Assignments Statistics → I-neuron

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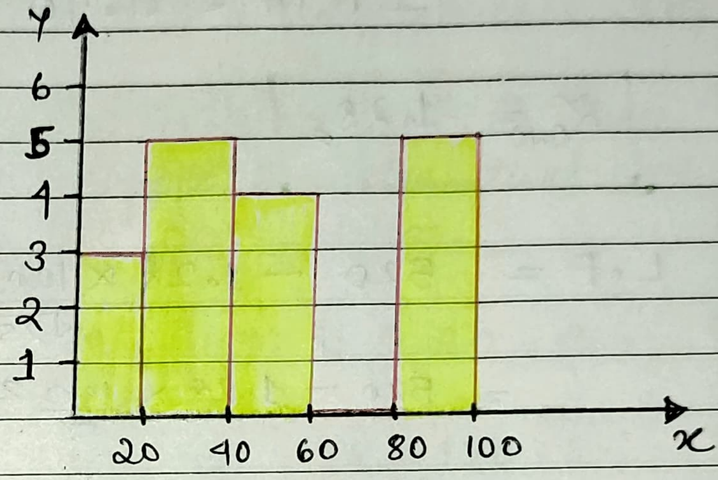
Q① Plot a histogram,

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

Solu → Considering, bins = 5 & bin size = 20.



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% CI about the means.

Solu → given,

- $\sigma = 100$
- $n = 25$
- $\mu = 520$
- C.I = 80% ⇒ 0.80
- $\alpha = 1 - 0.80 = 0.20$
- $\frac{\alpha}{2} = \frac{0.20}{2} = 0.10$

If the value falls b/w Lf & Uf then we will then accept the hypothesis or else, we reject it.

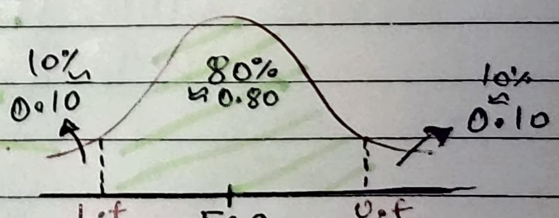


fig ①.

i.e

Parameters = Point estimate ± margin of error.

P.T.O

continue...

ⓐ lower fence $= \mu - Z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)$

ⓑ upper fence $= \mu + Z_{\frac{\alpha}{2}}\left(\frac{\sigma}{\sqrt{n}}\right)$

let find out the value of $Z_{\frac{\alpha}{2}} = Z_{0.10}$ from Z table.

$$1 - 0.10 = 0.90$$

$$\boxed{Z_{0.10} = 1.28}$$

Now,

$$L.F = 520 - 1.28 \times \frac{100}{\sqrt{25}}$$

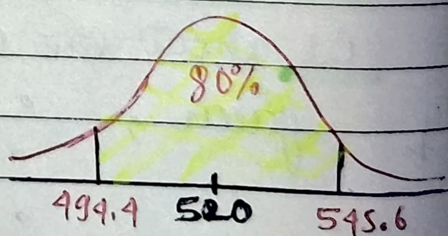
$$= 520 - 1.28 \times \frac{\cancel{100}\,20}{\cancel{5}}$$

$$= 494.4$$

$$U.F = 520 + 1.28 \times \frac{100}{\sqrt{25}}$$

$$= 520 + 1.28 \times \frac{\cancel{100}\,20}{\cancel{5}}$$

$$= 545.6$$



The value is under decision boundary, thus the hypothesis is accepted.

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

ⓐ State the null & alt hypothesis. (H_0 & H_1)

ⓑ at a 10% significance level, is there enough evidence to support the idea that vehicles owner in ABC city is 60% or less.

Solu, given, $p^0 = 60\% \Rightarrow 0.60$, thus, $q^0 = 1 - p^0$

$q^0 = 0.40.$ $\quad q^0 = 1 - 0.60 = 0.40$

$n = 250$, $x = 170$

ⓐ $H_0 = \ p^0 \leq 60$

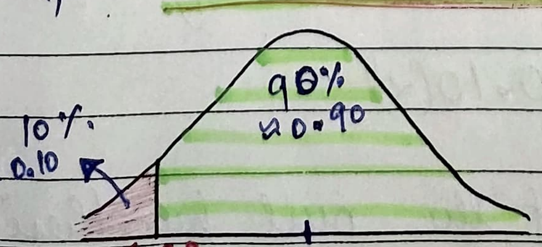
$H_1 = \ p^0 > 60$

ⓑ for $\alpha = 10\% \Rightarrow 0.10$, $C.I = 1 - \alpha = 1 - 0.10$

$C.I = 0.90 \Rightarrow 90\%$

① Since, this is an one tail test (left tailed)
let's find out the decision boundary, from z table.
for $Z_{0.10} = -1.28$

② $\hat{p} = \frac{x}{n} = \frac{170}{250} = 0.68$



let's find out z test for proportion

→

⇒ Z test with proportion

$$\Rightarrow \quad Z_{test} = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

$$\Rightarrow \quad = \frac{0.68 - 0.60}{\sqrt{\frac{0.60 \times 0.40}{250}}}$$

$$\Rightarrow \quad \Rightarrow \frac{0.08}{0.0309}$$

$$\Rightarrow 2.58$$

Since, $Z_{test\ score} > Z_\alpha$

$2.58 > -1.28$

∴ ~~We reject the null hypothesis~~

i.e. We accept the null hypothesis.

Checking with p value :-

Area @ 2.58 = 0.99506 (single tailed)

i.e.

(P.value) $0.99506 > 0.10(\alpha)$

Hence, we accept the null hypothesis.

Q.(4) What is the value of the 99 percentile?

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

Solu

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

Here, Percentile = 99, n = 20.

$I.V = \frac{99}{100} \times (20+1) = \frac{99}{100} \times 21 = 20.79$

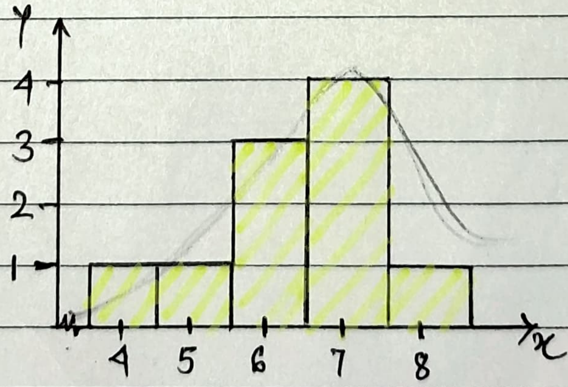
Since 20.79 is closest to 12, thus 99 percentile in this set is 12.

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

Solu The Relationship between Mean, Median & Mode in :-

(1) Left Skewed Data is Mean < Median < Mode.

(eg) • data set ⇒ 4, 5, 6, 6, 6, 7, 7, 7, 7, 8, ploting in histogram



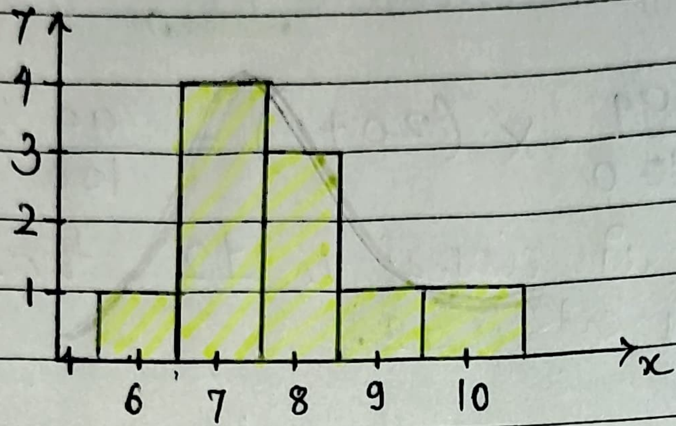
Here, • Mean $= \frac{4+5+6+6+6+7+7+7+7+8}{10} = 6.3$

• Median $= \frac{6+7}{2} = 6.5$ i.e Mean < Median < Mode

• Mode = 7

② Right skewed data :- Mean > Median > Mode

(eg) : data set : 6, 7, 7, 7, 7, 8, 8, 8, 9, 10, plotting in histogram



Here • Mean = $\frac{6+7+7+7+7+8+8+8+9+10}{10}$ = 7.7

• Median = $\frac{7+8}{2}$ = 7.5

• Mode = 7

i.e Mean > Median > Mode