Practical - 01.

* Basics of R software :-

R is a software for data analysis of statistical computing.

This software is used for effective data handling and output storage is possible.

It is capable of graphical display.

It is a free software.

1) $2^2 + \sqrt{25} + 35$

2 ^ 2 + sqrt 25 + 35

= 44

2) $2 \times 5 \times 3 + 62 \div 5 + \sqrt{49}$

2 * 5 * 3 + 62 / 5 + sqrt 49

49.4

3) $\sqrt{76 + 4 \times 2 + 9 \div 5}$

sqrt (76 + 4 * 2 + 9/5)

9.262329

4) $42 + |-10| + 7^2 + 8 \times 9$

42 + abs (-10) + 7^2 + 8 * 9

128

$x = 20$; $y = 30$

Find, $x + y$; $x^2 + y^2$; $\sqrt{y^3 - x^3}$; abs $(x - y)$

i) $x + y$
$= 50$

ii) $x^2 + y^2$
$= 1300$

iii) $\sqrt{y^3 - x^3}$
$= 137.9405$

iv) abs $(x-y)$
$= 10$

Calculate the following :-

1) c(2, 3, 4, 5)^2
4 9 16 25

2) c(4, 5, 6, 8) * 3
12 15 18 24

3) c(2, 3, 5, 7) * c (-2, -3, -5, -4)
-4 -9 -25 -28

4) c(2, 3, 5, 7) * c (8, 9)
16 27 40 63

5) c(1, 2, 3, 4, 5, 6) ^ c (2, 3, 4)
1 8 81 16 125 1296

6) c(2, 3, 5, 7) * c (1, 2, 3)
warning message.

7) c(1, 2, 3, 4, 5) ^ c (2, 3, 4)
warning message.

Find the sum , product , maximum , minimum of the given value. 026

5, 8, 6, 7, 9, 10, 15, 5

x = c(5, 8, 6, 7, 9, 10, 15, 5)

1) length(x)
= 8

2) Sum(x)
= 65

3) max(x)
= 15

4) prod(x)
= 11340000

5) min(x)
= 5

matrix Calculation

x → matrix (nrow = 4 , ncol=2 , data = c(1, 2, 3, 4, 5, 6, 7, 8)

$$\begin{bmatrix} 1 & 5 \\ 2 & 6 \\ 3 & 7 \\ 4 & 8 \end{bmatrix}$$

$$x = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix} \qquad y = \begin{bmatrix} 2 & 4 & 10 \\ -2 & 8 & -11 \\ 10 & 6 & 12. \end{bmatrix}$$

find x+y , x*y, 2x+3y

i) x+y

$$\begin{bmatrix} 3 & 8 & 17 \\ 0 & 13 & -3 \\ 13 & 12 & 21 \end{bmatrix}$$

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250

ii) x * y

$$\begin{bmatrix} 2 & 16 & 70 \\ -4 & 40 & -88 \\ 30 & 36 & 108 \end{bmatrix}$$

iii) 2 * x + 3 * y

$$\begin{bmatrix} 8 & 20 & 44 \\ -2 & 34 & -17 \\ 36 & 30 & 54 \end{bmatrix}$$

2) Perform the following :

x = 6 (2, 4, 6, 1, 1, 3, 5, 7, 18, 16, 14, 17, 19, 3, 3, 2, 15, 9, 14, 18, 12)

length (x)

23

a = table (x)

transform (a)

x	Frequency
0	1
1	1
2	1
3	2
4	3
5	1
6	2
7	1
9	1
10	1
12	1
14	1
15	2
16	1
17	1
18	1
19	2
	1

```
breaks = seq (0, 20, 5)
b = cut ( x , breaks , right = False)
c = table (b)
```

b	Freq
0, 5	8
5, 10	5
10, 15	4
15, 20	6.

SSP

Practical - 0 - 2

Problems on Pdf and cdf
Can the following be pdf

① $f(x) = \begin{cases} 2 - x & , 1 \le x \le 2 \\ 0 & \text{o.w} \end{cases}$

$$\int f(x)\, dx = 1$$

$$= \int^{2} (2 - x)\, dx$$

$$= \int^{2} 2dx - \int_{1}^{2} x\, dx$$

$$= 2x \Big|_{1}^{2} - \frac{x^2}{2} \Big|_{1}^{2}$$

$$= (4-2) - (2 - 0.5)$$

$$\neq 1$$

② $F(x) = \begin{cases} 3x^2 & , 0 < x < 1 \\ 0 & \text{o.w} \end{cases}$

→ $\int F(x)\, dx = 1$

$$= \int_{0}^{1} 3x^2\, dx$$

$$= \int^{1} \left[\frac{3x^3}{3} \right]_{0}^{1}$$

$$= \left(\frac{3(1)^3}{3} \right)^{3} - \left(\frac{3(0)^3}{3} \right)$$

$$= 1.$$

(3) $f(x) = \left\{ \frac{3x}{2}(1-x/2) \right. ; \quad 0 \le x < 2$

$\rightarrow \int f(x)\,dx = 1$

$$\int_0^2 \frac{3x}{2}\left(1-\frac{x}{2}\right) dx$$

$$= \int_0^2 \frac{3x}{2} - \frac{3x^2}{4}\,dx$$

$$= \left[\frac{3x}{2}\right]_0^2 dx - \left[\frac{3x^2}{4}\right]_0^2 dx$$

$$= \left[\frac{3x^2}{4}\right]_0^2 - \left[\frac{3x^3}{12}\right]_0^2$$

$$= 3 - 2$$

$$= 1$$

Hence it is p.d.f.

Q·2 Can the following p·m·f

i)

x	1	2	3	4	5
f(x)	0·2	0·8	−0·1	0·5	0·1

$f(x) = -0\cdot1$

Since One probability is negative
Hence it is not p·m·f.

ii)

x	0	1	2	3	4	5
f(x)	0·1	0·8	0·2	0·2	0·1	0·1

Since $P(x) \geq 0 \ \forall\ x$
and $\Sigma P(x) = 1$

Hence it is a p·m·f.

iii)

x	10	20	30	40	50
f(x)	0·2	0·3	0·3	0·2	0·2

$\Sigma f(x) = 0\cdot2 + 0\cdot3 + 0\cdot3 + 0\cdot2 + 0\cdot2$
$= 1\cdot2$

Since $\Sigma P(x) \neq 1$
It is not a p·m·f

·3 Find

x	0	1	2	3	4	5	6
f(x)	0·1	0·1	0·2	0·2	0·1	0·2	0·1

i) $P(x \leq 2) = P(0) + P(1) + P(2)$
$= 0\cdot1 + 0\cdot1 + 0\cdot2$
$= 0\cdot4.$

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ii) $P(\text{at least } 4) = P(4) + P(5) + P(6)$
$= 0.1 + 0.2 + 0.1$
$= 0.4$

iii) $P(3 < x < 6) = P(4) + P(5)$
$= 0.1 + 0.2$
$= 0.3$

Q.4. Find c.d.f

X	0	1	2	3	4	5	6
P(x)	0.1	0.1	0.2	0.2	0.1	0.2	0.1

→ $F(x) = 0 \quad , x < 0$
$= 0.1 \quad , 0 \le x < 1$
$= 0.2 \quad , 1 \le x < 2$
$= 0.4 \quad , 2 \le x < 3$
$= 0.6 \quad , 3 \le x < 4$
$= 0.7 \quad , 4 \le x < 5$
$= 0.9 \quad , 5 \le x < 6$
$= 1.0 \quad , x \ge 6$

→

X	1.0	1.2	1.4	1.6	1.8
P(x)	0.2	0.35	0.15	0.25	0.1

$F(x) = 0.2 \quad , x < 10$
$= 0.55 \quad , 10 \le x < 12$
$= 0.70 \quad , 12 \le x < 14$
$= 0.90 \quad , 14 \le x < 16$
$= 1.0 \quad , x \ge 18$

CSO

Practical - 03.

Probability distribution & Binomial distribution

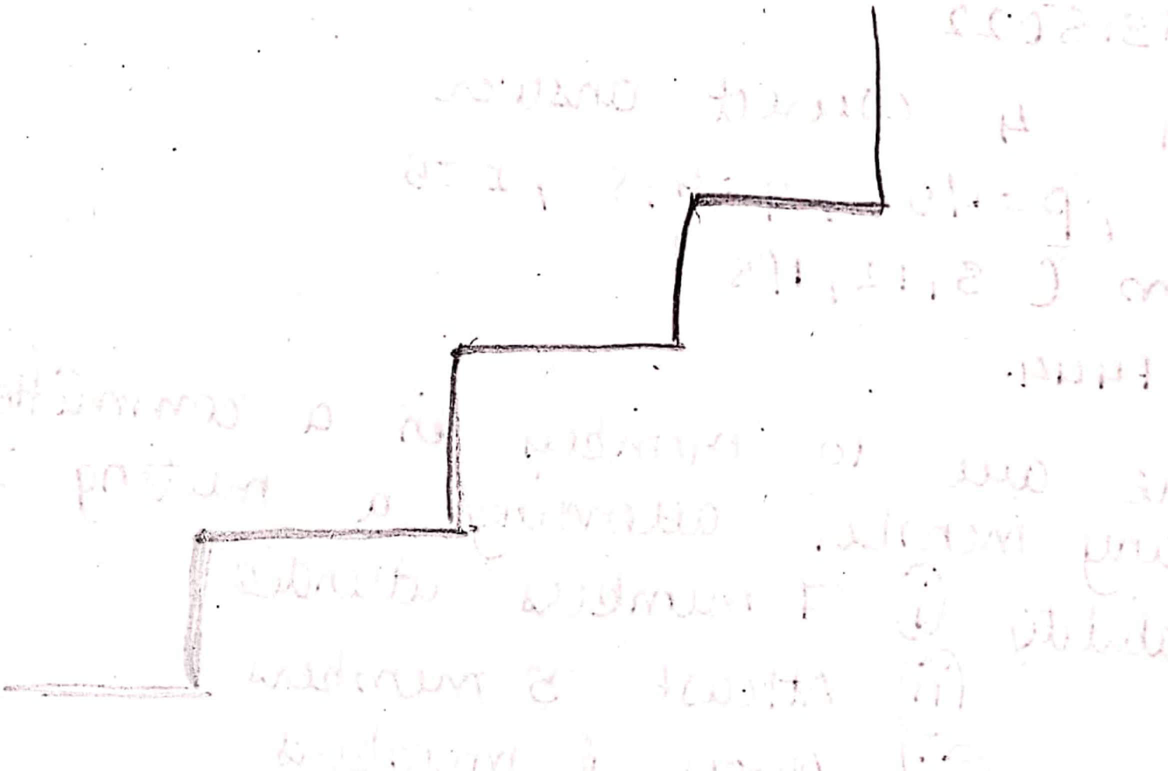
i) Find the following PDF of the following cdf and draw the graph

X	10	20	30	40	50
F(x)	0.15	0.25	0.3	0.2	0.1

$P(x) = 0$ if $x < 10$
$= 0.15$ $10 \le x < 20$
$= 0.40$ $20 \le x < 30$
$= 0.70$ $30 \le x < 40$
$= 0.90$ $40 \le x < 50$
$= 1.0$ $x \ge 50$

Command x

```
> x = c (10, 20, 30, 40, 50)
> prob = c (0.15, 0.25, 0.3, 0.2, 0.1)
> cumsum prob
[1] 0.15 0.40 0.70 0.90 1.00
> Plot ( x, cumsum (prob), x lab = "values", ylab = "probability", main = "graph of CDF", "s")
```



Binomial Distribution

1) Suppose there are 12 MCQ in a test. Each question has 5 option and only one of them is correct. Find the probability of having i) 5 correct answer ii) Atmost 4 correct answer

It is given that $n=12$, $p=1/5$ $q=4/5$
x = total ~~answer~~ no. of correct answer
$x \sim B(n,p)$

① Correct Answer
> $n=12$, $p=1/5$, $q=4/5$, $x=5$
pbinom (5,12,1/5)
0·05315022

② Atmost 4 correct answer
> $n=12$, $p=1/5$, $q=4/5$, $x=5$
pbinom (5,12,1/5)
0·927444.

2) There are 10 members in a committee, the probability of any member attending a meeting is 0·9, find the probability (i) 7 members attended
(ii) Atleast 5 members
(iii) Almost 6 members

It is given that
$n=10$, $p=0·9$, $q=0·1$
X = Total number of member attended
$X \sim B(n,p)$

i) 7 members attended :-
$n=10$, $p=0·9$, $q=0·1$, $x=7$
dbinom (7,10,0·9)
=[1] 0·0573.

ii) Atleast 5 members attended

$n = 10$, $p = 0.9$, $q = 0.1$, $x = 5$

```
1 - pbinom (5,10,0.9)
[1]  0.9933
```

iii) Atmost 6 members attended

$n = 10$, $p = 0.9$, $q = 0.1$, $x = 5$

```
pbinom (6,10,0.9)
[1]  0.01279
```

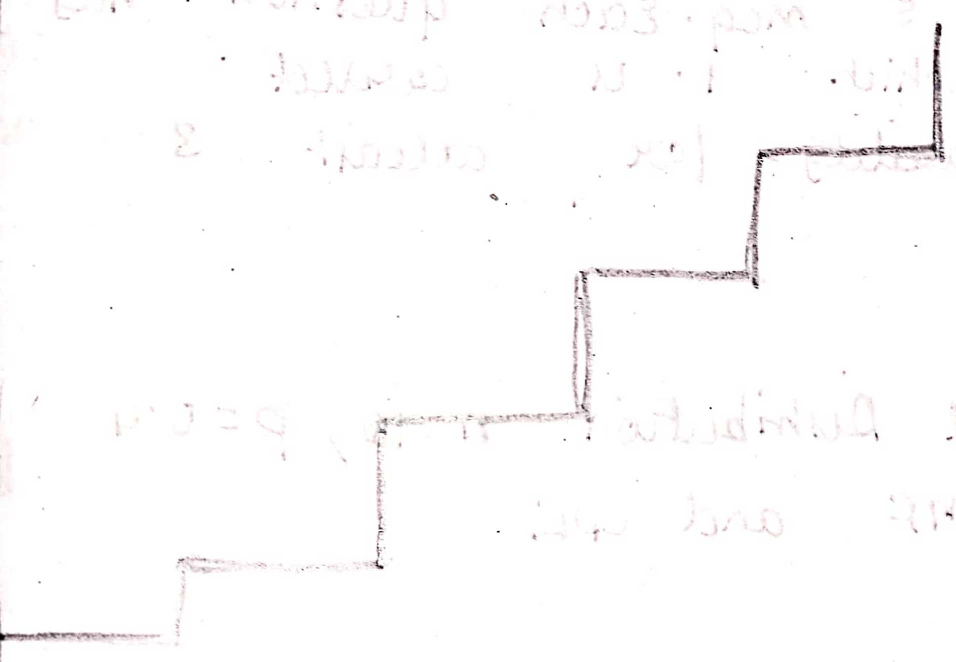
Find the cdf and draw the graph

X	1	2	3	4	5	6
F(X)	0.1	0.1	0.2	0.2	0.1	0.1.

Command

```
> x = c (0,1,2,3,4,5,6)
> ~~prob~~ ( prob = c ( 0.1, 0.1 ,0.2 , 0.2 ,0.1 , 0.2 , 0.1)
> cumsum (prob)
[1]  0.1   0.2   0.4   0.6   0.7   0.9   1.0
```

$P(x) = 0$	if	$x \le 0$
0.1		$0 \le x \le 1$
0.2		$1 \le x \le 2$
0.4		$2 \le x \le 3$
0.6		$3 \le x \le 4$
0.7		$4 \le x \le 5$
0.9		$5 \le x \le 6$
1.0		$6 \le x \le 7.$



Practical -04.

SEO

1) Find the compute Binomial distribution $n=5$ & $p=0.1$

2) Find the probability of exactly 10 success trial with $p=0.1$

3) X follows binomial distribution with $n=12$, $p=0.1$
find i) $P(X=5)$ ii) $P(X \le 5)$ iii) $P(X>7)$
iv) $P(5<X<7)$

4) Probability of sales man makes sale is 0.15
Find the probability i) No sale for 10 customers
ii) More than 3 sale in 20 customer.

5) A student wrote 5 mcq. Each question has 4 option, out of which 1 is correct. Calculate the probability for atleast 3 correct answers.

6) $\bar{x}$ follows Binomial Distribution $n=10$, $p=0.4$
Plot the graph PMF and CDF

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Solution :-

1) $n = 5$ $p = 0.1$ $x = 0:5$

Command dbinom (0:5, 5, 0.1)

[1] 0.59409 0.32805 0.07290 0.00310 0.0045 0.00001

2) $n = 100$, $p = 0.1$, $x = 10$

command dbinom (10, 100, 0.1)

[1] 0.1318653.

3) i) $n = 12$, $p = 0.25$, $x = 5$

command dbinom (5, 12, 0.25)

[1] 0.1032414.

ii) $n = 12$ $p = 0.25$ $x = 5$

command dbinom (5, 12, 0.25)

[1] 0.9455978.

iii) $n = 12$ $p = 0.25$ $x = 7$

[1] 0.0027851

4) i) $n = 10$, $P = 0.15$, $x = 0$

dbinom (0, 10, 0.15)

[1] 0.1968744

ii) $n = 30$, $p = 0.15$

$P(x > 3) = 1 - p(x \leq 3) = 1 -$ pbinom (3, 20, 0.15)

[1] 0.3522748.

5) $n=6$, $p = 1/4$, or $x \le 2$

command 1- pbinom (2, 5, 1/4)

[1] 0.1035156

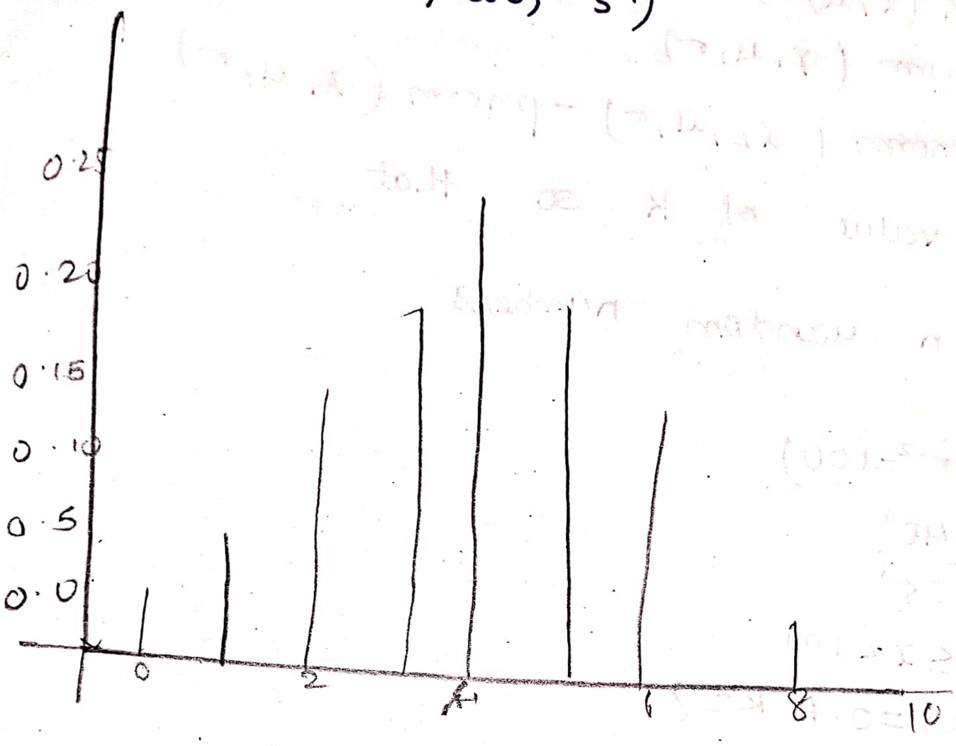
6) $n = 10$; $p = 0.4$

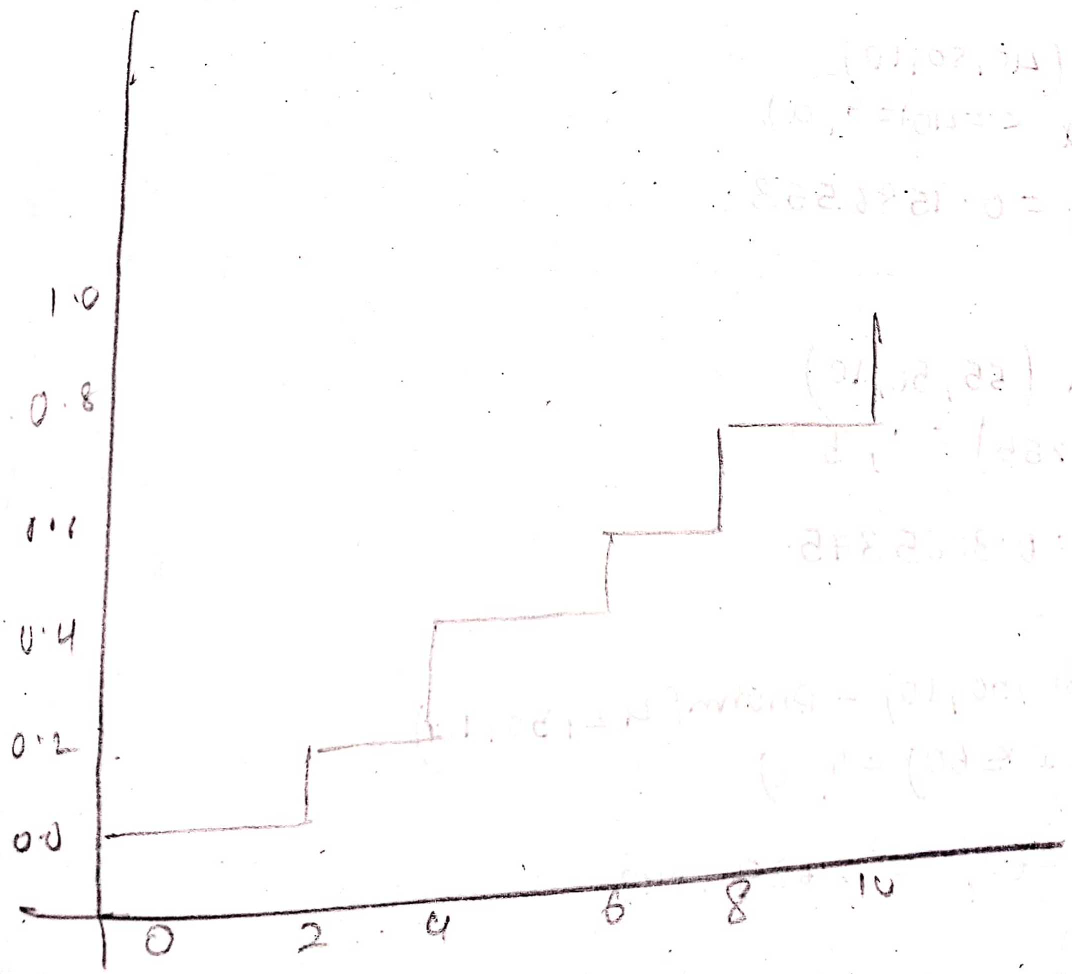
x = 0:n

```
prob = dbinom (x, n, p)
cumprob = pbinom (x, n, p)
d = data.frame("x values" = x, "probability" = prob)
print(d)
```

x. values	Probability
0	0.0060466176
1	0.0403107340
2	0.1209323520
3	0.2149903480
4	0.2503226560
5	0.2006581243
6	0.1114767328
7	0.0424673280
8	0.0106168320
9	0.0013728640
10	0.0001048574

Plot (x, prob, "h")
Plot (x, cumprob, "s")





Practical -05.

i.e.)

1) $P[x = x] = dnorm(x, \mu, \sigma)$
2) $P[X \le x] = pnorm(x, \mu, \sigma)$
3) $P[x > x] = 1 - pnorm(x, \mu, \sigma)$
4) $P[x_1 < x, x_2] = pnorm(x_2, \mu, \sigma) - pnorm(x_1, \mu, \sigma)$
5) To find the value of K so that
6) To generate n random numbers

1] $X \sim N(\mu = 50, \sigma^2 = 100)$

i) $P(x \le 40)$
ii) $P(x > 55)$
iii) $P(42 \le x \le 60)$
iv) $P(x \le k) = 0.7$ $k = ?$

Soln :-

1)
```
> a = pnorm(40,50,10)
> cat("p(x <=40)=", a)
P(x<=40) = 0.1586553.
```

2)
```
> b = 1-pnorm(55, 50, 10)
> cat("p(x>55) = ", b)
P(x>55) = 0.3085375.
```

3)
```
> c = pnorm(60,50,10) - pnorm(42,50,10)
> cat("p(42<=x<=60) =", c)
P(42<=x<=60) = 0.6294893.
```

1\. > d = qnorm (0.7, 50, 10)
> cat ("P(X <= k) = 0.7 , k = ", d)
P(X <= k) = 0.7   k = 55.24401

2\] $X \sim N(\mu = 100, \sigma^2 = 36)$

som :-

i) $\mu = 100, \ \sigma^2 = 36, \ \sigma = 6.$
> a = Pnorm (110, 100, 6)
> cat ("P (X <= 110) = ", a)
P(X ≤ 110 = 0.95 22096.

ii) > b = pnorm (95, 100, 6)
> cat (" P(X ≤ 95) = ", b)
= 0.2023284.

iii) > c = 1 - pnorm (115, 100, 6)
> cat ("(P X ≤ 115 = ", c)
= 0.006209665.

iv) > d = pnorm (105, 100, 6) - pnorm (95, 100, 6)
> cat ("P(95 ≤ x ≤ 105) = ", d)
= 0.953432.

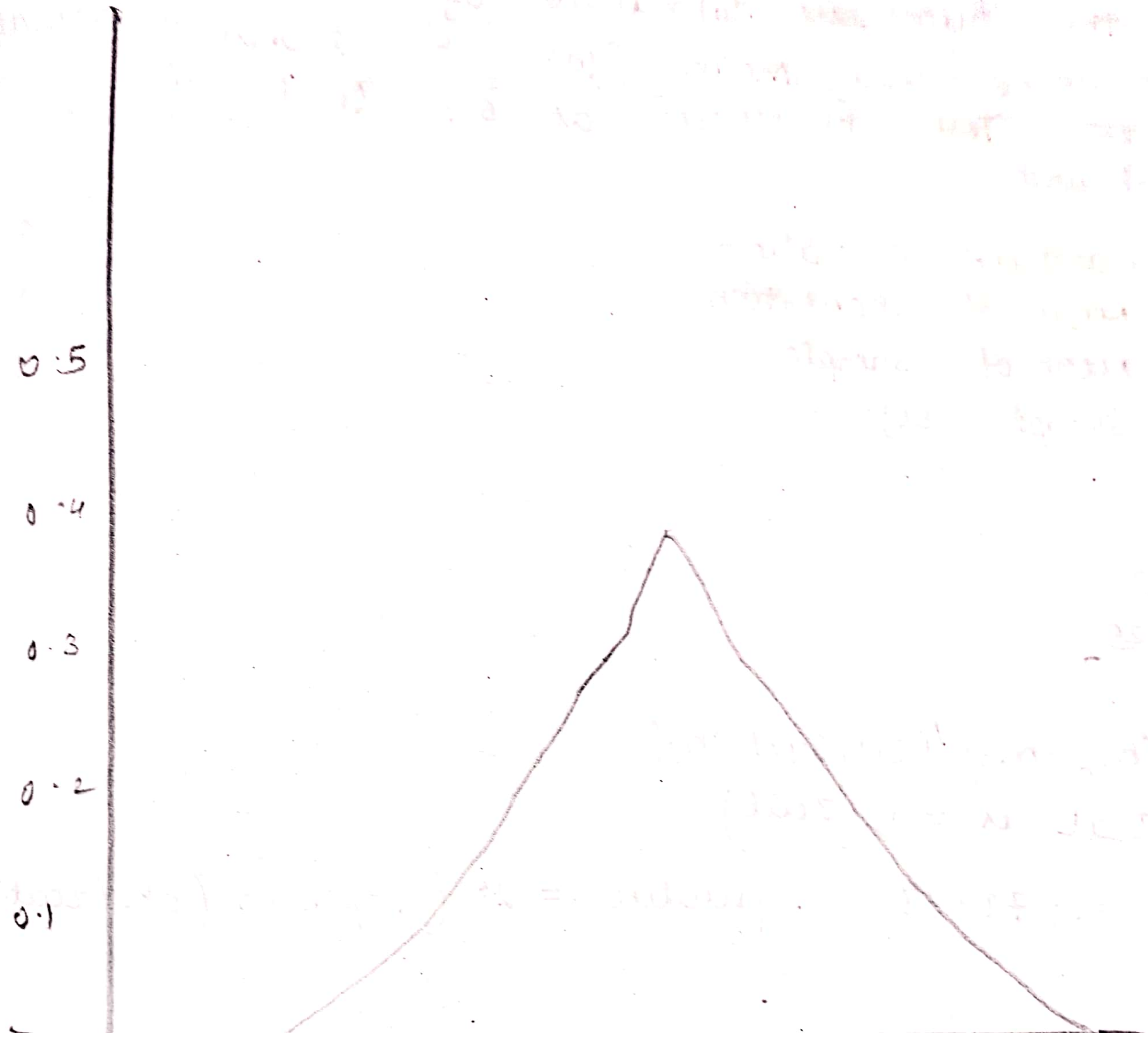
3) Generate 10 random numbers from normal distribution with mean = 60 & s.d = 5. also sample mean, variance, median & standard deviation.

Solution :-

```
> x norm (10,60,5)
> a m = mean(x)
> a.m
[1] 60.01123
> me = median (x)
> me
[1] 59.86623
> n =10
> variance =(n-1) * var(x) / n
> variance
[1]  44.45974
> s.d = sqrt (variance)
> sd
[1] 6.667814.
```

4] Draw the graph of standard normal distribution

```
> x = seq(-3, 3, by =0.1)
> y = dnorm(x)
> Plot (xy, xlab = " x values" ,ylab = " probability",
        main = standard normal graph.
```


0.5
0.4
0.3
0.2
0.1

Practical - 06

z - distribution

i) Test the hypothesis $(H_0) = \mu = 10$ against $H_1 : \mu \neq 10$ & standard deviation 2) Sample size = 400, mean = 10.2 & standard deviation = 2.25. Test hypothesis at 5% level of significance

→

s.d = standard deviation
mo = mean of population
mx = mean of sample
n = sample size.

```
> mo = 10
> mx = 10.2
> sd = 2.25
> n = 400
> zcal = (mx - mo)/(sd/sqrt(n))
> cat("zcal is =", zcal)
zcal is = 1.777778 > pvalue = 2*(1-pnorm(abs(zcal)))
> pvalue
[1] 0.07544036
```

Since the 0.07544036 is greater than 0 than we will accept the value.

2) Test the Hypothesis (H_0) : $\mu = 75$ against (H_1) : $\mu \neq 75$
at 5% level of significance

```
> m0 = 75
> mx = 80
> s.d = 3
> n = 100
> zcal( mx - m0) / (sd / sqrt(n))
> cat (" Zcal is : ", zcal)
Zcal is -66.6667
> pvalue = 2* (1-pnorm (abs(zcal)))
> pvalue
[1] 0
```

value accepted

3)

20	24	27	30	46	35	26	46	27	10	20
22	30	37	35	21	~~22~~	23	24	25	26	27
19	28	29	30	29	27	15	22	20	18	

```
> x = c( 20, 24, 27, 30, 46, 35, 26, 46, 27, 10, 20, 21, 30, 37,
  35, 21, 23, 24, 25, 26, 27, 19, 28, 29, 30, 29, 27, 15,
  22, 20, 18)
> mx = mean(x)
> mx
[1] 26.06667
> n = length(x)
> n
30
```

037

```
> variance =(n-1) * var(x)/n
> variance
[1] 52.995666
> sd= sqrt (variance)
> sd
[1] 7.279805
> mo = 25
> zcal =(mx-mo) /(sd / sqrt (n))
> cat ("zcal is =", zcal)
zcal is = 0.80254547
> pvalue
[1] 0.4222375
```

value accepted.

4)

```
> p =0.2
> q = 1-p
> p = 50/400
> n =400
> zcal =(p-P) /(sqrt (P*Q/n))
> cat ("zcal is :", zcal)
zcal is -3.75
> pvalue = 2*(1-pnorm (abs(zcal
> pvalue
[1] 0.0001768346
> p
[1] 0.125
```

value rejected.

5)

5)

```
> n = 200
> P = 0.5
> p = 0.56
> n = 200
> zcal = (p - P)/ (sqrt(P*q/n))
> cat ("zcal is :" zcal)
  zcal is 1.697056
> pvalue = 2* (1-pnorm(abs(zcal)))
> pvalue
[1]  0.08968602
> P
[1] 0.5
```

Ho accepted.

Practical-07

Large sample test:

1) A study of noise level in two hospital is calculated below. Test the hypothesis that the noise level in two hospital are same.

Hos A	Hos B
84	34
61	5
7	8

Ho the noise levels are same.

```
> n1 = 84
> n2 = 34
> mx = 61
> my = 59
> sdx = 7
> sdy = 8
> z = (mx-my)/sqrt((sdx^2/n1)+(sdy^2/n2))
> z
[1] 1.273682
> cat("z calculated is =", z)
z calculated is = 1.273682
> pvalue = 2*(1-pnorm(abs(z)))
> pvalue
[1] 0.2027 61
```

Since pvalue > 0.05 we accept Ho value at 5% level of significance

2) > n1 = 1000
> n2 = 2000
> mx = 67.5
> my = 68
> s.dx = 2.5
> s.dy = 2.5
> z = (mx - my) / sqrt((sdx^2/n1) + (sdy^2/n2))
> z
[1] -5.163978
> cat ("x Calculated is =", z)
> pvalue = 2* (1-pnorm (abs(z)))
> pvalue
[1] 2.417564e-07

∵ Pvalue > 0.5, we accept H_0 at 5% level of significance

3) H_0 = The proportion of the population are equal
> n1 = 400
> n2 = 500
> p1 = 0.2
> p2 = 0.155
> P = (n1 * p1 + n2 * p2) / (n1 + n2)
> P
[1] 0.175
> z = (p1 - p2) / sqrt(p*q*(1/n2 + 1/n2))
> z
[1] 1.76547

> cat ("z calculated is", z)
z calculated is 1.7654
> pvalue = 2* (1- pnorm (abs (z)))
> pvalue
[1] 0.07748487.
∴ H_0 value > 0 we accept H_0 at 5% level of significance.

4]. From each of the box of the apples a sample size of 200 is collected. It is found that there are 44 bad apples in first and 30 in second. Test the hypothesis.

→ H_0 The two box are equivalent.
> n_1 = 200
> n_2 = 200
> p_1 = 44/200
> P_2 = 30/200
> P = (n_1 * P_1 + n_2*P_2) /(n_1+n_2)
> P
[1] 0.185
> q = 1-p.
> q
[1] 0.815
> z
[1] 1.802741
> pvalue = 2* (1-pnorm (abs (z)))
> pvalue
[1] 0.07142888.
H_0 value is accepted.

6]

> Ho Heights of two classes are same.

```
> n1 = 60
> n2 = 50
> mx = 63.5
> my = 69.5
> sdx = 2.5
> sdy = 2.5
> z = (mx-my) / sqrt((sdx*2/n1) + (sdy*2/n2))
> z
[1] -12.53359
> pvalue = 2*(1-pnorm(abs(z)))
> pvalue
[1] 0
```

Since pvalue < 0.05, we reject Ho at 5% level of significance.

Practical - 08.

Small Sample Test

1] The tens are selected & height are found to be 63, 63, 68, 69, 71, 71, 72 cms Test the hypothesis that mean height is 66 cm or not at 1.

Ho mean = 66 cms

```
> mean =66
> x = c(63,63,68,69,71,71,72)
> t.test (x)
```

One sample t test

data : x

t = 47.94 , df = 6 , pvalue = 5.22e-09

alternative hypothesis : true mean is not equal to

95 percent confidence interval :

64.66479 71.62092

Sample estimates :

mean of x

68.14286

∴ pvalue < 0.01 is rejected in 1% level of signifi

2] Two random sample was drawn from two different population.

Sample 1 = 8, 10, 12, 11, 16, 15, 18, 7

Sample 2 = 20, 15, 18, 9, 8, 10, 11, 12

Test the hypothesis that there is no difference between population

> x = c(8, 10, 12, 11, 16, 15, 18, 7)
> y = c(20, 15, 18, 9, 8, 10, 11, 17)
> t.test(x, y)

Two sample t.test

data : x & y.

t = -036247, df = 13.887, pvalue = 0.7225

alternative hypothesis difference is not equal.

-5.192719 3.692719.

Sample estimates

12.125 12.875

Ho value is accepted.

3] following the weights of 10 people :-

Before (100, 125, 95, 96, 98, 102, 115, 104, 109, 110)
After (95, 80, 95, 98, 90, 100, 110, 85, 100, 101)

Ho The diet program is not effective.

> x = c(100, 125, 95, 96, 98, 102, 115, 104, 109, 110)
> y = c(95, 80, 95, 98, 90, 100, 110, 85, 100, 101)
> t.test(x, y, paired = T. alternative = "less")

Paired t.test.

data : x and y.

t = 2.3215, df = 9, p.value = 0.9773.

alternative hypothesis : true.

95 percent confidence interval

mean of the differences : 10 :

4] Marks before & after a training program
→ Before = (20, 25, 32, 28, 27, 36, 35, 25)
After = (30, 35, 32, 37, 37, 40, 40, 23)

Ho The training program is not effective.
> x = c(20, 25, 32, 28, 27, 36, 35, 25)
> y = c(30, 35, 32, 37, 37, 40, 40, 23)
> t.test (x, y, paired = T, alternative = "greater")
Paired t-test

data: x and y.
t = -3.3859, df = 7, p-value = 0.9942
alternative hypothesis: true.
interval:
-8.967339 Inf.
Sample estimates:
mean of difference
-5.75

5] →

Ho variance of population is not equal
> x = c(66, 67, 75, 76, 82, 84, 88, 90, 92)
> y = c(64, 66, 74, 78, 82, 85, 87, 92, 93, 95, 9[illegible]
> var. test (x, y)
F test to compare two variances.
data: x and y.
F = 0.70686, num df = 8. denom df = 10, P-val[illegible]
0.6359.

95 percent confidence interval:

0.1833632 3.0360393

ratio of variances

0.7068507

042

6]. The A.P of sample 100 observation is 52 out of if sd is 7 test the hypothesis that the population mean 55 or not at 5% level of significance.

Ho population mean = 55

```
> n=100
> mx =52
> m0= 55
> sd =7
> zcal = (mx - m0) /(sd / sqrt (n))
> pvalue = 2*(1-pnorm (abs (zcal))
> pvalue
[1] 1.82153e-05
```

Chi square distribution &

SAD

1) use the following data to test whether the cleanliness of home depend upon the childs condition or not :

		condition of home	
condition of child	clean	70	50
	fairly clean	80	20
	Dirty	35	45

Som :- H_0: condition of home & the child are independent.

```
> x = c (70, 80, 35, 50, 20, 45)
> m=3
> n = 2
> y = matrix( x, nrow = m, ncol = n)
> y
```

	[,1]	[,2]
[1,]	70	50
[2,]	80	20
[3,]	35	45

```
> pvalue = chisq.test(y)
> pvalue
```

data : y.
x-squared = 25.646, df = 2, pvalue = 2.698e-06
∴ Ho value is rejected.

2]. Table below shows the relation between the performance between mathematics and computer of cs students.

Maths

		HG	MG	LG
	HG	56	71	12
Computer	MG	47	163	38
	LG	14	42	85

→ Ho performance between maths & computer is indep
x = c (56, 47, 14, 71, 163, 38, 14, 42, 85)
m = 3
n = 3
Y = matrix (x, nrow = 3, ncol = 3)
y.

[1,] [1,2] [1,3]

i Q

x = read.csv("C:/users/admin/Desktop/m

x

	Stats	Calc
1	40	60
2	45	48
3	42	47
4	15	20
5	37	25
6	36	27
7	49	57
8	59	58
9	20	25
10	27	27

Practical -10.

Topic :-

Q following are the amounts of sulphur oxide emitted by a factory.

17, 15, 20, 29, 19, 18, 22, 25, 27, 9, 24, 20, 17, 6, 24, 14, 15, 23, 24, 26.

Apply sign test, to test the hypothesis that the population median is 21.5.

→ Ho : population median is 21.5.

H1 : It is less than 21.5.

```
x = c(17, 15, 20, 29, 19, 18, 22, 25, 27, 9, 24,
     20, 17, 6, 24, 14, 15, 23, 24, 26)
m = 21.5
sp = length(x[x>m])
sn = length(x[x<m])
n = sp + sn
n
[1] 20
pv = pbinom(sp, n, 0.5)
pv
[1] 0.4119015
```

∴ Since, p.value > 0.05, we accept the Ho 5% level of significance.

[note :- If the alternative is greater than median pv = Pbinom (sn, n, 0.5)]

9) For the observations 12, 19, 31, 28, 43, 40, 55, 49, 70, 63. Apply sign test to test p... median is 25 against the alternative ... than 25.

H_0 : median is 25.

H_1 : It is more than 25

```
x = c(12, 19, 31, 28, 43, 40, 55, 49, 70, 63)
m = 25
sp = length(x[x>m])
sn = length(x[x<m])
n = sp + sn
n
[1] 10
pv = pbinom(sn, n, 0.5)
pv
[1] 0.0546875
```

Since, p-value > 0.05, we accept the H_0 5% level of significance.

8] For the following data 60, 65, 63, 89, 61, 71, 5... 51, 48, 66. Test the hypothesis using wilcoxon's signed rank test. For testing the hypothesis median is 60 against the alternative it is greater than 60.

H_0 : Median is 60.

H_1 : It is greater than 60.

x = c(60, 65, 63, 89, 61, 71, 58, 51, 48, 66).

~~mu=60~~

mu = 60 :

wilcox.test (x, alter = "greater", mu = 60)

wilcoxon signed rank test with continuity correction.

data : x

V = 29, p-value = 0.2386

alternative hypothesis : true location is greater than 60.

since, p-value > 0.05, we accept the H_0 at 5% level of significance.