(Recap) MCT - (Mean/median/mode) (Variance) (Std-dev)

Avg = $\frac{a+b+c}{3}$ = $(\bar{x})$

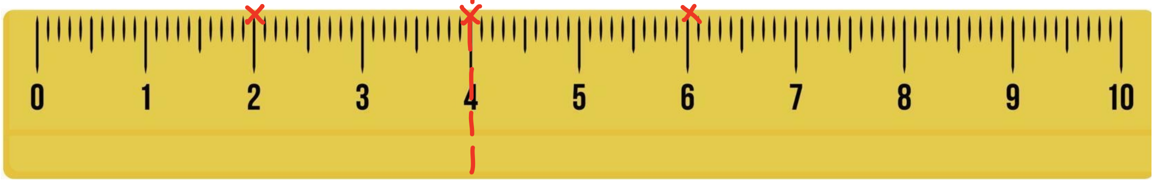
$(\bar{x}) = \frac{2+4+6}{3}$ (Mean)

Problem

(-2)

-di

2



S → Mean

(2-4)

(-2)

-4 ← 1 → 4 (2)

0 → 4

0 → 6 (2)

-6

0 → 8 (2)

-8

S/D

Spread

bp = v

Spread

$$\text{(Variance)} = \boxed{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

(Sample variance)

Spread

[2, 4, 8]

[2, 6, 19]

I love v 3000
8000
18,000
2 now

(00)

Quant

M

Vishnu

Why

but

Variance is in terms of distance squared. (Standard Deviation is a better measure to quantify the spread.)

CD

0 / Pen-d 6

4 - 2
4 :

4 — 2.2
4 — 2.2

4.4

Conn

Mc

$$\frac{\sum (x_i - \bar{x})^2}{n-1}$$

$$\sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$$

Spread

$a_1 = 10{,}000$

$a_2 = 100$

$\boxed{a_1 > a_2}$

$\sqrt{a_1} = 100$

$\sqrt{a_2} = 10$

$\boxed{a_1 > a_2}$

$\boxed{\text{Std} = \text{Spread}}$

St — Spread

Joy

PCA / SVD

V St } goal

Clear

V

St

2002

(Survey)

(Are you happy Campus!)

Pop

25,000+

Sample

500

600

Valli = 500

Urag = 650

Khan = 750

An = 800

No

200

50

692 — good

google

Power analysis

isnt it better to take maximum sample

1m+

90

10

T

S1

2000

85

15

C

T

Repre

C1

biased Sam

S2

55,000

50

50

C

T

1

good

Size | Sample

100%

2000

5000

7000

10000

Rep

1.4

google = Avg Indi = (5.9) = (5.5) = 1.4B = 4

R R => V V V V L S

(google)

1,00,000/- — 5000 — 87,000/-

Sam Cen

S C

Pop

Yes

(Pop) = VL | VS

Possible

1.4B

126 - Pop

Pop mean

pop std

pop mode

pop str

Pop Param

Sample $\bar{x}$

m

m

v

s

Sample Statistic

(Normal distribution)

(Village)

↓

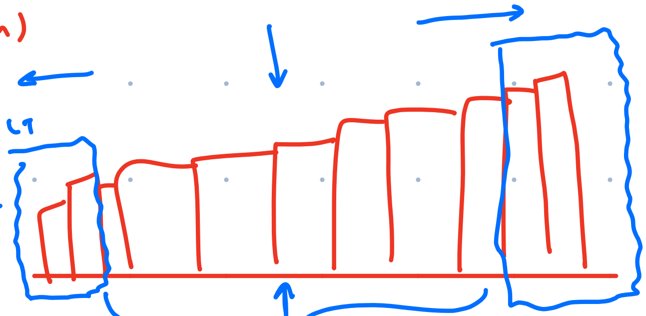
(100)

Recap

Stat

Pattern

100



most / Avg

H → O

Aditya

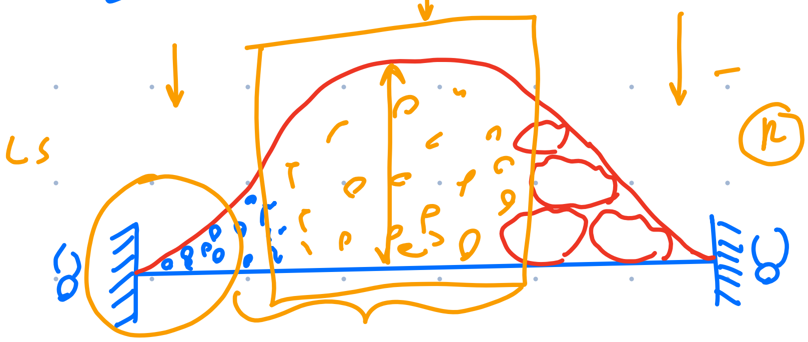
JOY

Rock

Stone

Pebble

Density Curve



Plan

Rule → DR

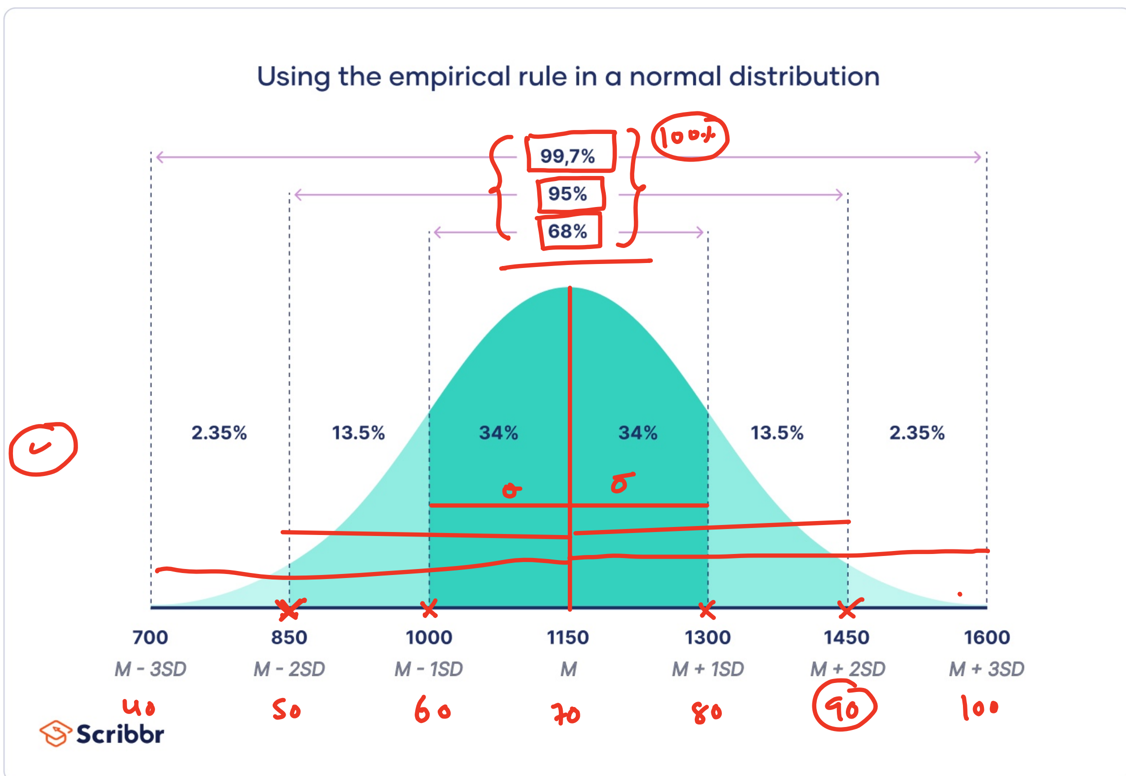
68/95/99.7 Empirical rule

100

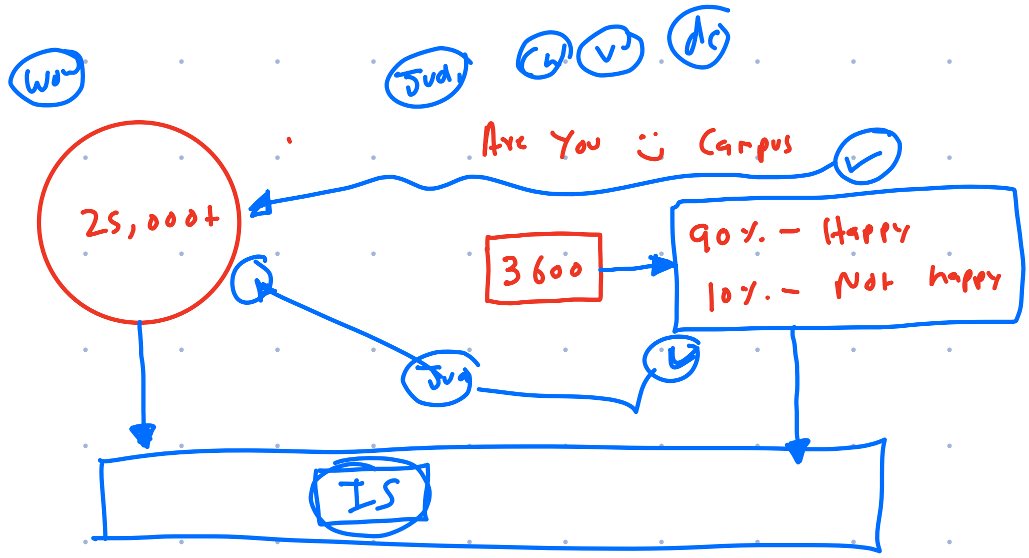
↓

70%

Std = 10



(60% − 80%) = 68



While descriptive statistics describes the data, inferential statistics is used to draw conclusions about the population based on statistical findings on sample analysis.

Judge

Who: pop

Sample

Is = 100%

No

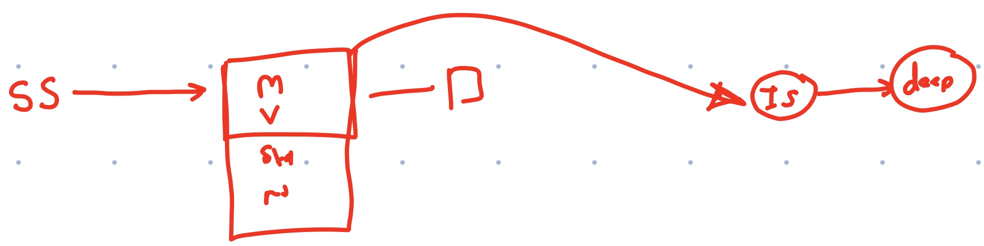
Calc A

V

Joy

Clah

whats the diff bitween in inferential and sample statistics

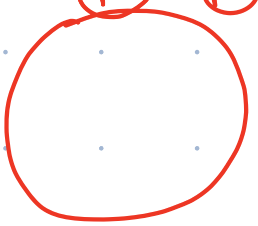


life

Covid = 19

Rel Pun

1



=>

α PS => PA ⇔ SA

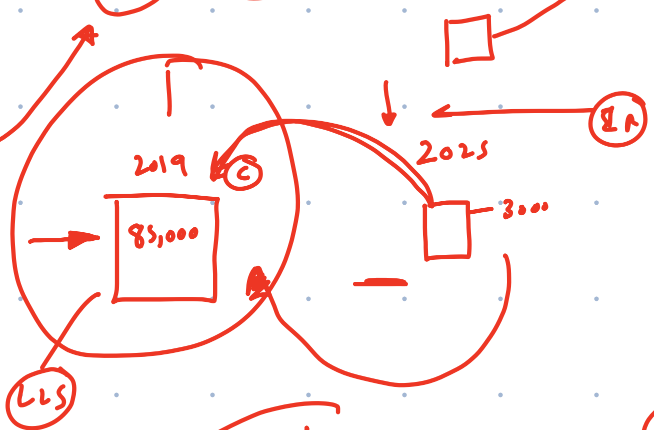
2 Avg problem = Vill 126 = 118.167

Caten

3 (1.4B) → ○ good

Is

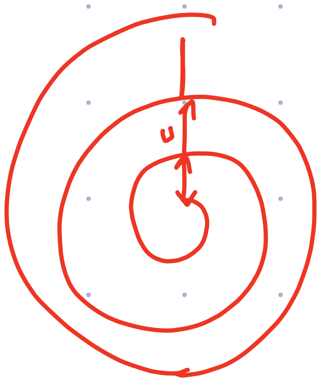
PW

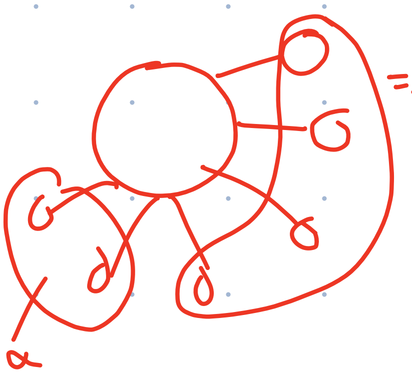


T b p p

gov
MR
5+

Fun





=> SS

DS = RS
PS
G.R

(Imp) = VVVVI

(learn to take a break)

1. Random
2. Purposive
3. Stratified

revise

DS ⟹ Check

read

here

Materials

(CI)

UB/LB

$$C.I = \bar{x} \pm Z \cdot \frac{s}{\sqrt{n}}$$

$\bar{x}$ = Sample mean

Z = Z Critical value

s = Std dev

n = Sample Size

1.4B → (Avg protein)

162.75

Pop mean (μ)

Judge

How

Problem

1. CI is never calculated you assume
   Ex: 95%, 99%, 65%, 99.25%.

(upper bound)

$$UB = \bar{x} + Z \cdot \frac{s}{\sqrt{n}}$$

$$LB = \bar{x} - Z \cdot \frac{s}{\sqrt{n}}$$

lower bound

122 + 14
122 − 14

Pop

PA

55 men) — on — 122 grm with std = 14 grm

Interval at 95% Confidence — 99

Change

Conf

Data: $\bar{x} = 122$ g
$\sigma = 14$ g

$n = 55$

$\boxed{Z = 1.96}$ — assume

$\boxed{Z\text{-test}}$

$$UB = \bar{x} + Z \cdot \frac{s}{\sqrt{n}} = 122 + 1.96\left(\frac{14}{\sqrt{55}}\right) = \boxed{125 \text{ grm}}$$

$$LB = \bar{x} - Z \cdot \frac{s}{\sqrt{n}} = 122 - 1.96\left(\frac{14}{\sqrt{55}}\right) = \boxed{118 \text{ grm}}$$

CI

(Range)

Could be

125

$\boxed{95\%}$

μ

118

Sample — Pop

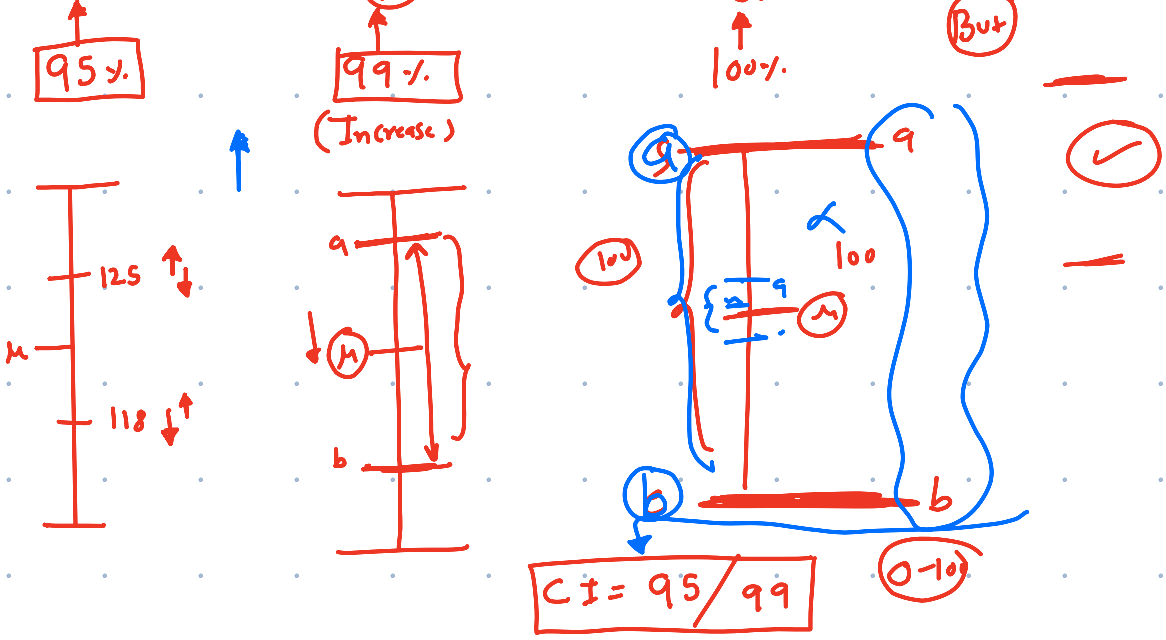
Clear

CI - range of val likely to contain pp

5%

1%

0%



(C I) = risk = Not

BFL

(Hyp Test)

Komal — berlin ↕ 10 → NY

Apoorva → NY

Komal → (Apoorva still same)

Komal → (Apoorva Not same)

(1)

No change (Same)

Eve Chy (Same)

Taken

Hyp

Status quo — (No change) Past P F

PS → Null Hyp (H_0)

PS → Alternate Hyp (H_1/H_a) → (EC)

(Ex)

(2020 → 85,000/-) — (Conducted) Pop — Salary

2025 → 70 → 97,000/-

$H_0 : (\mu) = 85,000/-$

$H_a : (\mu) \neq 85,000/-$

Ex (Choc) → (100 gram) Std

1,00,000/- — 100 → 99.8 gm

$H_0 : \mu = 100$

$H_a : \mu \neq 100$

(Remember)

p — Ho / Ha ⇒ t / z / f / χ^2 / A → Ho - true ; Ha - true

Ho - T	Ho - f
Ha - f	Ha - T

Prob — Ho / Ha

Stat — True / false

(Accepted / Rejected)

No — A t
— A f

Errors

(ground truth)

Komal

Kind
Soft

(A R)

Apoorva (P)

Not kind
Not soft

⇒ (error)

Nandina (P)

Kind
Soft

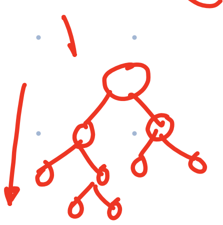
Type-I / α /

Pat: (+) Doc: (+) (True positive)	Pat: — Doc: + (False positive)
Pat: (+) Doc: (−) (False Negative)	Pat: — Doc: — (True Negative)

Type-II

Error

B — T1 / T2



1000

T - II

(legal) (NG) — T I

→ (G)

Problem

	R	A
	Ho – T	Ho – T
	Ha – T	Ha – T
	Ho – T	Ha – T — Type – I
	Ha – T	Ho – T — Type – II

ISL = SI

TI

TII

2021	→ 150
2025	→ 185

$H_0 : \mu = 150$ — P

R — $H_a : \mu \neq 150$

S <= 30

(T-test)

ND

T-test is a parametric test that compares the means of the two ~~samples~~ Sample Groups. Ideally, a sample for t-test should have less than 30 values. There are a few other assumptions that are taken before we can conduct a t-test.

Assumptions

1. The samples are independent
2. Homogeneity in sample variances
3. The Data is assumed to be normally distributed.

Slow

Re | MCT | P/S | $CI = \bar{x} \pm z \cdot \frac{s}{\sqrt{n}}$ | HT | E HT
S | | UB = | Ho — | TI = FPE
| | LB = | Ha | TII = FNE

{ = PP

(PhonePe)

Cup

Add

(UB – LB) 95%

$(CI - \bar{x} \pm z \cdot \frac{s}{\sqrt{n}})$ | HT Ho Ha | TI TII

T

25,000+ — Pop

S1 — 30 — 99.2% > S2 — 30 — 87.17%

$\bar{S}_1 > \bar{S}_2$

T = ST

1. Means (given)
2. Compare

- $a_1 > a_2$
- $a_2 > a_1$
- $a_1 \neq a_2$
- $a_1 \approx a_2$
- $a \geq a_2$
- $a_2 \geq 1$

Significance

D	ND
1g	log

0.01

SH

ND

Data = ST PS

PS

(RA) = Res

Phd = ✓

T-test

1. One Sample
2. Ind " T-test
3. Paired T-test

Goal

One-Sample-t-test

(Check fact) — Bar = 100g

1,00,000+ — 30

1,00,000 — 100g, 30 — 99.7

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$\bar{x}$ = Sample mean

μ = Pop mean

s = Sample std-dev

n = Sample size

Ind Sample T-test

P1 — S1, P2 — S2 — Ind

USA — 30 — 99.6

Bharat — 30 — 99.99%

S.E

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Paired T-test

P

diet pill

	Before	After	
P1	90	85	a
P2	100	80	b
P3	90	70	c
P4	65	55	d

Effic. ENO / E S

$$t = \frac{\bar{X}_d}{\frac{s}{\sqrt{n}}}$$

(T-test) => T-distribution

1 z-test (dof)

H E

Covid-19 = R/S/1

pop

Avp

α

Do You know pop std-dev

Yes

NO

Use T-test

NO 100

Sample size >30

Yes

NO

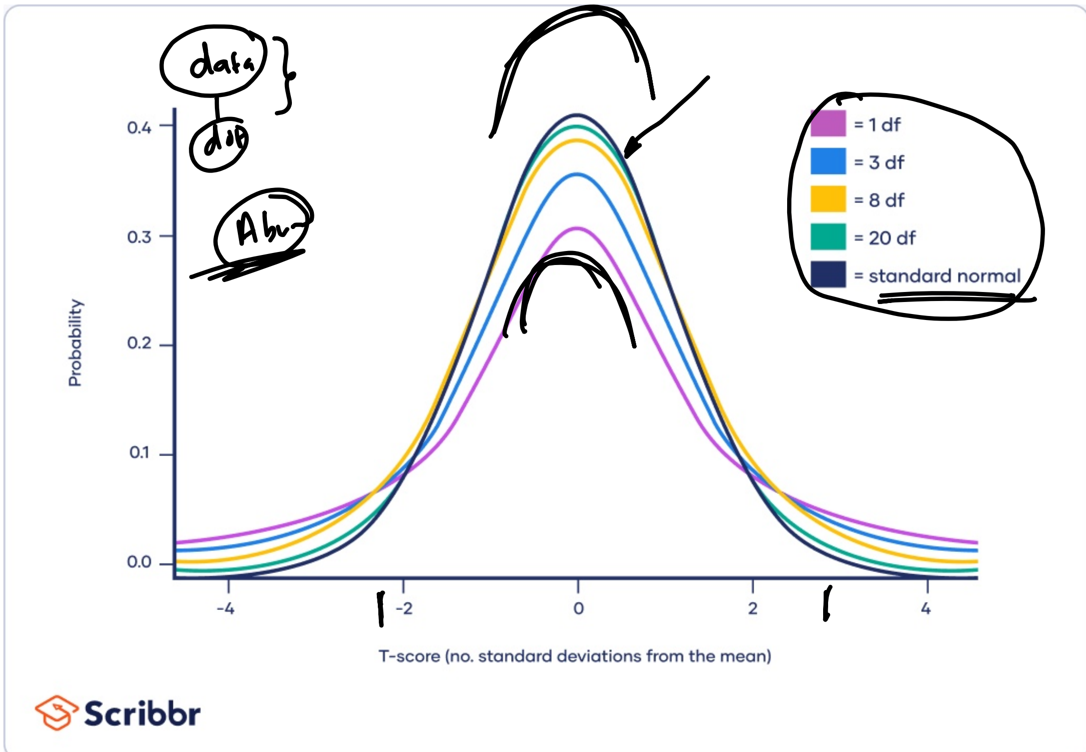
≤30

Z-test

T-test

Ex

(n-1) = df



Error

gain

100%

Yepo rak

1

Don

rep

RBI

(Independ) : 30

1

30

< Ghana

lap pu Burkh

H0 => □

Bree

α

> 1 <

(done) T (13 pg) One-Sample-T

$\boxed{Pop(n) = 100}$

The average salary of a person is hundred dollars back when the survey was conducted in 2020 in fresh survey conducted in 2025 with 30 participants, it was found out that the average salary of a person is one $40 with a standard deviation of $20 can you calculate whether this is a significant difference in salary or not at a confidence interval of 95%?

Data: Pop-mean(μ) = 100 | $n = 30$ | CI = 95%

Sample mean($\bar{x}$) = 140 | $S = 20$

① (Hyp)

$H_0 : \mu = 100$ (No Significant Change in Salary)

$H_a : \mu \neq 100$ (Sig Changes in Salaries)

(>, <) Two-tailed - t-test ②

CI = 95 / α = 5%

Same | CSt | T | S/C | (A) | (w) | Src | PL

② Significance level (α)

$\alpha = 100\% - CI\%$

$= 100 - 95$

$\boxed{\alpha = 5\%}$ or $\boxed{\alpha = 0.05}$

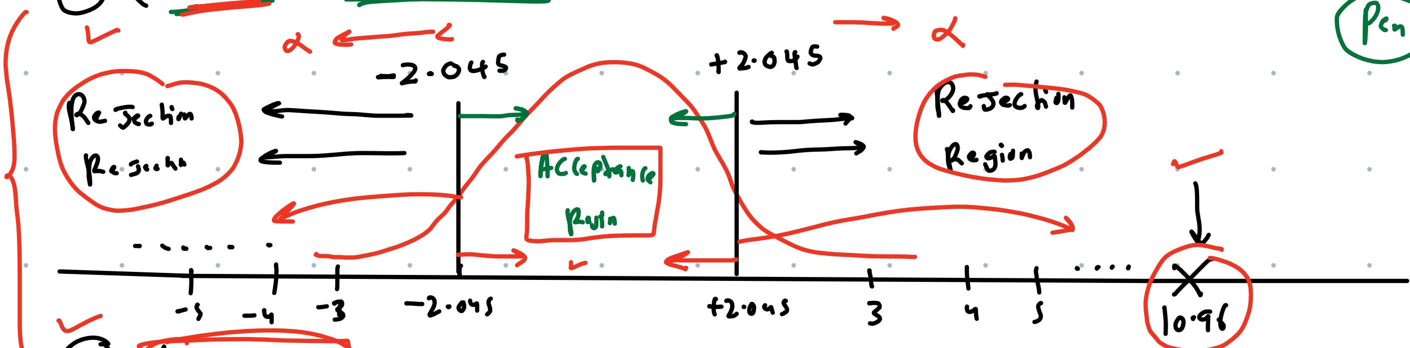
③ degrees of freedom $\boxed{df = n-1}$

$\boxed{df = 30 - 1 = 29}$

④ (Boundation) (T-Critical_value) = 2.045

{(t_s > t_c) - R, (t_s < t_c) - R}

α | Pcn



⑤ t-statistic

$$\boxed{t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}} = \frac{140 - 100}{\frac{20}{\sqrt{30}}} = \boxed{10.95}$$

$\boxed{\text{Rej } H_0}$

NO α CI t

T ③ ④ cdf α ✓ ✓ α

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390

✓

Pdf
cdf
ppf

C → ppf → P P F = Avc

One tail

from Bibhu Mohanty to Rudra (privately): 11:41 AM
Sir, how do we decide this is two tailed? what does that mean and is it coming from the assuption we took(>,<) than sample mean?

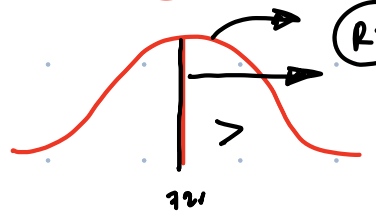
from kavita sharma to Rudra (privately): 11:41 AM
after 30 no. gap is 10 in table why?

from Kaushal to Everyone: 11:41 AM
What is source of T - Table? I there any formula to calculate?

Kaushal = 72%

Svv = > = Better

② ⓪



O/T

P

eas

eq
ed } σ

B'llone ⇒ 350 kg

(Puspa) = 150

LT

Ⓐ

Pen/Pep

Note: t_c / t_s

α α α

Code

p_value < alpha

✓

data

t-stat

$\boxed{CI = 95\%}$

$\alpha = 5\%$

$\boxed{t\text{-critical value} = 2.045}$

w

elle

$\boxed{P\_value =}$

(P_value) = (Probabil valu)

Extreme

Pop

T

S

170

166

168

10 = 2

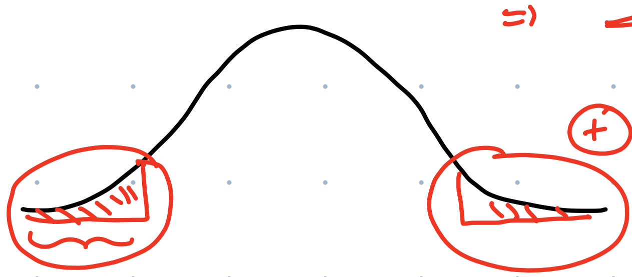
8

2

P_value = 20.. ⇒ ✓

Avc

⇒ + = $\boxed{P\_value}$



+ ⇒

100 − 60 =

Claim

HD — 30 min

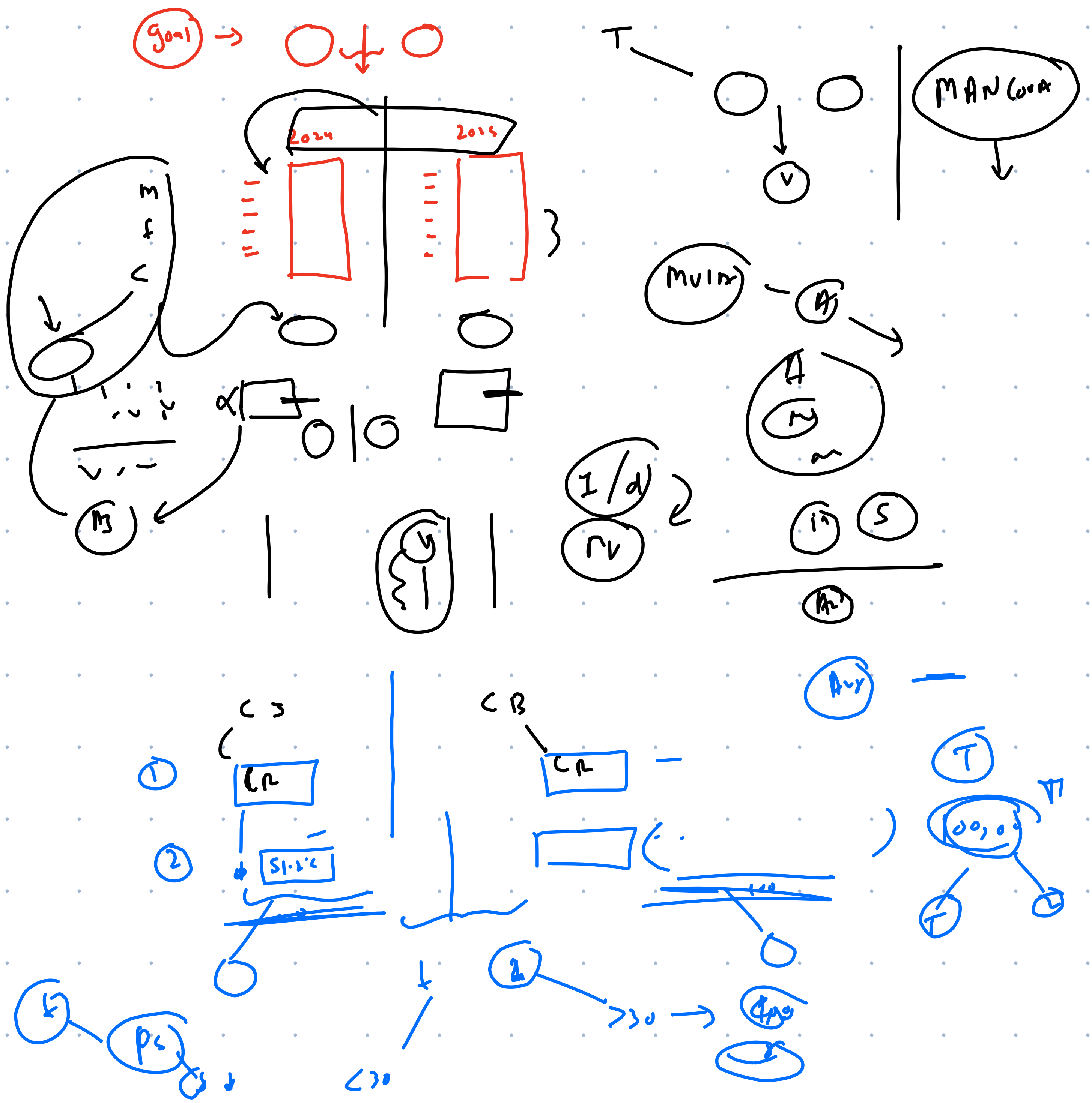
Older = 60%

Cal P ⇒ $\boxed{\text{Fischer Exact Test}}$

PPE ∝ α

$$p = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{a!b!c!d!n!}$$

a
b
c
d
n
= CT



T-test ✓	Z test ✓
Parametric	Parametric
○ ○ (2)	○ ○ 2 ✓
Means	Means ✓
$t < 30$	$Z > 30$
$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$ ✓	$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$ pop std dev

s / σ

s pop

(Z-test) −(no-dof) (logic) Same)

Ex

pop 78 ML

A factory has a machine that dispenses $\boxed{80\ \text{ML}}$ of a shampoo in a bottle and an employee believes that the average amount of shampoo is not AIM but 78 ML using the sample size of 40 samples and a standard deviation of 2.5 ML. can you state the null and alternate hypothesis at 95% confidence interval and provide enough evidence to support the idea that the machine is working properly or is not working properly

±2.5mL

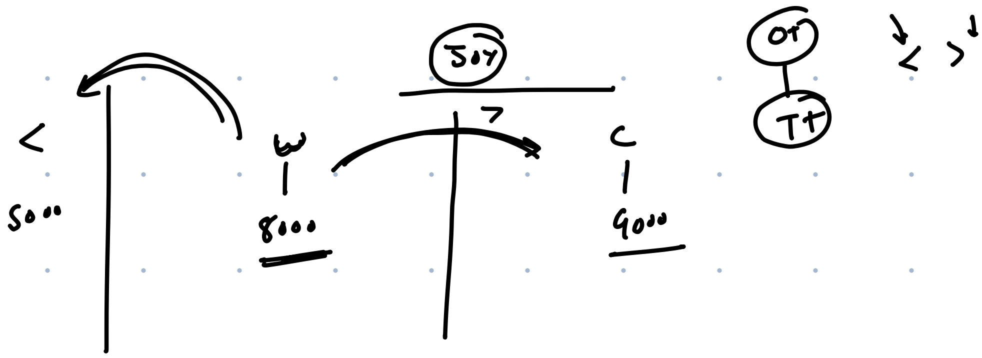
Sample_mean = 78

Pop_mean = 80

Std_dev = 2.5

$\boxed{n = 40}$ ✓ >30 → Z test

CI = 95%



(Z test for prop)

(Ratio) (Z prop)

(Cup tea) $\frac{2w}{1m}$ 2:1

$a:b :: c:d$

$\boxed{a:b :: c:d}$

(for C1)

1999

A	60
B	20
C	20

2025

$\boxed{A}$ = 40

$\boxed{B}$ = 10

$\boxed{C}$ = 50

60:20:20

3:1:1

4:1:5

T-test ✓	Z test ✓	F-test
Parametric	Parametric	Parametric
○ - ○ 2	○ - ○ 2 ✓	○ ○
Means	Means ✓	Variance
$t < 30$	$Z > 30$	No test
$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$ ✓	$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$ pop std dev	$F = \frac{var1}{var2}$ [var1 > var2]

In a sample survey conducted in Bangalore, it was found that 960 people out of 1860 were vegetarian and rest were non-vegetarian. Can you find out whether both vegetarian and non-vegetarian are equally popular in Bangalore at 1% level of significance

$$Z = \frac{\hat{p} - P}{\sqrt{\frac{P \cdot Q}{n}}}$$

$\hat{p}$ = Sample prop $= (960/1860)$

P = Prop of Success =

Q = " " Failure =

$\boxed{P + Q = 100\%}$ or $\boxed{P + Q = 1}$

So

SD

2 SciPy - old - Classical

Stats model - New = Con Str cal

$\frac{960}{1860} = 51$ - V

49 - NV

$\frac{460}{1860} = 24\%$

Forecast

CI = 99

$\alpha = 1\%$

CI = 95

$\alpha = 5\%$

Goal

(FMCG)

9	Size	Sample mean	SSD : (Sum of Squared deviation)
Oreo	10	15 grm	90
Parle	13	14 grm	108

$\underbrace{95\% \text{ CI}}$ → Var o - Var p

df n-1 =

1 Hyp

$H_0 : \sigma_o^2 = \sigma_p^2$ (var are Same)

$H_a : \sigma_o^2 \neq \sigma_p^2$ (Var are Sig diff)

(<, >) (two-tailed t-test)

② $Var\_oreo = \frac{SSD}{n-1} = \frac{90}{10-1} = \frac{90}{9} = 10$

$Var\_parle = \frac{SSD}{n-1} = \frac{108}{13-1} = \frac{108}{12} = 9$

$\boxed{Var\_oreo > Var\_parle}$

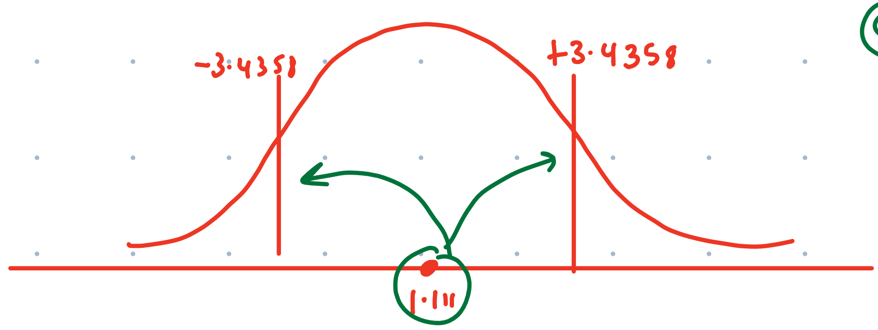
③ $F\_stat = \frac{Var\_oreo \;(9)}{Var\_parle \;(12)} = \frac{10}{9} = \boxed{1.\overline{11}}$

$\left(F\_stat_{\underbrace{0.05}_{\alpha}} \underbrace{(9, 12)}_{df} = \underbrace{1.\overline{11}}_{ans} \right)$

④ Boundation : $\boxed{F\_critical\_value = 3.4358}$

Accept H_0

Clear



Numerator Degrees of Freedom

C

Denominator Degrees of Freedom

R

	1	2	3	4	5	6	7	8	9
1	647.7890	799.5000	864.1630	899.5833	921.8479	937.1111	948.2169	956.6562	963.2846
2	38.5063	39.0000	39.1655	39.2484	39.2982	39.3315	39.3552	39.3730	39.3869
3	17.4434	16.0441	15.4392	15.1010	14.8848	14.7347	14.6244	14.5399	14.4731
4	12.2179	10.6491	9.9792	9.6045	9.3645	9.1973	9.0741	8.9796	8.9047
5	10.0070	8.4336	7.7636	7.3879	7.1464	6.9777	6.8531	6.7572	6.6811
6	8.8131	7.2599	6.5988	6.2272	5.9876	5.8198	5.6955	5.5996	5.5234
7	8.0727	6.5415	5.8898	5.5226	5.2852	5.1186	4.9949	4.8993	4.8232
8	7.5709	6.0595	5.4160	5.0526	4.8173	4.6517	4.5286	4.4333	4.3572
9	7.2093	5.7147	5.0781	4.7181	4.4844	4.3197	4.1970	4.1020	4.0260
10	6.9367	5.4564	4.8256	4.4683	4.2361	4.0721	3.9498	3.8549	3.7790
11	6.7241	5.2559	4.6300	4.2751	4.0440	3.8807	3.7586	3.6638	3.5879
12	6.5538	5.0959	4.4742	4.1212	3.8911	3.7283	3.6065	3.5118	$\boxed{3.4358}$
13	6.4143	4.9653	4.3472	3.9959	3.7667	3.6043	3.4827	3.3880	3.3120
14	6.2979	4.8567	4.2417	3.8919	3.6634	3.5014	3.3799	3.2853	3.2093
15	6.1995	4.7650	4.1528	3.8043	3.5764	3.4147	3.2934	3.1987	3.1227
16	6.1151	4.6867	4.0768	3.7294	3.5021	3.3406	3.2194	3.1248	3.0488
17	6.0420	4.6189	4.0112	3.6648	3.4379	3.2767	3.1556	3.0610	2.9849
18	5.9781	4.5597	3.9539	3.6083	3.3820	3.2209	3.0999	3.0053	2.9291
19	5.9216	4.5075	3.9034	3.5587	3.3327	3.1718	3.0509	2.9563	2.8801
20	5.8715	4.4613	3.8587	3.5147	3.2891	3.1283	3.0074	2.9128	2.8365
21	5.8266	4.4199	3.8188	3.4754	3.2501	3.0895	2.9686	2.8740	2.7977
22	5.7863	4.3828	3.7829	3.4401	3.2151	3.0546	2.9338	2.8392	2.7628
23	5.7498	4.3492	3.7505	3.4083	3.1835	3.0232	2.9023	2.8077	2.7313
24	5.7166	4.3187	3.7211	3.3794	3.1548	2.9946	2.8738	2.7791	2.7027
25	5.6864	4.2909	3.6943	3.3530	3.1287	2.9685	2.8478	2.7531	2.6766
26	5.6586	4.2655	3.6697	3.3289	3.1048	2.9447	2.8240	2.7293	2.6528
27	5.6331	4.2421	3.6472	3.3067	3.0828	2.9228	2.8021	2.7074	2.6309
28	5.6096	4.2205	3.6264	3.2863	3.0626	2.9027	2.7820	2.6872	2.6106
29	5.5878	4.2006	3.6072	3.2674	3.0438	2.8840	2.7633	2.6686	2.5919
30	5.5675	4.1821	3.5894	3.2499	3.0265	2.8667	2.7460	2.6513	2.5746
40	5.4239	4.0510	3.4633	3.1261	2.9037	2.7444	2.6238	2.5289	2.4519
60	5.2856	3.9253	3.3425	3.0077	2.7863	2.6274	2.5068	2.4117	2.3344

2-groups NO

T-test ✓	Z test ✓	F-test
Parametric ✓	Parametric ✓	Parametric ✓
○ ○ 2 ✓	○ - ○ ✓ 2 ✓	○ ○ ✓
Means	Means ✓	Variance
$t < 30$	$z > 30$	No var
$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$ ✓	$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$ pop std dev	$F = \frac{Var1}{Var2}$ [Var1 > Var2]

T/z/f

(drink) → Tea | Coffee | red-bull | Ucalio

4 = at once

T / z / f

W / B

A

(F-test) → ANOVA (Ana of Var)

1. >2 groups
2. Var/ mean

ANOVA ∝

(ANOVA) ↑

- ANCOVA
- MANOVA
- MANCOVA

ANOVA
- → One_way — ML
- → Two-way → Two — 100% — ML

dep

Sales

Area | locality | no-mac-donalds | Price

Two = Σ

I d

	gender	education_level	income
0	m	hs	30000
1	f	bs	50000
2	m	bs	45000
3	f	ms	60000
4	m	hs	32000
5	f	bs	55000
6	m	ms	48000
7	f	hs	33000
8	m	bs	52000
9	f	ms	47000

alpha = 0.05

3

dep

1 income ~ gender α

2 income ~ educ_level α

3 income ~ gender : edu_lev ✓

Interac eff

	df	sum_sq	mean_sq	F	PR(>F)
gender	1.0	1.444000e+08	1.444000e+08	4.676923	0.096605
education_level	2.0	6.775810e+08	3.387905e+08	10.972871	0.023767
gender:education_level	2.0	4.119048e+06	2.059524e+06	0.066705	0.936490
Residual	4.0	1.235000e+08	3.087500e+07	NaN	NaN

α NS

gender = p_value = $\boxed{0.0966 > 0.05}$ (Accept Ho) = g - I α No

Noo Sig

EL p_value = 0.023 < 0.05

(Reject) = S =

(T / z / f / 2p / AN / ° / +)

(Parametric)

(χ^2_c) - (Chi-square)

1. $\boxed{\text{goodness of fit}}$
2. Test of independance

100's 1000's

(No - it is non-parametric)

Temp — 25, 24.3, 32, 83.45, ... (-273.15 — 0)

(Result) → Pos, Neg, N — Cat se

(Claim) — (Ex)

Chec ✓

CI = 95% α = 5%

Riya → Riya's paradise

Kavita

	M	T	W	Th	F
Ob	23	16	14	19	28
Ex	20	20	20	20	20

1. $\boxed{H_0 : Ob = Ex \quad (\text{purchase})}$

   $H_a : Ob \neq Ex$ (Do not purchase)

2. $df = 5 - 1$
   $= 4$

   $\boxed{\chi^2_c\text{-critical} = 9.488}$

3. $$\chi^2\text{-stat} = \frac{\sum (Ob - Ex)^2}{Ex} = \frac{(23-20)^2}{20} + \frac{(16-20)^2}{20} + \frac{(14-20)^2}{20} + \frac{(19-20)^2}{20} + \frac{(28-20)^2}{20}$$

   $= 6.3$

Acc

Degrees of freedom (*df*)	Significance level (α) .99	.975	.95	.9	.1	.05	.025	.01
1	-------	0.001	0.004	0.016	2.706	3.841	5.024	6.635
2	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210
3	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345
4	~~0.297~~	~~0.484~~	~~0.711~~	~~1.064~~	~~7.779~~	9.488	11.143	13.277
5	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086
6	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812
7	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475
8	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090
9	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666
10	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209
11	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725
12	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217
13	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688
14	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141
15	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578
16	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000
17	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409
18	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805
19	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191
20	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566
21	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932
22	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289
23	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638
24	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980
25	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314
26	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642
27	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963
28	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278
29	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588
30	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892
40	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691
50	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154
60	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379

B Top = 72

Gap

Surv

DS

IS / rd / ns / pc

Prachi

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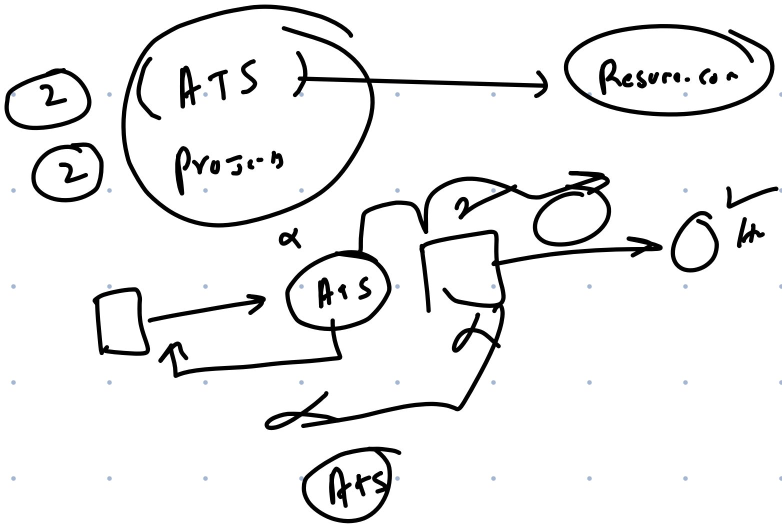
beard and h

AI

CP = Gsuc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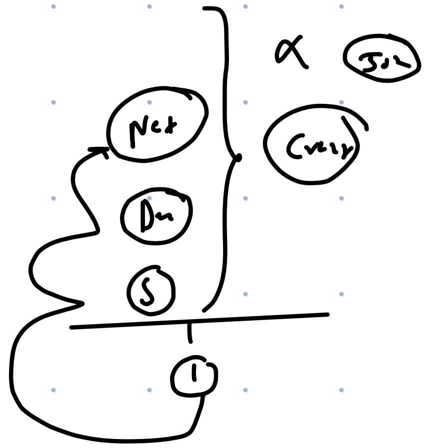
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Crazy