1 st Question

In the Question it is mentioned

p(success)=4P(failure)

totalproability=1

letp(fail)=x

x+4x=1

5x=1

x=1/5(probability of fail)

probability of success=4(1/5)

according to our Question we have to p=1/5 and q=4/5

beause it is asking what is the probabilty that atmost 3 (atmost means upto 3)

1) At most 3 means 0 unscuceesfull +1 unsuccesfull +2 unsuccesfull +3 unsucessfull

sample=10

n=10

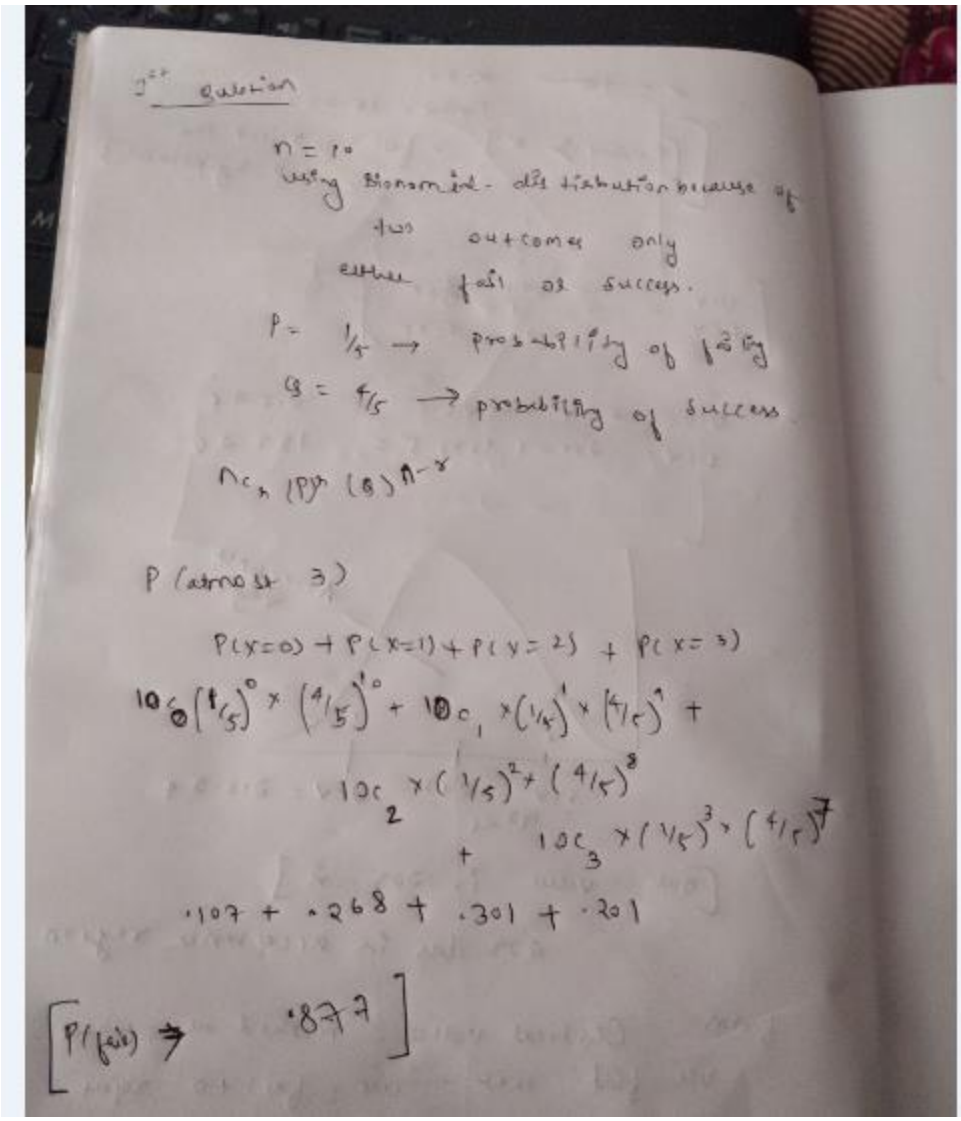
We will follow the Binomial distirbution because there Are only 2 outcomes specifically mentioned

either success or fail

and if you see trials dosentdepend upon (on other things) its independent the probabilty of success dosent depend upon probability of failure

if you toss a coin 1000 times the prob offail and prob of success will always remain same

so n here is repeated trails



2nd Question

Since it's a Normal distribution with the mean ,Standarddeviation, and confidence interval given to us .as in Question the sample is taken from the population

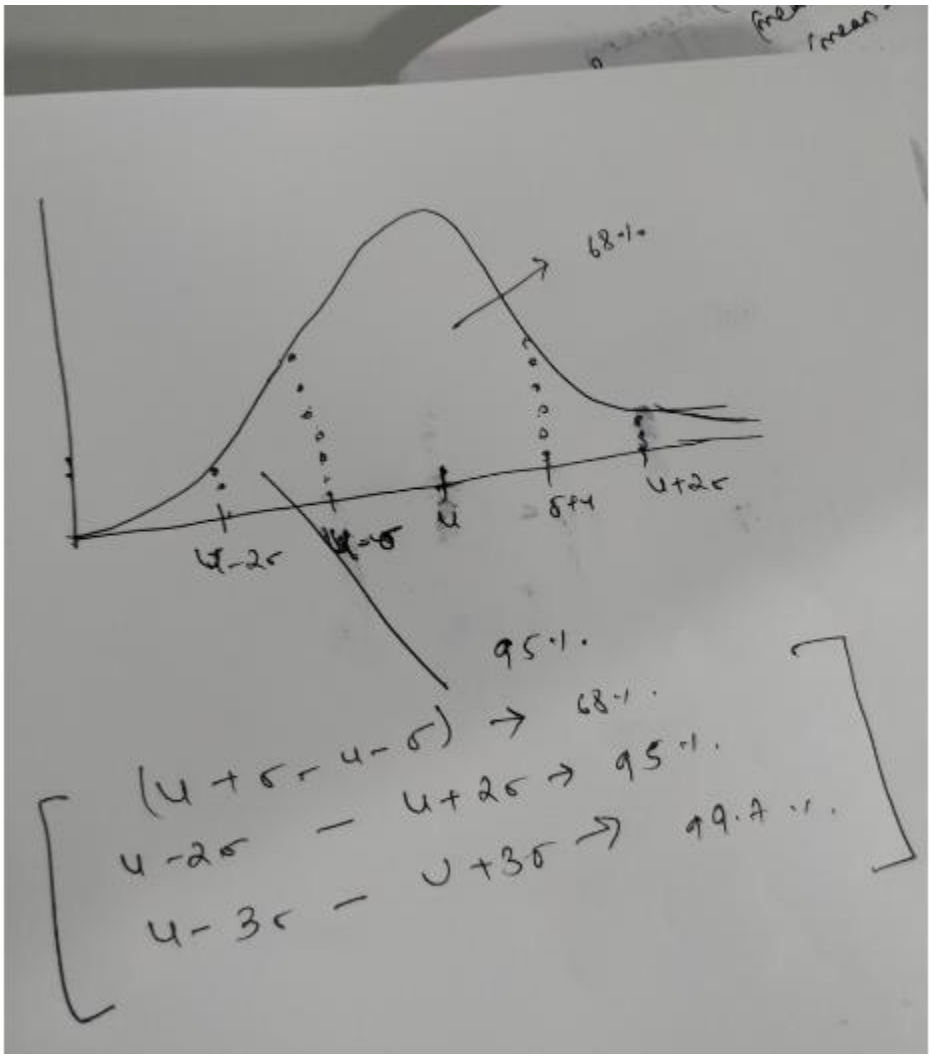
1 st condition – if a sample is taken from a population then the mean of sample would be same as population (Centera Limit Theorem)

2) 2nd condition -For a normal distribution graph the graph will be symmetric about mean,median mode

3) Centeral Limit Theorem can only be applied to a normal distributed Graph

The skewness should be Zeo for a perfectly normally distributed graph

4) For a normally distributed graph the standard deviation of sample is equal to standard deviation of population divided by squareroot of sample



Normally - distributed Graph

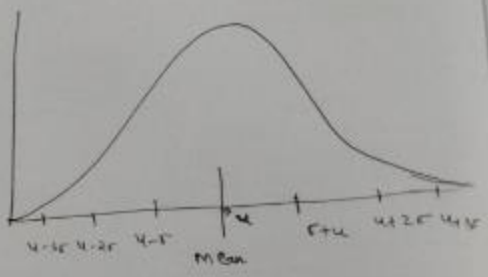
μ → population mean

N → Sample size

z → Z-score

n → sample mean

σ → here standard deviation of sample



Sample - standard deviation = $\frac{\text{Population standard deviation}}{\sqrt{N}}$

$$\sigma_n = \frac{\sigma}{\sqrt{N}}$$

$$z = \frac{n - \mu}{\sigma} =$$

$z =$

[NOTE :- Z-score is always calculated from left hand side in Z table]

sample = 100 = N

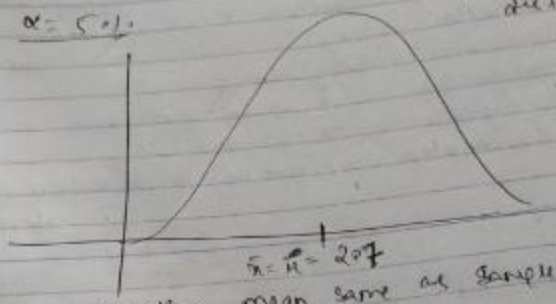
$\bar{x}$ = 207

Sample S.D = 65 seconds

Zc = 95%

α = 5%

Normal distribution



$\bar{x} = \mu = 207$

assuming population mean same as sample mean (centre limit theorem)

using critical value method. we will find UCV (upper critical value) & (LCV) lower critical value)

$UCV = \mu + Z_c \times \sigma_{sample}$

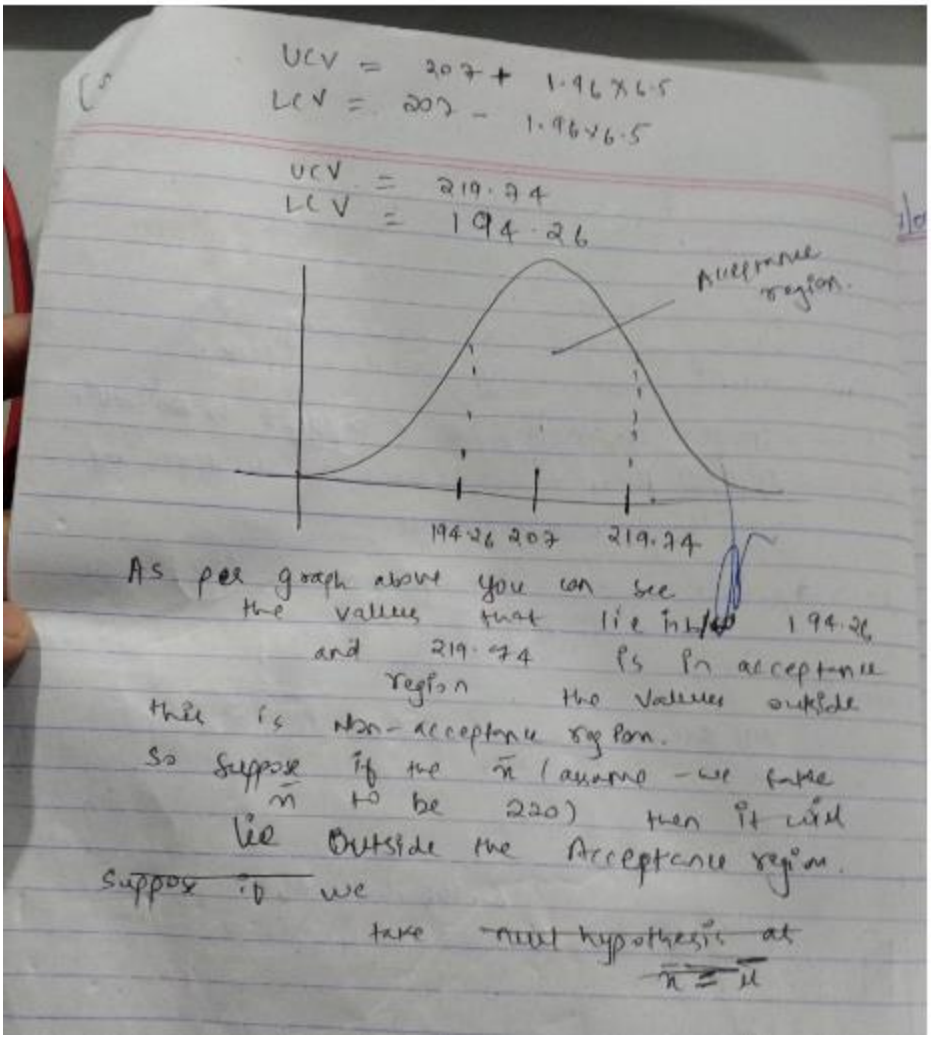
$LCV = \mu - Z_c \times \sigma_{sample}$

$$\sigma_{sample} = \frac{\sigma_{population}}{\sqrt{N}}$$

$$\sigma_{sample} = \frac{65}{\sqrt{100}}$$

$\sigma_{sample} = 6.5$

if standard deviation of population is not known consider standard deviation of sample as standard deviation of population



2) We also know that the most of the data points lie within between (u-sigma) and (u+sigma)
3) Area between (u-sigma) and (u +sigma) = 68 percent
4) Area between (u-2sigma) and (u +2sigma) = 95.7 percent
5) Area between (u-3sigma) and (u +3sigma) = 99.7percent
6)

3rd Question

3H Question

$\mu = 200$

$\bar{x} = 207$

S.D of sample = 65

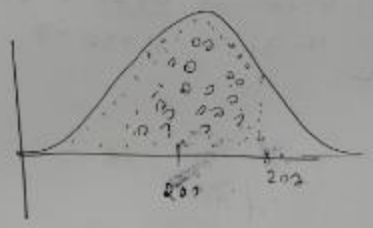
$n = 50$.

$H_0 = \quad \mu \leq 200$

$H_1 = \quad \mu > 200$

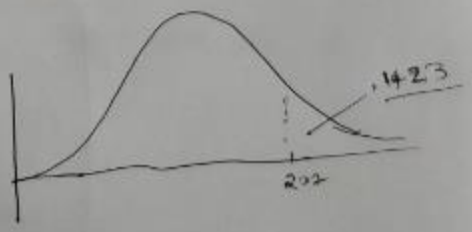
$$Z_{calc} = \frac{\bar{x} - \mu}{\sigma} = \frac{207 - 200}{6.5}$$

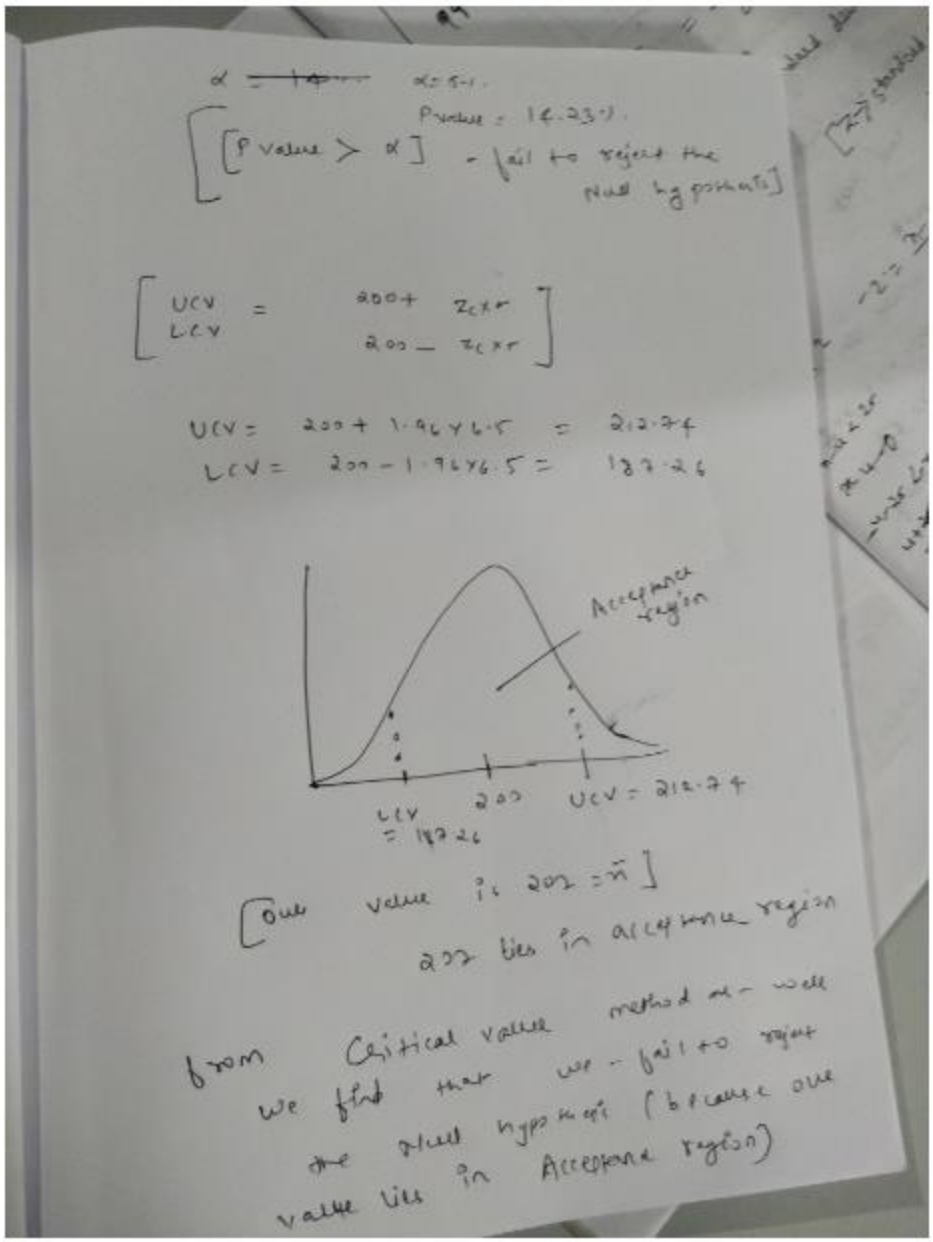
$$Z_{calc} = 7/6.5 = 1.0769$$



[area before 207
the cumulative pvalue
= .8577]

[1 − .8577 = .1423]





From both critical value method and P valuemethod we are getting the same answer (p value >alpha) so wefail to reject the Null hypothesis

Type 1 error -we reject the null hypothesis but actually it was true

Type 2 error -We incorrectly accept the null hypothesis but actually it was False

Alpha – probability of type 1 error

Beta – probability of Type 2 error

Alpha is indirectly propotional to beta

If alpha increases beta decreases

As a statistician I don't want my type 1 error to be more (because I don't want to reject it when it was actually true)

So according to Question the (alpha and beta to same is very very very rare)

And if Beta is high that means alpha is low that means (you are accepting the null hypothesis incorrectly when it is False)

if we see our example

our null hypothesis is time of effect for a painkiller to do satisfactory job is 200 sec

alternate hypothesis is time of effect for a painkiller to do satisfactory job isnot 200 sec

now type 1 error would be - time of effect for a painkiller to do satisfactory job **is not 200** sec but actually it is

type 2 error would be = time of effect for a painkiller to do satisfactory job is 200 sec but actually itsnot

so in type 2 error weare incorrectly accepting thenull hypothesis but actually it isFalse

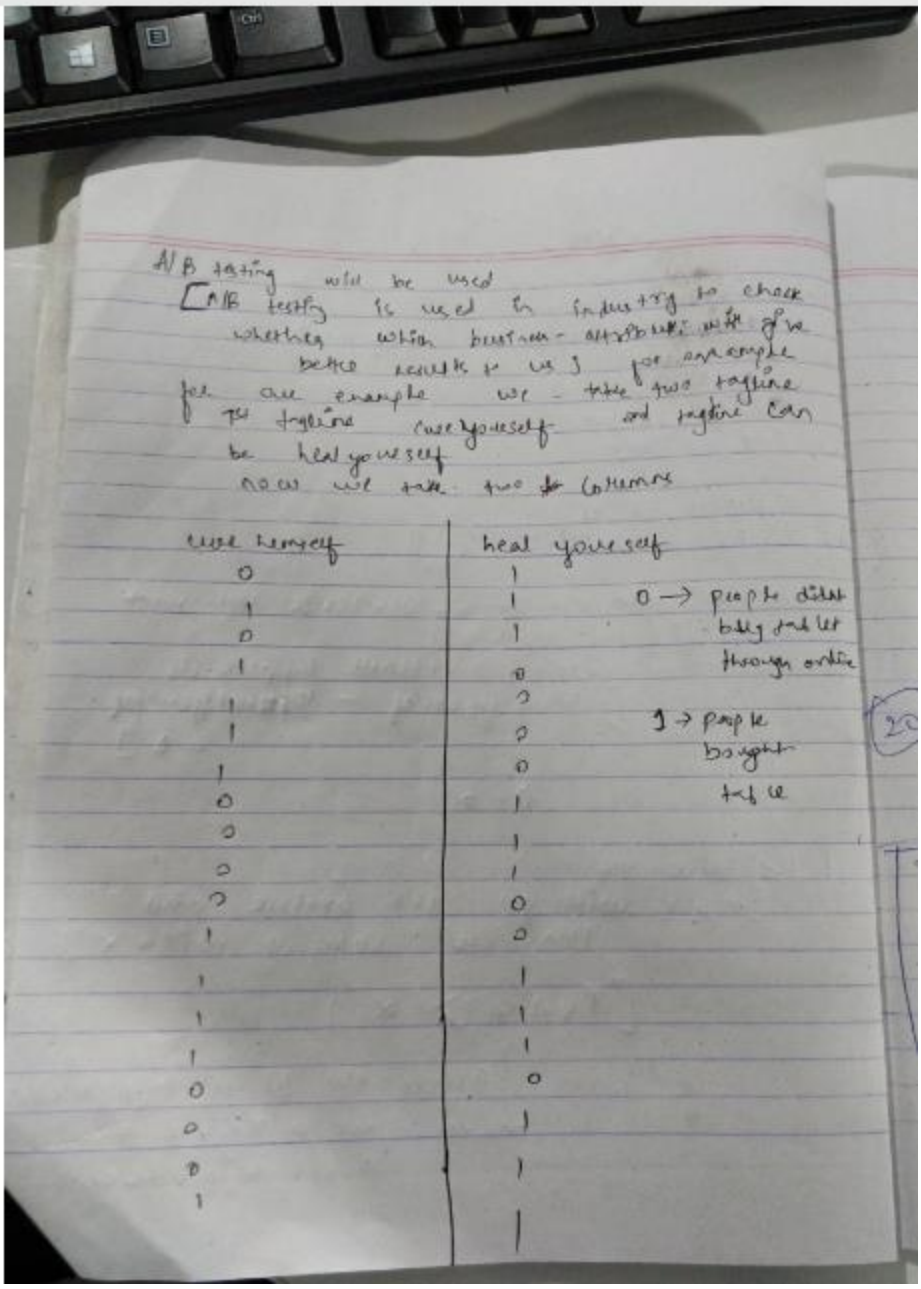
condition1-so if alpha is .05 (the probability of type 1 error to occur is very less)

condition2-if alpha and beta both occur to be .15 and .15 each there is equal probability oftype 1 error as well as type 2 error

so acc to our Question i would always recommend type 1 error to be less but if the Question demands that type 1 error and type 2 error should be same (probability should be same) then i ll go for decision 2

4th Question For A/B Testing

A/B testing is used in industry to check what business attributes will be beneficial .For our example we take two tagline 1 st Tagline --- Cure Yourself,2nd Tagline ---heal yourself we will create two columns with values as zero and 1 (We have taken a sample of 600)(assume it). These sample are taken from individuals who have clicked heal yourself link in webpage and bought the medicine and those who have clicked on cure himself and bought the medicine .We have taken zero and 1 zero for those who didn't purchase it and 1 for those who purchased it



Then we take null hypothesis as -------- ucureyourself >uhealyourself

So our alternate hypothesis would be ----------ucureyourself<uhealyourself

In order to check which tagline is best suited for our business we can use different tools .I know XLSAT so I am telling about XLSAT

We will go to Data Analysis and Then XLSTAT inside that we will select two propotion (because A/B is direct implementation of two population propotion Test) we can select frequency ,Sample size for 1 st column as well as for 2 nd column

We can set alternate hypothesis =ucure yourself – u healyourself <D where D =0 and when we will execute it we can get p value and according to that we can come to conclusion

If p value > alpha - Accept the null hypothesis – in statistics terms fail to reject the null hypothesis

Else reject the null hypothesis .According to this we can increase our business and we can come to know which tagline do we have to use best .