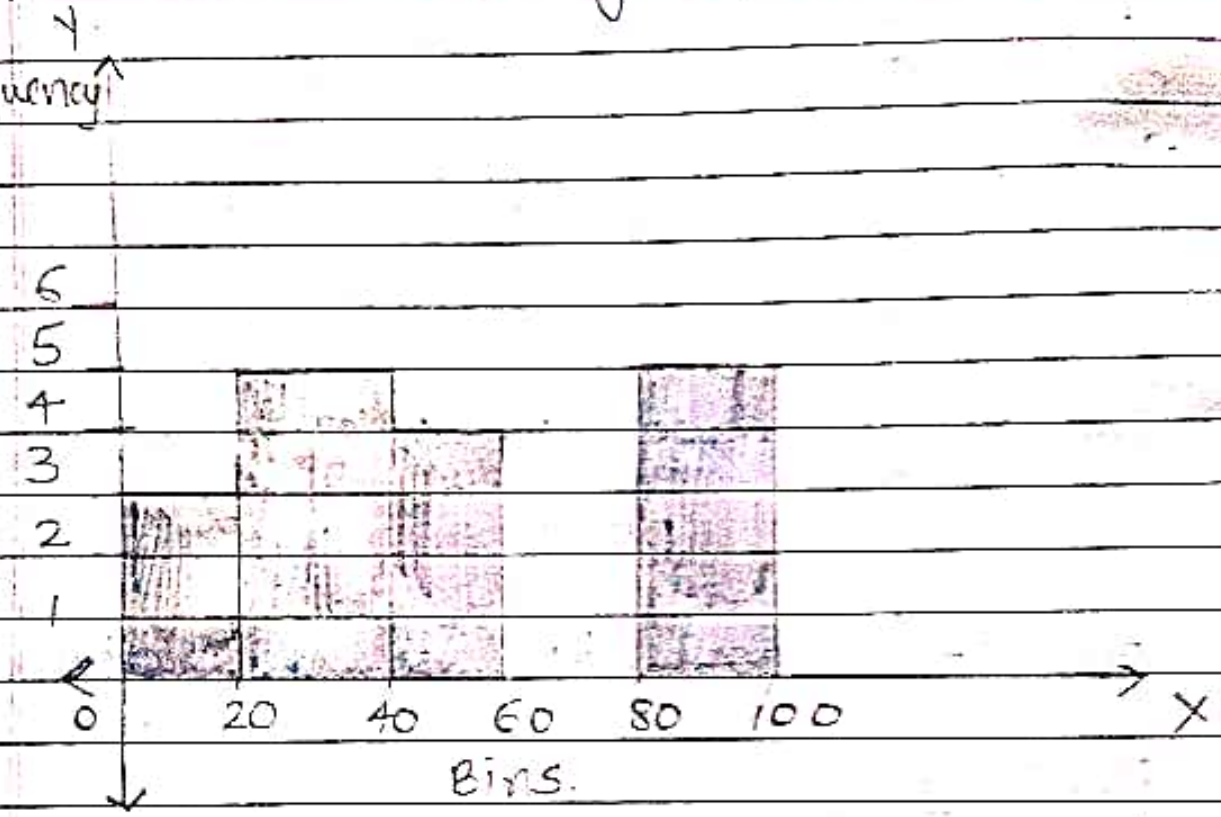
FSDA

Aishwarya Mahadik

Statistics Assignment.

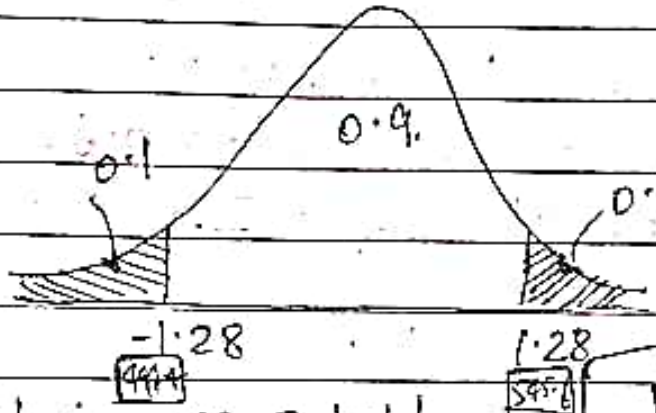
Q①



Q.(2). 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 mean.

Ans. $\bar{x} = 520, \sigma = 100, n = 25, C.I. = 80\%$.

$\therefore \alpha = 1 - C.I. = 1 - 0.8 = 0.2$



→ Search 0.1 in -ve z table

→ Search 0.9 in +ve z table.

$\therefore$ point estimator $\pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

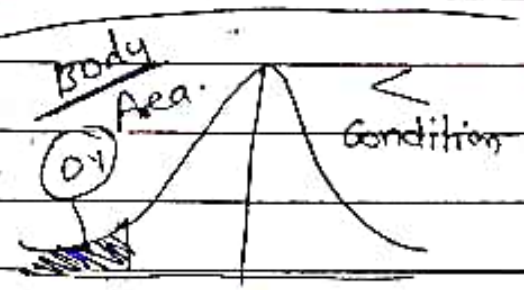
Lower fence $= \bar{x} - Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

$= 494.4$

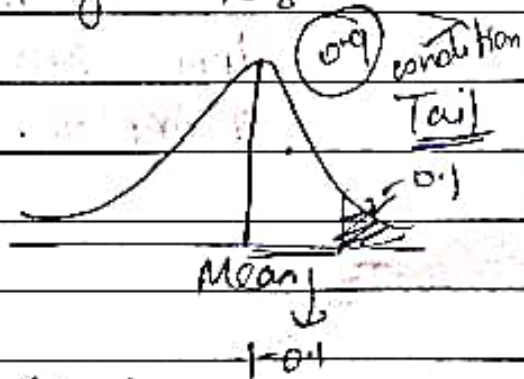
Upper fence $= \bar{x} + Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

$= 545.6$.

(494.4, 545.6).



Search 0.1 in -ve z-table we get -1.28.



Search 0.9 in +ve z-table we get +1.28.

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. He conducted a hypothesis testing surveying 250 residents and 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 vehicle owner in ABC city is 60% or less.

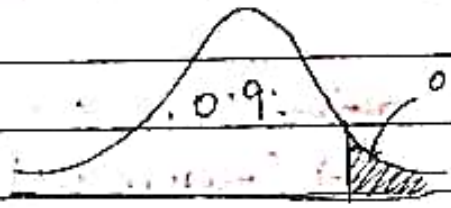
Ans. $p_0 = 0.6$, $n = 250$; $\hat{p} = \frac{170}{256} = 0.68$, $\alpha = 0.1$.

$H_0: p_0 \leq 0.6$ Vs $H_1: p_0 \not\leq 0.6$.

$\therefore$ $H_0: p_0 \leq 0.6$ Vs $H_1: p_0 > 0.6$.

Reject H_0 if $Z_{cal} > Z_\alpha$

$$Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}} = 2.58198$$



$\therefore$ $2.58198 > 1.29$ check 0.9 in the z-table we get 1.29.

we Reject the null hypothesis And conclude that the claim of sales manager is true, more then 60% of the citizens own a vehicle.

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

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

$= \frac{99}{100} \times 21$

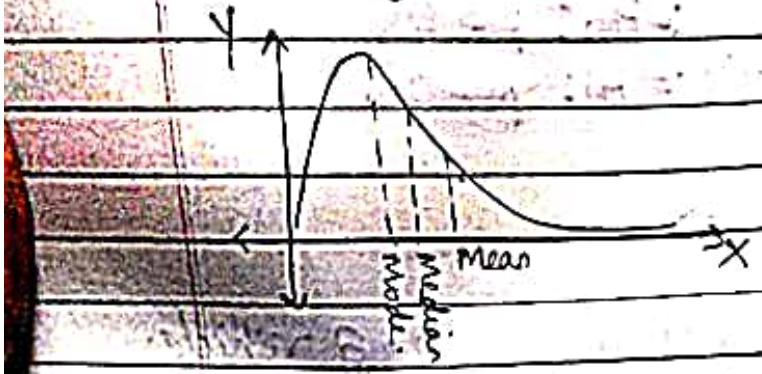
$= 20.79.$

12 is the 99 percentile.

(5). Skewness.

Ans) Skewness refers to asymmetry.
There are three types of skewness.

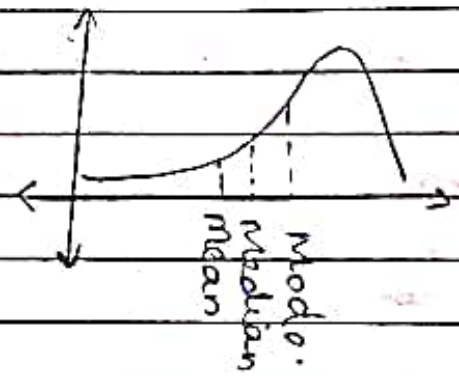
① Positively skewed.



Mean > Median > Mode.

Eg. ① Wealth Distribution.
Most people have money (income) ranging from 20k - 50k. Very few people have income starting from 100k.

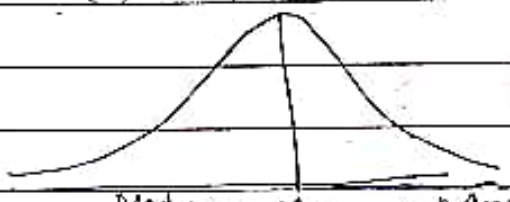
② Negatively skewed.



Mode > Median > Mean.

Eg. Covid - 19
At the beginning, the cases very few in number but eventually got raised.

(3) Symmetrical



Mean = Median = Mode

Eg. Blood pressure, weight, height, etc.

Most people will have the normal blood pressure 120/80 and some may have extreme low or extreme high due to adversities in their B.P.

sample variance is divided by n-1 ?

(1) When you have an entire population and calculate any parameter (population variance or population standard deviation) your results will be accurate. This is because we have the entire data.

(2) When we work with the sample we have only a part of the population. Our answers won't be that accurate.

(3) So here we will have sample statistic $\bar{x}$ instead of μ, so any x-value in our sample will be closer to $\bar{x}$ then μ.

(4) so therefore $\sum_{i=1}^{N} (x_i - \mu)^2 > \sum_{i=1}^{n} (x_i - \bar{x})^2$

(5) If we are interested in finding sample mean and want to extrapolate our findings to the population, Bessel's correction (n-1 in the denominator) is needed.