

Binomial & Poisson Distribution

1/2/19

1) i) $P(X < 8) = P(X \leq 7)$ Given $X = (20, 1/2)$

R code

`> pbinom(7, 20, 0.5)`

answer :- 0.131588

ii) $P(X > 12) = 1 - P(X \leq 12)$

R code

`> 1 - pbinom(12, 20, 0.5)`

answer :- 0.1315

iii) $P(8 \leq X \leq 10)$

R code

`> pbinom(10, 20, 0.5) - pbinom(7, 20, 0.5)`

answer :- 0.4565105

2) $X = \text{no. of heads in 10 tosses}$
 $\Rightarrow X(10, 0.5)$

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

R code

~~`> pbinom`~~ `> 1 - pbinom(4, 10, 0.5)`

answer :- 0.623

ii) $P(X = 5)$

R code

`> dbinom(5, 10, 0.5)`

answer :- 0.246

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

`> sum(dbinom(4:6, 10, 0.5))`

answer :- 0.65625

3) X' is no. of students who used Google as a source

Given $n=42$ $p=0.558$

since $n=42$,

1.) X follows poisson distribution, with $\lambda = 42 \times 0.558$

4.) $P(X=17)$

R code :-

`> dpois(17, 23.436)`

answer :- 0.0362

5.) $P(X \leq 13)$

R code :-

`> ppois(13, 23.436)`

answer :- 0.01413

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

R code :-

`> 1 - ppois(11, 23.436)`

answer :- 0.9965

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

R code :-

`> 1 - ppois(14, 23.436)`

answer :- 0.97439

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

R code :-

`> ppois(19, 23.436) - ppois(15, 23.436)`

answer :- 0

08/02/19

Normal Distributions

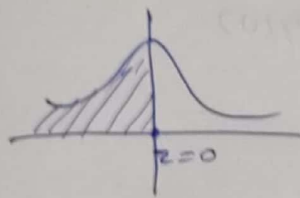
$dnorm(x, mean, sd)$:- at particular value

$pnorm(x, mean, sd)$:- at $x \leq \alpha$.

Question :- Find the area under the curve to the left of mean

Sol :- Since mean is not given, it implies STANDARD NORMAL DISTRIBUTION.

$P(Z < 0)$



R code:-

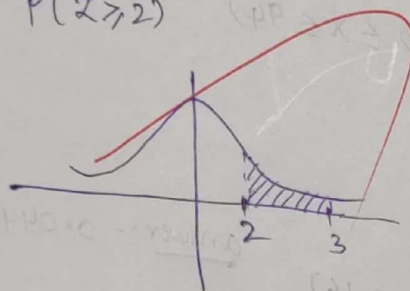
```
> x = seq(-3, 3, length = 200)
> y = dnorm(x, 0, 1)
> plot(x, y, type = "l")
> x = seq(-3, 0, length = 100)
> y = dnorm(x, 0, 1)
> polygon(c(-3, x, 0), c(0, y, 0), col = "red")
> pnorm(0, 0, 1)
```

Answer :- 0.5

question :- Get the area to the right of 2

sl

$P(Z > 2)$

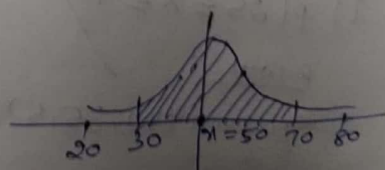


```
> x = seq(-3, 3, length = 200)
> y = dnorm(x, 0, 1)
> plot(x, y, type = "l")
> x = seq(2, 3, length = 100)
> y = dnorm(x, 0, 1)
> polygon(c(2, x, 3), c(0, y, 0), col = "red")
> 1 - pnorm(2, 0, 1)
```

Ex:-

$P(30 \leq X \leq 70)$

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



$$> \text{pnorm}(70, 50, 10) - \text{pnorm}(30, 50, 10)$$

Problems :-

1. i) $P(0.8 \leq Z \leq 1.5)$ ii) $P(Z \leq 2)$ iii) $P(Z \geq 1)$

i) R code:-

$$> \text{pnorm}(1.5, 0, 1) - \text{pnorm}(0.8, 0, 1)$$

answer :- 0

ii) R code:-

$$> \text{pnorm}(2, 0, 1)$$

answer :- 0.977

iii) R code:-

$$> 1 - \text{pnorm}(1, 0, 1)$$

answer :- 0.158

2. i) $P(38 \leq X \leq 46)$ ii) $P(82 \leq X \leq 94)$ iii) $P(62 \leq X \leq 86)$

$$\text{mean} = 70 \quad \text{SD} = 16$$

i) R code

$$> \text{pnorm}(46, 70, 16) - \text{pnorm}(38, 70, 16)$$

answer :- 0.044

ii) R code

$$> \text{pnorm}(94, 70, 16) - \text{pnorm}(82, 70, 16)$$

answer :- 0.159

iii) R code

$$> \text{pnorm}(86, 70, 16) - \text{pnorm}(62, 70, 16)$$

answer :- 0.532

3. Mean = 35 SD = 5

- i) $P(25 \leq X \leq 40)$

R code

$$> \text{pnorm}(40, 35, 5) - \text{pnorm}(25, 35, 5)$$

answer :-
0.818 X 10

ii) $P(X > 40)$

R code

$> 1 - \text{pnorm}(40, 35, 5)$

answer:-

0.158×1000

$= 158 \text{ students}$

$= 159 \text{ students}$

iii) $P(X < 20)$

R code

$> \text{pnorm}(20, 35, 5)$

answer:- 0.0013×1000

$= 1 \text{ student}$

iv) $P(X = 50)$

R code

$> \text{dnorm}(50, 35, 5)$

answer:- 0.0008×1000

$= 0 \text{ students}$

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