**S291-Homework2**

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**### Question 1 ###**

**### Part a**

poissonfunction <- function(x,lambda){

summation <- sum(x\*log(lambda) - lambda - log(factorial(x)))

return(summation)

}

poissonfunction(M,lambda = 3)

**### Part b**

set.seed(123)

M <- rpois(100, lambda = 3)

K <- rpois(100, lambda = 3)

L <- rpois(100, lambda = 3)

poisson1 <- data.frame(M,K,L)

poisson1

apply(poisson1, 2, poissonfunction, lambda = 3)

**### Question 2 ###**

**### Part a, Part b**

dataframe1 <- data.frame(

age = c(47, 56, 46, 70, 82, 32, 45, 39, 21, 18, 27, 58),

weight = c(119, 76, 53, 58, 65, 43, 95, 56, 71, 42, 61, 72),

sex = c('M', 'M', 'M', 'M', 'M', 'F', 'F', 'F', 'F', 'F', 'F', 'F'),

tobacco = c('Y', 'Y', 'Y', 'Y', 'N', 'N', 'N', 'N', 'N', 'N', 'N', 'N')

)

dataframe1

**### Part c**

mean\_age <- tapply(dataframe1$age, list(dataframe1$sex, dataframe1$tobacco), mean)

mean\_age

**### Part d**

lapply(dataframe1[1:2],range); lapply(dataframe1[3:4],function(x) (length(x)))

**### Part e**

list1 <- as.list(subset(dataframe1, select = c(age,weight)));list1

**### Part f**

unlist(lapply(list1, median))

**### Question 3 ###**

**### Part a**

install.packages("palmerpenguins")

library(palmerpenguins)

data("penguins")

head(penguins)

summary(penguins)

table(penguins$species)

is.factor(penguins$species)

**### Part b**

linear1 <- lm(flipper\_length\_mm ~ factor(species), data = penguins)

linear1

summary(linear1)

#speciesChinstrap and speciesGentoo are taken as reference

**### Part c**

one.of.each <- factor(levels(penguins$species))

one.of.each

predict(linear1,newdata=data.frame(species=one.of.each))

# or

penguins$predicted\_flipper\_length <- predict(linear1, newdata = penguins)

penguins$predicted\_flipper\_length

**### Part d**

linear2 <- lm(flipper\_length\_mm~bill\_length\_mm, data = penguins)

linear2

summary(linear2)

**### Part e**

confinterval<- confint(linear2, level = 0.90)

confinterval

#You should be 90 percent confident the true value of β1 lies somewhere between 1.516 and 1.863 ; also β0 lies somewhere between 118.99 and 134.37

**OUTPUTS**

**Q1)**

**Part (b):**

M K L

1 2 3 2

2 4 2 6

3 2 3 3

4 5 6 3

5 6 3 2

6 0 5 5

7 3 5 2

8 5 3 2

9 3 2 1

10 3 1 1

11 6 6 3

12 3 2 2

13 4 1 2

14 3 6 4

15 1 4 0

16 5 1 4

17 2 3 2

18 0 6 2

19 2 3 5

20 6 2 6

21 5 4 2

22 4 2 6

23 3 2 4

24 8 2 4

25 4 2 1

26 4 7 2

27 3 1 3

28 3 1 3

29 2 1 4

30 1 4 5

31 6 3 3

32 5 5 3

33 4 4 3

34 4 4 1

35 0 3 2

36 3 4 2

37 4 5 1

38 2 4 5

39 2 7 1

40 2 3 4

41 1 2 3

42 2 2 4

43 2 0 1

44 2 1 3

45 1 5 2

46 1 2 4

47 2 2 2

48 3 1 7

49 2 2 7

50 5 4 4

51 0 5 2

52 3 3 2

53 4 2 3

54 1 2 2

55 3 1 3

56 2 2 4

57 1 3 1

58 4 2 2

59 5 3 3

60 2 2 5

61 4 3 6

62 1 2 5

63 2 4 4

64 2 2 6

65 4 2 3

66 3 3 3

67 4 4 2

68 4 2 2

69 4 2 0

70 3 2 3

71 4 3 5

72 3 1 0

73 4 5 1

74 0 4 1

75 3 4 4

76 2 3 4

77 2 2 7

78 3 3 3

79 2 5 1

80 1 3 4

81 2 5 4

82 4 2 1

83 2 4 2

84 4 2 2

85 1 3 1

86 3 3 2

87 7 2 1

88 5 3 2

89 5 5 1

90 1 5 4

91 1 2 2

92 4 2 1

93 2 7 1

94 4 3 5

95 2 6 4

96 1 3 5

97 4 2 7

98 1 4 1

99 3 1 1

100 3 3 4

M K L

-187.9301 -182.8427 -190.9873

**Q2)**

**Part (a & b):**

age weight sex tobacco

1 47 119 M Y

2 56 76 M Y

3 46 53 M Y

4 70 58 M Y

5 82 65 M N

6 32 43 F N

7 45 95 F N

8 39 56 F N

9 21 71 F N

10 18 42 F N

11 27 61 F N

12 58 72 F N

**Part (c):**

N Y

F 34.28571 NA

M 82.00000 54.75

Part (d):

$age

[1] 18 82

$weight

[1] 42 119

$sex

[1] 12

$tobacco

[1] 12

**Part (e):**

$age

[1] 47 56 46 70 82 32 45 39 21 18 27 58

$weight

[1] 119 76 53 58 65 43 95 56 71 42 61 72

**Part (f):**

age weight

45.5 63.0

**Q3)**

**Part (a):**

# A tibble: 6 × 8

species island bill\_length\_mm bill\_depth\_mm flipper\_length\_mm

*<fct>* *<fct>* *<dbl>* *<dbl>* *<int>*

1 Adelie Torgersen 39.1 18.7 181

2 Adelie Torgersen 39.5 17.4 186

3 Adelie Torgersen 40.3 18 195

4 Adelie Torgersen NA NA NA

5 Adelie Torgersen 36.7 19.3 193

6 Adelie Torgersen 39.3 20.6 190

# ℹ 3 more variables: body\_mass\_g <int>, sex <fct>, year <int>

> summary(penguins)

species island bill\_length\_mm bill\_depth\_mm

Adelie :152 Biscoe :168 Min. :32.10 Min. :13.10

Chinstrap: 68 Dream :124 1st Qu.:39.23 1st Qu.:15.60

Gentoo :124 Torgersen: 52 Median :44.45 Median :17.30

Mean :43.92 Mean :17.15

3rd Qu.:48.50 3rd Qu.:18.70

Max. :59.60 Max. :21.50

NA's :2 NA's :2

flipper\_length\_mm body\_mass\_g sex year

Min. :172.0 Min. :2700 female:165 Min. :2007

1st Qu.:190.0 1st Qu.:3550 male :168 1st Qu.:2007

Median :197.0 Median :4050 NA's : 11 Median :2008

Mean :200.9 Mean :4202 Mean :2008

3rd Qu.:213.0 3rd Qu.:4750 3rd Qu.:2009

Max. :231.0 Max. :6300 Max. :2009

NA's :2 NA's :2

> table(penguins$species)

Adelie Chinstrap Gentoo

152 68 124

> is.factor(penguins$species)

[1] TRUE

**Part (b):**

Call:

lm(formula = flipper\_length\_mm ~ factor(species), data = penguins)

Coefficients:

(Intercept) factor(species)Chinstrap

189.95 5.87

factor(species)Gentoo

27.23

> summary(linear1)

Call:

lm(formula = flipper\_length\_mm ~ factor(species), data = penguins)

Residuals:

Min 1Q Median 3Q Max

-17.9536 -4.8235 0.0464 4.8130 20.0464

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 189.9536 0.5405 351.454 < 2e-16 \*\*\*

factor(species)Chinstrap 5.8699 0.9699 6.052 3.79e-09 \*\*\*

factor(species)Gentoo 27.2333 0.8067 33.760 < 2e-16 \*\*\*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 6.642 on 339 degrees of freedom

(2 observations deleted due to missingness)

Multiple R-squared: 0.7782, Adjusted R-squared: 0.7769

F-statistic: 594.8 on 2 and 339 DF, p-value: < 2.2e-16

**Part (c):**

[1] Adelie Chinstrap Gentoo

Levels: Adelie Chinstrap Gentoo

> predict(linear1,newdata=data.frame(species=one.of.each))

1 2 3

189.9536 195.8235 217.1870

> # or

> penguins$predicted\_flipper\_length <- predict(linear1, newdata = penguins)

> penguins$predicted\_flipper\_length

1 2 3 4 5 6 7

189.9536 189.9536 189.9536 189.9536 189.9536 189.9536 189.9536

8 9 10 11 12 13 14

189.9536 189.9536 189.9536 189.9536 189.9536 189.9536 189.9536

15 16 17 18 19 20 21

189.9536 189.9536 189.9536 189.9536 189.9536 189.9536 189.9536

22 23 24 25 26 27 28

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29 30 31 32 33 34 35

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36 37 38 39 40 41 42

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43 44 45 46 47 48 49

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50 51 52 53 54 55 56

189.9536 189.9536 189.9536 189.9536 189.9536 189.9536 189.9536

57 58 59 60 61 62 63

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92 93 94 95 96 97 98

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99 100 101 102 103 104 105

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106 107 108 109 110 111 112

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113 114 115 116 117 118 119

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120 121 122 123 124 125 126

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309 310 311 312 313 314 315

195.8235 195.8235 195.8235 195.8235 195.8235 195.8235 195.8235

316 317 318 319 320 321 322

195.8235 195.8235 195.8235 195.8235 195.8235 195.8235 195.8235

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344

195.8235

**Part (d):**

Call:

lm(formula = flipper\_length\_mm ~ bill\_length\_mm, data = penguins)

Coefficients:

(Intercept) bill\_length\_mm

126.68 1.69

> summary(linear2)

Call:

lm(formula = flipper\_length\_mm ~ bill\_length\_mm, data = penguins)

Residuals:

Min 1Q Median 3Q Max

-43.708 -7.896 0.664 8.650 21.179

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 126.6844 4.6651 27.16 <2e-16 \*\*\*

bill\_length\_mm 1.6901 0.1054 16.03 <2e-16 \*\*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 10.63 on 340 degrees of freedom

(2 observations deleted due to missingness)

Multiple R-squared: 0.4306, Adjusted R-squared: 0.4289

F-statistic: 257.1 on 1 and 340 DF, p-value: < 2.2e-16

**Part (e):**

5 % 95 %

(Intercept) 118.990087 134.37877

bill\_length\_mm 1.516214 1.86391