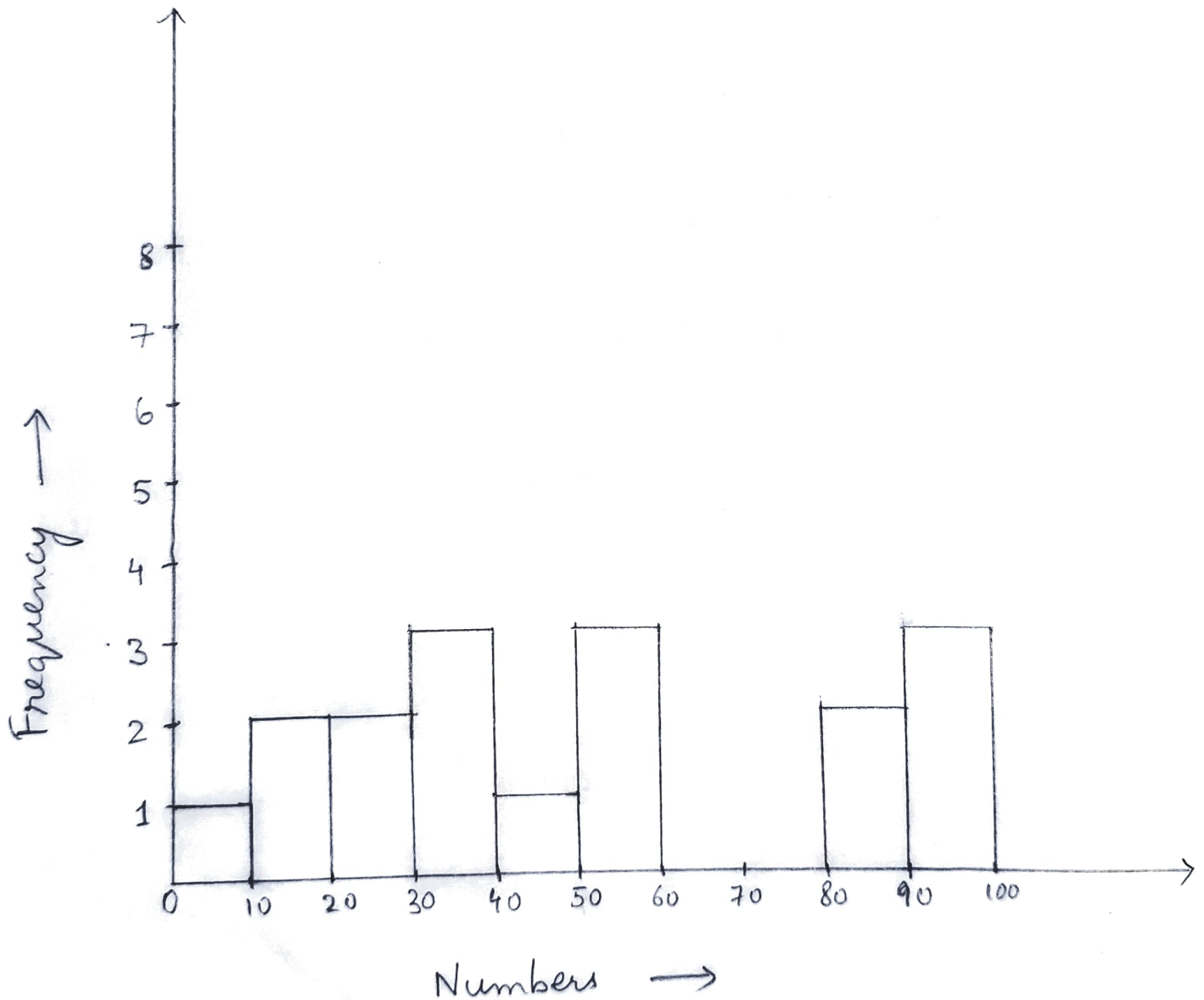


STATISTICS

Q1. Plot a histogram.

10, 13, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88,
90, 92, 94, 99

Solⁿ.



Q2 In a quant test of the CAT Exam, the population standard deviation is known to be 100. A sample of 25 tests taken has a mean of 520. Construct an 80% C.I. about the mean?

Soln. Here, $\bar{x} = 520$, $n = 25$, $\sigma = 100$

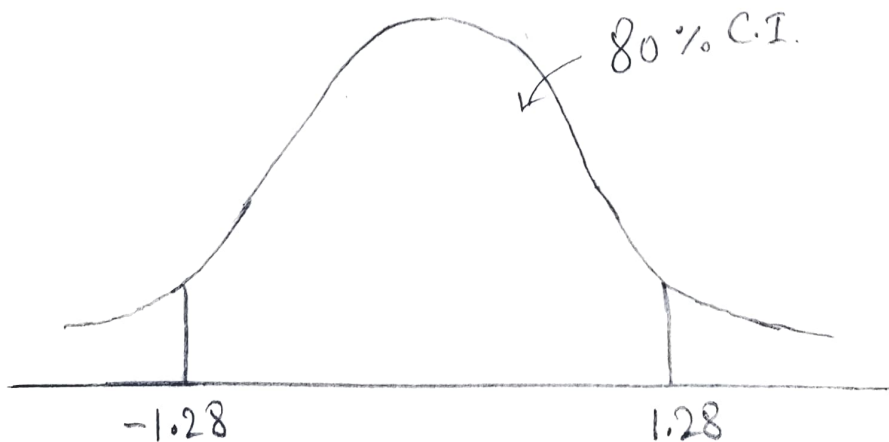
$$\text{Significance value, } \alpha = 1 - 0.80 \\ = 0.20$$

$$\therefore \frac{\alpha}{2} = \frac{0.20}{2} = 0.10$$

$$\text{Confidence Interval, C.I} = \text{Point estimate} \pm \text{Margin error} \\ = \bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

Now, $z_{\alpha/2} = z_{0.10} = -1.28$ (from z table)

and $z_{0.90} = 1.28$



Now,

$$\begin{aligned}\text{Lower fence} &= \bar{x} - z_{0.10} \frac{\sigma}{\sqrt{n}} \\&= 520 - 1.28 \times \frac{100}{\sqrt{25}} \\&= 520 - 1.28 \times \frac{100}{5} \\&= 520 - 25.6 \\&= 494.4\end{aligned}$$

$$\begin{aligned}\text{Higher fence} &= \bar{x} + z_{0.10} \frac{\sigma}{\sqrt{n}} \\&= 520 + 1.28 \times \frac{100}{\sqrt{25}} \\&= 520 + 1.28 \times \frac{100}{5} \\&= 520 + 25.6 \\&= 545.6\end{aligned}$$

\therefore 80% C.I. lies between 494.4 to 545.6.

Q3. A car company believes that the percentage of citizens in city ABC that own a vehicle is 60% or less. A sales manager disagrees with this. He conducted a hypothesis testing surveying 250 residents & found that 170 residents responded yes to owning a vehicle.

- State the null & alternate hypothesis
- At a 10% significance level, is there enough evidence to support the idea that vehicle owner in ABC city is 60% or less.

Solⁿ. a) $H_0: P_0 \leq 60\%$, The percentage of vehicle owner is 60% or less.

$H_1: P_1 > 60\%$, The percentage of vehicle owner is greater than 60%.

b) Here, significance level = 10%

$$\therefore \alpha = 0.10$$

$$\therefore Z_{0.10} = -1.28$$

$$n = 250, \quad x = 170$$

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

$$P_0 = 0.6$$

$$q_0 = 1 - P_0 = 1 - 0.6 = 0.4$$

Now,

$$z \text{ test} = \frac{\hat{p} - P_0}{\sqrt{\frac{P_0 q_0}{n}}}$$

$$= \frac{0.68 - 0.6}{\sqrt{\frac{0.6 \times 0.4}{250}}}$$

$$= 2.58$$

$\therefore 2.58 > -1.28$, so we accept the null hypothesis

\therefore There is enough evidence to support the idea that vehicle owner in ABC city is 60% or less.

Q4. What is the value of 99 percentile?

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

Solⁿ. Here, $n = 20$

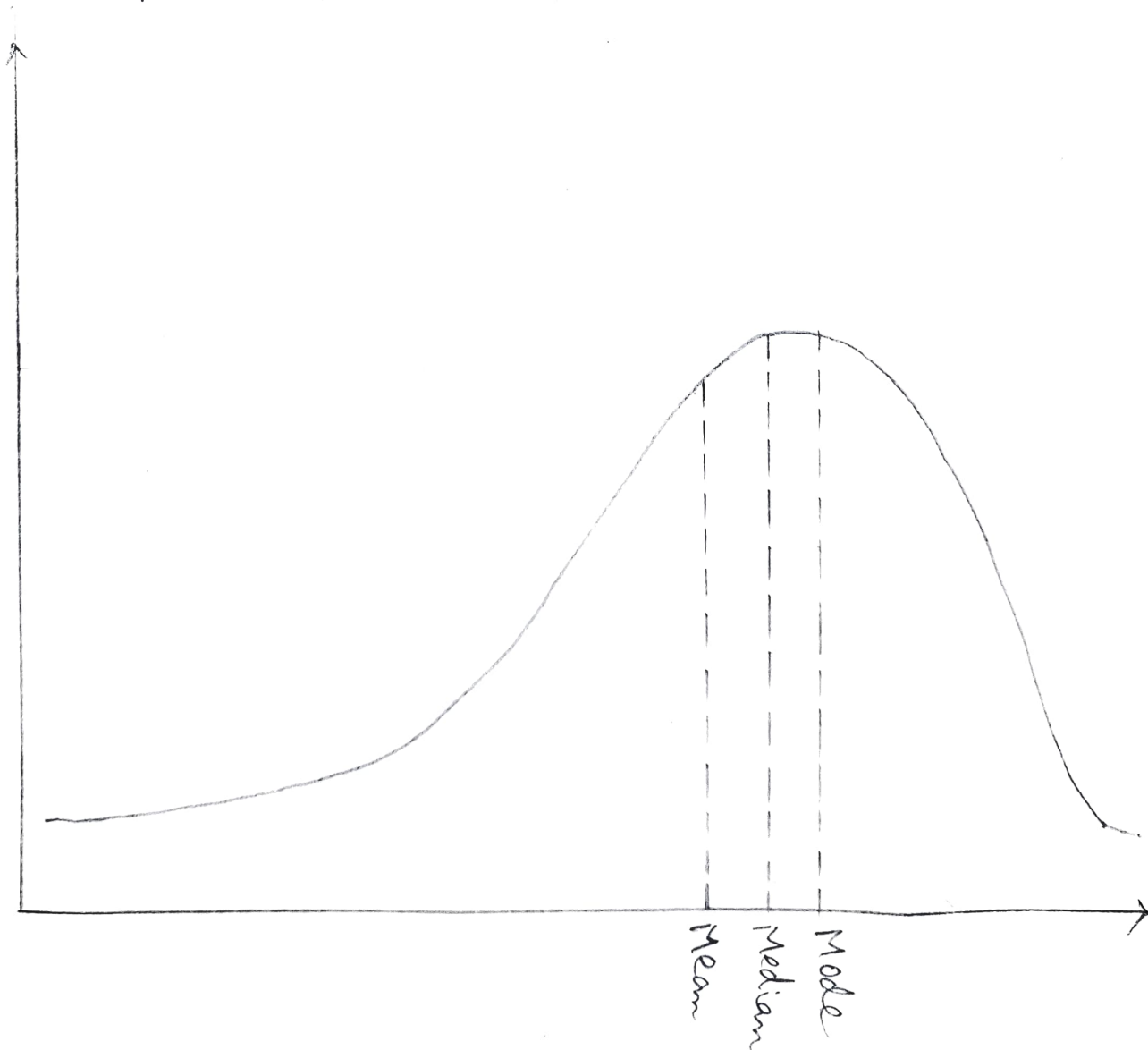
$$\begin{aligned}\therefore \text{Value of 99 percentile} &= \frac{\text{Percentile} \times (n+1)}{100} \\ &= \frac{99}{100} \times (20+1) \\ &= \frac{99}{100} \times 21 \\ &= 20.79 \\ &= 20^{\text{th}} \text{ index} \\ &= 12.\end{aligned}$$

\therefore The value of 99 percentile is 12.

Q5. In left & right skewed data, what is the relationship between mean, median & mode? Draw the graph to represent the same.

Solⁿ. In a left-skewed distribution the relationship between mean, median and mode is expressed as:

$$\text{Mean} < \text{Median} < \text{Mode}.$$



In a right-skewed distribution the relationship between mean, median and mode is expressed as:

$$\text{Mean} > \text{Median} > \text{Mode}.$$

