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Task 1

The researcher initially started by using the built in functions into R Studio to import the *vessels.csv* dataset. They then altered the imported dataset by removing the Licence.Category column as they were not interested in the data it held. They then used the `unique()` function to remove duplicated excess rows. They then wrote the cleaned data-set to a new csv file labelled *cleaned_vessels.csv* .

```
df <- subset(ves, select = -Licence.Category)

data <- unique(df)

write.csv(data, "cleaned_vessels.csv")
```

They found that the largest and smallest lengths of boats in the dataset were *199.65 m* and *10.04 m* respectively

```
longest_length <- max(cleaned_vessels$Overall.length)

longest_length

min_length <- min(cleaned_vessels$Overall.length)

min_length


199.65

10.04
```

They found that *99* duplicates were removed from the original data set using the `unique()`and `nrow()` functions. The unique() function removed the duplicates, then they used the `nrow()` function on both the original and the cleaned data set finding the difference in rows was 99 and hence the number of rows removed as duplicates.

Furthermore, they found the most common vessel name to be *KINGFISHER.* They used the table() function to create a frequency table, from which they were able to calculate the name of the vessel which appeared the most in the *Vessel.name* collum using the `max()` function.

```
vessel_freq <-table(cleaned_vessels$Vessel.name)

mode_vessel<-names(vessel_freq)[which.max(vessel_freq)]

mode_vessel

KINGFISHER
```

Task 2

The Researcher was tasked with splitting the data up into two subsets based on the location of the home port. They used the `subset()` function in R to create a subset of *cleaned_vessles*, `Home.port== " … "` creates the subset based on the name of the home port. In this case, the desired home ports were *ARGLASS* and *NEWLYN.*

```
Ardglass<- subset(cleaned_vessels,Home.port== "ARDGLASS")

Ardglass
```

```
Newlyn <- subset(cleaned_vessels,Home.port =="NEWLYN")

Newlyn
```

Then they had to find the number of vessels that Ardglass or Newlyn as the home port. Simply using the `nrow()` function on the newly created subsets was the easiest way to find the required information. It was found that Ardglass had *18* vessels that identified it as the home port while Newlyn had a much greater *52* vessels.

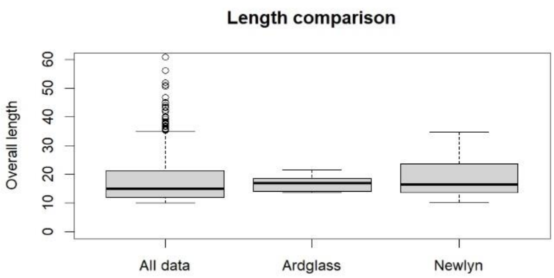
```
num_rows_arglass <- nrow(Ardglass)

num_rows_arglass

num_rows_newlyn <- nrow(Newlyn)

num_rows_newlyn
```

```
18

52
```

The researcher chose to use a boxplot to compare the different data-sets. They limited the y variable between 0 and 1500, as it led to the boxplot not being able to be properly analysed.

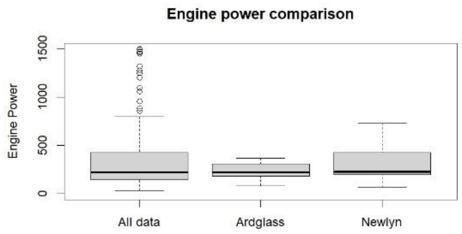
From the length boxplot, they determined that Newlyn was fairly standard compared to the complete data. However, they noted that Ardglass had a slightly greater mean length while also having a much tighter interquartile range, implying low dispersion in the central portion of the dataset.

```
boxplot(cleaned_vessels$Overall.length, Ardglass$Overall.length,
Newlyn$Overall.length, names=c("All data", "Ardglass","Newlyn"),
ylim=c(0,60), main="Length comparison", ylab="Overall length")
```



For engine power, again it’s important to note that Ardglass had a much tighter interquartile range and a smaller range. For Newlyn, the researcher comments on the clear negative skew pulling the mean towards the bottom of the interquartile range implying there may be a few very small values pulling the mean down. Hence the researcher has established Newlyn to be suitably typical.

```
boxplot(cleaned_vessels$Overall.length, Ardglass$Overall.length,
Newlyn$Overall.length, names=c("All data", "Ardglass","Newlyn"),
ylim=c(0,60), main="Length comparison", ylab="Overall length")
```

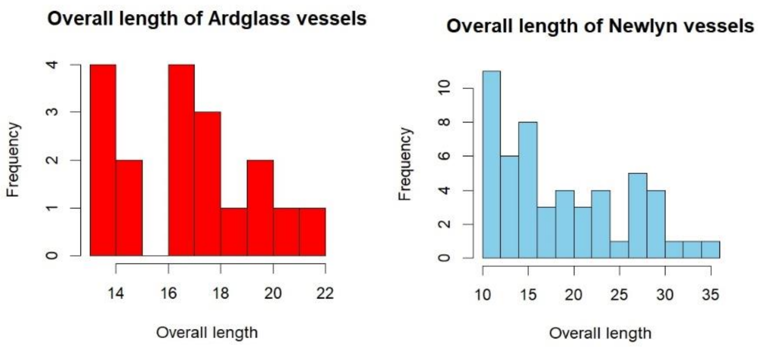


Task 3

Here the researcher was tasked to compare overall lengths and engine powers of vessels in the two ports. They used histograms and specifically didn't restrict the ranges of any of the values as they wanted to have an accurate portrayal of the data in hand. They used *10* breaks for all the histograms to keep it constant across all the data.

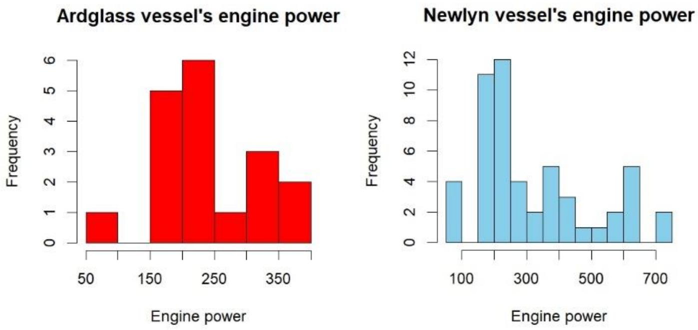
```
hist(Ardglass$Overall.length, main="Overall length of Ardglass vessels", xlab="Overall length", col="red", breaks = 10)

hist(Newlyn$Overall.length, main="Overall length of Newlyn vessels", xlab="Overall length", col="skyblue", breaks = 10)

hist(Ardglass$Engine.power, main="Ardglass vessel's engine power", xlab="Overall length", col="red", breaks = 10)

hist(Newlyn$Engine.power,main="Newlyn vessel's engine power", xlab="Overall length", col="skyblue", breaks = 10)
```

They came to the conclusion that despite having different number of datapoints, both the vessels' lengths are similarly distributed, both showing greater frequencies at the lower lengths then a tapering off as the lengths increase, implying for both ports that there are greater numbers of boats in the *10-16* range



For the engine power, they found that both the ports had a very similar distribution with the largest peaks around *150-250* range. No vessels in the *100-150* range and then a taper off in the number of vessels as the lengths increase after the 2 large peaks.

It is clear there is also a strong relation between the engine power and the overall length of the vessels, as the histograms all follow the same patterns and trends clearly showing how engine power and length of a vessel are linked together.



Task4

For the final task the researcher had to preform a welch t-test two different ways. First calculating the test statistic manually and then secondly using the built in `t.test()` function.

Firstly, for the engine power of the vessels they found that p-value was *0.0074832* and hence there was sufficient evidence at the *5%* level to reject the null hypothesis and instead accept the alternative hypothesis. Using the equation for the test statistic and assigning variables to the related values, they found the t value was *-2.763119* which relates to the p-value of *0.0074832*.

```
Ard_mean <- mean(Ardglass$Engine.power)

New_mean <- mean(Newlyn$Engine.power)

Ard_var <- var(Ardglass$Engine.power)

New_var <- var(Newlyn$Engine.power)

result <- (Ard_mean - New_mean) / ((Ard_var)/18 + (New_var)/52)^0.5

result


-2.76319
```

Next using the built in `t.test()` function they found that the t-value was *2.7632* and the relating p-value was *0.00748*. Here, `var.equal = FALSE` means the function doesn't assume the variances are equal which is critical when preforming a t-test.

```
result <- t.test(Ardglass$Engine.power, Newlyn$Engine.power,
var.equal = FALSE)

p_value<- result$p.value

p_value


0.00748
```

The same approach was again taken to perform a t-test on the overall length of the vessels. Instead of using `Engine.power` they used `Overall.length` and found a p-value of *0.0912844* and *0.09128* , respectively to the two methods, finding there was insufficient evidence at the *5%* level to reject the null hypothesis.

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