excerises

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we ‘apply’ functions allow us to apply a function to a vector or list of values iteratively This helps minimize errors in code and makes the analyses more efficent

with lapply() and sapply() functions, we can only provide one argument to iterate on ‘sapply()’ functions simplifies the output to a vector (or the simplest data structure possible), while ‘lapply()’ returns an output in the form of a list

with ‘mapply()’ we can provide multiple arugements to iterate on

Calculating the mass of a bunch of dinosaurs

```
mass_from_length_theropoda <- function(length){
    mass <- 0.73 * length^3.63
    return(mass)
}
```

```
  theropoda_lengths <- c(17.8013631070471, 20.3764452071665, 14.0743486294308, 25.65782386974, 26.09520
```

```
mass_from_length_theropoda(length = theropoda_lengths)
```

```
##  [1]  25262.027  41253.332  10767.568  95233.732 101260.017  40775.516
##  [7]  24072.130   4785.145  39129.521  29666.193  26830.297  64700.869
## [13]  42768.180  94697.262  79013.471 103955.226  92798.465  41901.983
## [19]  17439.569  41055.045  37544.201  25198.303  12928.490  36388.290
## [25]  34962.862  80307.929   8854.525  50183.194  28846.165  35735.369
## [31] 115908.187  31765.368  58958.713   5561.862  28349.410  15418.314
## [37]   9218.648   1197.666  94407.873  19552.500
```

```
theropoda_masses <- mass_from_length_theropoda(length = theropoda_lengths)

my_list <- list(theropoda_masses)
second_list <- c(my_list, list(c("Luna", "Avi", "Anitia")))
second_list[[1]]
```

```
##  [1]  25262.027  41253.332  10767.568  95233.732 101260.017  40775.516
##  [7]  24072.130   4785.145  39129.521  29666.193  26830.297  64700.869
## [13]  42768.180  94697.262  79013.471 103955.226  92798.465  41901.983
## [19]  17439.569  41055.045  37544.201  25198.303  12928.490  36388.290
## [25]  34962.862  80307.929   8854.525  50183.194  28846.165  35735.369
## [31] 115908.187  31765.368  58958.713   5561.862  28349.410  15418.314
## [37]   9218.648   1197.666  94407.873  19552.500
```

```
data.frame(theropoda_masses, c("Anita", "Avi", "Luna", "Maria"))
```

```
##    theropoda_masses c..Anita....Avi....Luna....Maria..
## 1         25262.027                              Anita
## 2         41253.332                                Avi
## 3         10767.568                               Luna
## 4         95233.732                              Maria
## 5        101260.017                              Anita
## 6         40775.516                                Avi
## 7         24072.130                               Luna
## 8          4785.145                              Maria
## 9         39129.521                              Anita
## 10        29666.193                                Avi
## 11        26830.297                               Luna
## 12        64700.869                              Maria
## 13        42768.180                              Anita
## 14        94697.262                                Avi
## 15        79013.471                               Luna
## 16       103955.226                              Maria
## 17        92798.465                              Anita
## 18        41901.983                                Avi
## 19        17439.569                               Luna
## 20        41055.045                              Maria
## 21        37544.201                              Anita
## 22        25198.303                                Avi
## 23        12928.490                               Luna
## 24        36388.290                              Maria
## 25        34962.862                              Anita
## 26        80307.929                                Avi
## 27         8854.525                               Luna
## 28        50183.194                              Maria
## 29        28846.165                              Anita
## 30        35735.369                                Avi
## 31       115908.187                               Luna
## 32        31765.368                              Maria
## 33        58958.713                              Anita
## 34         5561.862                                Avi
## 35        28349.410                               Luna
## 36        15418.314                              Maria
## 37         9218.648                              Anita
## 38         1197.666                                Avi
## 39        94407.873                               Luna
## 40        19552.500                              Maria
```

```
mass_from_length<- function(length, a = 0.73, b = 3.63){
  mass <- a * length^b
return(mass)
}
```

```
  a_values <- c(0.759, 0.751, 0.74, 0.746, 0.759, 0.751, 0.749, 0.751, 0.738, 0.768, 0.736, 0.749, 0.74
```

```
  b_values <- c(3.627, 3.633, 3.626, 3.633, 3.627, 3.629, 3.632, 3.628, 3.633, 3.627, 3.621, 3.63, 3.63
```

```
mass_from_length(length = theropoda_lengths, a = a_values, b = b_values)
```

```
##  [1]  26039.686  42825.603  10800.224  98273.049 104257.481  41822.386
##  [7]  24840.644   4899.022  39915.948  30937.922  26354.908  66384.865
## [13]  43837.944  97141.451  80553.856 105556.405  97374.660  42760.136
## [19]  18749.274  42109.012  40674.182  26003.425  13229.824  37472.789
## [25]  34684.033  80187.272   9460.977  51630.571  29253.772  36399.306
## [31] 117511.962  33384.288  58581.226   5462.316  28637.745  15864.172
## [37]   9284.810   1218.755  98522.609  19534.524
```

```
dino_data <- data.frame(theropoda_lengths, a_values, b_values)
dino_data %>%
  mutate(mass = mass_from_length(theropoda_lengths)) %>%
  head() %>%
  return(mass)
```

```
##   theropoda_lengths a_values b_values      mass
## 1          17.80136    0.759    3.627  25262.03
## 2          20.37645    0.751    3.633  41253.33
## 3          14.07435    0.740    3.626  10767.57
## 4          25.65782    0.746    3.633  95233.73
## 5          26.09520    0.759    3.627 101260.02
## 6          20.31115    0.751    3.629  40775.52
```

conditoning on length

```
mass_from_length_max <- function(length) {
  if (length < 20){
    mass <- 0.73 * length^3.63
    return(mass)
  } else{
    mass <- NA
  }
  return(mass)
}
```

```
sapply(theropoda_lengths, mass_from_length_max)
```

```
##  [1] 25262.027        NA 10767.568        NA        NA        NA 24072.130
##  [8]  4785.145        NA 29666.193 26830.297        NA        NA        NA
## [15]        NA        NA        NA        NA 17439.569        NA 37544.201
## [22] 25198.303 12928.490 36388.290 34962.862        NA  8854.525        NA
## [29] 28846.165 35735.369        NA 31765.368        NA  5561.862 28349.410
## [36] 15418.314  9218.648  1197.666        NA 19552.500
```

?mapply #a dataset with dinosaur length

```
read.csv(file = "../datasceince2023/data-raw/dinosaur_lengths (1).csv") -> dinosaur
get_mass_from_length_by_name <- function(length, dinosaur){
  if (dinosaur == "Stegosauria"){
    a = 10.95
    b = 2.64
     mass <- a * length^b
  } else if (dinosaur == "Theropoda"){
    a = 0.73
    b = 3.63
     mass <- a * length^b
  } else if (dinosaur == "Sauropoda"){
    a = 214.44
    b = 1.46
     mass <- a * length^b
  } else{
  mass = NA
  }
  return(mass)
}
mapply(FUN = get_mass_from_length_by_name, dinosaur$length, dinosaur$species )
```

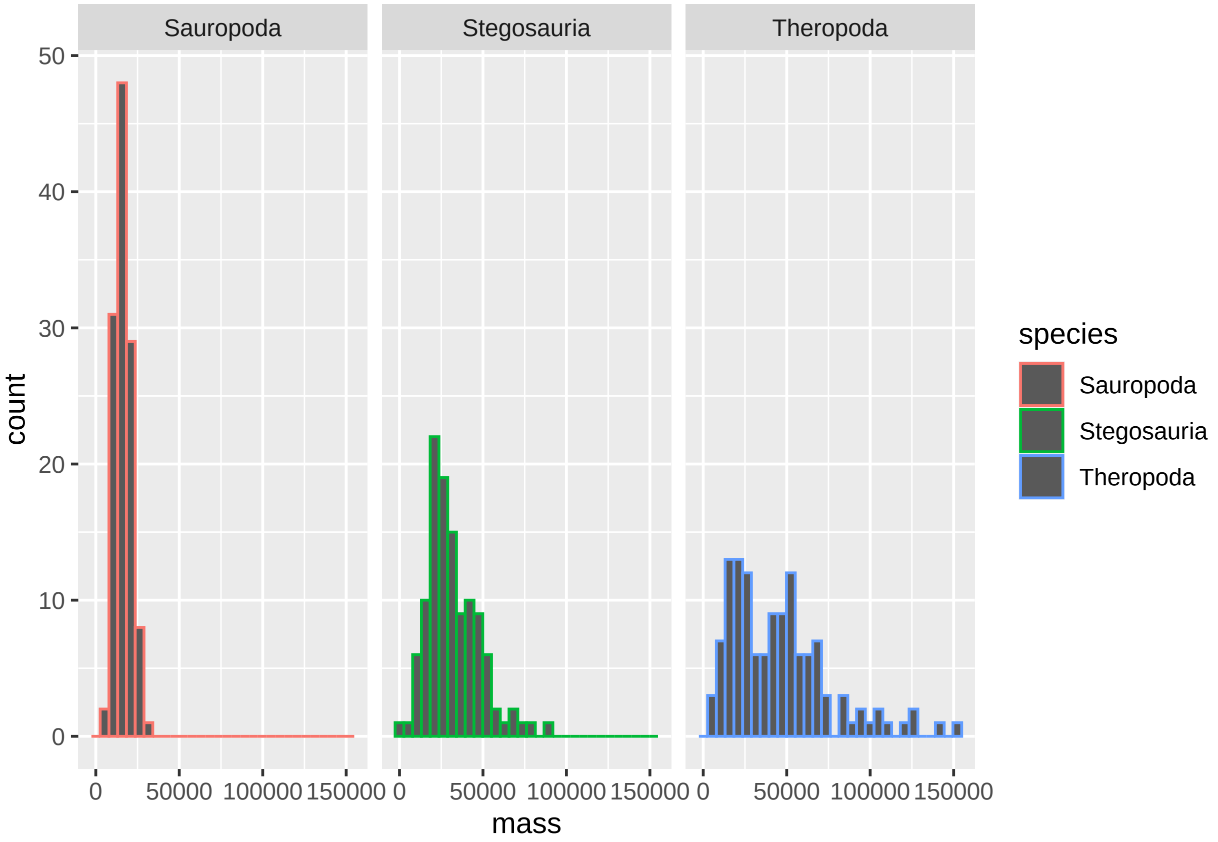
```
##   [1]  24341.681         NA         NA  22114.190         NA         NA
##   [7]  57349.470  14160.494  49677.749  42105.917  10221.747  15339.988
##  [13]  70624.102  23883.825  28552.864  18801.370  19438.673         NA
##  [19]  19607.970  16032.845         NA  50350.112  15969.078  29582.848
##  [25]  15201.456  12980.541   9937.867   9599.415  49245.963  23846.751
##  [31]  53805.661  53326.467         NA  15554.977  18544.119         NA
##  [37]         NA  82492.318  17909.041  38694.503  80303.181  19592.802
##  [43]  10614.785  29560.809  71658.477         NA  83961.661         NA
##  [49]  26284.040  21766.002  63571.873   5480.255  33917.314  22778.032
##  [55]  13819.165  21154.149  17635.099  14577.594         NA  14032.340
##  [61]  30231.694         NA  11293.886  72743.800  23679.901  64258.574
##  [67]  14931.085  16323.818         NA         NA         NA   7599.703
##  [73]         NA         NA         NA         NA  46920.035  70529.031
##  [79]   9484.528         NA  68340.494  44959.626         NA  48249.486
##  [85]  11730.174         NA  52295.177         NA         NA         NA
##  [91]  40358.292  38891.137  30878.439  19125.425         NA         NA
##  [97]   8697.216  19627.357         NA         NA  13411.390  33157.499
## [103]  10874.733  24554.930  16819.494  18421.449         NA  19645.723
## [109]  38206.241  53196.019  22346.109         NA  22685.103         NA
## [115]  13613.983  34685.790         NA  18654.525         NA 101482.428
## [121]  89149.257         NA  20820.837         NA  22232.852  59702.598
## [127]         NA  16321.774  22748.880         NA         NA         NA
## [133]         NA  25987.768  49818.253  13106.766         NA  32112.443
## [139]         NA  16984.463  10859.926  93973.020  52342.265  19151.788
## [145]         NA  13954.186         NA  15021.820  35933.327 140435.607
## [151]  20467.332  23869.639         NA         NA  15211.979  57098.945
## [157]  23588.700  27381.008  85932.513         NA   9331.295         NA
## [163]         NA  32005.502  16613.444   7904.857         NA  26352.263
## [169]  19880.480  15543.679  15493.654  13546.034         NA  36095.081
## [175]  42437.608         NA         NA  51637.913         NA  44120.181
## [181]   9535.583  59840.348         NA         NA         NA  44822.176
## [187]  14232.684  34751.496  11292.437         NA         NA         NA
## [193]  22002.082  19554.166  13223.770         NA         NA  68935.505
## [199]   9172.206  90096.476  25796.762  50594.426  61952.966  20132.528
## [205]         NA  13979.439  15481.074  12104.000  21789.436  54009.090
## [211]  13812.364   8071.939  21144.506  44097.848  16250.303  70065.996
## [217]  11170.349  22826.560  40885.088  17292.043  18394.391  50267.629
## [223]  70791.032  28464.276  41431.346         NA  14242.918         NA
## [229]         NA  52014.366  32865.058         NA  11906.150  17964.362
## [235]  14844.497  13079.836  76048.107  18843.875         NA  30737.511
## [241]  37983.026  18711.957  22636.970  29868.755  42799.606         NA
## [247]  43632.463 103600.943         NA         NA  10330.761  23659.805
## [253]  19126.024  17175.845  28017.230  54437.041         NA  20657.057
## [259]  13275.051         NA   8222.362         NA 108964.075         NA
## [265]   5845.741  26356.588         NA  59636.239  14857.582  45043.701
## [271]  47427.024         NA         NA  11807.182  27575.709  18177.367
## [277]         NA  22108.648  33908.940         NA         NA         NA
## [283]         NA  45862.941  23366.240  16165.694  10263.470         NA
## [289]  24026.928  33497.651         NA  15770.110  48190.121  33107.401
## [295]  20523.437  21387.730  15771.706  12632.938  28352.199  10401.651
## [301]  41162.369  16740.472  29576.590  28831.907  21622.906         NA
## [307]  26736.709  18663.882  10872.689  13072.222  35308.681  17145.703
## [313]  19620.530   1550.370         NA  11509.202  16574.358  94984.150
## [319]   9448.048  56370.430         NA  47899.078  27521.456  24907.229
## [325]  12800.024  34456.895         NA  19137.794   9084.302         NA
## [331]  20396.019   7636.822  15452.482         NA  11482.576         NA
## [337]  21323.042  17062.973  24482.018  19394.529  61929.256         NA
## [343]  29113.203  53044.431  17891.216  21665.733  21611.857  13917.623
## [349]  21715.000         NA  10525.601  31777.548  45932.499  16396.801
## [355]         NA  21020.829   9499.589         NA  11886.269  13597.168
## [361]         NA  32610.060  50496.496  23180.857  20838.975  27426.143
## [367]  51655.501  52241.022  27527.983  40947.425  26691.614  23152.573
## [373]  43419.737  44236.593  60396.602  15878.961  70561.697  17374.235
## [379]  10332.362  34844.884         NA  43839.492         NA  10259.928
## [385]  24344.124         NA  23490.643  15151.289  40052.674  31011.453
## [391]         NA  36300.595  28716.671  21434.730         NA  27977.292
## [397]  13912.492         NA         NA  45387.391  21638.866  12782.316
## [403]         NA         NA         NA  74279.377  19250.194  19647.872
## [409]  39022.265         NA         NA   9446.876  33097.292         NA
## [415]  23694.389  15501.027  13490.363   7311.070  63156.403  40543.550
## [421]  19942.976         NA         NA  26888.995         NA  18102.809
## [427] 125939.133         NA         NA  14393.863         NA  62045.506
## [433]  60194.052  36753.957         NA         NA  32061.537         NA
## [439]  67466.670  17627.746  24171.682  25917.752  67098.902         NA
## [445]  17699.295  18903.752  13127.745  17295.450  42209.926  23426.667
## [451] 118937.988         NA  18165.832         NA  46816.660         NA
## [457]  53237.908  23121.375  25937.746         NA  47637.068         NA
## [463] 127540.554         NA  12313.099  24276.516  15500.675  16109.794
## [469]  15965.471  54296.492         NA         NA  14365.977 153749.934
## [475]  59143.016  18524.301   6227.675  13606.978         NA         NA
## [481]  49146.996 103896.484  38059.728  41076.716         NA  30013.153
## [487]  41805.513  20113.277  24071.440         NA         NA   8489.727
## [493]  24349.181         NA         NA  44921.367  26262.993  16883.382
## [499]  14444.693         NA
```

```
dinosaur %>%
  rowwise() %>%
  mutate(mass = get_mass_from_length_by_name(lengths, species)) -> masses
  head(masses)
```

```
## # A tibble: 6 x 3
## # Rowwise:
##   species      lengths   mass
##   <chr>          <dbl>  <dbl>
## 1 Stegosauria     18.5 24342.
## 2 Ankylosauria    16.4    NA
## 3 Ankylosauria    23.7    NA
## 4 Sauropoda       23.9 22114.
## 5 Ankylosauria    21.7    NA
## 6 Ankylosauria    21.4    NA
```

```
masses %>%
  filter(!is.na(mass)) %>%
ggplot() +
  geom_histogram(mapping = aes(x = mass, color = species)) +
  facet_wrap(~species)
```

```
## ‘stat_bin()‘ using ‘bins = 30‘. Pick better value with ‘binwidth‘.
```



??facetwrap