The Normal Distribution

**Description**

Density, distribution function, quantile function and random generation for the normal distribution with mean equal to mean and standard deviation equal to sd.

**Usage**

dnorm(x, mean = 0, sd = 1, log = FALSE)

pnorm(q, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)

qnorm(p, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)

rnorm(n, mean = 0, sd = 1)

**Problem1**. In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. assuming the distribution to be normal, find (i) how many score above 18 ? (ii) how many sc ore below 18 ?(iii) how many students score between 12 and 15 ?

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| --- |
| > n=1000  > mean=14  > sd=2.5  > Nd1=pnorm(18,14,2.5,lower.tail=F)  > Nd1  [1] 0.05479929  > ans1=n\*Nd1  > ans1  [1] 54.79929  > round(ans1)  [1] 55  x=seq(from=1,to=27,by=1)  y=dnorm(x,mean=14,sd=2.5)  plot(x,y,type="l",Col="blue",main="Normal Curve")    > abline(v=14,col="red")    x=seq(from=18,to=27,by=1)  y=dnorm(x,mean=14,sd=2.5)  polygon(c(18,x,27),c(0,y,0),col="yellow")    Solution(ii)  > Nd2=pnorm(18,14,2.5,lower.tail=T)  > Nd2  [1] 0.9452007  > ans2=n\*Nd2  > ans2  [1] 945.2007  > round(ans2)  [1] 945  **Graph**  x=seq(from=1,to=27,by=1)  y=dnorm(x,mean=14,sd=2.5)  plot(x,y,type="l",Col="blue",main="Normal Curve")    abline(v=14,col="red")    x=seq(from=1,to=18,by=1)  y=dnorm(x,mean=14,sd=2.5)  polygon(c(1,x,18),c(0,y,0),col="red")    Solution (iii)  Nd3=pnorm(15,14, 2.5, lower.tail=T)-pnorm(12,14,2.5, lower.tail=T)  > Nd3  [1] 0.4435663  > ans3=n\*Nd3  > ans3  [1] 443.5663  > round(ans3)  [1] 444 |
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| |  | | --- | | **Graph :**  x=seq(from=1,to=27,by=1)  y=dnorm(x,mean=14,sd=2.5)  plot(x,y,type="l",Col="blue",main="Normal Curve")    abline(v=14,col="red")    x=seq(from=12,to=15,by=1)  y=dnorm(x,mean=14,sd=2.5)  polygon(c(12,x,15),c(0,y,0),col="blue") | |

**Problem 2:** Suppose the weights of 900 male students are normally distributed with mean µ = 140 pounds and standard deviation 10 pounds. Find the number of students whose weights are (i) between 138 and 148 pounds (ii) more than 152 pounds.

To find the number of students whose weights are between 138 and 148 pounds

**i.e., P(138<X<148)= P(X=148)- P(X=138)**

**R – Command:-**

mu=140

> mu

[1] 140

> sd=10

> sd

[1] 10

> n=900

> n

[1] 900

> a=pnorm(138, mean = 140, sd=10)

> a

[1] 0.4207403

> b=pnorm(148, mean = 140, sd=10)

> b

[1] 0.7881446

> c=(b-a)

> c

[1] 0.3674043

> ans=(b-a)\*n

> ans

[1] 330.6639

round(ans)

[1] 331

(ii) To find the number of students whose weights more thab 152 pounds

**i.e., P(X<152)= 1- P(X=152)**

**R – Command:-**

d=pnorm(152, mean = 140, sd=10)

> d

[1] 0.8849303

> ans=(1-d)

> ans

[1] 0.1150697

> ans1=ans\*n

> ans1

[1] 103.5627

> round(ans1)

[1] 104

or

ans2=pnorm(152, mean = 140, sd=10,lower.tail=F)

> ans2

[1] 0.1150697

> ans3=(ans2\*n)

> ans3

[1] 103.5627

round(ans3)

[1] 104

**Output:-**

1. The number of students whose weights are (i) between 138 and 148 pounds

is 331

1. The number of students whose weights is more than 152 pounds is 104