ASSIGNMENT-3

NAME: M Gyanada Chowdary

REG.NO: 21BCE7727

1. The serum cholesterol level X in 14-yearold boys has approximately a normal distribution with mean

170 and standard deviation 30. Plot the Normal Distribution diagram for each.

(a). Find the probability that the serum cholesterol level of a randomly chosen 14-Year old boy exceeds

230.

(b). In a middle school there are 300, 14-year-old boys. Find the probability that at Least 8 boys have

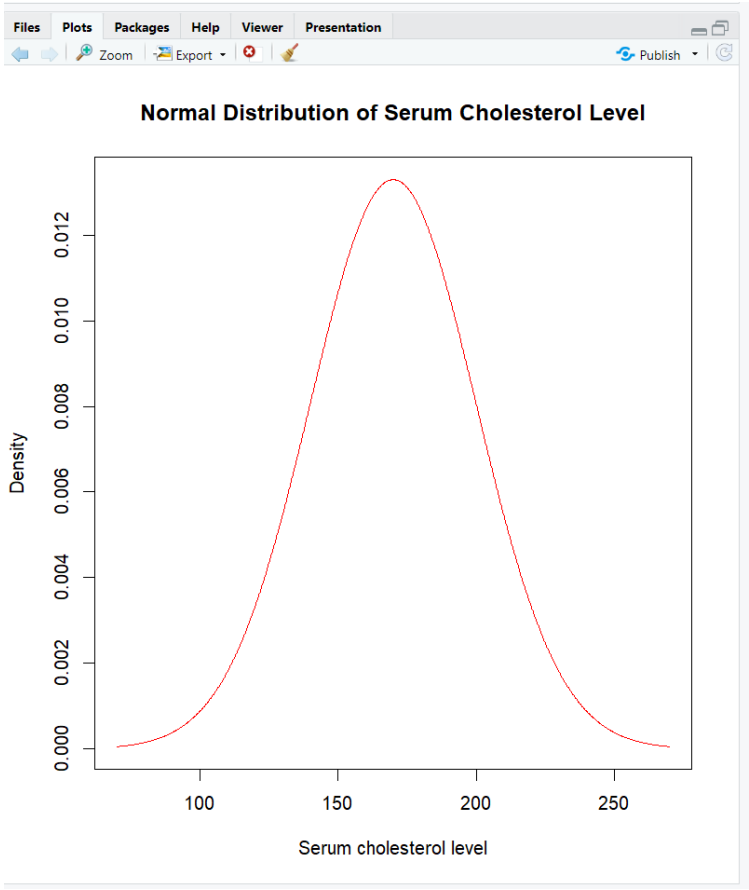
serum cholesterol level that exceeds 230.

CODE:

```
#21BCE7727
#M Gyanada Chowdary
x <- seq(70, 270, length = 1000);
y <- dnorm(x, mean = 170, sd = 30);
plot(x, y, type = "l", xlab = "Serum cholesterol level", ylab = "Density", main = "Normal Distribution of Serum Cholesterol Level",col='red');
#a)
1 - pnorm(230, mean = 170, sd = 30);
#b)
1 - pbinom(7, size = 300, prob = 0.02275);
```

```r
#21BCE7727
#M Gyanada Chowdary
x <- seq(70, 270, length = 1000);
y <- dnorm(x, mean = 170, sd = 30);
plot(x, y, type = "l", xlab = "Serum cholesterol level", ylab = "Density", main = "Normal Distribution of Serum Cholesterol Level",col='red')
#a)
1 - pnorm(230, mean = 170, sd = 30);
#b)
1 - pbinom(7, size = 300, prob = 0.02275);
```

GRAPH:



OUTPUT:

```
Console  Terminal  Background Jobs
R 4.2.2 · ~/
> #21BCE7727
> #M Gyanada Chowdary
> x <- seq(70, 270, length = 1000);
> y <- dnorm(x, mean = 170, sd = 30);
> plot(x, y, type = "l", xlab = "Serum cholesterol level", ylab = "Density", main = "Normal Distribution of Serum Cholesterol Level",col='red');
> #a)
> 1 - pnorm(230, mean = 170, sd = 30);
[1] 0.02275013
> #b)
> 1 - pbinom(7, size = 300, prob = 0.02275);
[1] 0.3749221
>
```

2. Lifetimes of batteries in a certain application are normally distributed with mean 50 hours and standard deviation 5 hours.

Find the probability that a randomly chosen battery lasts between 42 and 52 hours.

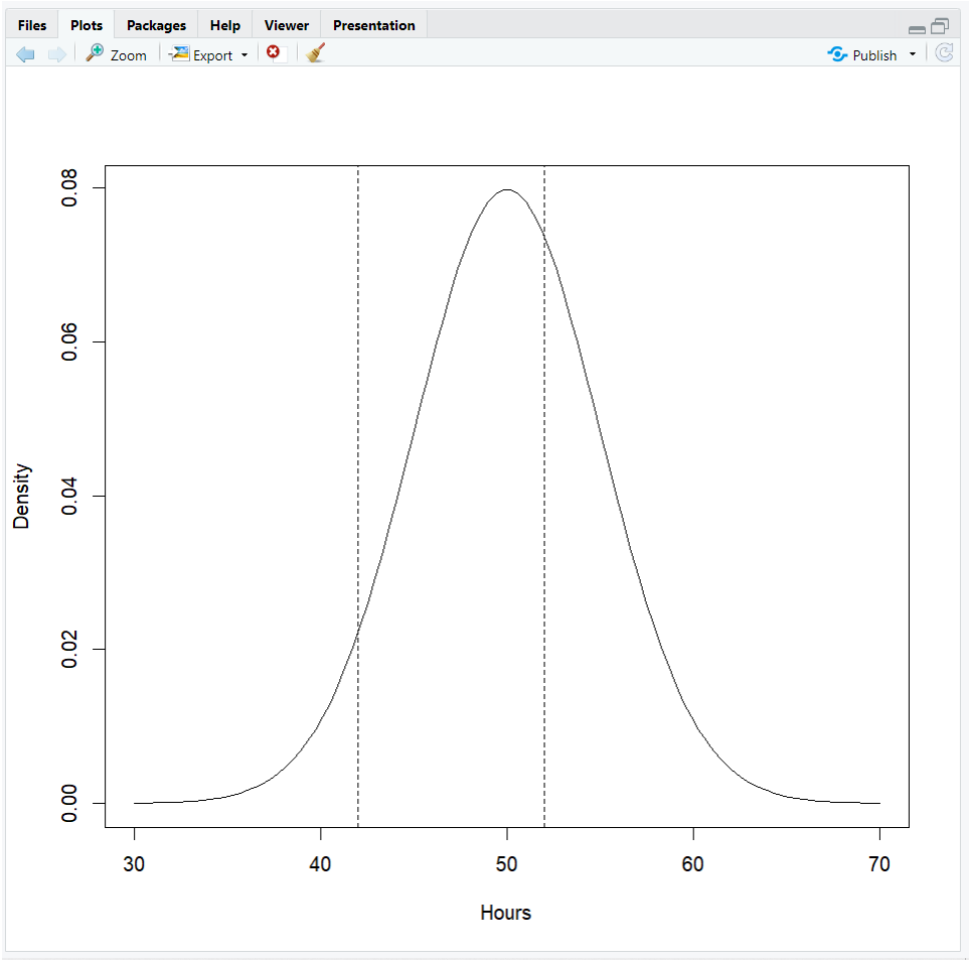
Plot the Normal Distribution diagram for the same.

CODE:

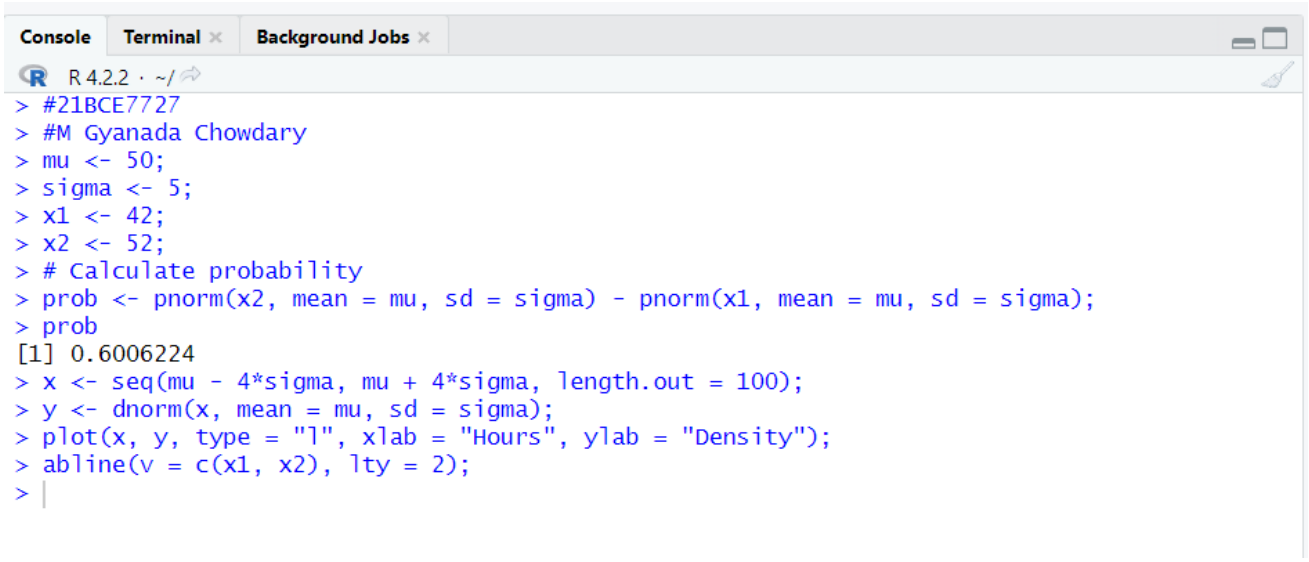
```
#21BCE7727
#M Gyanada Chowdary
mu <- 50;
sigma <- 5;
x1 <- 42;
x2 <- 52;

# Calculate probability
prob <- pnorm(x2, mean = mu, sd = sigma) - pnorm(x1, mean = mu, sd = sigma);
prob

x <- seq(mu - 4*sigma, mu + 4*sigma, length.out = 100);
y <- dnorm(x, mean = mu, sd = sigma);
plot(x, y, type = "l", xlab = "Hours", ylab = "Density");
abline(v = c(x1, x2), lty = 2);
```

```r
#21BCE7727
#M Gyanada Chowdary
mu <- 50;
sigma <- 5;
x1 <- 42;
x2 <- 52;

# Calculate probability
prob <- pnorm(x2, mean = mu, sd = sigma) - pnorm(x1, mean = mu, sd = sigma);
prob

x <- seq(mu - 4*sigma, mu + 4*sigma, length.out = 100);
y <- dnorm(x, mean = mu, sd = sigma);
plot(x, y, type = "l", xlab = "Hours", ylab = "Density");
abline(v = c(x1, x2), lty = 2);

```

GRAPH:



OUTPUT:



3. Suppose that X ~ N(10, 2). Find the values of

(a) P(X ≤ 10.34)

(b) P(X ≥ 11.98)

(c) P(7.67 ≤ X ≤ 9.90)

(d) P(|X − 10| ≤ 3)

(e) The value of x for which P(X ≤ x) = 0.81

(g) The value of x for which P(X ≥ x) = 0.04

(h) The value of x for which P(|X − 10| ≥ x) = 0.63

CODE:

#21BCE7727

#M Gyanada Chowdary

mu <- 10

sigma <- 2

(a) P(X <= 10.34)

```
z1 <- (10.34 - mu) / sigma
prob_a <- pnorm(z1)
prob_a

# (b) P(X >= 11.98)
z2 <- (11.98 - mu) / sigma
prob_b <- 1 - pnorm(z2)
prob_b

# (c) P(7.67 <= X <= 9.90)
z3 <- (7.67 - mu) / sigma
z4 <- (9.90 - mu) / sigma
prob_c <- pnorm(z4) - pnorm(z3)
prob_c

# (d) P(|X - 10| <= 3)
z5 <- (-3) / sigma
z6 <- 3 / sigma
prob_d <- pnorm(z6) - pnorm(z5)
prob_d

# (e) X for P(X <= x) = 0.81
prob_e <- 0.81
z7 <- qnorm(prob_e)
x_e <- z7 * sigma + mu
x_e

# (g) X for P(X >= x) = 0.04
prob_g <- 0.04
z8 <- qnorm(1 - prob_g)
```

x_g <- z8 * sigma + mu

x_g

(h) X for P(|X - 10| >= x) = 0.63

prob_h <- 0.63

z9 <- qnorm(1 - prob_h / 2)

x_h <- z9 * sigma

x_h

```r
#21BCE7727
#M Gyanada Chowdary
mu <- 10
sigma <- 2

# (a) P(X <= 10.34)
z1 <- (10.34 - mu) / sigma
prob_a <- pnorm(z1)
prob_a

# (b) P(X >= 11.98)
z2 <- (11.98 - mu) / sigma
prob_b <- 1 - pnorm(z2)
prob_b

# (c) P(7.67 <= X <= 9.90)
z3 <- (7.67 - mu) / sigma
z4 <- (9.90 - mu) / sigma
prob_c <- pnorm(z4) - pnorm(z3)
prob_c

# (d) P(|X - 10| <= 3)
z5 <- (-3) / sigma
z6 <- 3 / sigma
prob_d <- pnorm(z6) - pnorm(z5)
prob_d

# (e) X for P(X <= x) = 0.81
prob_e <- 0.81
z7 <- qnorm(prob_e)
x_e <- z7 * sigma + mu
x_e

# (g) X for P(X >= x) = 0.04
prob_g <- 0.04
z8 <- qnorm(1 - prob_g)
x_g <- z8 * sigma + mu
x_g

# (h) X for P(|X - 10| >= x) = 0.63
prob_h <- 0.63
z9 <- qnorm(1 - prob_h / 2)
x_h <- z9 * sigma
x_h
```

OUTPUT:

```
> #21BCE7727
> #M Gyanada Chowdary
> mu <- 10
> sigma <- 2
> # (a) P(X <= 10.34)
> z1 <- (10.34 - mu) / sigma
> prob_a <- pnorm(z1)
> prob_a
[1] 0.5674949
> # (b) P(X >= 11.98)
> z2 <- (11.98 - mu) / sigma
> prob_b <- 1 - pnorm(z2)
> prob_b
[1] 0.1610871
> # (c) P(7.67 <= X <= 9.90)
> z3 <- (7.67 - mu) / sigma
> z4 <- (9.90 - mu) / sigma
> prob_c <- pnorm(z4) - pnorm(z3)
> prob_c
[1] 0.3580517
> # (d) P(|X - 10| <= 3)
> z5 <- (-3) / sigma
> z6 <- 3 / sigma
> prob_d <- pnorm(z6) - pnorm(z5)
> prob_d
[1] 0.8663856
> # (e) X for P(X <= x) = 0.81
> prob_e <- 0.81
> z7 <- qnorm(prob_e)
> x_e <- z7 * sigma + mu
> x_e
[1] 11.75579
> # (g) X for P(X >= x) = 0.04
> prob_g <- 0.04
> z8 <- qnorm(1 - prob_g)
> x_g <- z8 * sigma + mu
> x_g
[1] 13.50137
> # (h) X for P(|X - 10| >= x) = 0.63
> prob_h <- 0.63
> z9 <- qnorm(1 - prob_h / 2)
> x_h <- z9 * sigma
> x_h
[1] 0.9634537
```

4. The resistance in milliohms of 1 meter of copper cable at a certain temperature is normally distributed

with mean μ = 23.8 and variance σ

2 = 1.28. Plot the Normal Distribution diagram for each.

(a) What is the probability that a 1-meter segment of copper cable has a resistance less than 23.0?

(b) What is the probability that a 1-meter segment of copper cable has a resistance greater than 24.0?

(c) What is the probability that a 1-meter segment of copper cable has a resistance between 24.2 and

24.5?

CODE:

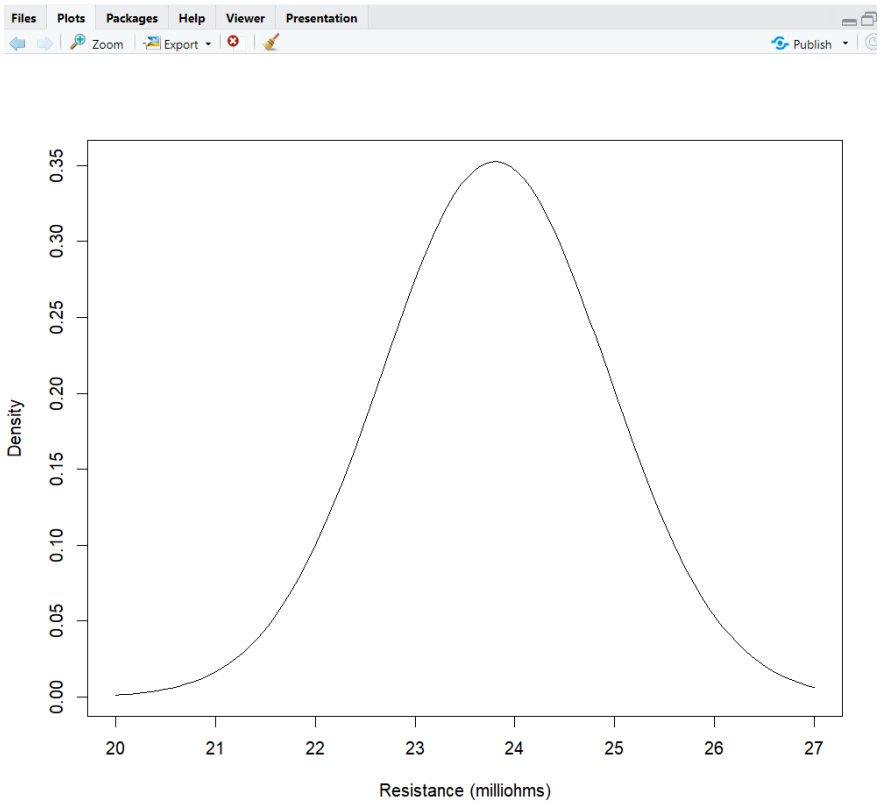
```
#21BCE7727
#M Gyanada Chowdary
mu <- 23.8;
sigma2 <- 1.28;
sigma <- sqrt(sigma2);

# (a) Probability of resistance less than 23.0
x1 <- 23.0;
z1 <- (x1 - mu) / sigma;
prob_a <- pnorm(z1);
prob_a

# (b) Probability of resistance greater than 24.0
x2 <- 24.0;
z2 <- (x2 - mu) / sigma;
prob_b <- 1 - pnorm(z2);
prob_b

# (c) Probability of resistance between 24.2 and 24.5
x3 <- 24.2;
x4 <- 24.5;
z3 <- (x3 - mu) / sigma;
z4 <- (x4 - mu) / sigma;
prob_c <- pnorm(z4) - pnorm(z3);
prob_c

# Plot normal distribution
x <- seq(20, 27, length=100);
```

y <- dnorm(x, mean=mu, sd=sigma);

plot(x, y, type="l", xlab="Resistance (milliohms)", ylab="Density");

```r
#21BCE7727
#M Gyanada Chowdary
mu <- 23.8;
sigma2 <- 1.28;
sigma <- sqrt(sigma2);

# (a) Probability of resistance less than 23.0
x1 <- 23.0;
z1 <- (x1 - mu) / sigma;
prob_a <- pnorm(z1);
prob_a

# (b) Probability of resistance greater than 24.0
x2 <- 24.0;
z2 <- (x2 - mu) / sigma;
prob_b <- 1 - pnorm(z2);
prob_b

# (c) Probability of resistance between 24.2 and 24.5
x3 <- 24.2;
x4 <- 24.5;
z3 <- (x3 - mu) / sigma;
z4 <- (x4 - mu) / sigma;
prob_c <- pnorm(z4) - pnorm(z3);
prob_c

# Plot normal distribution
x <- seq(20, 27, length=100);
y <- dnorm(x, mean=mu, sd=sigma);
plot(x, y, type="l", xlab="Resistance (milliohms)", ylab="Density");
```

GRAPH:



OUTPUT:

```
Console   Terminal   Background Jobs
R 4.2.2 · ~/
> #21BCE7727
> #M Gyanada Chowdary
> mu <- 23.8;
> sigma2 <- 1.28;
> sigma <- sqrt(sigma2);
> # (a) Probability of resistance less than 23.0
> x1 <- 23.0;
> z1 <- (x1 - mu) / sigma;
> prob_a <- pnorm(z1);
> prob_a
[1] 0.2397501
> # (b) Probability of resistance greater than 24.0
> x2 <- 24.0;
> z2 <- (x2 - mu) / sigma;
> prob_b <- 1 - pnorm(z2);
> prob_b
[1] 0.4298419
> # (c) Probability of resistance between 24.2 and 24.5
> x3 <- 24.2;
> x4 <- 24.5;
> z3 <- (x3 - mu) / sigma;
> z4 <- (x4 - mu) / sigma;
> prob_c <- pnorm(z4) - pnorm(z3);
> prob_c
[1] 0.09378587
> # Plot normal distribution
> x <- seq(20, 27, length=100);
> y <- dnorm(x, mean=mu, sd=sigma);
> plot(x, y, type="l", xlab="Resistance (milliohms)", ylab="Density");
>
```

--END---