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20BCD7138

Example-1

The speed of a file transfer from a server on campus to a personal computer at a student's home on a weekday evening is normally distributed with a mean of 60 kilobits per second and a standard deviation of four kilobits per second.

(a). What is the probability that the file will transfer at a speed of 68 kilobits per second or more?

(b). What is the probability that the file will transfer at a speed of less than 55 kilobits per second?

(a)

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> # MAT1011 Lab-4 (05-04-2022)
> # Example1
> x3=1-pnorm(68,mean=60,sd=4,lower.tail=TRUE)
> x3
[1] 0.02275013
> x4=pnorm(55,mean=60,sd=4,lower.tail=TRUE)
> x4
[1] 0.1056498

> x=seq(40,80,length=150)
> y=dnorm(x,mean=60,sd=4)
> plot(x,y, type="l")
> x=seq(68,100,length=150)
> y=dnorm(x,mean=60,sd=4)
> polygon(c(68,x,100),c(0,y,0),col="red")
> 1-pnorm(68,mean=60,sd=4,lower.tail="TRUE")
[1] 0.02275013
```
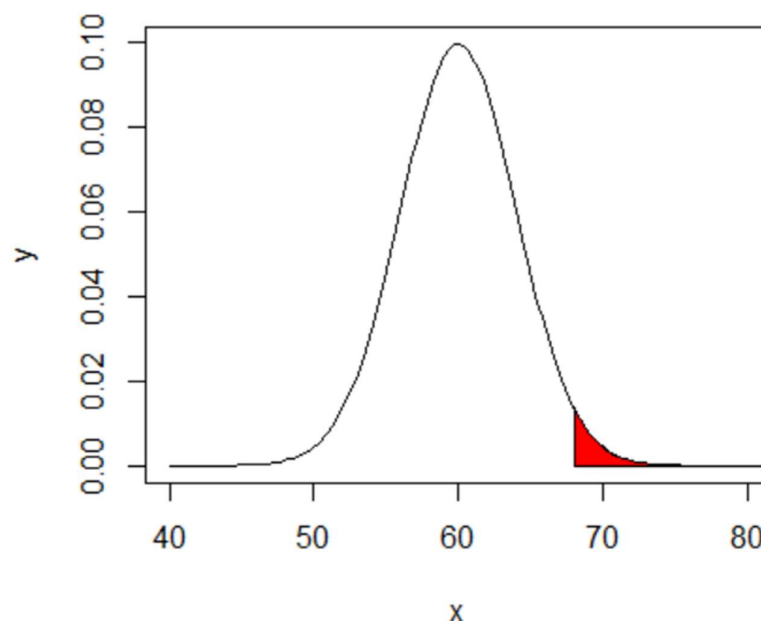
(b)

```
> x=seq(40,80,length=150)
> y=dnorm(x,mean=60,sd=4)
> plot(x,y,type="l")
> x=seq(10,55,length=150)
> y=dnorm(x,mean=60,sd=4)
> polygon(c(10,x,55),c(0,y,0),col="green")
> pnorm(55,mean=60,sd=4,lower>tail=TRUE)
Error: unexpected '=' in "pnorm(55,mean=60,sd=4,lower>tail="
> pnorm(55,mean=60,sd=4,lower.tail=TRUE)
[1] 0.1056498
```
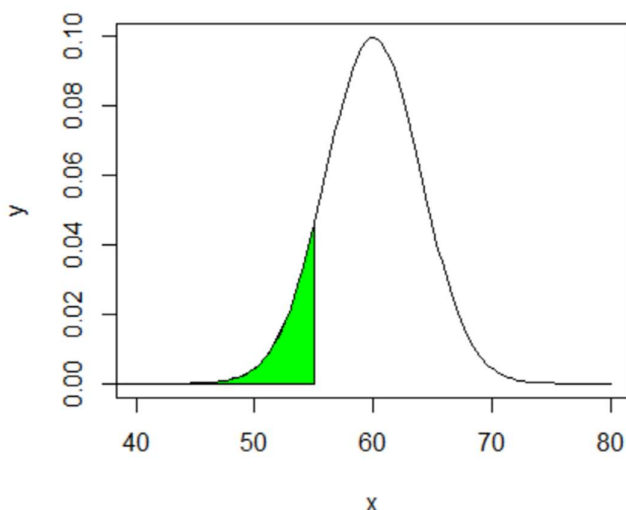

Example-2

```
> ## KHAN MOHD OWAIS RAZA (20BCD7138)
> # The masses of 300 students are normally distributed with mean 68 kgs
> # and standard deviation 3 kgs, how many students have masses
> # (i)greater than 72 kg                    P(x>72)*300
> # (ii)less than or equal to 64 kg          P(x<=64)*300
> # (iii)between 65 and 71 kg                P(65<x<71)*300
>
> 1-pnorm(72,mean=68,sd=3,lower.tail=TRUE)
[1] 0.09121122
> (1-pnorm(72,mean=68,sd=3,lower.tail=TRUE))*300
[1] 27.36337
> x=1-pnorm(72,mean=68,sd=3,lower.tail=TRUE)
> x=seq(40,90,length=150)
> y=dnorm(x,mean=68,sd=3)
> plot(x,y,type="l")
> x=seq(72,100,length=150)
> y=dnorm(x,mean=68,sd=3)
> polygon(c(72,x,100),c(0,y,0),col="blue")
```
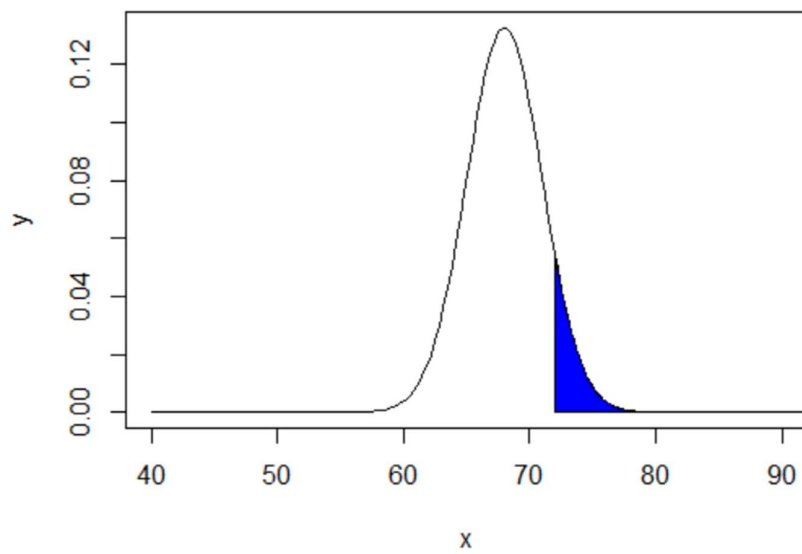
```
> # (ii)less than or equal to 64 kg
> x=pnorm(64,mean=68,sd=3,lower.tail=TRUE)
> x=seq(40,90,length=150)
> y=dnorm(x,mean=68,sd=3)
> plot(x,y,type="l")
> x=seq(64,100,length=150)
> y=dnorm(x,mean=68,sd=3)
> polygon(c(64,x,100),c(0,y,0),col="orange")
> pnorm(64,mean=68,sd=3,lower.tail=TRUE)
[1] 0.09121122
```
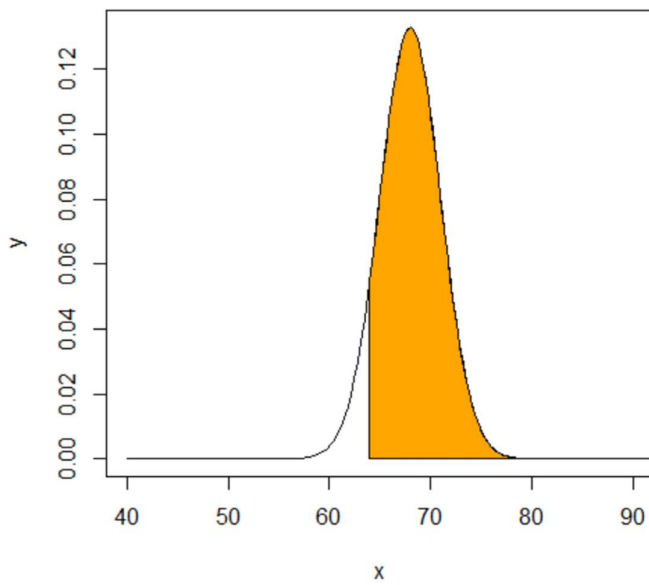
The P-value from the binomial test is P = 2*P[X>=31] which is same as 2*(1-P[X<30]), since P[X>=31] = 1-P[X<30]. Here n=41 and p=0.5. Find out normal distribution.

```
> # Khan Mohd Owais Raza 20BCD7138
> # MAT1011 Lab (Binomial Distribution)
> Prob <- 1 - pnorm( (30 + 1/2 - 41 * 0.5) / sqrt(41 * 0.50 * 0.5))
> Pvalue <- 2 *Prob
> Pvalue
[1] 0.001787289
> 2 * sum( dbinom(31:41, size = 41, prob = 0.5) )
[1] 0.001450491
> 2 * (1 - pbinom(30, size = 41, prob = 0.5))
[1] 0.001450491
```

What is the probability that a randomly chosen exam paper will have a "B" grade? Assume that "B" grade range is between 70% and 75%.

```
> pnorm(75, mean=70, sd=10)-pnorm(70, mean=70, sd=10)
[1] 0.1914625
```

Suppose that you have a machine that packages rice inside boxes. The process follows a Normal distribution and it is known that the mean of the weight of each box is 1000 grams and the standard deviation is 10 grams. Plot the normal distribution.

```
> # KHAN MOHD OWAIS RAZA 20BCD7138
> Mean <- 1000
> Sd <- 10
> x <- seq(-3, 3, length = 100) * Sd + Mean
> f <- dnorm(x, Mean, Sd)
> plot(x, f, type = "l", lwd = 2, col = "blue", ylab = "", xlab = "Weight")
> abline(v = Mean)
> pnorm(1010, Mean, Sd)
[1] 0.8413447
> 1 - pnorm(1010, Mean, Sd, lower.tail = FALSE)
[1] 0.8413447
```
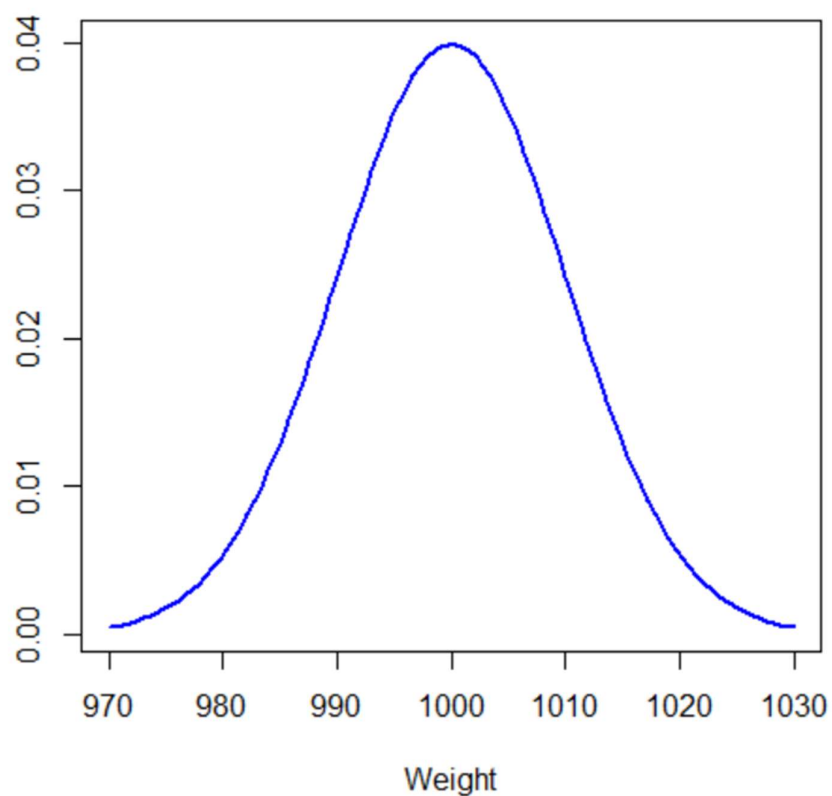
## 1] Calculate the probability of a box weighing more than 980 grams

```
> # KHAN MOHD OWAIS RAZA 20BCD7138
> pnorm(980, Mean, Sd, lower.tail = FALSE)
[1] 0.9772499
> 1 - pnorm(980, Mean, Sd)
[1] 0.9772499
> pnorm(1020, Mean, Sd)
[1] 0.9772499
> normal_area(mean = Mean, sd = Sd, lb = 980, acolor = rgb(0, 0, 1, alpha = 0.5))
```
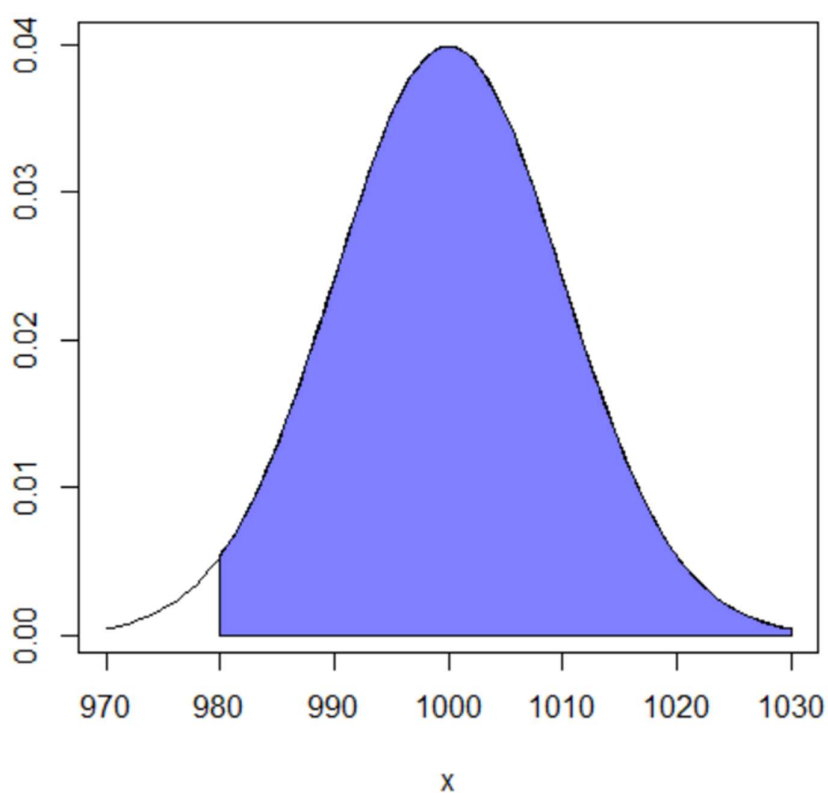
We have a sample with $\bar{Y} = 100$ and $\sigma = 5$. Compute normal distribution and plot the graph for the function.

```
> # KHAN MOHD OWAIS RAZA 20BCD7138
> data <- rnorm(n=10000, mean=100, sd=5)
> mean(data)
[1] 99.96372
> sd(data)
[1] 5.027273
> hist(data, main ="", col = "goldenrod1", xlim = c(80, 120), freq = FALSE,xlab = "")
>  curve(dnorm(x, mean=mean(data), sd=sd(data)), add=TRUE,col="darkblue", lwd=3)
> .
```
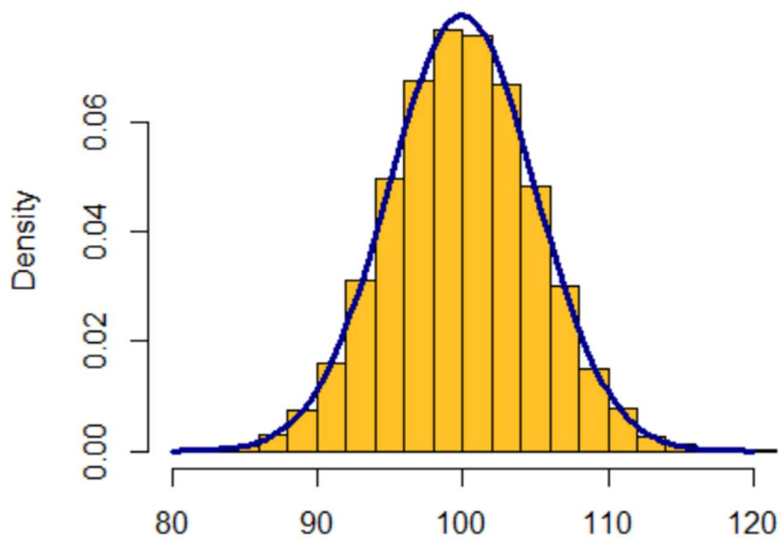

Question-5

Suppose IQ scores are normally distributed with mean 100 and standard deviation 15. What is the 95th percentile of the distribution of IQ scores?

```
> # KHAN MOHD OWAIS RAZA (20BCD7138)
> # MAT1011 Lab on 05-04-2022
> mean=100
> sd=15
> percentile=0.95
> qnorm(percentile, mean, sd)
[1] 124.6728
```