Milgram

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Milgram

reference:
- Cannon, et al., Stat2, chapter 07, example 8.7, 8.11

Import the data.

```
data <- read.csv("Milgram.csv", header=TRUE)
head(data, 4)
```

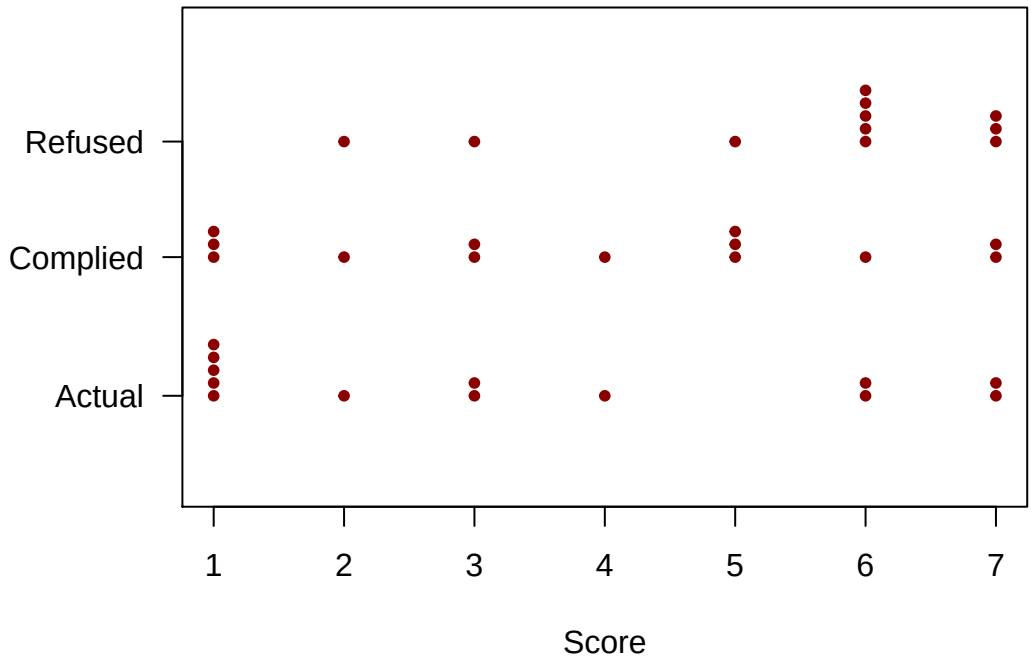
```
##   Results Score
## 1  Actual     6
## 2  Actual     1
## 3  Actual     7
## 4  Actual     2
```

```
dim(data)
```

```
## [1] 37  2
```

View the data.

```
oldpar <- par(mar=c(4, 6, 3, 2))
stripchart(Score ~ Results, data=data,
           ylim=1:2, at=c(1.2, 1.5, 1.75), pch=20,
           las=1, method="stack", col="darkred")
```



```
par(oldpar)
Milgram.means <- with(data, tapply(Score, Results, mean))
Milgram.means
```

```
##   Actual Complied  Refused
## 3.307692 3.846154 5.545455
```

ANOVA.

```
Milgram.aov <- aov(Score ~ Results, data=data)
options(show.signif.stars=FALSE)
summary(Milgram.aov)
```

```
##             Df Sum Sq Mean Sq F value Pr(>F)
## Results      2  31.84  15.919   3.488 0.0419
## Residuals   34 155.19   4.564
```

```
Milgram.lm <- lm(Score ~ Results, data=data)
F.observed <- summary(Milgram.lm)$fstatistic[1]
F.observed
```

```
##    value
## 3.487685
```

Randomize the data and test again.

```
new.data <- data
new.data$Score <- sample(new.data$Score)      # randomize
new.Milgram.aov <- aov(Score ~ Results, data=new.data)
summary(new.Milgram.aov)
```

```
##             Df Sum Sq Mean Sq F value Pr(>F)
## Results      2   6.78   3.388   0.639  0.534
## Residuals   34 180.25   5.302
```

```
new.Milgram.lm <- lm(Score ~ Results, data=new.data)
summary(new.Milgram.lm)
```

```
##
## Call:
## lm(formula = Score ~ Results, data = new.data)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3.8182 -1.9231  0.1818  2.1538  3.1538
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)      3.92308    0.63860   6.143 5.62e-07
## ResultsComplied -0.07692    0.90312  -0.085    0.933
```

```
## ResultsRefused   0.89510    0.94327   0.949    0.349
##
## Residual standard error: 2.303 on 34 degrees of freedom
## Multiple R-squared:  0.03623,    Adjusted R-squared:  -0.02047
## F-statistic: 0.639 on 2 and 34 DF,  p-value: 0.534
```

```
summary(new.Milgram.lm)$fstatistic
```

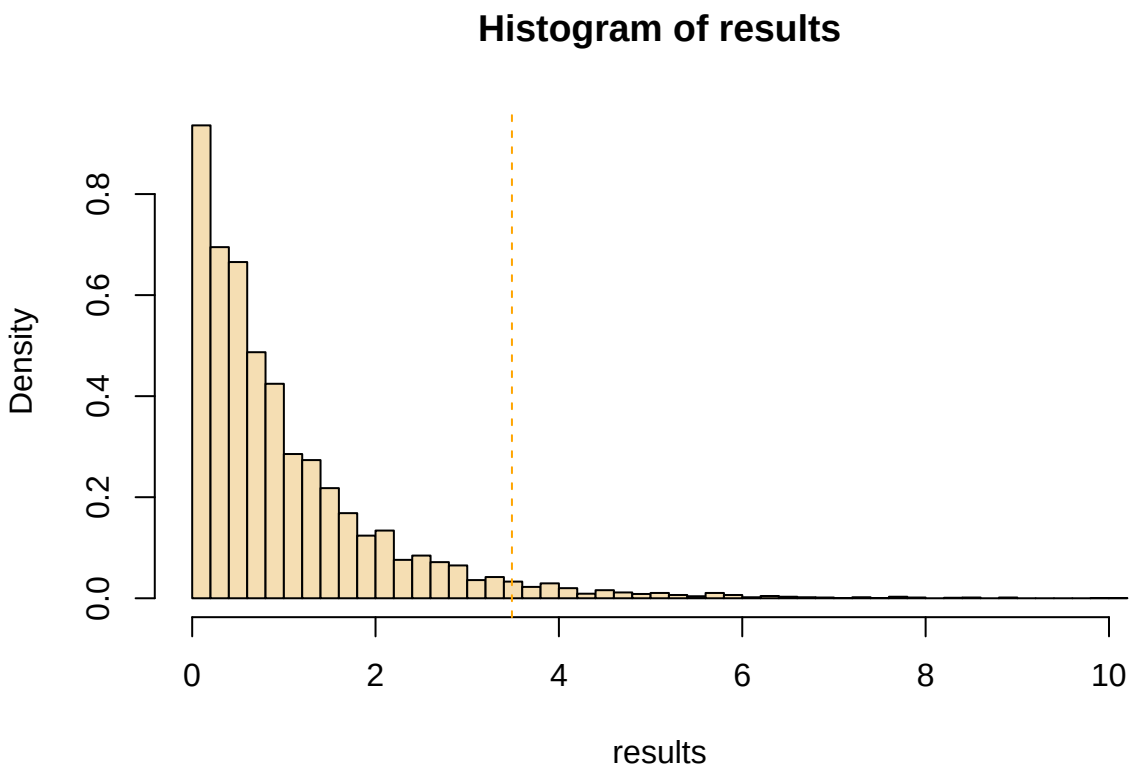
```
##      value      numdf      dendf
##  0.6389937  2.0000000 34.0000000
```

```
F.rand <- summary(new.Milgram.lm)$fstatistic[1]
F.rand                                          # new F
```

```
##     value
## 0.6389937
```

Randomization F-test.

```
n.experiments <- 10000
results <- rep(NA, n.experiments)
for (i in 1:n.experiments){
  new.data <- data
  new.data$Score <- sample(new.data$Score)      # randomize
  new.Milgram.lm <- lm(Score ~ Results, data=new.data)
  F.rand <- summary(new.Milgram.lm)$fstatistic[1]
  results[i] <- F.rand                            # new F
}
hist(results,
     freq=FALSE, breaks=60, col="wheat")
abline(v=F.observed, lty=2, col="orange")
```

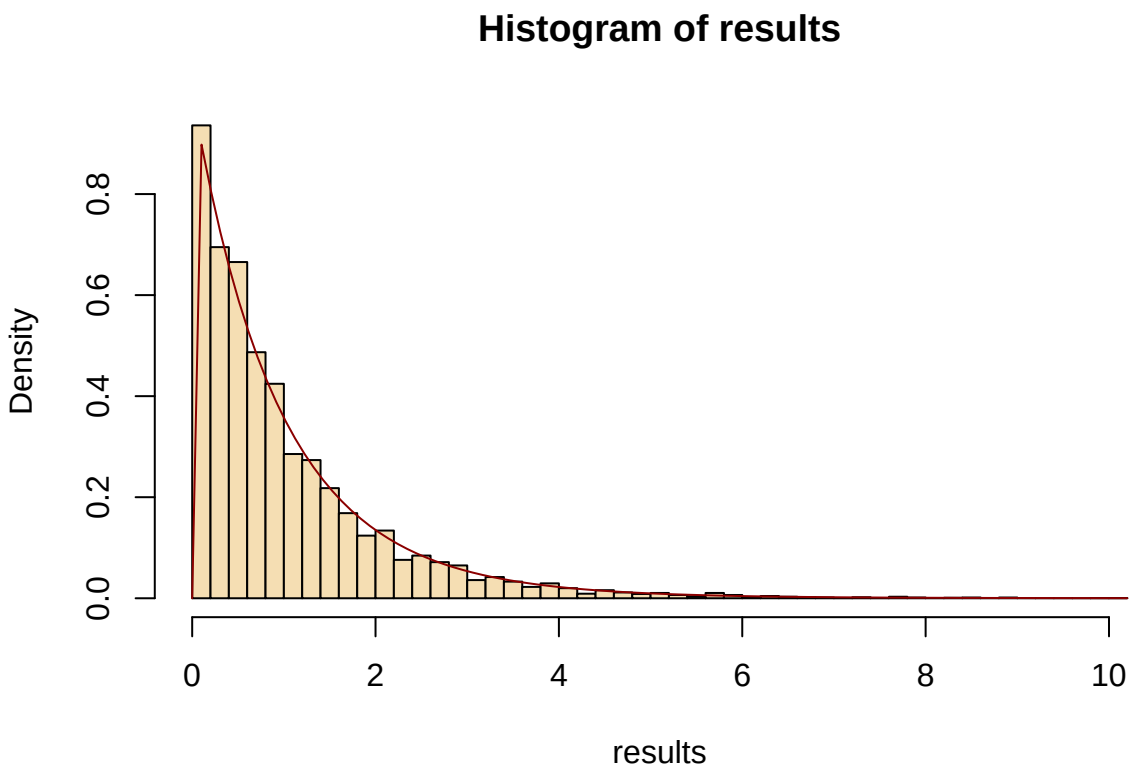



```
p.value <- sum(results >= F.observed) / n.experiments
p.value
```

```
## [1] 0.0399
```

Comparison with F distribution.

```
hist(results,
     freq=FALSE, breaks=2 * 31, col="wheat")
curve(df(x, df1=2, df2=34), col="darkred", add=TRUE)
```


Histogram of results
Density
0.0
0.2
0.4
0.6
0.8
0
2
4
6
8
10
results