + 3.2 = 38.2$$

8. Find the mode of the following frequency distribution:

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 - 70	70 – 80
Frequency	5	8	7	12	28	20	10	10

Ans:

Modal Class 40 – 50, Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$$\text{Mode} = 40 + \left(\frac{28 - 12}{2 \times 28 - 12 - 20}\right) \times 10 = 40 + \left(\frac{16}{56 - 32}\right) \times 10$$

$$= 40 + \left(\frac{16}{24}\right) \times 10 = 40 + \frac{20}{3} = 46.666 = 46.67$$

9. Find the median of the following frequency distribution:

Class	130 – 139	140 – 149	150 – 159	160 – 169	170 – 179	180 – 189	190 – 199
frequency	4	9	18	28	24	10	7

Ans:

Class interval	f	$c.f.$
129.5 – 139.5	4	4
139.5 – 149.5	9	13
149.5 – 159.5	18	31
159.5 – 169.5	28	59
169.5 – 179.5	24	83
179.5 – 189.5	10	93
189.5 – 199.5	7	100

$n = 100 \Rightarrow \frac{n}{2} = 50$

Median class = 159.5 – 169.5, $l = 159.5$, $c.f. = 31$, $f = 28$, $h = 10$

$$\text{Median} = 159.5 + \left(\frac{50 - 31}{28}\right) \times 10$$

$$= 159.5 + \frac{19}{28} \times 10$$

$$= 166.285 = 166.3$$

10. The mode of the following frequency distribution is 34.5. Find the value of x.

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	4	8	10	*x*	8

Ans:

Here, mode = 34.5. So, modal class is 30 – 40, f_1 = x, f_0 = 10 and f_2 = 8

$$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h \Rightarrow 34.5 = 30 + \left(\frac{x-10}{2x-10-8}\right) \times 10$$

$$\Rightarrow 4.5 = \left(\frac{x-10}{2x-18}\right) \times 10 \Rightarrow 4.5 = \frac{x-10}{2(x-9)} \times 10$$

$$\Rightarrow \frac{4.5 \times 2}{10} = \frac{x-10}{x-9} \Rightarrow \frac{9}{10} = \frac{x-10}{x-9}$$

$\Rightarrow 9(x - 9) = 10(x - 10) \Rightarrow 9x - 81 = 10x - 100 \Rightarrow 10x - 9x = 100 - 81 \Rightarrow x = 19$

11. Find the median of the following frequency distribution:

More than or equal to	150	140	130	120	110	100	90	80
frequency	0	12	27	60	105	124	141	150

Ans:

Wages (in ₹)	*f*	*c.f.*
80 – 90	9	9
90 – 100	17	26
100 – 110	19	45
110 – 120	45	90
120 – 130	33	123
130 – 140	15	138
140 – 150	12	150

$n = 150 \Rightarrow \frac{n}{2} = 75$

Median class = 110 – 120

$l = 110$, $f = 45$, $c.f. = 45$, $h = 10$

$$\text{Median} = l + \frac{\frac{n}{2} - cf}{f} \times h = 110 + \frac{75 - 45}{45} \times 10$$

$$= 116.67$$

12. The median of the distribution given below is 14.4. Find the values of x and y, if the sum of frequency is 20.

Class Interval	0 – 6	6 – 12	12 – 18	18 – 24	24 – 30
Frequency	4	*x*	5	*y*	1

Ans:

Class Interval	*f*	*cf*
0 – 6	4	4
6 – 12	*x*	4 + *x*
12 – 18	5	9 + *x*
18 – 24	*y*	9 + *x* + *y*
24 – 30	1	10 + *x* + *y*
Total	10 + *x* + *y*	

$n = 20 \Rightarrow \frac{n}{2} = 10$

Median = 14.4

$\therefore$ Median class = 12 – 18

$\therefore$ $l = 12$, $c = 4 + x$, $f = 5$, $h = 6$

$$\text{Median} = l + \frac{\frac{n}{2} - c}{f} \times h$$

$$14.4 = 12 + \frac{10 - (4 + x)}{5} \times 6$$

$$\Rightarrow 2.4 = \frac{6 - x}{5} \times 6 \Rightarrow \frac{2.4 \times 5}{6} = 6 - x$$

$\Rightarrow x = 4$, $\therefore y = 6$ (as $x + y = 10$)

13. Find the median income of the following frequency distribution:

Weekly Income (Rs.)	0 – 1000	1000 – 2000	2000 – 3000	3000 – 4000	4000 – 5000	5000 – 6000
Frequency	250	190	100	40	15	5

Ans:

Income in ₹	Number of families (f)	c.f.
0 – 1000	250	250
1000 – 2000	190	440
2000 – 3000	100	540
3000 – 4000	40	580
4000 – 5000	15	595
5000 – 6000	5	600

$n = 600 \Rightarrow \frac{n}{2} = 300$

$\therefore$ Median class = 1000 – 2000

$l = 1000$, $c = 250$, $f = 190$, $h = 1000$

$$\text{Median} = l + \frac{\frac{n}{2} - c}{f} \times h$$

$$= 1000 + \frac{300 - 250}{190} \times 1000$$

$$= 1000 + \frac{5000}{19} = 1263.158$$

14. 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

Class	x_i	Frequency f_i	$f_i x_i$
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		$\Sigma f_i = 92 + p$	$\Sigma f_i x_i = 5160 + 30p$

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

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

$\Rightarrow 50p - 30p = 5160 - 4600 \Rightarrow 20p = 560 \Rightarrow p = \frac{560}{20} = 28$

15. Find 'p' if the mean of the given data is 15.45.

Class Interval	0 – 6	6 – 12	12 – 18	18 – 24	24 – 30
Frequency	6	8	p	9	7

Class	x_i	f_i	$f_i x_i$
0 – 6	3	6	18
6 – 12	9	8	72
12 – 18	15	p	$15p$
18 – 24	21	9	189
24 – 30	27	7	189
Total		$\Sigma f_i = 30 + p$	$\Sigma f_i x_i = 468 + 15p$

$$\text{Mean} = \frac{468 + 15p}{30 + p} \Rightarrow \frac{468 + 15p}{30 + p} = 15.45 \Rightarrow 468 + 15p = 463.5 + 15.45p$$

$$\Rightarrow 468 - 463.5 = 15.45p - 15p \Rightarrow 4.5 = 0.45p \Rightarrow p = \frac{4.5}{0.45} \Rightarrow p = 10$$

16. Find the value of p, if the mode of the following distribution is 48:

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 - 70	70 – 80
Frequency	7	14	13	12	*p*	18	15	8

Ans:

Here mode = 48

$\therefore$ Modal class: 40 – 50

$l = 40$, $f_0 = 12$, $f_1 = p$, $f_2 = 18$, $h = 10$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h \Rightarrow 48 = 40 + \frac{p - 12}{2p - 12 - 18} \times 10 \Rightarrow 8 = \frac{10p - 120}{2p - 30}$$

$\Rightarrow 16p - 240 = 10p - 120$

$\Rightarrow 6p = 120 \Rightarrow p = 20$

17. The median of the following data is 52.5. Find the values of x and y. if the total frequency is 100

Class Interval	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency	2	5	x	12	17	20	y	9	7	4

Ans:

C.I.	f	$c.f.$
0 – 10	2	2
10 – 20	5	7
20 – 30	x	$7 + x$
30 – 40	12	$19 + x$
40 – 50	17	$36 + x$
50 – 60	20	$56 + x$
60 – 70	y	$56 + x + y$
70 – 80	9	$65 + x + y$
80 – 90	7	$72 + x + y$
90 – 100	4	$76 + x + y$
	$\Sigma f_i = 76 + x + y$	

As given $\Sigma f_i = 100$

$\Rightarrow 76 + x + y = 100$

$\Rightarrow x + y = 24$ ...(i)

Median = 52.5, $n = 100 \Rightarrow \frac{n}{2} = 50$

Median class is 50 – 60 (as given median is 52.5.)

$\Rightarrow$ Using formula for the median.

$$52.5 = 50 + \frac{[50 - (36 + x)]}{20} \times 10 = 50 + \frac{14 - x}{2}$$

$$\Rightarrow 52.5 - 50 = \frac{14 - x}{2} \Rightarrow 2.5 \times 2 = 14 - x \Rightarrow 5 = 14 - x$$

$\Rightarrow x = 14 - 5 = 9 \Rightarrow y = 24 - 9 = 15$

18. The mean of the following frequency distribution is 25.2. Find the missing frequency x.

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	8	x	10	11	9

Ans:

Let the missing frequency be f, the assumed mean be A = 47.5 and $h = 3$.

Class	Frequency (f_i)	Class mark (f_i)	$f_i x_1$
0 – 10	8	5	40
10 – 20	x	15	15x
20 – 30	10	25	250
30 – 40	11	35	385
40 – 50	9	45	405
Total	$\Sigma f_i = 38 + x$		$\Sigma f_i x_i = 15x + 1080$

Thus, we have, $\sum f_i = 38 + x$; $\sum f_i x_i = 15x + 1080$ and $\bar{x} = 25.2$

We know that, $\bar{x} = \dfrac{\sum f_i x_i}{\sum f_i}$

$\Rightarrow \quad 25.2 = \dfrac{5x + 1080}{38 + x} \Rightarrow 25.2(38 + x) = 15x + 1080$

$\Rightarrow \quad 957.6 + 25.2x = 15x + 1080 \Rightarrow 25.2x - 15x = 1080 - 957.6$

$\Rightarrow \quad 10.2x = 122.4 \Rightarrow x = 12$ Hence, $x = 12$.

19. A survey regarding the heights (in cm) of 50 girls of class Xth of a school was conducted and the following data was obtained. Find the mean, median and mode of the given data.

Heights (in cm)	120 – 130	130 – 140	140 – 150	150 – 160	160 – 170
No. of Girls	2	8	12	20	8

Ans:

Height (in cm)	Number of girls	Cumulative frequency
120 – 130	2	2
130 – 140	8	10
140 – 150	$12 = f_0$	$22 = c.f.$
150 – 160	$20 = f_1$	42
160 – 170	$8 = f_2$	50
Total	50	

$n = 50 \Rightarrow \dfrac{n}{2} = 25$

$\therefore$ Median class = 150 – 160

$l = 150$, $c.f. = 22$, $f = 20$, $h = 10$

$\therefore$ Median $= l + \dfrac{\frac{n}{2} - c.f.}{f} \times h$

$= 150 + \dfrac{25 - 22}{20} \times 10 = 150 + 1.5 = 151.5$

Modal class = 150 – 160

$l = 150$, $h = 10$, $f_1 = 20$, $f_0 = 12$, $f_2 = 8$

Mode $= l + \left(\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 150 + \dfrac{20 - 12}{2 \times 20 - 12 - 8} \times 10 = 150 + 4 = 154$

Now, Mode = 3 Median – 2 Mean

$\Rightarrow 154 = 3 \times 151.5 - 2$ Mean $\Rightarrow 154 - 454.5 = -2$ Mean

$\Rightarrow 300.5 = 2$ Mean $\Rightarrow$ Mean $= \dfrac{300.5}{2} = 150.25$

20. Find mean, median and mode of the following data:

Marks	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100–120	120 –140
No. of Students	6	8	10	12	6	5	3

Ans:

Classes	Frequency	Cumulative frequency
0 – 20	6	6
20 – 40	8	14
40 – 60	10	24
60 – 80	12	36
80 – 100	6	42
100 – 120	5	47
120 – 140	3	50
	$n = 50$	

$\therefore \quad \dfrac{n}{2} = 50$

Median class = (60 – 80)

$l = 60$, $f = 12$, $c.f. = 24$, $h = 20$.

$$\text{Median} = l + \frac{\frac{n}{2} - c.f.}{f} \times h$$

$$= 60 + \frac{25 - 24}{12} \times 20 = 60 + \frac{1 \times 5}{3}$$

$$= \frac{180 + 5}{3} = \frac{185}{3} = 61.6$$

Modal class = (60 – 80) as its frequency is 12

$h = 20$, $l = 60$, $f_1 = 12$, $f_0 = 10$, $f_2 = 6$.

Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h = 60 + \frac{12 - 10}{2 \times 12 - 10 - 6} \times 20 = 60 + \frac{2}{8} \times 20 = 65$

Now, Mode = 3 Median – 2 Mean

65 = 3 (61.6) – 2 Mean

2 Mean = 184.8 – 65

2 Mean = 119.8 $\Rightarrow$ Mean = $\frac{119.8}{2}$ = 59.9

$\therefore$ Mean = 59.9; Median = 61.6; Mode = 65