1.

```
df <- data.frame(s1=c(92,90,87,105,86,83,102),
+                 s2=c(100,108,98,110,114,97,94),
+                 s3=c(143,149,138,136,139,120,145),
+                 s4=c(147,144,160,149,152,131,134),
+                 s5=c(142,155,119,134,133,146,152))
>
> aov <- aov(c(df$s1, df$s2, df$s3, df$s4, df$s5) ~ rep(1:5, each=7))
>
> summary(aov)
                    Df Sum Sq Mean Sq F value   Pr(>F)
rep(1:5, each = 7)   1  13386   13386   72.24 8.04e-10 ***
Residuals           33   6115     185
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
>




    >
```

p-value is much less than the 0.01 significance level, we reject the null hypothesis and believe that there is a significant variation in the mean pullout force across the five studs

F-statistic has a large value of 72.24, further supporting the rejection of the null hypothesis.

2.
```
> birds <-
list(sparrow=c(22,23.9,20.9,23.8,25,24,21.7,23.8,22.8,23.1,23.1,23.5,23,23),

+
robin=c(21.8,23,23.3,22.4,23,23,23,22.4,23.9,22.3,22,22.6,22,22.1,21.1,23),

+
wren=c(19.8,22.1,21.5,20.9,22,21,22.3,21,20.3,20.9,22,20,20.8,21.2,21))

>

> aov <- aov(unlist(birds) ~ rep(names(birds), sapply(birds, length)))

> summary(aov)
```

```
                                   Df Sum Sq Mean Sq F value   Pr(>F)

rep(names(birds), sapply(birds, length))  2  31.11  15.556   22.33 2.48e-07 ***

Residuals                                42  29.26   0.697

---

Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

>
```

p-value is less than 0.01, so we reject the null hypothesis Therefore, w there is a significant difference in the mean egg length among at least two of the 3 bird species

F value is also really high again which supports rejection