Correlation Coefficient

Scatter

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}}$$

Where, n is the no of Data pair.

$\boxed{y = mx + b}$

Linear Regression

$$\hat{y} = a + bx$$

Where,

$$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$$

$$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}$$

Q.1

x	y
1	8.1
1.1	7.8
1.2	8.5
1.3	9.8
1.4	9.5

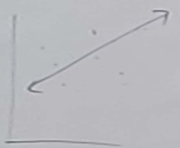
x	y
1.5	8.9
1.6	8.6
1.7	10.2
1.8	9.3
1.9	9.2
2.0	10.5

Q.2

y	x	x^2	xy	y^2
76	123			
62	55			
66	100			
58	75			
88	159			
70	109			
37	48			
82	138			
88	164			
43	28			
$\Sigma y =$	$\Sigma x = 899$	$\Sigma x^2 =$	$\Sigma xy =$	Σy^2

Correlation Coefficient

Scatter



$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}}$$

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$$\boxed{y = mx + b}$$

Linear Regression

$$\hat{y} = a + bx$$

where,

$$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$$

$$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}$$

Q.1

x	y
1	8.1
1.1	7.8
1.2	8.5
1.3	9.8
1.4	9.5

x	y
1.5	8.9
1.6	8.6
1.7	10.2
1.8	9.3
1.9	9.2
2.0	10.5

Q.2

y	x	x^2	xy
76	123		
62	55		
66	100		
58	75		
88	159		
70	109		
37	48		
82	138		
88	164		
43	28		
$\Sigma y =$	$\Sigma x = 899$	$\Sigma x^2 =$	$\Sigma xy =$

Hypothesis Testing

test

$\boxed{n \geq 30}$

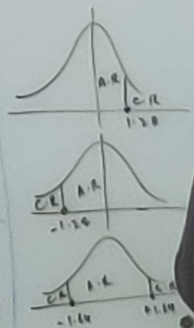
$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$$

$$z = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$

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

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$ $\boxed{n < 30}$

	0.1	0.05	0.01
$H_1: \mu > \mu_0$	$z > 1.28$	$z > 1.64$	$z > 2.33$
$H_1: \mu < \mu_0$	$z < -1.28$	$z < -1.64$	$z < -2.33$
$H_1: \mu > \mu_0$	$z > 1.64$ and $z < -1.64$	$z > 1.96$ and $z < -196$	$z > 2.58$ and $z < -2.58$



Q. A Random Sample of 100 Recorded deaths in US the past Year Showed An Average li

Q. A Random Sample of 100 Recorded deaths in US the past Year showed An Average life span of 71.8 Years. Assuming a population Standard deviation of 8.9 Years does this Seem to indicate that the life span today is greater than 70 Years? Use a 0.05 level of significance.

① $H_0: \mu_0 = 70$ Years

② $H_1: \mu_0 > 70$ Years

③ $\alpha = 0.05$

④ Critical Region $Z > 1.645$

⑤ $Z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \_\_\_$

$\bar{x} = 71.8$

$\mu_0 = 70$

$n = 100$

$\sigma = 8.9$

⑥ Decision Reject H_0

Q. A manufacturer of Sports equipment has developed a new Synthetic fishing line that Company Claims a mean breaking strength of 8 kilogram with Standard ... $\sigma = 0.5$ kilogra... test hypoth... against Alte...

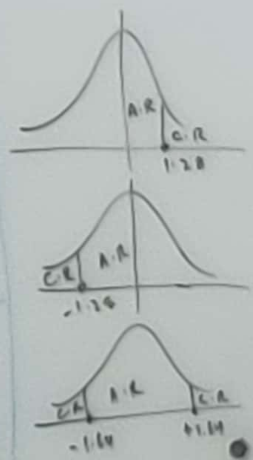
one tail

0.01

$Z > 2.33$

$Z < -2.33$

$Z > 2.58$ and $Z < -2.58$



Q. A Random Sample of 100 Recorded deaths in US the past Year Showed An Average life span of $\bar{x}$ 71.8 Years. Assuming a population Standard deviation of 8.9 Years does this Seem to indicate that the life span today is greater than 70 Years (μ)? Use a 0.05 level of Significance.

① $H_0: \mu_0 = 70$ Years

② $H_1: \boxed{\mu_0 > 70 \text{ Years}}$

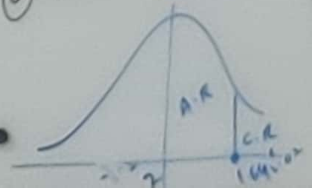
③ $\alpha = 0.05$

④ Critical Region $Z > 1.645$

⑤ $Z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = 2.02$

$\bar{x} = 71.8$
$\mu_0 = 70$
$n = 100$
$\sigma = 8.9$

⑥ Decision Reject H_0



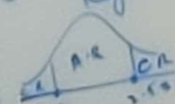
Q. A Manufacturer of Sports equipment has developed a new Synthetic fishing line that Company Claims a Mean breaking Strength of 8 Kilogram with Standard deviation $\sigma = 0.5$ Kilogram test hypothesis $\mu = 8$ against Alternate hypothesis if the Random Sample 50 = n lines is tested and found to have a Mean breaking Strength of 7.8 ($\bar{x}$). Use level of Significance 0.01

① $H_0: \mu = 8$

② $H_1: \mu \neq 8$

③ $\alpha = 0.01$

④ Critical Region



⑤ $Z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

$\bar{x} = 7.8$ $n = 50$

Q. A Random Sample of 100 Recorded deaths in US the past Year showed An Average life span of 71.8 ($\bar{x}$) Years. Assuming a population standard deviation of 8.9 Years does this seem to indicate that the life span today is greater than 70 (μ) Years? Use a 0.05 level of significance.

1. $H_0 : \mu_0 = 70$ Years
2. $H_1 : \boxed{\mu_0 > 70 \text{ Years}}$
3. $\alpha = 0.05$
4. Critical Region $Z > 1.645$
5. $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = 2.02$

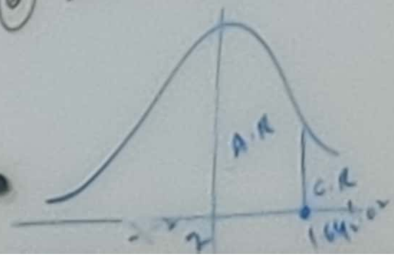
$\bar{x} = 71.8$

$\mu_0 = 70$

$n = 100$

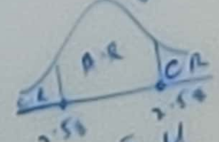
$\sigma = 8.9$

6. Decision Reject H_0



Q. A Manufacturer of Sports equipment has developed a new synthetic fishing line that Company Claims a mean breaking strength of 8 Kilogram with standard deviation $\sigma = 0.5$ Kilogram. Test hypothesis $\mu = 8$ against Alternative hypothesis if the Random sample $50 = n$ lines is tested and found to have a mean breaking strength of 7.8 ($\bar{x}$). Use level of significance 0.01

1. $H_0 : \mu = 8$ ✓
2. $H_1 : \mu \neq 8$
3. $\alpha = 0.01$
4. Critical Region



5. $z = \dfrac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

$\bar{x} = 7.8$ $n = 50$

10.19

1) $H_0 : \mu = 40$

2) $H_1 : \mu < 40$ → one tail

$\bar{x} = 38$

$\sigma = 5.8$

$\alpha = 0.05$

$n = 64$

3) $\alpha = 0.05$

4) $Z_{critical}$

5) $Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

Z_{calc}

6)

10.20

$H_0 : \mu = 5.5$

$H_1 : \mu < 5.5$ one tail

$\bar{x} = 5.23$

$\sigma = 0.24$

$\alpha = 0.05$

$n = 64$

10.21

$H_0 : \mu = 800$

$H_1 : \mu \neq 800$ two tail

$\bar{x} = 788$

$\sigma = 40$

$\alpha = 0.05$

$n = 30$

10.23

$H_0 : \mu = 10$

$H_1 : \mu \neq 10$

$n = 10$

$\alpha = 0.01$

10.2, 9.7, 10.1, 10.3, 10.1
9.8, 9.9, 10.4, 10.3, 9.8

$\bar{x} =$ ______

$s =$ ______

10.19

① H_0 $\mu = 40$

② H_1 : $\mu < 40$ → one tail

$\bar{x} = 38$

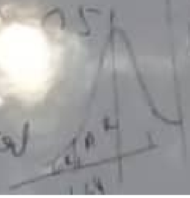
$\sigma = 5.8$

$\alpha = 0.05$

$n = 64$

③ $\alpha = 0.05$

④ $Z_{critical}$



⑤ $Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

Z_{calc}

⑥

10.20

H_0 : $\mu = 55$

H_1 $\mu < 55$ one tail

$\bar{x} = 52.3$

$\sigma = 0.24$

$\alpha = 0.05$

$n = 64$

10.21

H_0 : $\mu = 800$

H_1 : $\mu \neq 800$ two tail

$\bar{x} = 788$

$\sigma = 40$

$\alpha = 0.05$

$n = 30$

10.23

H_0 $\mu = 10$

H_1 $\mu \neq 10$

$n = 10$

$\alpha = 0.01$

10.2, 9.7, 10.1, 10.3, 10.1

9.8, 9.9, 10.4, 10.3, 9.8

$\bar{x} =$ ______

$s =$ ______

Q $H_0 : \mu = 46$

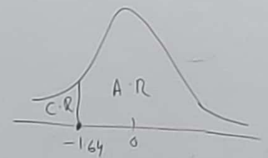
$H_1 : \mu < 46 \rightarrow$ one tail

$\alpha = \underline{0.05} = 5\%$

$\beta = 95\%$

Z

Probability



lessthan

$< \longrightarrow \alpha \longrightarrow -Z$ — $Z_{critical}$ $-Ve$

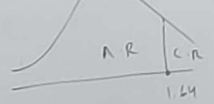
Q

$H_0 : \mu = 46$

$H_1 : \mu > 46 \rightarrow$ one tail

$\alpha = 0.05 = 5\%$

$\beta = 0.95 = 95\%$



greaterthan

$> \longrightarrow \beta \longrightarrow +Z$

$\downarrow$

$Z_{critical}$

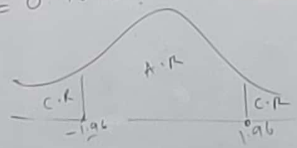
Q

$H_0 : \mu = 46$

$H_1 : \mu \neq 46 \rightarrow$ two tail

$\alpha = 0.05$

$\beta = 0.95 = 95\%$



$\neq \longrightarrow \alpha/2 \longrightarrow -Z$

noteq

$\downarrow$

$-Z$

$+Z$

level of significance $= \alpha$

Confidence interval $= \beta = 1 - \alpha$

degree of freedom

$= \nu = n - 1$

$\downarrow$

no of data

$\nu = n_1 + n_2 - 2$

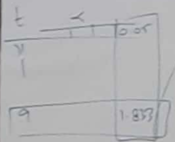
1. H_0
2. H_1
3. α & β
4. $Z_{critical}$ or $t_{critical}$
5. Test $\longrightarrow$ Z test $\rightarrow n > 30$; t test $\rightarrow n \leq 30$

pdf $\rightarrow$ 935 $\rightarrow$ (5)

6. Reject or Fail to Reject

Q $H_0 : \mu = 46$

$H_1 : \mu < 46 \rightarrow$ one tail

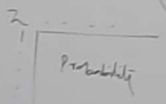


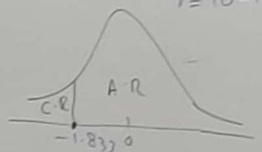
$\alpha = \underline{0.05} = 5\%$

$\beta = 95\%$

$n = 10$

$\nu = 10 - 1 = 9$





less than

$< \longrightarrow \alpha \longrightarrow t \longrightarrow t = -ve$

k

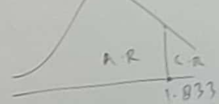
ν

Q $H_0 : \mu = 46$

$H_1 : \mu > 46 \rightarrow$ one tail

$\alpha = 0.05 = 5\%$

$\beta = 0.95 = 95\%$



greater than

$> \longrightarrow \alpha^{8\nu} \longrightarrow t$

$\downarrow$

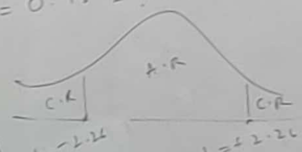
$t = +ve$

Q $H_0 : \mu = 46$

$H_1 : \mu \neq 46 \longrightarrow$ two tail

$\alpha = 0.05$

$\beta = 0.95 = 95\%$



$\neq \longrightarrow \alpha/2 \longrightarrow t$

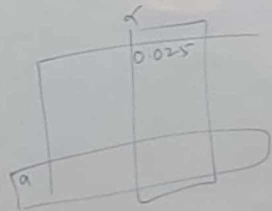
not eq and ν

$t = +ve$

$t = -ve$

$\alpha/2 = 0.025$

$\alpha' = 0.025$



Z

$\alpha = 1\%$

$\downarrow$

$-2.33 \rightarrow <$

$2.33 \rightarrow >$

$-2.58 \rightarrow \neq$

$+2.58$

level of significance $= \alpha$

Confidence Interval $= \beta = 1 - \alpha$

degree of freedom

$= \nu = n - 1$

no of data

$\nu = n_1 + n_2 - 2$

1. H_0
2. H_1
3. α & β
4. Z critical or t critical
5. Test $\longrightarrow$ Z test $\rightarrow n > 30$

   t test $\rightarrow n \leq 30$
6. Reject or Fail to Reject

pdf $\rightarrow$ 7.35

Z → $\alpha = 1\%$

↓

$-2.33 \rightarrow <$

$2.33 \rightarrow >$

-2.58

$+2.58 \rightarrow \neq$

α

0.025

Level of significance $= \alpha$

Confidence Interval $= \beta = 1 - \alpha$

degree of freedom

$= \nu = n - 1$

↓

no of data

$\nu = n_1 + n_2 - 2$

1. H_0
2. H_1
3. α & β
4. $Z_{critical}$ or $t_{critical}$
5. Test → Z test → $n > 30$
   t test → $n \leq 30$
6. Reject or Fail to Reject

pdf → 7.35 → 5

t	α	0.05
ν		
1		
9		1.833

z

1 | Probability

Q $H_0 : \mu = 46$

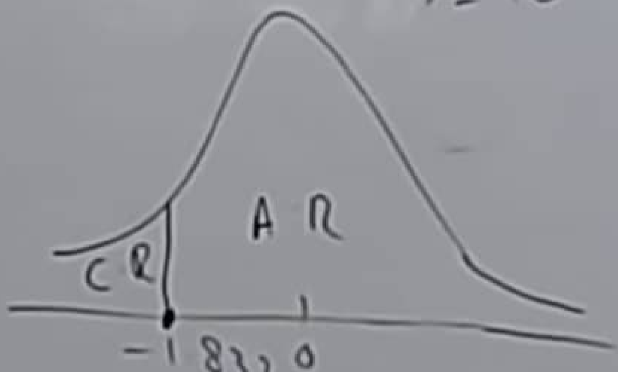
$H_1 : \mu < 46 \rightarrow$ one tail

$\alpha = 0.05 = 5\%$

$\beta = 95\%$

$n = 10$

$\nu = 10 - 1 = 9$



less than

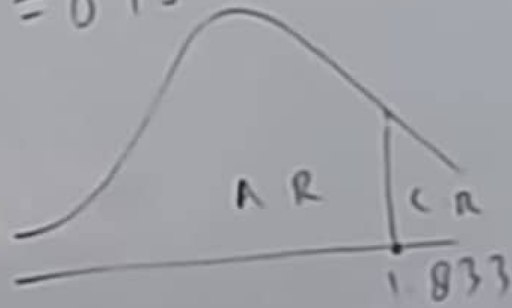
$< \longrightarrow \alpha \; \& \; \nu \longrightarrow t \longrightarrow t = -ve$

Q $H_0 \quad \mu = 46$

$H_1 \quad \mu > 46 \rightarrow$ one tail

$\alpha = 0.05 = 5\%$

$\beta = 0.95 = 95\%$



greater than

$> \longrightarrow \alpha \; \& \; \nu \longrightarrow t$

$\downarrow$

$t = +ve$

Q7

$H_0 : \mu = 46$

$H_1 : \mu \neq 46 \rightarrow$ two tail

$\alpha = 0.05$

$\beta = 0.95 = 95\%$

$t \longrightarrow \alpha/2 \longrightarrow t$

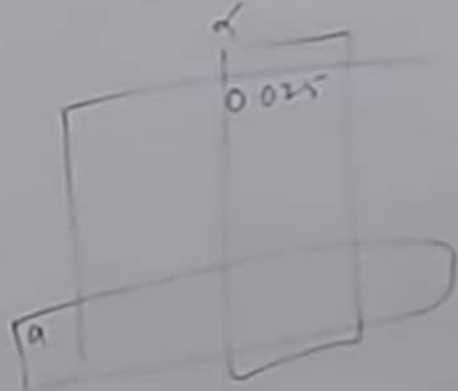
n = 9 and ν

$t = +ve$

$t = -ve$

$\alpha/2 = 0.025$

$\alpha = 0.025$



level of significance = α

Confidence interval = $\beta = 1-\alpha$

degree of freedom

$= \nu = n-1$

no. of data

$\nu = n_1 + n_2 - 2$

1. H_0
2. H_1
3. α & β
4. Z critical → t critical
5. Test → Z test → n > 30; t test → n ≤ 30
6. Reject → Fail to Reject

$\boxed{9.35} \rightarrow$ 5

one way

Anova (Analysis of Variance

H_0 $\mu_1 = \mu_2 = \mu_k$

H_1 at least one of them are not equal

Sum of Square total = Sum of Square of A + Sum of Square of Error

$SST = SSA + SSE$

$$SST = \sum_{i=1}^{k} \sum_{j=1}^{n} (y_{ij} - \bar{y}_{..})^2$$

$$SSA = n \sum (\bar{y}_{i.} - \bar{y}_{..})^2$$

$$SSE = \sum_{i=1}^{k} \sum_{j=1}^{n} (y_{ij} - \bar{y}_{i.})^2$$

Q.

Block 1	Block 2
2.1	1.9
5.3	0.5
1.4	2.8
4.6	3.1
0.9	

$\Sigma y_{1.} =$ $\Sigma y_{2.}$

$\bar{y}_{1.} =$ ___ $\bar{y}_{2.} =$

one way

Anova (Analysis of Variance

$H_0 : \mu_1 = \mu_2 = \mu_3$

H_1 : at least one of them are not equal.

Sum of square total = Sum of square of A + Sum of square of Error

$SST = SSA + SSE$

$$SST = \sum_{i=1}^{k} \sum_{j=1}^{n} (y_{ij} - \bar{y}_{..})^2$$

$$SSA = n \sum (\bar{y}_{i.} - \bar{y}_{..})^2$$

$$SSE = \sum_{i=1}^{k} \sum_{j=1}^{n} (y_{ij} - \bar{y}_{i.})^2$$

Q2

Block 1	Block 2	Block 3
2.1	1.9	2
5.3	0.5	1.8
1.4	2.8	4
4.6	3.1	2.1
0.9		
$\sum y_{1.} = 14.3$	$\sum y_{2.} = 8.3$	$\sum y_{3.} = 9.9$
$\bar{y}_{1.} = 2.86$	$\bar{y}_{2.} = 2.075$	$\bar{y}_{3.} = 2.47$

$y_{..} = 2.1 + 5.3 + \dots 2.1 = 32.5$

G.M $= \bar{y}_{..} = 2.5$

SST =

SSA =

SSE

$$SST = (2.1 - 2.5)^2 + (5.3 - 2.5)^2 + \dots + (1.9 - 2.5)^2 + (0.5 - 2.5)^2 + \dots (2 - 2.5)^2 + \dots + (2.1 - 2.5)^2$$

$SST =$ ______

$$SSA = 5(2.86 - 2.5)^2 + 4(2.075 - 2.5)^2 + 4(2.47 - 2.5)^2$$

$$SSE = (2.1 - 2.86)^2 + \dots + (0.9 - 2.86)^2 + (1.9 - 2.075)^2 + \dots + (2.075 - 3.1)^2 + (2 - 2.47)^2 + \dots + (2 - 2.1)^2$$

$y_{..} = 2.1 + 5.3 + \dots 2.1 = 32.5$

$G.M = \bar{y}_{..} = 2.5$

$SST = (2.1 - 2.5)^2 + (5.3 - 2.5)^2 + \ldots\ldots + (1.9 - 2.5)^2 + (0.5 - 2.5)^2$

$+ \ldots\ldots + (2 - 2.5)^2 + \ldots\ldots + (2.1 - 2.5)^2$

$SST = \_\_\_\_\_\_$

$SSA = 5(2.86 - 2.5)^2 + 4(2.075 - 2.5)^2 + 4(2.47 - 2.5)^2$

$SSE = (2.1 - 2.86)^2 + \ldots\ldots + (0.9 - 2.86)^2 + (1.9 - 2.075)^2 + \ldots$

$\ldots + (2.075 - 3.1)^2 + (2 - 2.47)^2$

$+ \ldots\ldots + (2 - 2.1)^2$

$y = 2.1 + 5.3 + \ldots 2.1 = 32.5$

$\bar{y} = 2.5$

8.3

$\sum y_3 = 9.9$

$= 2.075$

$\bar{y}_3 = 2.47$

2

1.8

4

2.1