Data transformation with dplyr

Practice with penguins

BAGUMAHO DOMINIC

```r
library(palmerpenguins)
library(dplyr)
```

All exercises in this assignment use the `penguins` data as a starting point.

- Run all code chunks above.
- Run the code chunk that contains `glimpse(penguins)`.
- How many variables are in the data set?

  ### Answer(By Dominic)

  There are 8 variables in the data set (These are represented by the number of columns in the table)

- How many observations are in the data set?

  ### Answer (By Dominic)

  There are 344 observations in the data set(These are represented by the number of rows in the data table)

What data types are contained in the variables?

(Reminder: https://ds4owd-001.github.io/website/slides/lec-02-visualisation.html#/types-of-variables)

Answer (By Dominic)

Continuous variables (Year, Flipper length, Body mass, bill depth and bill length)

Ordinal variables (Sex)

Categorical variables (Island, Species)

```
glimpse(penguins)
```

```
Rows: 344
Columns: 8
$ species           <fct> Adelie, Adelie, Adelie, Adelie, Adelie, Adelie, Adel~
$ island            <fct> Torgersen, Torgersen, Torgersen, Torgersen, Torgerse~
$ bill_length_mm    <dbl> 39.1, 39.5, 40.3, NA, 36.7, 39.3, 38.9, 39.2, 34.1, ~
$ bill_depth_mm     <dbl> 18.7, 17.4, 18.0, NA, 19.3, 20.6, 17.8, 19.6, 18.1, ~
$ flipper_length_mm <int> 181, 186, 195, NA, 193, 190, 181, 195, 193, 190, 186~
$ body_mass_g       <int> 3750, 3800, 3250, NA, 3450, 3650, 3625, 4675, 3475, ~
$ sex               <fct> male, female, female, NA, female, male, female, male~
$ year              <int> 2007, 2007, 2007, 2007, 2007, 2007, 2007, 2007, 2007~
```

Task 1: Create a subset of the data using filter()

Use `filter()` to create a subset from `penguins` that only contains observations for Adelie penguins.

-
  ```
  penguins |>
    filter(species == "Adelie")
  ```

  ```
  # A tibble: 152 x 8
     species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
     <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
   1 Adelie  Torgersen           39.1          18.7               181        3750
   2 Adelie  Torgersen           39.5          17.4               186        3800
   3 Adelie  Torgersen           40.3          18                 195        3250
   4 Adelie  Torgersen           NA            NA                  NA          NA
   5 Adelie  Torgersen           36.7          19.3               193        3450
   6 Adelie  Torgersen           39.3          20.6               190        3650
   7 Adelie  Torgersen           38.9          17.8               181        3625
   8 Adelie  Torgersen           39.2          19.6               195        4675
   9 Adelie  Torgersen           34.1          18.1               193        3475
  ```

```
10 Adelie  Torgersen           42          20.2               190        4250
# i 142 more rows
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that only contains observations where body mass is less than or equal to 2900 g.

```r
penguins |>
  filter(body_mass_g <= 2900)
```

```
# A tibble: 7 x 8
  species   island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
  <fct>     <fct>              <dbl>         <dbl>             <int>       <int>
1 Adelie    Biscoe              34.5          18.1               187        2900
2 Adelie    Biscoe              36.5          16.6               181        2850
3 Adelie    Biscoe              36.4          17.1               184        2850
4 Adelie    Dream               33.1          16.1               178        2900
5 Adelie    Torgersen           38.6          17                 188        2900
6 Chinstrap Dream               43.2          16.6               187        2900
7 Chinstrap Dream               46.9          16.6               192        2700
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that only contains observations for Adelie penguins with a bill length greater than 40 mm.

```r
penguins |>
  filter(species == "Adelie",
         bill_length_mm > 40)
```

```
# A tibble: 51 x 8
   species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
 1 Adelie  Torgersen           40.3          18                 195        3250
 2 Adelie  Torgersen           42            20.2               190        4250
 3 Adelie  Torgersen           41.1          17.6               182        3200
 4 Adelie  Torgersen           42.5          20.7               197        4500
 5 Adelie  Torgersen           46            21.5               194        4200
 6 Adelie  Biscoe              40.6          18.6               183        3550
 7 Adelie  Biscoe              40.5          17.9               187        3200
 8 Adelie  Biscoe              40.5          18.9               180        3950
 9 Adelie  Dream               40.9          18.9               184        3900
10 Adelie  Dream               42.2          18.5               180        3550
# i 41 more rows
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that excludes observations for chinstraps.

```
penguins |>
  filter(species != "Chinstrap")
```

```
# A tibble: 276 x 8
   species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
 1 Adelie  Torgersen           39.1          18.7               181        3750
 2 Adelie  Torgersen           39.5          17.4               186        3800
 3 Adelie  Torgersen           40.3          18                 195        3250
 4 Adelie  Torgersen           NA            NA                  NA          NA
 5 Adelie  Torgersen           36.7          19.3               193        3450
 6 Adelie  Torgersen           39.3          20.6               190        3650
 7 Adelie  Torgersen           38.9          17.8               181        3625
 8 Adelie  Torgersen           39.2          19.6               195        4675
 9 Adelie  Torgersen           34.1          18.1               193        3475
10 Adelie  Torgersen           42            20.2               190        4250
# i 266 more rows
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that only contains gentoo penguins with a bill depth greater than or equal to 15.5 millimeters.

```
penguins |>
  filter(species == "Gentoo",
         bill_depth_mm >= 15)
```

```
# A tibble: 63 x 8
   species island bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>           <dbl>         <dbl>             <int>       <int>
 1 Gentoo  Biscoe           50            16.3               230        5700
 2 Gentoo  Biscoe           50            15.2               218        5700
 3 Gentoo  Biscoe           46.7          15.3               219        5200
 4 Gentoo  Biscoe           46.8          15.4               215        5150
 5 Gentoo  Biscoe           49            16.1               216        5550
 6 Gentoo  Biscoe           49.3          15.7               217        5850
 7 Gentoo  Biscoe           49.2          15.2               221        6300
 8 Gentoo  Biscoe           48.7          15.1               222        5350
 9 Gentoo  Biscoe           46.3          15.8               215        5050
10 Gentoo  Biscoe           46.1          15.1               215        5100
# i 53 more rows
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that contains observations for male penguins recorded at Dream and Biscoe Islands.

```
penguins |>
  filter(sex == "male",
         island %in% c("Dream","Biscoe"))
```

```
# A tibble: 145 x 8
   species island bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>           <dbl>         <dbl>             <int>       <int>
 1 Adelie  Biscoe           37.7          18.7               180        3600
 2 Adelie  Biscoe           38.2          18.1               185        3950
 3 Adelie  Biscoe           38.8          17.2               180        3800
 4 Adelie  Biscoe           40.6          18.6               183        3550
 5 Adelie  Biscoe           40.5          18.9               180        3950
 6 Adelie  Dream            37.2          18.1               178        3900
 7 Adelie  Dream            40.9          18.9               184        3900
 8 Adelie  Dream            39.2          21.1               196        4150
 9 Adelie  Dream            38.8          20                 190        3950
10 Adelie  Dream            39.8          19.1               184        4650
# i 135 more rows
# i 2 more variables: sex <fct>, year <int>
```

```
# Or
penguins |>
  filter(sex == "male",
         island == "Dream" | island == "Biscoe")
```

```
# A tibble: 145 x 8
   species island bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>           <dbl>         <dbl>             <int>       <int>
```

```
 1 Adelie  Biscoe           37.7          18.7               180        3600
 2 Adelie  Biscoe           38.2          18.1               185        3950
 3 Adelie  Biscoe           38.8          17.2               180        3800
 4 Adelie  Biscoe           40.6          18.6               183        3550
 5 Adelie  Biscoe           40.5          18.9               180        3950
 6 Adelie  Dream            37.2          18.1               178        3900
 7 Adelie  Dream            40.9          18.9               184        3900
 8 Adelie  Dream            39.2          21.1               196        4150
 9 Adelie  Dream            38.8          20                 190        3950
10 Adelie  Dream            39.8          19.1               184        4650
# i 135 more rows
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that contains observations for female Adelie penguins with bill lengths less than 35 mm.

```
penguins |>
  filter(species == "Adelie",
         sex == "female",
         bill_length_mm < 35)
```

```
# A tibble: 7 x 8
  species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
  <fct>   <fct>                <dbl>         <dbl>             <int>       <int>
1 Adelie  Torgersen           34.4          18.4               184        3325
2 Adelie  Biscoe              34.5          18.1               187        2900
3 Adelie  Torgersen           33.5          19                 190        3600
4 Adelie  Torgersen           34.6          17.2               189        3200
5 Adelie  Dream               34            17.1               185        3400
6 Adelie  Dream               33.1          16.1               178        2900
7 Adelie  Dream               32.1          15.5               188        3050
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` containing observations for female chinstrap penguins on Dream and Torgersen Islands.

```
penguins |>
  filter(sex == "female",
         species == "Chinstrap",
         island %in% c("Dream", "Torgersen"))
```

```
# A tibble: 34 x 8
   species   island bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>     <fct>           <dbl>         <dbl>             <int>       <int>
 1 Chinstrap Dream            46.5          17.9               192        3500
 2 Chinstrap Dream            45.4          18.7               188        3525
 3 Chinstrap Dream            45.2          17.8               198        3950
 4 Chinstrap Dream            46.1          18.2               178        3250
 5 Chinstrap Dream            46            18.9               195        4150
 6 Chinstrap Dream            46.6          17.8               193        3800
 7 Chinstrap Dream            47            17.3               185        3700
 8 Chinstrap Dream            45.9          17.1               190        3575
 9 Chinstrap Dream            58            17.8               181        3700
10 Chinstrap Dream            46.4          18.6               190        3450
# i 24 more rows
# i 2 more variables: sex <fct>, year <int>
```

```
# Or
penguins |>
  filter(sex == "female",
         species == "Chinstrap",
         island == "Dream" | island == "Torgersen")
```

```
# A tibble: 34 x 8
   species   island bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>     <fct>           <dbl>         <dbl>             <int>       <int>
 1 Chinstrap Dream            46.5          17.9               192        3500
 2 Chinstrap Dream            45.4          18.7               188        3525
 3 Chinstrap Dream            45.2          17.8               198        3950
 4 Chinstrap Dream            46.1          18.2               178        3250
 5 Chinstrap Dream            46            18.9               195        4150
 6 Chinstrap Dream            46.6          17.8               193        3800
 7 Chinstrap Dream            47            17.3               185        3700
 8 Chinstrap Dream            45.9          17.1               190        3575
 9 Chinstrap Dream            58            17.8               181        3700
10 Chinstrap Dream            46.4          18.6               190        3450
# i 24 more rows
# i 2 more variables: sex <fct>, year <int>
```

Use `filter()` to create a subset from `penguins` that contains penguins that are either gentoos OR have a body mass greater than 4500 g.

```
penguins |>
  filter(species == "Gentoo" | body_mass_g > 4500)
```

```
# A tibble: 133 x 8
   species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
 1 Adelie  Torgersen           39.2          19.6               195        4675
 2 Adelie  Dream               39.8          19.1               184        4650
 3 Adelie  Dream               39.6          18.8               190        4600
 4 Adelie  Torgersen           42.9          17.6               196        4700
 5 Adelie  Biscoe              41            20                 203        4725
 6 Adelie  Biscoe              43.2          19                 197        4775
 7 Adelie  Biscoe              45.6          20.3               191        4600
 8 Gentoo  Biscoe              46.1          13.2               211        4500
 9 Gentoo  Biscoe              50            16.3               230        5700
10 Gentoo  Biscoe              48.7          14.1               210        4450
# i 123 more rows
# i 2 more variables: sex <fct>, year <int>
```

Task 2: Add new columns with mutate()

Add a column to `penguins` that contains a new column `flipper_m`, which is the `flipper_length_mm` (flipper length in millimeters) converted to units of meters.

```
penguins |>
  mutate(flipper_m = flipper_length_mm/1000)
```

```
# A tibble: 344 x 9
   species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
 1 Adelie  Torgersen           39.1          18.7               181        3750
 2 Adelie  Torgersen           39.5          17.4               186        3800
 3 Adelie  Torgersen           40.3          18                 195        3250
 4 Adelie  Torgersen           NA            NA                  NA          NA
 5 Adelie  Torgersen           36.7          19.3               193        3450
 6 Adelie  Torgersen           39.3          20.6               190        3650
 7 Adelie  Torgersen           38.9          17.8               181        3625
 8 Adelie  Torgersen           39.2          19.6               195        4675
 9 Adelie  Torgersen           34.1          18.1               193        3475
```

```
10 Adelie  Torgersen           42            20.2                190        4250
# i 334 more rows
# i 3 more variables: sex <fct>, year <int>, flipper_m <dbl>
```

Add a new column to `penguins` that contains a new column `body_mass_kg`, which is the `body_mass_g` (body mass in grams) converted to units of kilograms.

```
penguins |>
  mutate(body_mass_kg = body_mass_g/1000)
```

```
# A tibble: 344 x 9
   species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
 1 Adelie  Torgersen           39.1          18.7               181        3750
 2 Adelie  Torgersen           39.5          17.4               186        3800
 3 Adelie  Torgersen           40.3          18                 195        3250
 4 Adelie  Torgersen           NA            NA                  NA          NA
 5 Adelie  Torgersen           36.7          19.3               193        3450
 6 Adelie  Torgersen           39.3          20.6               190        3650
 7 Adelie  Torgersen           38.9          17.8               181        3625
 8 Adelie  Torgersen           39.2          19.6               195        4675
 9 Adelie  Torgersen           34.1          18.1               193        3475
10 Adelie  Torgersen           42            20.2               190        4250
# i 334 more rows
# i 3 more variables: sex <fct>, year <int>, body_mass_kg <dbl>
```

Add a new column to `penguins` that contains a new column `bill_ratio`, which is the ratio of bill length to bill depth.

```
penguins |>
  mutate(bill_ratio = bill_length_mm/ bill_depth_mm)
```

```
# A tibble: 344 x 9
   species island    bill_length_mm bill_depth_mm flipper_length_mm body_mass_g
   <fct>   <fct>              <dbl>         <dbl>             <int>       <int>
 1 Adelie  Torgersen           39.1          18.7               181        3750
 2 Adelie  Torgersen           39.5          17.4               186        3800
 3 Adelie  Torgersen           40.3          18                 195        3250
 4 Adelie  Torgersen           NA            NA                  NA          NA
 5 Adelie  Torgersen           36.7          19.3               193        3450
 6 Adelie  Torgersen           39.3          20.6               190        3650
 7 Adelie  Torgersen           38.9          17.8               181        3625
 8 Adelie  Torgersen           39.2          19.6               195        4675
 9 Adelie  Torgersen           34.1          18.1               193        3475
10 Adelie  Torgersen           42            20.2               190        4250
# i 334 more rows
# i 3 more variables: sex <fct>, year <int>, bill_ratio <dbl>
```

Add a new column called id to `penguins` with a sequence of values from 1 to the length of the data frame. Use `relocate()` to move the column to the first position in the data frame.

```r
penguins |>
  mutate(id = 1:n()) |>
  relocate(id,.before = species)
```

```
# A tibble: 344 x 9
      id species island    bill_length_mm bill_depth_mm flipper_length_mm
   <int> <fct>   <fct>              <dbl>         <dbl>             <int>
 1     1 Adelie  Torgersen           39.1          18.7               181
 2     2 Adelie  Torgersen           39.5          17.4               186
 3     3 Adelie  Torgersen           40.3          18                 195
 4     4 Adelie  Torgersen           NA            NA                  NA
 5     5 Adelie  Torgersen           36.7          19.3               193
 6     6 Adelie  Torgersen           39.3          20.6               190
 7     7 Adelie  Torgersen           38.9          17.8               181
 8     8 Adelie  Torgersen           39.2          19.6               195
 9     9 Adelie  Torgersen           34.1          18.1               193
10    10 Adelie  Torgersen           42            20.2               190
# i 334 more rows
# i 3 more variables: body_mass_g <int>, sex <fct>, year <int>
```

Task 3: Summarize data with group_by() and summarize() & count()

Starting with `penguins`, group the data by species, then create a summary table containing the maximum and minimum length of flippers (call the columns flip_max and flip_min). How will you handle NA values?

Answer(By Dominic)

I will use the “na.rm” argument to handle any missing values in flipper_length_mm. This argument doesnot remove the NA values but just ignores it.

```
penguins |>
  group_by(species) |>
  summarise(flip_max = max(flipper_length_mm, na.rm = TRUE),
            flip_min = min(flipper_length_mm, na.rm = TRUE))
```

```
# A tibble: 3 x 3
  species   flip_max flip_min
  <fct>        <int>    <int>
1 Adelie         210      172
2 Chinstrap      212      178
3 Gentoo         231      203
```

Starting with **penguins**, group the data by species and year, then create a summary table containing the mean bill depth (call this bill_depth_mean), the mean bill length (call this bill_length_mean), and the count for each group. How will you handle NA values?

```
penguins |>
  group_by(species, year) |>
  summarise(bill_depth_mean = mean(bill_depth_mm, na.rm = TRUE),
            bill_length_mean = mean(bill_length_mm, na.rm = TRUE),
            count = n())
```

```
# A tibble: 9 x 5
# Groups:   species [3]
  species    year bill_depth_mean bill_length_mean count
  <fct>     <int>           <dbl>            <dbl> <int>
1 Adelie     2007            18.8             38.8    50
2 Adelie     2008            18.2             38.6    50
3 Adelie     2009            18.1             39.0    52
4 Chinstrap  2007            18.5             48.7    26
5 Chinstrap  2008            18.4             48.7    18
6 Chinstrap  2009            18.3             49.1    24
7 Gentoo     2007            14.7             47.0    34
8 Gentoo     2008            14.9             46.9    46
9 Gentoo     2009            15.3             48.5    44
```

Use the `count()` function to count the number of observations for each species in `penguins`.

```
penguins |>
  count(species)
```

```
# A tibble: 3 x 2
  species       n
  <fct>     <int>
1 Adelie      152
2 Chinstrap    68
3 Gentoo      124
```

Use the `count()` function to count the number of observations for each species and island in `penguins`.

```
penguins |>
  count(species, island)
```

```
# A tibble: 5 x 3
  species   island        n
  <fct>     <fct>     <int>
1 Adelie    Biscoe       44
2 Adelie    Dream        56
3 Adelie    Torgersen    52
4 Chinstrap Dream        68
5 Gentoo    Biscoe      124
```

Use `filter()` to create a subset from `penguins` that contains observations for female penguins recorded at Torgersen and Biscoe Islands. Then use add the pipe `|>` and `count()` to verify that you written the correct code.

```
penguins |>
  filter(sex == "female",
         island %in% c("Torgesrsen", "Biscoe")) |>
  count (sex, island)
```

```
# A tibble: 1 x 3
  sex    island     n
  <fct>  <fct>  <int>
1 female Biscoe    80
```

Task 7: Data communication

In the YAML header (between the three dashes at the top of the document)

1. Add your name as the author of this document
2. Render the document and fix any errors

Task 8: Stage, Commit & Push to GitHub

1. Open the Git pane in RStudio. It's in the top right corner in a separate tab.
2. **Stage** your changes by checking appropriate box next to all files (if you select one file with your mouse, you can then highlight them all with Ctrl + A on your keyboard and check all boxes).
3. Write a meaningful commit message (e.g. "Completed part a of homework assignment 03.) in the **Commit message** box.
4. Click **Commit**. Note that every commit needs to have a commit message associated with it.