How can linear interpolation be performed in R? Can you provide an example?

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Linear interpolation is a method used to estimate values between two known data points. In R, this can be performed by using the "approx" function, which takes in two vectors representing the x and y coordinates of the known data points. The function then calculates the linear interpolation for any given x value within the range of the known data points. An example of this would be:

x

Perform Linear Interpolation in R (With Example)

Linear interpolation is the process of estimating an unknown value of a function between two known values.

Given two known values (x1, y1) and (x2, y2), we can estimate the y-value for some point x by using the following formula:

y = y1 + (x-x1)(y2-y1)/(x2-x1)

The following example shows how perform linear interpolation in R.

Example: Linear Interpolation in R

Suppose we have the following data frame with x and y values in R:

#define data frame
df <- data.frame(x=c(2, 4, 6, 8, 10, 12, 14, 16, 18, 20),

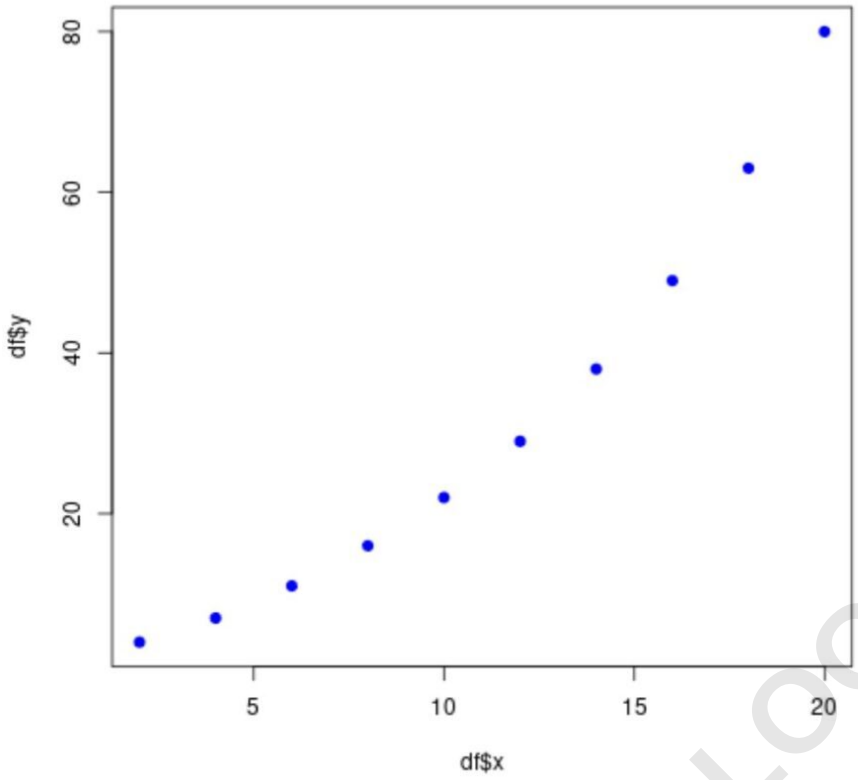
```
y=c(4, 7, 11, 16, 22, 29, 38, 49, 63, 80))

#view data frame
df
```

```
x y
1 2 4
2 4 7
3 6 11
4 8 16
5 10 22
6 12 29
7 14 38
8 16 49
9 18 63
10 20 80
```

We can use the following code to create a scatterplot to visualize the (x, y) values in the data frame:

```
#create scatterplot
plot(df$x, df$y, col='blue', pch=19)
```



Now suppose that we'd like to find the y-value associated with a new x-value of 13.

We can use the approx() function in R to do so:

```
#fit linear regression model using data frame
model <- lm(y ~ x, data = df)

#interpolate y value based on x value of 13
y_new = approx(df$x, df$y, xout=13)

#view interpolated y value
y_new
```

$x
13

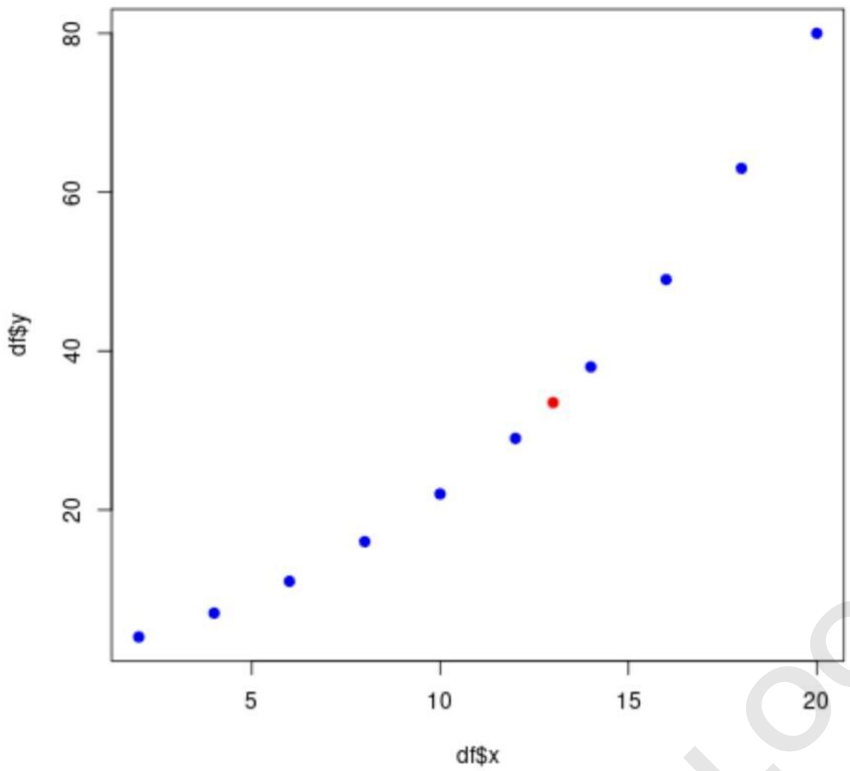
$y
33.5

The estimated y-value turns out to be 33.5.

If we add the point (13, 33.5) to our plot, it appears to match the function quite well:

```
#create scatterplot
plot(df$x, df$y, col='blue', pch=19)

#add the predicted point to the scatterplot
points(13, y_new$y, col='red', pch=19)
```



Additional Resources

The following tutorials explain how to perform other common tasks in R: