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

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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