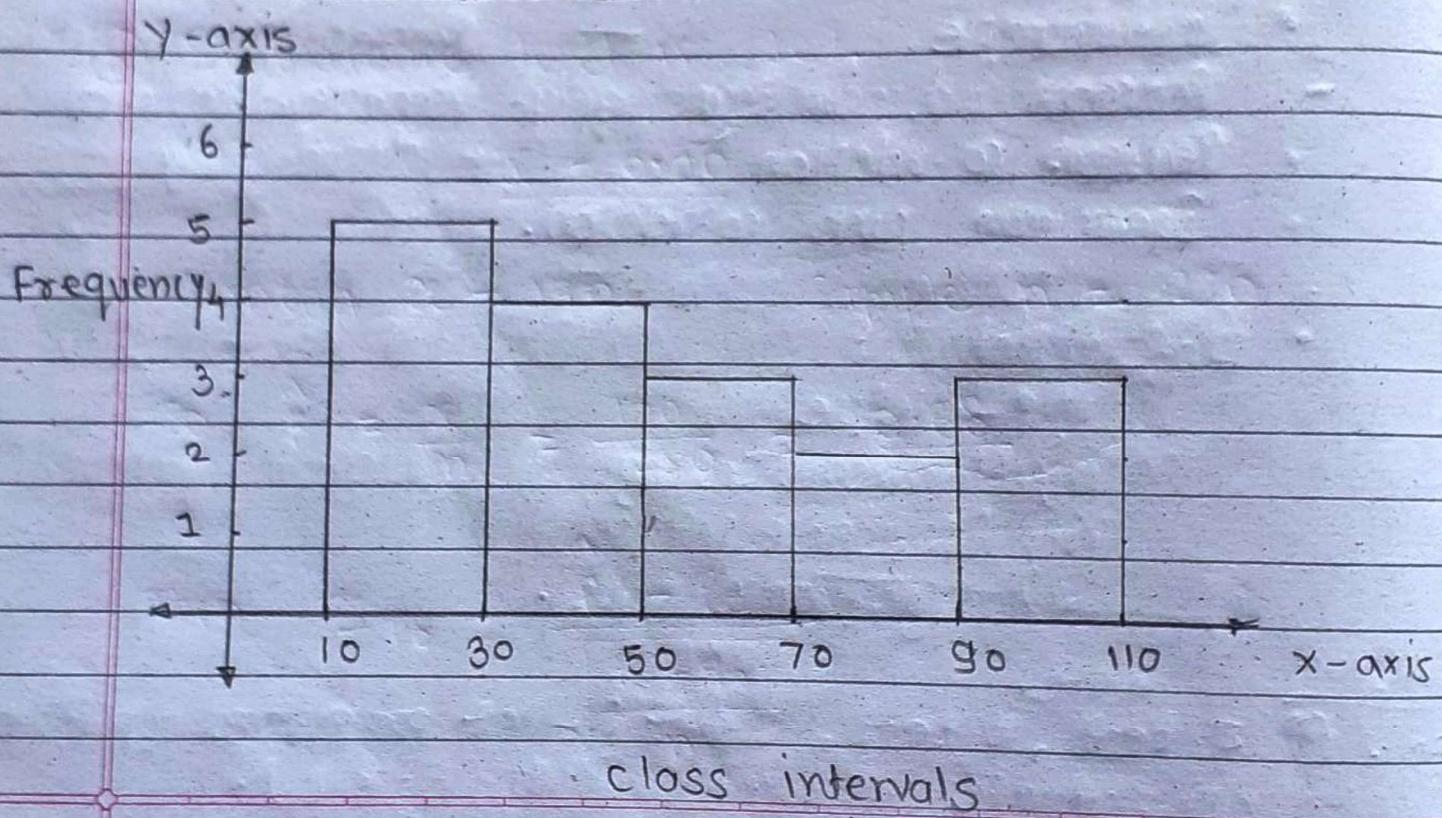


Q.1 Plot a histogram:-

10, 18, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88, 90, 92, 94, 99

→ Class Interval	10 - 30	30 - 50	50 - 70	70 - 90	90 - 110
frequency	3	5	2	4	3



Q.2 In a quant test of the CAT Exam, the population standard deviation is known to be 100. A sample of 25 test taken has a mean of 520. Construct an 80% CI about the mean.

+ Given,

Population standard deviation $\sigma = 100$

Sample size, $n = 25$

mean $\bar{x} = 520$

C.I. with respect $\alpha = 1 - 0.80 = 0.20$

When Population standard is given, we applies test

Point estimate \pm Margin of Error

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$\left(\frac{\sigma}{\sqrt{n}} \right)$ = Standard Error.

$$= 520 \pm z_{0.10} \left(\frac{100}{\sqrt{25}} \right)$$

$$\text{Upper bound of C.I.} = 520 + z_{0.10} \left(\frac{100}{5} \right)$$

$$= 520 + 1.28 (20) \quad (z_{0.10} = 1.28)$$

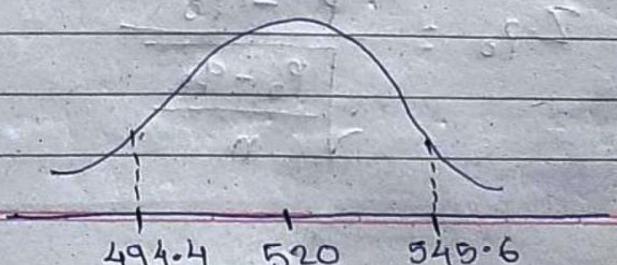
$$= 520 + 25.6$$

$$\text{Upper bound of C.I.} = 545.6$$

$$\text{Lower bound of C.I.} = 520 - 1.28 (20)$$

$$= 520 - 25.6$$

$$\text{Lower bound of C.I.} = 494.4$$



Q.3 A car believes that the percentage of citizens in city ABC that owns a vehicle is 60% or less. A sales manager disagrees with this. A sales manager disagrees with this. He conducted a hypothesis testing surveying 250 residents & found that 170 residents responded yes to owning a vehicle.

- (a) state the null and alternate hypothesis.
- (b) At a 10% significance level, is there enough evidence to support the idea that vehical owner in ABC city is 60% or less.
- (c)
 - i) Null hypothesis (H_0) - The percentage of citizens in city ABC that owns a vehicle is 60% or less.
 - ii) Alternate hypothesis (H_1) - The percentage of citizens in city ABC that owns a vehicle is more than 60%.
- (d) Null hypo $H_0 = \geq 60$
- Alternate hyp $H_1 = < 60$
- (e) Significance level is 10%.

$$\alpha = 0.10$$

$$\text{mean } \bar{x} = 170$$

$$\text{Sample } n = 250$$

$$\text{so } \hat{p} = \frac{\bar{x}}{n} = \frac{170}{250} = 0.68$$

$$\text{Then } Z_{p_0} = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$

$$P_0 = 0.60$$

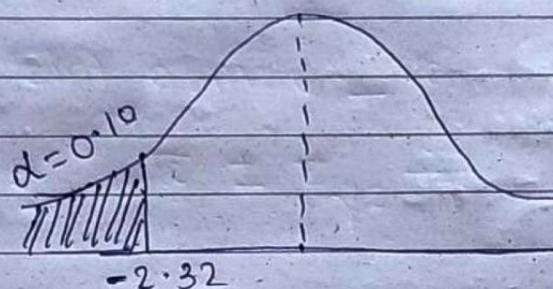
$$q_0 = 1 - 0.60 = \underline{0.40}$$

so

$$Z_{P_0} = \frac{0.68 - 0.60}{\sqrt{\frac{(0.60) \times (0.40)}{250}}}$$

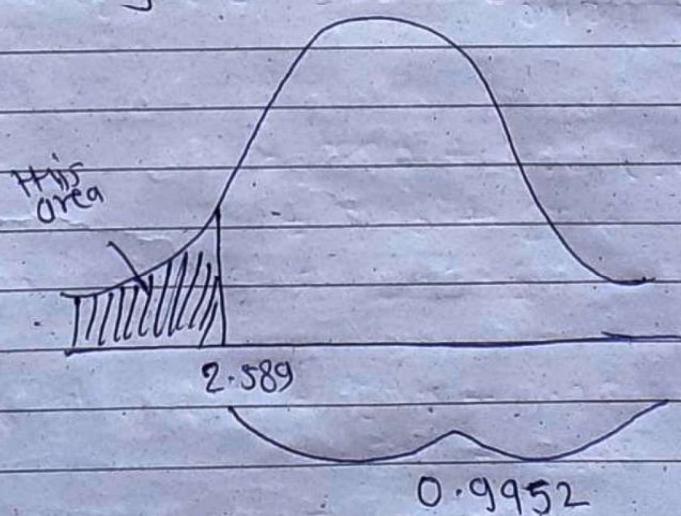
$$= \frac{0.08}{\sqrt{0.00096}} = \frac{0.08}{0.0309}$$

$$Z_{P_0} = 2.589 \approx 2.59$$



Z value (2.589) is greater than -2.32 so we accept null hypothesis.

So calculating P-value -



$$P \text{ value. } 1 - 0.9952 = 0.0048$$

P value < Significance value.
 $0.0048 < 0.20$

Q.4

What is the value of the 99 percentile?

2, 2, 3, 4, 5, 5, 5, 6, 7, 8, 8, 8, 8, 9, 9, 10, 11, 11, 12



Percentile is a value below which a certain percentage of observation lie.

Given $n = 20$

$$\text{Value} = \frac{\text{Percentile}}{100} \times (n+1)$$

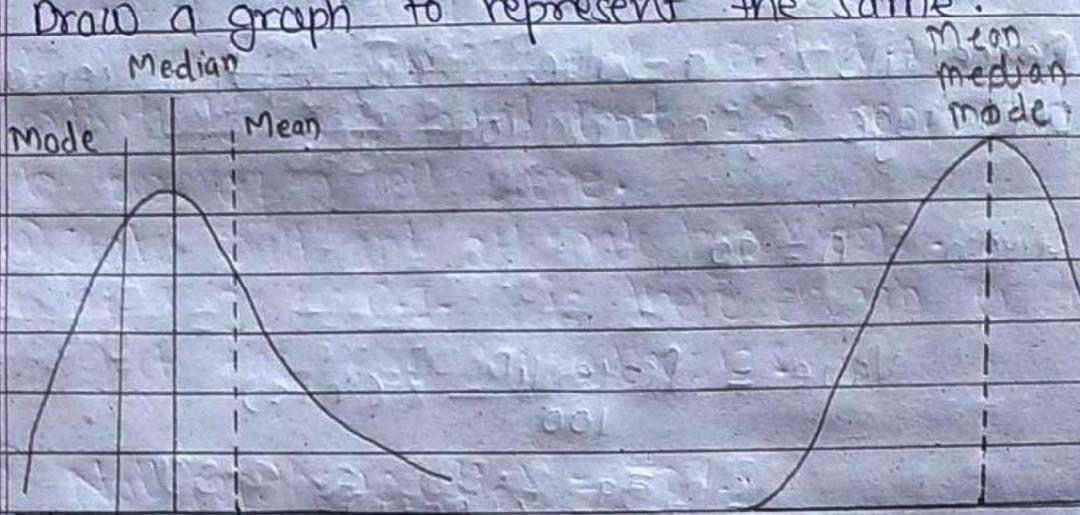
$$= \frac{99}{100} \times (20+1)$$

$$= 0.99 \times 21$$

$$\text{Value} = 20.79 \rightarrow \text{Index position.}$$

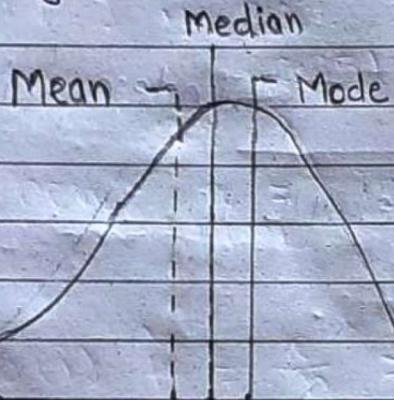
So value of the 99 percentile is 12.

Q.5 In left and right-skewed data, what is the relationship between mean, median, mode? Draw a graph to represent the same.



Right Skewed distribution

Symmetrical data.



Left Skewed distribution.

- In symmetrical frequency distribution,
mean = median = mode
- In Right or positively skewed frequency distribution
the mean is always greater than median and
the median is always greater than the mode.
 $\text{Mean} > \text{Median} > \text{mode}$
- In Left or negatively skewed frequency distribution
the mean is always lesser than median and

the median is always lesser than the mode.

$$\text{Mean} < \text{median} < \text{mode}$$

- Examples of Right skewed distribution :-
- ① Distribution of income in city : Most of the people earn 10k to 30k salary monthly whereas there are few people who earn 2 to 1 Lakh of monthly salary.
 - ② Distribution of scores in exam of mathematics subjects : - Most of student scores between 40 to 60 marks out of 100 whereas very few student get 90 to 100 marks.
- Examples of Left skewed distribution :-
- ① Distribution of scores in online exam during covid : - Most of students get 40 to 50 marks out of 50 marks whereas very few get 0 to 10 marks.
 - ② Distribution of mobile phones in city . - Most of the people having mobile phone valued more than 10k whereas very few people using phone having ~~value~~ price less than 1k.