Statistical Methods 2 Homework 1

2023-01-19

Loadings possible useful libraries

```
library(ggplot2)
library(Sleuth3)
library(MASS)
```

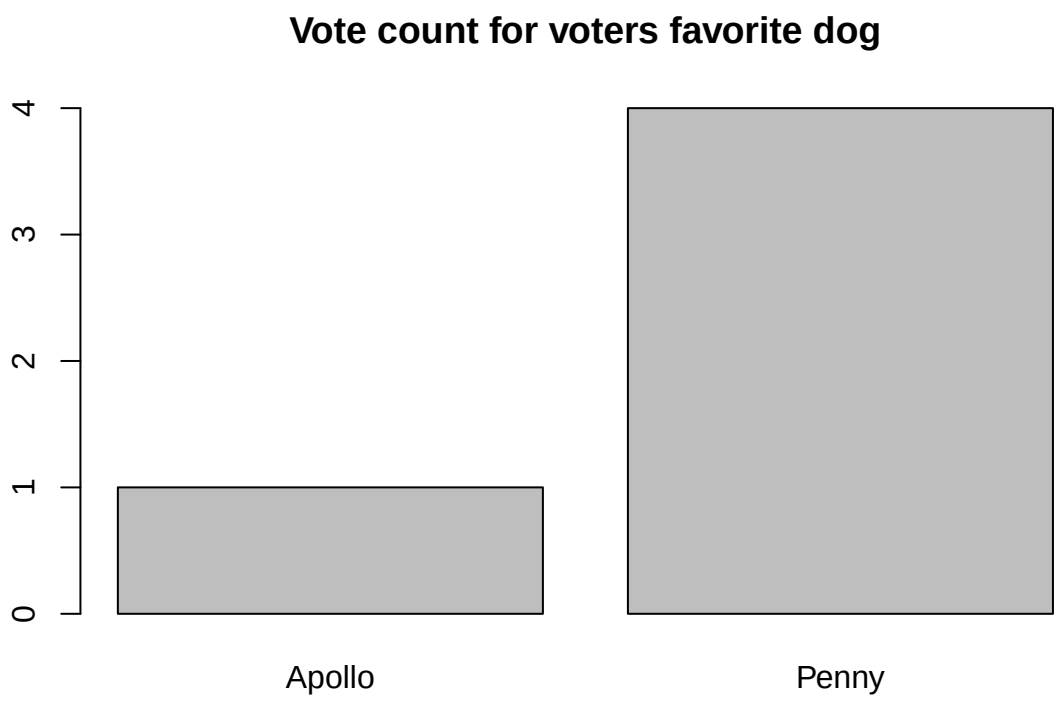
a)

```
#voting for favorite dog
name_of_voter <- c("Luis", "Fob", "Bob", "Rob", "Lob") #unique voters voting
fav_dog_data <- c("Apollo", "Penny", "Penny", "Penny", "Penny") #voters favorite dog
weight_in_kg <- c(1,10,20,30,40) #weight in kg of voter

df <- data.frame(name_of_voter,fav_dog_data,weight_in_kg)

print(df)
```

```
##   name_of_voter fav_dog_data weight_in_kg
## 1          Luis       Apollo            1
## 2           Fob        Penny           10
## 3           Bob        Penny           20
## 4           Rob        Penny           30
## 5           Lob        Penny           40
```

b)

```r
plot(x = factor(df$fav_dog_data), main = "Vote count for voters favorite dog")
```



c)

```r
mammals <- mammals
fit <- lm(brain ~ body, data=mammals)
summary(fit)
```

```
##
## Call:
## lm(formula = brain ~ body, data = mammals)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -810.07  -88.52  -79.64  -13.02 2050.33
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 91.00440   43.55258    2.09   0.0409 *
## body         0.96650    0.04766   20.28   <2e-16 ***
## ---
## Signif. codes:  0 ’***’ 0.001 ’**’ 0.01 ’*’ 0.05 ’.’ 0.1 ’ ’ 1
```

```
##
## Residual standard error: 334.7 on 60 degrees of freedom
## Multiple R-squared:  0.8727, Adjusted R-squared:  0.8705
## F-statistic: 411.2 on 1 and 60 DF,  p-value: < 2.2e-16
```

d)

```
B_0 <- fit$coefficients[1]
```

e)

```
se <- sigma(fit)
```

f)

```
log_body <- log(mammals$body)
log_brain <- log(mammals$brain)

mammals$log_body <- log_body
mammals$log_brain <- log_brain

mammals
```

```
##                              body   brain    log_body  log_brain
## Arctic fox                  3.385   44.50  1.21935391  3.7954892
## Owl monkey                  0.480   15.50 -0.73396918  2.7408400
## Mountain beaver             1.350    8.10  0.30010459  2.0918641
## Cow                       465.000  423.00  6.14203741  6.0473722
## Grey wolf                  36.330  119.50  3.59264385  4.7833164
## Goat                       27.660  115.00  3.31998733  4.7449321
## Roe deer                   14.830   98.20  2.69665216  4.5870062
## Guinea pig                  1.040    5.50  0.03922071  1.7047481
## Verbet                      4.190   58.00  1.43270073  4.0604430
## Chinchilla                  0.425    6.40 -0.85566611  1.8562980
## Ground squirrel             0.101    4.00 -2.29263476  1.3862944
## Arctic ground squirrel      0.920    5.70 -0.08338161  1.7404662
## African giant pouched rat   1.000    6.60  0.00000000  1.8870696
## Lesser short-tailed shrew   0.005    0.14 -5.29831737 -1.9661129
## Star-nosed mole             0.060    1.00 -2.81341072  0.0000000
## Nine-banded armadillo       3.500   10.80  1.25276297  2.3795461
## Tree hyrax                  2.000   12.30  0.69314718  2.5095993
## N.A. opossum                1.700    6.30  0.53062825  1.8405496
## Asian elephant           2547.000 4603.00  7.84267147  8.4344635
## Big brown bat               0.023    0.30 -3.77226106 -1.2039728
## Donkey                    187.100  419.00  5.23164323  6.0378709
## Horse                     521.000  655.00  6.25575004  6.4846352
## European hedgehog           0.785    3.50 -0.24207156  1.2527630
## Patas monkey               10.000  115.00  2.30258509  4.7449321
```

```
## Cat                          3.300   25.60  1.19392247  3.2425924
## Galago                       0.200    5.00 -1.60943791  1.6094379
## Genet                        1.410   17.50  0.34358970  2.8622009
## Giraffe                    529.000  680.00  6.27098843  6.5220928
## Gorilla                    207.000  406.00  5.33271879  6.0063532
## Grey seal                   85.000  325.00  4.44265126  5.7838252
## Rock hyrax-a                 0.750   12.30 -0.28768207  2.5095993
## Human                       62.000 1320.00  4.12713439  7.1853870
## African elephant          6654.000 5712.00  8.80297346  8.6503245
## Water opossum                3.500    3.90  1.25276297  1.3609766
## Rhesus monkey                6.800  179.00  1.91692261  5.1873858
## Kangaroo                    35.000   56.00  3.55534806  4.0253517
## Yellow-bellied marmot        4.050   17.00  1.39871688  2.8332133
## Golden hamster               0.120    1.00 -2.12026354  0.0000000
## Mouse                        0.023    0.40 -3.77226106 -0.9162907
## Little brown bat             0.010    0.25 -4.60517019 -1.3862944
## Slow loris                   1.400   12.50  0.33647224  2.5257286
## Okapi                      250.000  490.00  5.52146092  6.1944054
## Rabbit                       2.500   12.10  0.91629073  2.4932055
## Sheep                       55.500  175.00  4.01638302  5.1647860
## Jaguar                     100.000  157.00  4.60517019  5.0562458
## Chimpanzee                  52.160  440.00  3.95431592  6.0867747
## Baboon                      10.550  179.50  2.35612586  5.1901752
## Desert hedgehog              0.550    2.40 -0.59783700  0.8754687
## Giant armadillo             60.000   81.00  4.09434456  4.3944492
## Rock hyrax-b                 3.600   21.00  1.28093385  3.0445224
## Raccoon                      4.288   39.20  1.45582042  3.6686767
## Rat                          0.280    1.90 -1.27296568  0.6418539
## E. American mole             0.075    1.20 -2.59026717  0.1823216
## Mole rat                     0.122    3.00 -2.10373423  1.0986123
## Musk shrew                   0.048    0.33 -3.03655427 -1.1086626
## Pig                        192.000  180.00  5.25749537  5.1929569
## Echidna                      3.000   25.00  1.09861229  3.2188758
## Brazilian tapir            160.000  169.00  5.07517382  5.1298987
## Tenrec                       0.900    2.60 -0.10536052  0.9555114
## Phalanger                    1.620   11.40  0.48242615  2.4336134
## Tree shrew                   0.104    2.50 -2.26336438  0.9162907
## Red fox                      4.235   50.40  1.44338333  3.9199912
```

g)

```
fit <- lm(log_brain ~ log_body, data=mammals)
summary(fit)
```

```
##
## Call:
## lm(formula = log_brain ~ log_body, data = mammals)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -1.71550 -0.49228 -0.06162  0.43597  1.94829
##
```

```
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.13479    0.09604   22.23   <2e-16 ***
## log_body     0.75169    0.02846   26.41   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.6943 on 60 degrees of freedom
## Multiple R-squared:  0.9208, Adjusted R-squared:  0.9195
## F-statistic: 697.4 on 1 and 60 DF,  p-value: < 2.2e-16
```