→ Computation table:

x	y	x^2	x^3	x^4	xy	x^2y
0	1	0	0	0	0	0
1	1.8	1	1	1	1.8	1.8
2	1.3	4	8	16	2.6	5.2
3	2.5	9	27	81	7.5	22.5
4	6.3	16	64	256	25.2	100.8
Σx = 10	Σy = 12.9	Σx^2 = 30	Σx^3 = 100	Σx^4 = 354	Σxy = 37.1	Σx^2y = 130.3

→ Substitute the values we get,

$$12.9 = 5a + 10b + 30c \quad \text{—— (1)}$$

$$37.1 = 10a + 30b + 100c \quad \text{—— (2)}$$

$$130.3 = 30a + 100b + 354c \quad \text{—— (3)}$$

Solving (1), (2) & (3) we get,

$a = 1.42$, $b = -1.07$, $c = 0.55$

Substitute the value in Eq (0):

$$y = a + bx + cx^2$$

$$y = 1.42 - 1.07x + 0.55x^2$$

2) Fit a parabola of second degree of following data.

x	1	2	3	4
y	1.7	1.8	2.3	3.2

Table

x	y	x^2	x^3	x^4	xy	x^2y
1	1.7	1	8	1	1.7	1.7
2	1.8	4	8	16	3.6	7.2
3	2.3	9	27	81	6.9	20.7
4	3.2	16	64	256	12.8	51.2
Σx = 10	Σy = 9	Σx^2 = 30	Σx^3 = 100	Σx^4 = 354	Σxy = 25	Σx^2y = 80.8

→ Substitute the values

$9 = 4a + 10b + 30c$ — ①

$25 = 9a + 30b + 100c$ — ②

$80.8 = 30a + 100b + 354c$ — ③

$a = 0.258 \quad b = 1.164 \quad c = -0.122$

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

Sol: Consider $y = a + bx + cx^2$ whose normal Equation are

$$\Sigma y = na + b\Sigma x + c\Sigma x^2$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$$
$$\Sigma x^2y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

Computation table

x	y	x^2	x^3	x^4	xy	x^2y
2	3.07	4	8	16	6.14	12.28
4	12.85	16	64	256	51.4	205.6
6	31.47	36	216	1296	188.82	1132.92
8	57.38	64	512	4096	459.04	3672.32
10	91.29	100	1000	10000	912.9	9129
$\Sigma x = 30$	$\Sigma y = 196.06$	$\Sigma x^2 = 220$	$\Sigma x^3 = 1800$	$\Sigma x^4 = 15664$	Σxy 1618.3	$\Sigma x^2y = 14152.12$

→ Substitute the values.

$196.06 = 5a + 30a + 220c$

$912.9 = 30a + 220b + 1800c$

$14152.12 = 220a + 1800b + 15664c$

$a = 1164.606$ $\quad b = -471.96$ $\quad c = 38.78.$

5)

x	-3	-1	1	3
y	15	5	1	5

6)

x	-3	0	2	4
y	3	1	1	3

Most 2022 4M

6)

x	-1	1	2	3	5
y	8	0	5	16	$56.$

7)

x	-1	0	1	2	3	7
y	9	7	7	9	13	$49.$

4.

Sol: Consider $y = a+bx+cx^2$ whose normal Equation are

$$\Sigma y = na + b\Sigma x + c\Sigma x^2$$
$$\Sigma xy = a\Sigma x + \Sigma x^2 + c\Sigma x^3$$
$$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

Computation table

X	y	x^2	x^3	x^4	xy	x^2y
-3	15	9	-27	81	-45	135
-1	5	1	-1	1	-5	5
1	1	1	1	1	1	1
3	5	9	27	81	15	45
$\Sigma x = 0$	$\Sigma y = 26$	$\Sigma x^2 = 20$	$\Sigma x^3 = 0$	$\Sigma x^4 = 164$	$\Sigma xy = -34$	$\Sigma x^2 y = 186$

Substitute these values:

$$26 = 4a + 0b + 20c \quad \text{--- (1)}$$

$$-34 = 0a + 20c + 0c \quad \text{--- (2)}$$

$$186 = 20a + 0b + 164c \quad \text{--- (3)}$$

By solving the above (3) Equations

$a = 2.125 \quad b = -1.7 \quad c = 0.875$

Substitute these values in Eq (0).

$$= 2.125a - 1.70b + 0.875x^2$$

5)

x	-3	0	2	4
y	3	1	1	3.

Sol:

Normal Equation $a + bx + cx^2$

$$\Sigma y = na + b\Sigma x + c\Sigma x^2$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$$

$$\Sigma x^2y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

Computation table

x	y	x^2	x^3	x^4	xy	x^2y
-3	3	9	-27	81	-9	27
0	1	0	0	0	0	0
2	1	4	8	16	2	4
4	3	16.	64	256	12	48
$\Sigma x = 3$	$\Sigma y = 8$	$\Sigma x^2 = 29$	$\Sigma x^3 = 45$	$\Sigma x^4 = 353$	$\Sigma xy = 5$	$\Sigma x^2y = 79$

Substitute these values.

$$8 = 4a + 3b + 29c \quad \text{--- (1)}$$

$$5 = \cancel{29}3a + 29b + 45c \quad \text{--- (2)}$$

$$79 = 29a + 45b + 353c \quad \text{--- (3)}$$

By Solving the ①, ②, ③ Equations

$a = 0.850$ $b = -0.192$ $c = 0.178$.

Substitute the Values in $a + bx + cx^2$

$$0.850 + 0.192x + 0.178x^2$$

x	-1	1	2	3	5
y	8	0	5	16	56

Normal Equation $a + bx + cx^2$

$$\Sigma y = a\Sigma n + b\Sigma x + c\Sigma x^2$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$$

$$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

Computation table.

x	y	x^2	x^3	x^4	$x^2 y$	xy
-1	8	1	-1	1	-18	-8
1	0	1	1	1	1	0
2	5	4	8	16	20	10
3	16	9	27	81	144	48
5	56	25	125	625	1400	280
$\Sigma x = 10$	$\Sigma y = 85$	$\Sigma x^2 = 40$	$\Sigma x^3 = 160$	$\Sigma x^4 = 724$	$\Sigma x^2 y = 1573$	$\Sigma xy = 330$

Substitute then Values.

$$85 = 5a + 10b + 40c \quad \text{— ①}$$

$$330 = 10a + 40b + 160c \quad \text{— ②}$$

$$1573 = 40a + 160b + 724c \quad \text{— ③}$$

By solving Eq. ①, ② ③

$a = 1$ $b = -4.097$ $c = 3.011$

31/10/20..

⇒ Exponential curve :-

i) $y = ae^{bx}$

Taking log on both side

$\log_e^y = \log_e ae^{bx}$

$\log_e^y = \log_e^a + \log_e e^{bx}$

$\log_e^y = \log_e^a + bx \log_e^e$

$\log_e^y = \log_e^a + bx$ ⟶ it represent $Y = A + Bx$ it represent s.t line

let $Y = \log_e^y$

$A = \log_e^a$

$bx = Bx$

$\Sigma Y = nA + B\Sigma x$

$\Sigma xY = A\Sigma x + B\Sigma x^2$.

$\boxed{b = B}$

$A = \log_e^a$

$a = e^A$

$y = ae^{bx}$

⇒ Fit an Exponential form of the curve $y = ae^{bx}$

X	2	4	6	8
Y	25	38	56	84

Sol: Consider $y = ae^{bx}$

Transforming the Exponential equation $y = ae^{bx}$ by taking log on both side, we get

$\log_e y = \log_e a + \log_e e^{bx}$

$\log_e y = \log_e a + bx \log_e e$

$\log_e y = \log_e a + bx$

$\log_e y = \log_e a + bx$

If we replace $\log_e y = Y$, $\log_e a = A$ & $bx = Bx$

then $Y = A + Bx$

Computation table.

x	y	$Y = \log_e y$	x^2	xY
2	25	3.2188	4	6.4376
4	38	3.6375	16	14.55
6	56	4.0253	36	24.1518
8	84	4.4308	64	35.4464
$\Sigma x = 20$	$\Sigma y = 203$	$\Sigma Y = 15.3124$	$\Sigma x^2 = 120$	$\Sigma xY = 80.5858$

using the Normal Equation

$15.3124 = 4A + 20B$

$80.5858 = 20A + 120B$

Solving for A and B we get

$A = 2.82215$

$B = 0.20119$

$a = \text{antilog } A = \cancel{6}16.8129$

$b = B = 0.20119$

thus the $y = ae^{bx}$

2, Fit an Exponential curve of the form $y = ae^{bx}$

x	1	2	3	4
y	4	11	35	106

Sol:

Computation table:

x	y	$Y = \log_e y$	x^2	xY
1	4	1.3862	1	1.3862
2	11	2.3978	4	4.7956
3	35	3.5553	9	10.6659
4	100	4.6051	16	18.4204
$\Sigma x = 10$	$\Sigma y = 150$	$\Sigma Y = 11.9444$	$\Sigma x^2 = 30$	$\Sigma xY = 35.268$

$\Sigma Y = nA + B\Sigma x$

$\Sigma xY = A\Sigma x + B\Sigma x^2$

$11.9444 = 4A + 10B$ —— 1

$35.2681 = 10A + 30B$ —— 2

Solving 1 & 2

$A = 0.28255$

$B = 1.08142$

$a = e^A = e^{0.28255} = 1.3265$

$b = B = 1.08142$

$\boxed{y = ae^{bx}}$

$y = (1.3265)e^{1.08142x}$

⇒ Transforming the Exponential equation

ii) $Y = ab^x$

Taking log on both sides to base 10

$\log_{10} Y = \log_{10} a + \log_{10} b^x$

$\cancel{\log_{10} y = \log_{10} a + \log_{10} b^x}$

$\log_{10} y = \log_{10} a + x \log_{10} b$

if we replace $\log_{10} y = Y$, $\log_{10} a = A$ & $x \log_{10} b = Bx$

then $Y = A + Bx$

$\Sigma Y = nA + B\Sigma x$

$\Sigma xY = A\Sigma x + B\Sigma x^2$

1. Fit an Exponential Curve of the form $y = ab^x$

x	1	2	3	4
y	4	11	35	100

Sol:

Computation table

x	y	$Y = \log_{10} y$	x^2	xY
1	4	0.6020	1	0.6020
2	11	1.0413	4	2.0826
3	35	1.5440	9	4.632
4	100	2	16	8
$\Sigma x = 10$	$\Sigma y = 150$	$\Sigma Y = 5.1873$	$\Sigma x^2 = 30$	$\Sigma xY = 15.3166$

using a Normal Equation

$5.1873 = 4A + 10B$

$15.3166 = 10A + 30B$

Solving Eq ① and ②

$A = 0.12265$

$B = 0.46967$

$a = \text{antilog } A = 1.3263$

b " $B = 2.948$

$Y = ab^x$

$y = (1.3263)(2.948)^x$

2/11/22

Fit an Exponential form of the curve $y = ax^b$

x	61	26	7	26
y	350	400	500	600

Sol Consider $y = ax^b$.

$\log_{10}^{y} = \log_{10} ax^b$.

$\log_{10}^{y} = \log_{10}^{a} + \log_{10} x^b$

$\log_{10}^{y} = \log_{10}^{a} + b\log_{10}^{x}$

$Y = A + BX$

x	y	$X = \log_{10}^{x}$	$Y = \log_{10}^{y}$	X^2	XY
61	350	1.7853	2.544	3.1872	4.5418
26	400	1.4149	2.602	2.0019	3.6815
7	500	0.8450	2.698	0.7140	2.2805
26	600	1.4149	2.778	2.0019	3.9305
$\Sigma x = 120$	$\Sigma y = 1850$	$\Sigma X = 5.4601$	$\Sigma Y = 10.6230$	$\Sigma X^2 = 7.9050$	$= 14.4345$

$\Sigma Y = nA + B\Sigma X$

$\Sigma XY = A\Sigma X + B\Sigma X^2$

$10.6230 = 4A + 5.460B$

$= 14.4345 = 5.4601A + 7.9050B$

$A = 2.8556$

$B = -0.1464$ $\quad B = b = -0.1464$

$A = \log_{10}^{a} \rightarrow a = 10^A$

$a = 10^{2.8556}$ $\quad a = 717.134$

→ 5th unit

Chi- Square Test (χ^2 Test) 24

χ^2 = Test is defined as

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

where O_i = observed frequencies
E_i = Expected frequencies.

χ^2- Test is used to check the significance of the discrepancy between theory and Experiment. It Enables us to find the deviation of the Experiment from theory is just by chance of it is really due to the inadequacy of the theory to fit the observed data.

Conditions for using χ^2 - Test

1, The total number of observation used in this test must be large

2, The test is wholly dependent on the degree of freedom

3, Each of observation making up the Sample for the χ^2- test should be independent of Each other.

4, The observation collected for χ^2- Test must be based on the method of random Sampling.

1) Find the value of χ^2 for the following data and test for goodness of fit

(5% level of significance)

observed frequency	14	15	18	20	15	10
Expected frequency	17	10	15	25	10	15

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

$$= \frac{(14-17)^2}{17} + \frac{(15-10)^2}{10} + \frac{(18-15)^2}{15} + \frac{(20-25)^2}{25} + \frac{(15-10)^2}{10} + \frac{(10-15)^2}{10}$$

$$= \frac{9}{17} + \frac{5}{2} + \frac{3}{5} + \frac{25}{25} + \frac{5}{2} + \frac{5}{3}$$

$$= \frac{2243}{255} = 8.7960$$

Table value of χ^2 with 5 degree of freedom is 11.07 at 5% (0.05) level of significance

Since $\chi^2_{cal} < \chi^2_{tab}$ (i.e) $(8.7960 < 11.07)$

Therefore we accept null hypothesis and the fit is Good.

→ Find the value of x^2 for the following data and te[st]
for goodness of fit

(1% level of significance)

observed frequency	9	27	36	18
Expected frequency	15	30	30	15

Sol:

$$\Sigma i = \frac{O_i - A_i}{E_i}$$

$$\sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

O_i = observed frequencies

E_i = Expected

$$= \frac{(9-15)^2}{15} + \frac{(27-30)^2}{30} + \frac{(36-30)^2}{30} + \frac{(18-15)^2}{15}$$

$$= \frac{12}{5} + \frac{3}{10} + \frac{6}{5} + \frac{3}{5}$$

$$= \frac{9}{2} = 4.5$$

Table value of X^2 with 1 degree of freedom is 11.345

T. Test (2M)

when the population of Standard deviation is not known and the Size of Sample is less than or Equal to thirty we use t-Test

To Test the Significance of mean Sample the test statistic given by

$$t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)}$$

where $\bar{x} = \frac{\sum x_i}{n}$

n = Size of Sample

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

Q1) Find the students t-test for the following variable values. in a sample of Eight $-4, -2, -2, 0, 2, 2, 3, 3$ Taking mean universe to be zero $(\mu = 0)$

Sol: we have $t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)}$

where $\bar{x} = \frac{\sum x_i}{n}$

n = Size of Sample.

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

$$\bar{x} = \frac{\sum x_i}{n} = \frac{-4-2-2+0+2+2+3+3}{8}$$

$$\bar{x} = 0.25$$

: Computation table

x	$x-\bar{x}$	$(x-\bar{x})^2$
-4	$-4-0.25=4.25$	18.0625
-2	$-2-0.25=2.25$	5.0625
-2	$-2-0.25=2.25$	5.0625
0	0.25	0.0625
2	1.75	3.0625
2	1.75	3.0625
3	2.75	7.5625
3	2.75	7.5625
$\Sigma x = 2$	$\Sigma(x-\bar{x}) = 0$	$\Sigma(x-\bar{x})^2 = 49.5$

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

$$s = \sqrt{\frac{49.5}{7}} = 2.659215781$$

$$t = \frac{\bar{x}-\mu}{\left(\frac{s}{\sqrt{n}}\right)}$$

$$= \frac{0.25-0}{2.659215781} \times \sqrt{8} = 0.265908011$$

$t_{cal} = 0.265908011$

$t_{Tab} = 1.895$

Since $t_{cal} > t_{tab}$

Q2) A Random Sample of 10 boys had the IQ's 70, 120, 110, 101, 88, 83, 95, 98, 107 & 100. Do these data Support the assumption of a population mean IQ of 160 (5%)

$$\bar{x} = \frac{70+120+110+101+88+83+95+98+107+100}{10}$$

$$\bar{x} = 97.2$$

Computation table.

x	$x-\bar{x}$	$(x-\bar{x})^2$
70	-27.2	739.84
120	22.8	519.84
110	12.8	163.84
101	3.8	14.44
88	-9.2	84.64
83	-14.2	201.64
95	-2.2	4.84
98	0.8	0.64
107	9.8	96.04
100	2.8	7.84
$\Sigma x = 972$	$\Sigma x-\bar{x} = 0$	$\Sigma(x-\bar{x})^2 = 1833.61$

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

$$S = \sqrt{\frac{1833.61}{9}} = S = \cancel{203.7344444}$$

14.27355753

$$t = \frac{\bar{x}-\mu}{\left(\frac{s}{\sqrt{n}}\right)} = \frac{97.2-160}{\cancel{203.7344444}\ 14.27355753} \times \sqrt{10}$$

$$= \quad t = -13.913$$

$t_{cal} = -13.9132$

$t_{tab} = 1.833$

Since $t_{cal} > t_{Tab}$

No, these data does not support assumption of.

Q3:- The height of 10 females of a given location are found to be 66, 63, 58, 64, 57, 64, 66, 60, 60, 62 inches. It is reasonable to believe that average of height is greater than 60 inches. test at 5% level of significance

Sol:

$$\bar{x} = \frac{66+63+58+64+57+64+66+60+60+62}{10}$$

$$\bar{x} = 62$$

x	$x-\bar{x}$	$(x-\bar{x})^2$
66	4	16
63	1	1
58	-4	16
64	2	4
57	-5	25
64	2	4
66	4	16
60	-2	4
60	-2	4
62	0	0
$\Sigma(x) =$	$\Sigma(x-\bar{x}) = 0$	$(x-\bar{x})^2 = 90$

$$S = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}}$$

$$S = \frac{90}{9} = \sqrt{10} = 3.16227766$$

$$t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)} = \frac{97.2 - 60.}{3.16227766} \times \sqrt{10}.$$

$$= 2.000$$

$T_{cal} = 2.000$

$T_{tab} = 1.833$

09/11/22

F-Test

The objective of the F-Test is to find whether two independent estimates of population variance differ significantly or whether the two samples may be regarded as drawn from normal population having the same variance.

To carry out the test of significance we calculate F ratio which is defined as

$$F = \frac{S_1^2}{S_2^2} \quad (S_1^2 > S_2^2)$$

$$F = \frac{S_2^2}{S_1^2} \quad (S_2^2 > S_1^2)$$

$$S_1^2 = \frac{\Sigma(x - \bar{x})^2}{n_1 - 1}$$

$$S_2^2 = \frac{\Sigma(y - \bar{y})^2}{n_2 - 1}$$

degree of freedom $v_1 = n_1 - 1$

$v_2 = n_2 - 1$

Q1. Two Samples are drawn from two normal Equations. Test whether the two Samples have the Same Variance at 5% level of significance

Sample 1 60 65 71 74 76 82 85 87

Sample 2 61 66 67 85 78 63 85 86 87

Sol let

Sample 1 be = 'x'

Sample 2 be = 'y'

Calculate $\bar{x} = \frac{\Sigma x}{n} = \frac{600}{8} = 75$

$\bar{y} = \frac{\Sigma y}{n} = \frac{770}{10} = 77$

Computation table.

x	$x-\bar{x}$	$(x-\bar{x})^2$	y	$y-\bar{y}$	$(y-\bar{y})^2$
60	-15	225	61	-16	256
65	-10	100	66	-11	121
71	-4	16	67	-10	100
74	-1	1	85	8	64
76	1	1	78	1	1
82	7	49	63	-14	196
85	10	100	85	8	64
87	12	144	86	9	81
			88	11	121
$\Sigma x = 600$	$\Sigma x-\bar{x} = 0$	$\Sigma(x-\bar{x})^2 = 636$	91	14	196
			770		$(y-\bar{y})^2$ 1200

Nam

$v_1 = n_1 - 1 = 7$
$v_2 = n_2 - 1 = 9$

$$S_1^2 = \frac{\Sigma(x-\bar{x})^2}{n_1 - 1} = \frac{636}{7} = 90.8571$$

$$S_2^2 = \frac{\Sigma(y-\bar{y})^2}{n_2 - 1} = \frac{1200}{9} = 133.333$$

$$F = \frac{S_2^2}{S_1^2} = \frac{133.333}{90.8571} = 1.4675$$

$F_{tab} = F_{9,7} = 3.68$ (5%)

$F_{cal} = 1.4675$

Since $F_{tab} > F_{cal}$ (H_0 is accepted)

We conclude that population has same variance

Q2: The values of two random samples are given

S_1	15	25	16	20	22	24	21	17	19	23		
S_2	35	31	25	38	26	29	32	34	33	27	29	31

let

Sample 1 be = 'x'

2 be = 'y'

$$\bar{x} = \frac{202}{10} = 20.2$$

$$\bar{y} = \frac{370}{12} = 30.8333$$

16/11/2022

unit I

Probability;

→ what is probability

· Probability is the chance that some Event will happen.

It is the ratio of the number of ways a certain Event can occur to the number of possible outcomes.

Conditional propability:-

Conditional probability is a measure of the probability of an Event given that another Event has already occured.

If the Event of interest is A and the Event B is known or assumed to have occurred. "the conditional Probability of A given B', is usually written as $P(A|B)$

Replacement:

Note: if we replace the marbles in the bag Each time, then the chances do not change and the Events are Independent

With replacement! the Events are independent (the chances don't change)

without replacement: the Events are dependent (the chances change)

Dependent Events:

→ Events can also be dependent
→ which means they can be affected by previ[ous]
Events

Example: Marbles in a Bag

→ 2 blue and 3 red marbles are in a bag.
→ what are the chances of getting a blue marble;
→ The chance is 2 in 5
→ But after taking one out the chances change!
→ So the next time:
→ we got a red marble before, then the chances [of]
a blue marble next is 2 in 4
→ if we got a blue marble before, then the chance
of a blue marble next is 1 in 4
→ this is because we are removing marbles from
the bag.
→ So the next Event depends on what happened
in the previous Event, and is called dependent.

Independent Events

→ Events can be independent

→ Each Event is not affected by any other Events.

→ Example: Tossing a coin.

What it did in the past will not affected the current toss.

→ The chance is simply 1-in-2, or 50%, just like Any toss of the coin

→ So Each toss is an independent Event.

Addition of probability :- (2M)

$$P(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Multiplication theorem on probability

If A and B are any two Events in a Sample space 'S' then

$$P(A \cap B) = P(A)P(B/A), \; P(A) > 0$$

$$P(B \cap A) = P(B)P(A/B), \; P(B) > 0$$

Conditional probability :-

If A and B are any two Events in a Sample space the Conditional probability is defined a.

A given B

$$P(A/B) = P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}, \; P(B) > 0$$

$$P(B/A) = P\left(\frac{B}{A}\right) = \frac{P(B \cap A)}{P(A)}$$

(2)

$$\boxed{P(B/A) = \frac{P(A \cap B)}{P(A)}, \; P(A) > 0}$$

Note: the probability of a Event A when another Event B is known to have already happend is called Conditional probability theorem of total probability (vimp)

Statement: let B_1 and B_2 ..... B_n. B a set of exhaustive event and mutually Exclusive of a Sample space S,

$$P(B_i) \neq 0, \; i = 1, 2, \ldots n,$$

let A be any Event of 's', the probability of

$$P(A) = \sum_{i=1}^{n} P(B \cap A) = \sum_{i=1}^{n} P(B_i) P(A/B_i)$$

Prove:-

since let B_1 and B_2 .. B_n B a set of Exhaustive and mutually Exclusive Event of a Sample space s.

$$S = \bigcup_{i=1}^{n} B_i \; \& \; B \cap B_j = \phi, \; i \neq j$$

let A and Be any Event of S.

$$\therefore A \cap B, A \cap B_1 \ldots A \cap B_n$$

A =

Hence by additive rule of mutually Exculsive Events we obtain probability

$$P(A) = P[(A \cap B_1) \cup (A \cap B_2) \cup \ldots \cup (A \cap B_n)]$$

$$P(A) = P[(A \cap B_1) + P(A \cap B_2) + \ldots + P(A \cap B_n)$$

$$P(A) = P(B_1 \cap A) + P(B_2 \cap A) + \ldots + P(B_n \cap A)$$