LAB

Binomial & Poisson distribution

1. for a random variable X with a binomial (20, 1/2) distribution, find the following probabilities.

(i) find Pr(X<8)

(ii) find Pr(X>12)

(iii) find Pr(8<=X<=10)

(i) → Pbinom(7, 20, 0.5)

[1] 0.131588

(ii) →

1 - Pbinom(12, 20, 0.5)

[1] 0.131588

(iii) →

sum(dbinom(8:10, 20, 0.5))

= ~~0.25+7+2+4~~

[1] 0.4565105

2.

X = no. of heads in 10 tosses

$\Rightarrow X(10, 0.5)$

(i) $P(X \geq 5) = 1 - P(X \leq 4)$

R code

```
> 1-pbinom(4,10,0.5)
[1] 0.623
```

(ii) $P(X = 5)$

R code

```
> dbinom(5,10,0.5)
[1] 0.246
```

(iii) $P(4 \leq X \leq 6)$

```
> sum(dbinom(4:6,10,0.5))
[1] 0.65625
```

3.) 'x' is no of students who used google as a source Given $n = 42$ $P = 0.558$ since $n = 42$,

i.) X follows poisson distribution with $\lambda = 42 \times 0.55$

4.) $P(x = 17)$

R code:-

```
> dpois(17,23.430)
[1] 0.0362
```

5) $P(X \leq 13)$

Rcode:-

```
> ppois(13, 23.436)
[1] 0.01413
```

6) $P(X > 11) = 1 - P(X \leq 11)$

Rcode:-

```
> 1 - ppois(11, 23.436)
[1] 0.9965
```

7) $P(X \geq 15) = 1 - P(X \leq 14)$

Rcode:-

```
> 1 - ppois(14, 23.436)
[1] 0.97439
```

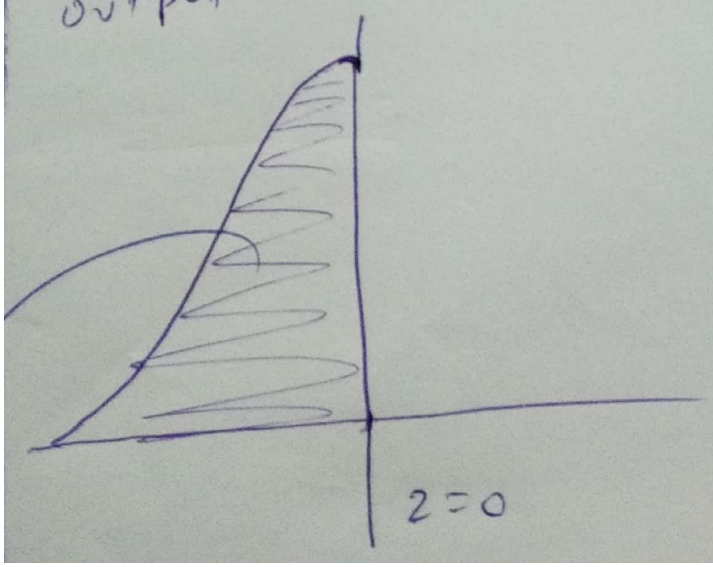
8) $P(16 \leq X \leq 19) = P(X \leq 19) - P(X \leq 15)$

```
> ppois(19, 23.436)
- ppois(15, 23.436)
[1]
```

8 find the area under the curve to left of the mean

```
> x = seq(-3, 3, length = 200)
> y = dnorm(x, mean = 0, sd = 1)
> plot(x, y, type = "l")
> x = seq(-3, 0, length = 100)
> y = dnorm(x, mean = 0, sd = 1)
> polygon(c(-3, x, 0),
    c(0, y, 0), col = "red")
# find area to the left of
  mean = 0 (it should be 0.5)
> pnorm(0, mean = 0, sd.
```

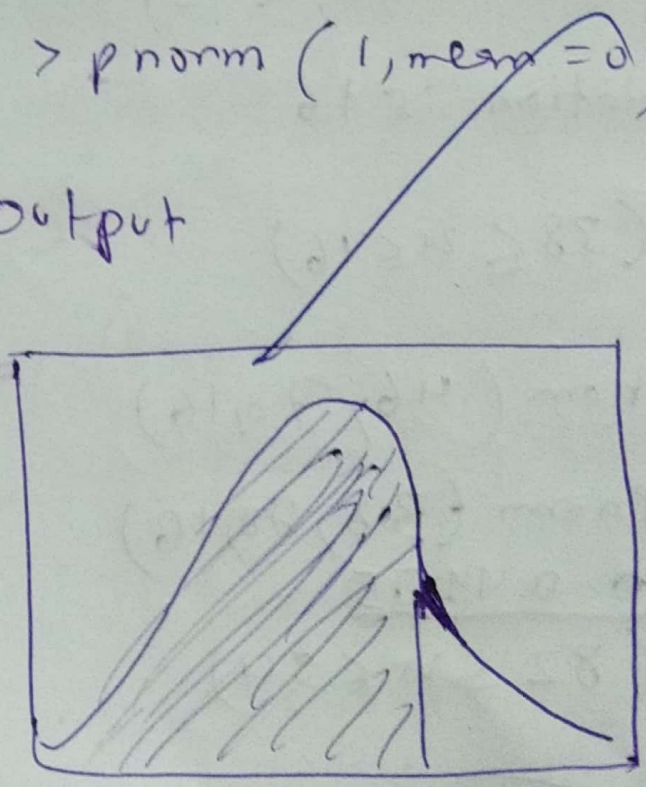
output



8. find the area to the left of 1.
first, draw an image, then compute

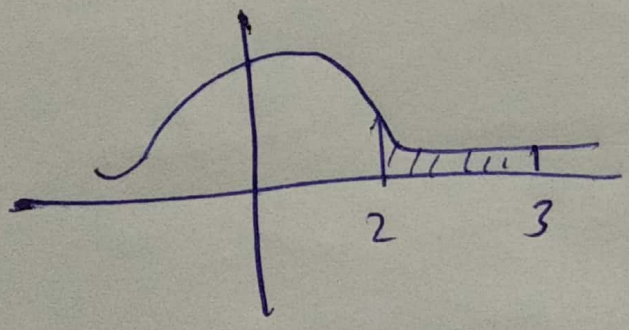
```
> x = seq (-3, 3, length=200)
> y = dnorm ( x, mean=0, sd=1)
> plot (x, y, type = "l")
> x = seq (-3, 1, length=100)
> y = dnorm (x, mean=0, sd=1)
> polygon (c(-3, x, 1), c(0, y, 0)
    , col = "red")
> pnorm (1, mean=0, sd=1)
```

output



Get the area to right of 2.

```
> x = seq(-3, 3, length = 200)
> y = dnorm(x, mean = 0, sd = 1)
> plot(x, y, type = "l")
> x = seq(2, 3, length = 100)
> y = dnorm(x, mean = 0, sd = 1)
> polygon(c(2, x, 3), c(0, y, 0), col = "red")
> 1 - pnorm(2, mean = 0, sd = 1)
```



PRACTICE PROBLEMS

Standard Normal distribution

1. Find (i) $P(0.8 \leq Z \leq 1.5)$

> pnorm(1.5, 0, 1)

- pnorm(0.8, 01)

0.147

(ii) $P(Z \leq 2)$

> pnorm(2, 0, 1)

0.977

(iii) $P(Z \geq 1)$

> pnorm(1, 0, 1)

0.158

2. If mean = 70 & standard deviation is 16

i) $P(38 \leq x \leq 46)$

> pnorm(46, 70, 16)

- pnorm(38, 70, 16)

[1] 0.044405

ii) $P(82 \leq x \leq 94)$

> pnorm(94, 70, 16)

- pnorm(82, 70, 16)

[1] 0.1598202

iii) $P(62 \leq x \leq 86)$

> pnorm(86, 70, 16) - pnorm(62, 70, 16)

Find $P(30 \leq x \leq 70)$ and sketch the graph

```
> x = seq(20, 80, length = 200)
> y = dnorm(x, mean = 50, sd = 10)
> plot(x, y, type = "l")
> x = seq(30, 70, length = 100)
> y = dnorm(x, mean = 50, sd = 10)
> polygon(c(30, x, 70), c(0, y, 0), col = "red")
> pnorm(70, mean = 50, sd = 10)
  - pnorm(30, mean = 50, sd = 1
```

output:

2. mean = 35

standard deviation = 5

no of students = 1000

(i) How many students marks lie between 25 & 40

(ii) How many students get more than 40

(iii) How many students get below 20

(iv) How many students get 50

R Code

> x = Seq (-3, 3, length = 200)

> y =

(i) > (Pnorm (40, 35, 5) - Pnorm (25, 35, 5)) * 1000

[1] 818.5946

(ii) > (1 - Pnorm (40, 35, 5)) * 1000

[1] 158.65

(iii) > (Pnorm (20, 35, 5)) * 1000

[1] 134.9898

(iv) > (dnorm (50, 35, 5)) * 1000

[1] 0.88 ≈ 1

~~x = 15.4~~

xbar = 18.4

n = 35

Sigma = 2.5

mu0 = 15.4

Z = (xbar