

# Lab 2: Data visualization

Not graded, just practice

Katie Schuler

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Practice your new ggplot skills with these practice exam questions! Best to open a fresh Google Colab notebook and test things out! Refer to the study guide to find answers as well.



Tip

More than one answer may be correct!

## 1 Setup

We will continue working with the `ratings` dataset from the visualization lecture (part of the `languageR` package).

```
library(ggplot2)
library(languageR)
```

It contains the following variables:

```
str(ratings)
```

```
'data.frame':  81 obs. of  14 variables:
 $ Word          : Factor w/ 81 levels "almond","ant",...: 1 2 3 4 5 6 7 8 9 10 ...
 $ Frequency     : num  4.2 5.35 6.3 3.83 3.66 ...
 $ FamilySize    : num  0 1.39 1.1 0 0 ...
 $ SynsetCount   : num  1.1 1.1 1.1 1.39 1.1 ...
 $ Length        : int   6 3 5 7 9 7 6 6 3 6 ...
 $ Class         : Factor w/ 2 levels "animal","plant": 2 1 2 2 2 2 1 2 1 1 ...
 $ FreqSingular  : int   24 69 315 26 19 24 53 74 155 37 ...
 $ FreqPlural    : int   42 140 231 19 19 6 78 77 103 14 ...
```

```

$ DerivEntropy      : num  0 0.562 0.496 0 0 ...
$ Complex           : Factor w/ 2 levels "complex","simplex": 2 2 2 2 2 2 2 2 2 2 ...
$ rInfl             : num  -0.542 -0.7 0.309 0.3 0 ...
$ meanWeightRating: num  1.49 3.35 2.19 1.32 1.44 ...
$ meanSizeRating   : num  1.89 3.63 2.47 1.76 1.87 ...
$ meanFamiliarity  : num  3.72 3.6 5.84 4.4 3.68 4.12 2.12 5.68 3.2 2.2 ...

```

## 2 Data viz day 1

1. Fill in the blanks below with one of the following words: **data**, **aesthetics**, **geom**.

The basic ggplot involves: (1) using your \_\_\_\_\_, (2) defining how variables are mapped to visual properties (\_\_\_\_\_), and (3) determining the geometrical object that a plot uses to represent data (\_\_\_\_\_)

2. When ggplot2 maps a categorical variable to an aesthetic, it automatically assigns a unique value of the aesthetic to each level of the variable. What is this process called?

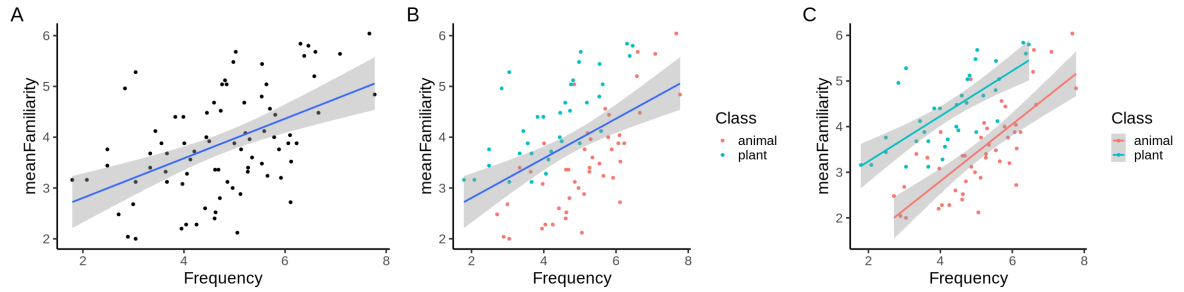
- (A) level assignment
- (B) variable aestheticization
- (C) autofill
- (D) scaling

3. The code below generated which of the following figures?

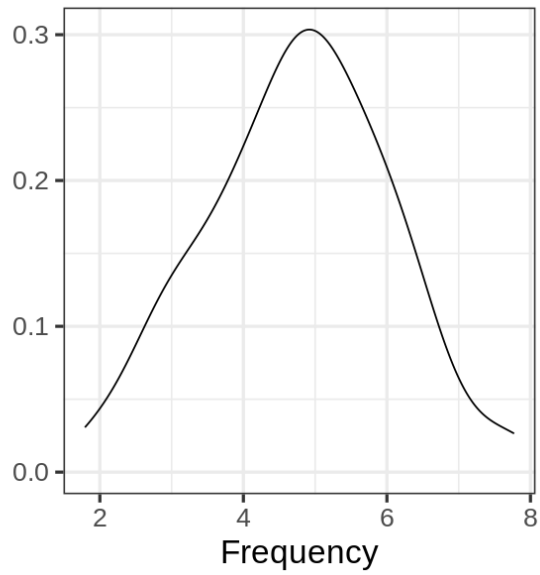
```

ggplot(
  data = ratings,
  mapping = aes(x = Frequency, y = meanFamiliarity)
) +
  geom_point(mapping = aes(color = Class)) +
  geom_smooth(method = "lm") +
  theme_classic(base_size=20)

```

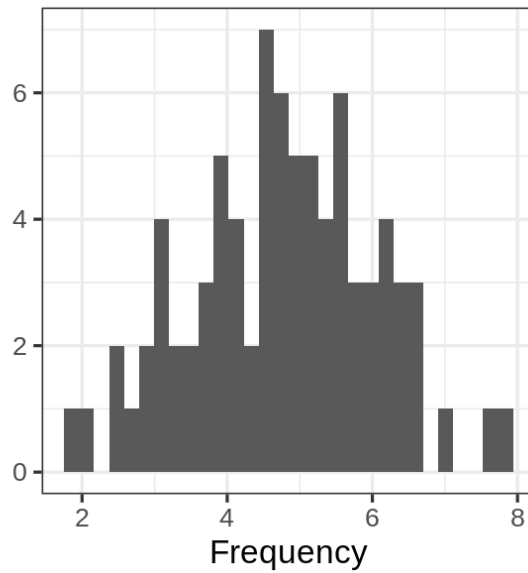


- (A) A
  - (B) B
  - (C) C
4. Suppose we want to map the variable **Complex** to the color aesthetic in a scatterplot. Which of the following arguments could we pass to `geom_point()`?
- (A) `color = Complex`
  - (B) `mapping=aes(color = Complex)`
  - (C) `color = mapping(Complex)`
  - (D) `aes(color=Complex)`
5. To adjust the size of the font to 20pt in the complete theme `theme_minimal()`, what argument should we include?
- (A) `base_size=20`
  - (B) `size=20`
  - (C) `font_family_size=20`
  - (D) None of the above
6. Which geoms are depicted in the following figure?



- (A) `geom_histogram()`
- (B) `geom_density()`
- (C) `geom_bar()`
- (D) `geom_smooth()`
- (E) `geom_point()`

7. Which geoms are depicted in the following figure?



- (A) `geom_histogram()`
- (B) `geom_density()`
- (C) `geom_bar()`
- (D) `geom_smooth()`
- (E) `geom_point()`

## 3 Data viz day 2

### 3.1 Plot 1

Given code blocks a, b, and c; and the plot below:

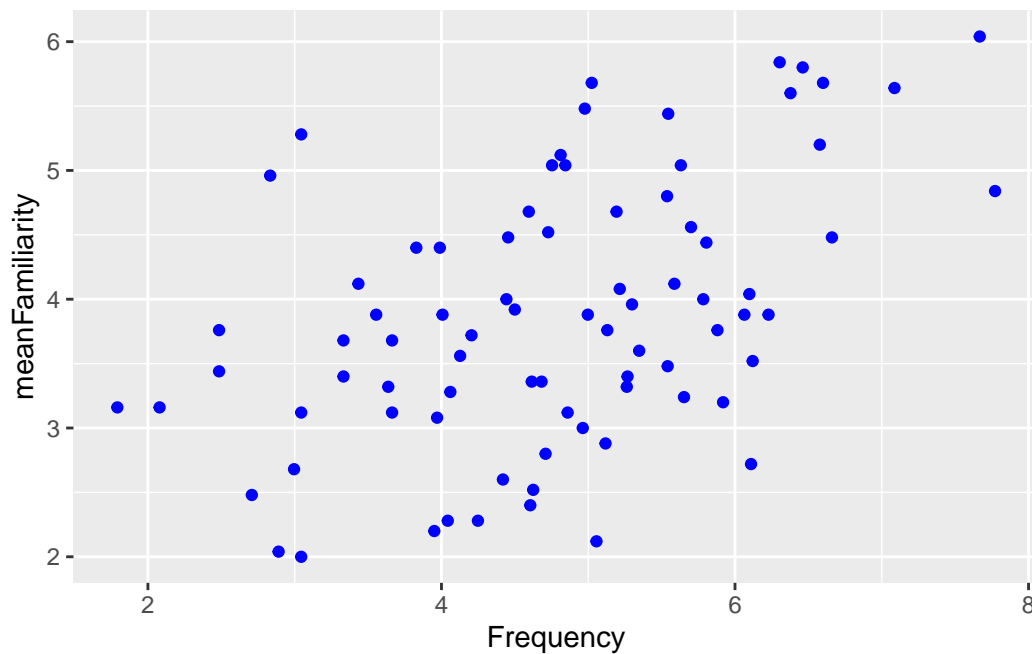
```
# CODE BLOCK a -----#
ggplot(
  data = ratings,
  mapping = aes(x = Frequency, y = meanFamiliarity)
) +
  geom_point(color = "blue")

# CODE BLOCK b -----#
```

```
ggplot(  
  data = ratings,  
  mapping = aes(x = Frequency, y = meanFamiliarity, color = "blue")  
)
```

# CODE BLOCK c -----#

```
ggplot(  
  data = ratings,  
  mapping = aes(x = Frequency, y = meanFamiliarity)  
) +  
  geom_point()
```

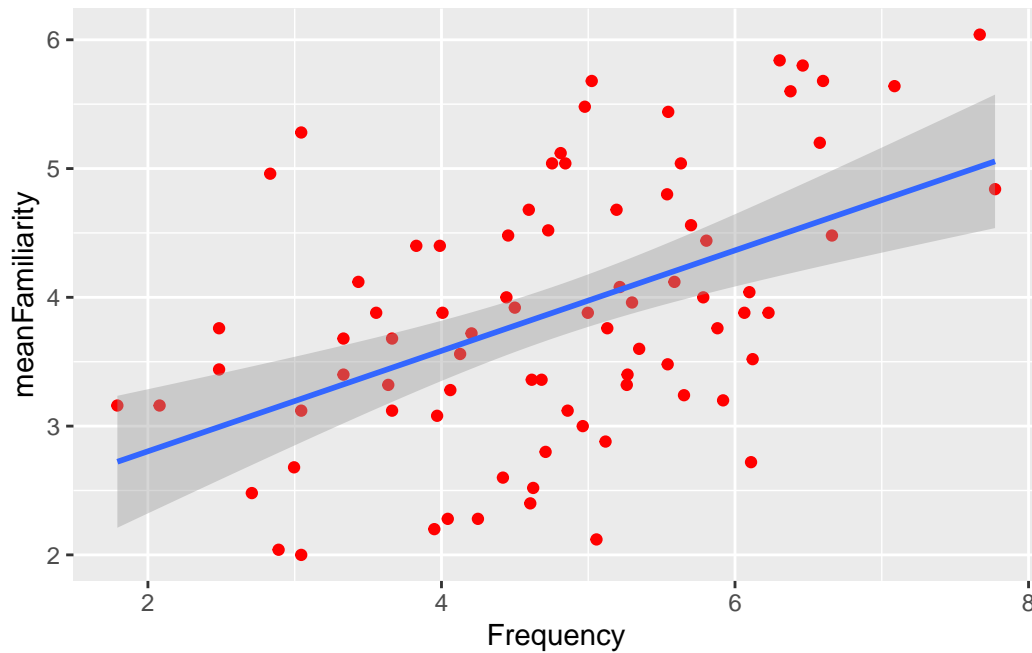


1. Which of the code blocks above generate the plot ?
  - (A) a
  - (B) b
  - (C) c
2. In the plot above, is the color aesthetic mapped, set, or both?
  - (A) mapped

- (B) set
  - (C) both
3. In the plot above, which of the following aesthetics should we set to make the points more transparent?
- (A) color
  - (B) fill
  - (C) alpha
  - (D) shape
4. In plot A above, which of the following would change the x axis label to “FQ”?
- (A) add a `labs()` layer with `x="FQ"` argument
  - (B) add a `labs()` layer with `y="FQ"` argument
  - (C) change the mapping argument from `x="Frequency"` to `x="FQ"`

### 3.2 Plot 2

Given the following plot:



1. In the plot above, which geom(s) are used to represent the data?
  - (A) `geom_histogram()`
  - (B) `geom_density()`
  - (C) `geom_bar()`
  - (D) `geom_point()`
  - (E) `geom_smooth()`
2. True or false, the blue line in the plot above is mapped to the `Class` aesthetic?
  - (A) True
  - (B) False
3. In the plot above, which of the following variables is mapped to the `x` aesthetic?
  - (A) Frequency
  - (B) meanFamiliarity

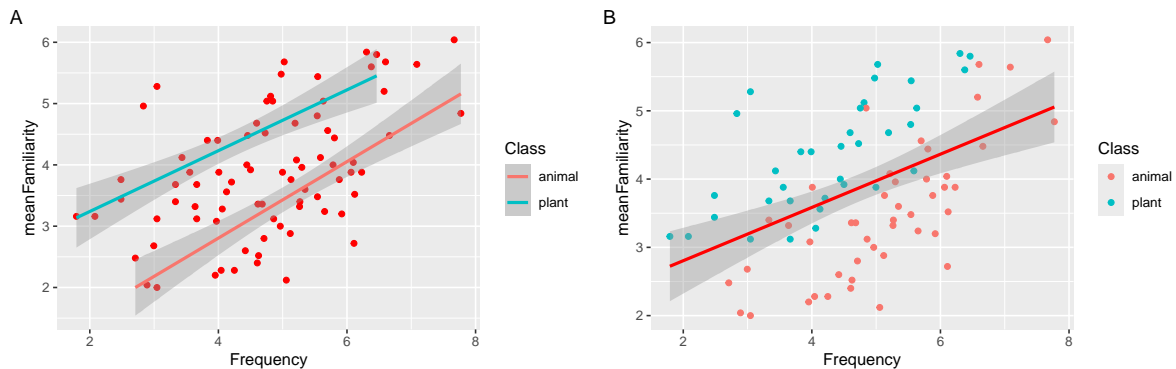


- (C) FreqSingular
  - (D) FreqPlural
4. True or false, in the plot above, the default statistical transformation in the geom responsible for the red dots is “identity”.
- (A) True
  - (B) False

### 3.3 Code block 1

Suppose we run the following code.

```
ggplot(
  data = ratings,
  mapping = aes(x = Frequency, y = meanFamiliarity, color = Class)
) +
  geom_point() +
  geom_smooth(method = "lm", color = "red")
```



1. Which of the following plots will be returned?
- (A) A
  - (B) B
2. Which aesthetic is mapped and which is set?
- (A) Class is set to color and the smoothing line is mapped to red

- (B) Class is mapped to color and the smoothing line is set to red
- (C) Both are mapped
- (D) Both are set

3. Which aesthetic is global and which is local?

- (A) Color is mapped to the class variable globally, and set to red locally
- (B) Color is mapped to the class variable locally, and set to red globally
- (C) Both are global
- (D) Both are local

### 3.4 Code block 2

Suppose we run the following code block

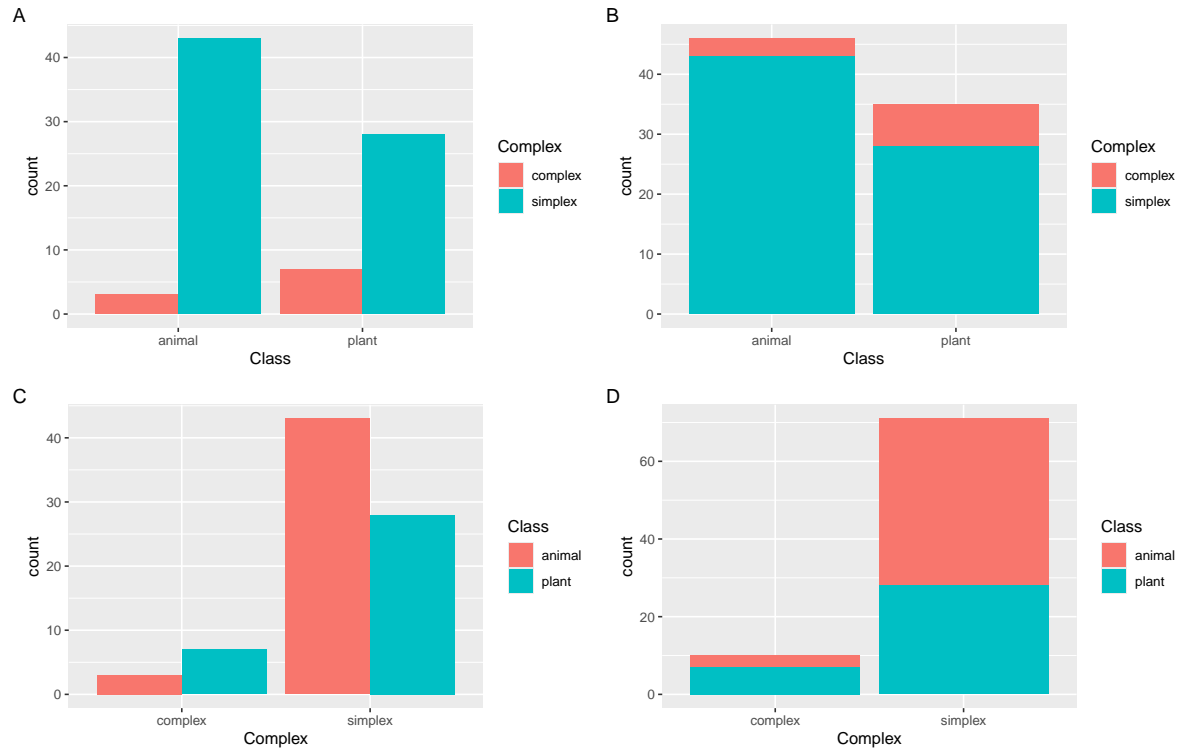
```
ggplot(  
  data = ratings,  
  mapping = aes(x = Class, fill = Complex)  
) +  
  geom_bar()
```

1. Which plot will be returned?

- (A) A
- (B) B
- (C) C
- (D) D

2. What would happen if we added the layer `scale_fill_manual(values = c("green", "orange"))` to the following plot?

- (A) error: no fill aesthetic specified
- (B) complex would turn green and simplex would turn orange



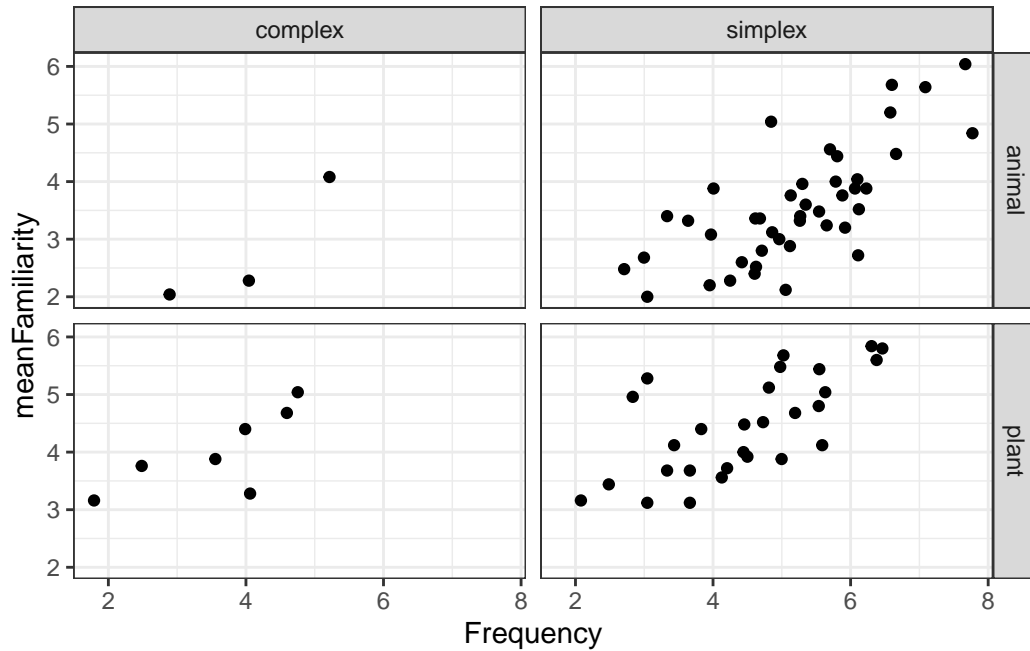
- (C) simplex would turn green and complex would turn orange
- (D) No change

3. What argument could we add to `geom_bar()` to add a black border around the bars?

- (A) `fill = black`
- (B) `border_color = 'black'`
- (C) `linetype = 'black'`
- (D) `color = 'black'`

### 3.5 Plot 3

Consider the following plot



1. To generate the facets in the plot above, which of the following lines of code must be included?
  - (A) `facet_grid(Complex ~ Class)`
  - (B) `facet_grid(Class ~ Complex)`
  - (C) `facet_grid(.~ Complex)`
  - (D) `facet_wrap(Class~Complex, ncol = 2)`
2. Which of the following geoms are added to the plot above?
  - (A) `geom_histogram()`
  - (B) `geom_density()`
  - (C) `geom_bar()`
  - (D) `geom_smooth()`
  - (E) `geom_point()`
3. Which built-in theme is applied to the following plot?

- (A) `theme_grey()`
- (B) `theme_classic()`
- (C) `theme_void()`
- (D) `theme_bw()`