# EPSY 5261 : Introductory Statistical Methods

Day 4

Visualization and Numerical Summaries

# Learning Goals

- At the end of this lesson, you should be able to…
  - Describe the general structure of a data set
    - What is a row?
    - What is a column?
  - Identify an attribute as categorical or quantitative
  - Create graphs for each variable type
  - Create summary statistics for each variable type

# Data Structure

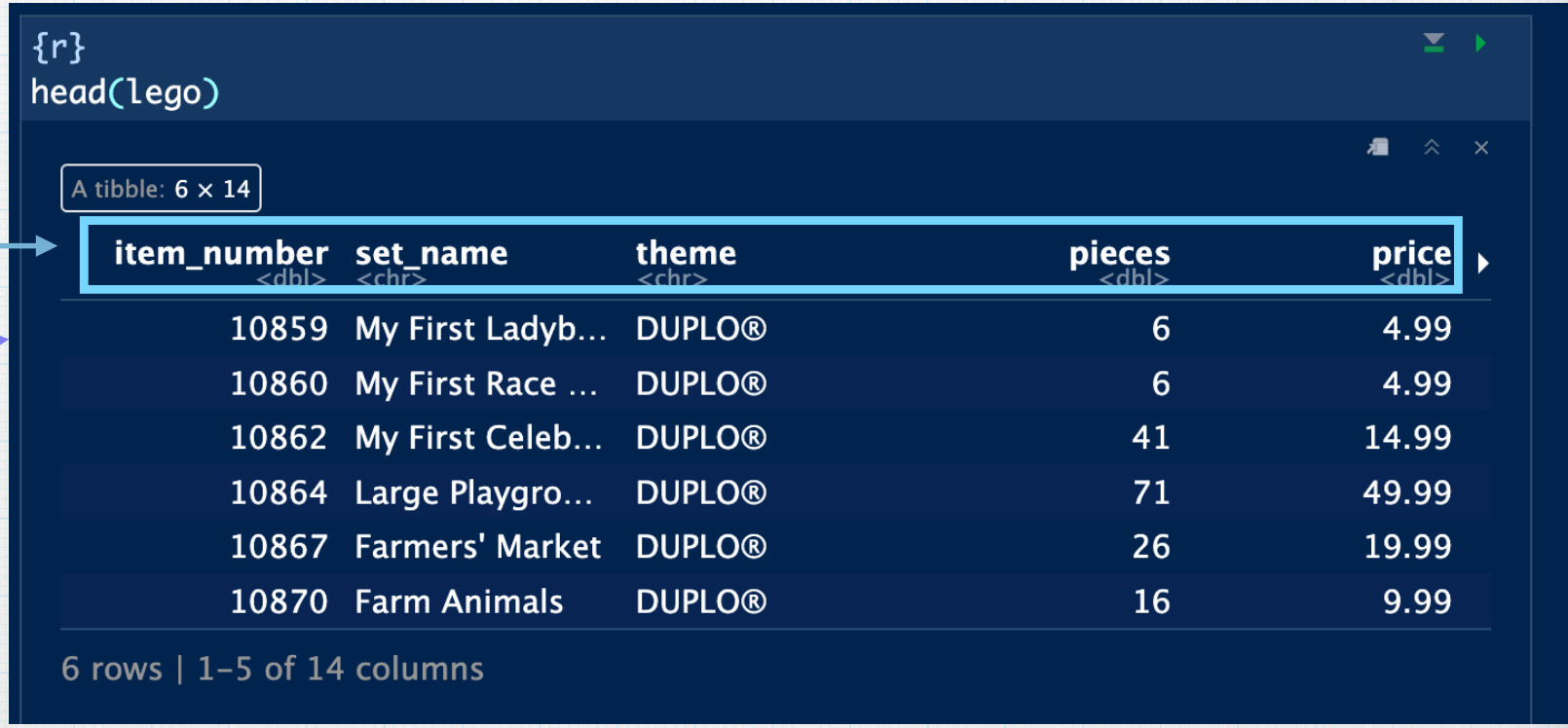
# Data Structure

| | Attribute 1 | Attribute 2 | Attribute 3 |
|---|---|---|---|
| Case 1 | | | |
| Case 2 | | | |
| Case 3 | | | |
| Case 4 | | | |

# Data Structure

Attributes

Cases



```
{r}
head(lego)
```

A tibble: 6 × 14

| item_number <dbl> | set_name <chr> | theme <chr> | pieces <dbl> | price <dbl> |
|---|---|---|---|---|
| 10859 | My First Ladyb… | DUPLO® | 6 | 4.99 |
| 10860 | My First Race … | DUPLO® | 6 | 4.99 |
| 10862 | My First Celeb… | DUPLO® | 41 | 14.99 |
| 10864 | Large Playgro… | DUPLO® | 71 | 49.99 |
| 10867 | Farmers' Market | DUPLO® | 26 | 19.99 |
| 10870 | Farm Animals | DUPLO® | 16 | 9.99 |

6 rows | 1–5 of 14 columns

# Variable Types

- Categorical
  - Recorded as words (or categories/levels)
  - Example: Highest Degree (High School, Bachelors, etc)
- Quantitative
  - Recorded as a number
  - Example: Height (recorded in inches)

# Type: Categorical

- "theme" is a categorical attribute
- The first 6 in our data set are all DUPLO themed

```
{r}
head(lego)
```

A tibble: 6 × 14

| item_number <dbl> | set_name <chr> | theme <chr> | pieces <dbl> | price <dbl> |
|---|---|---|---|---|
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| 10867 | Farmers' Market | DUPLO® | 26 | 19.99 |
| 10870 | Farm Animals | DUPLO® | 16 | 9.99 |

6 rows | 1–5 of 14 columns

# Type: Quantitative

- "pieces" is a quantitative attribute

```
{r}
head(lego)
```

A tibble: 6 × 14

| item_number <dbl> | set_name <chr> | theme <chr> | pieces <dbl> | price <dbl> |
|---|---|---|---|---|
| 10859 | My First Ladyb… | DUPLO® | 6 | 4.99 |
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| 10867 | Farmers' Market | DUPLO® | 26 | 19.99 |
| 10870 | Farm Animals | DUPLO® | 16 | 9.99 |

6 rows | 1–5 of 14 columns

# GOAL: Learn about our attributes

```r
head(lego)
```

A tibble: 6 × 14

| item_number <dbl> | set_name <chr> | theme <chr> | pieces <dbl> | price <dbl> |
|---|---|---|---|---|
| 10859 | My First Ladyb… | DUPLO® | 6 | 4.99 |
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6 rows | 1–5 of 14 columns

Datasets themselves are not useful for this

# GOAL: Learn about our attributes

```r
head(lego)
```

A tibble: 6 × 14

| item_number <dbl> | set_name <chr> | theme <chr> | pieces <dbl> | price <dbl> |
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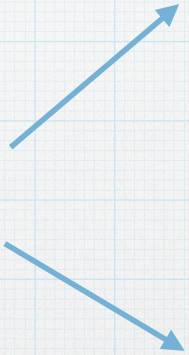
| 10870 | Farm Animals | DUPLO® | 16 | 9.99 |

6 rows | 1–5 of 14 columns



Statistics

Graphs

# Categorical Data

# Summary Statistics for Categorical

- Counts
- Percents
- Proportions

```r
df_stats( ~ theme, data = lego, "counts")
```

Description: df [1 × 4]

| response <chr> | n_City <int> | n_DUPLO® <int> | n_Friends <int> |
|---|---|---|---|
| theme | 25 | 25 | 25 |

1 row

```r
df_stats( ~ theme, data = lego, "props")
```

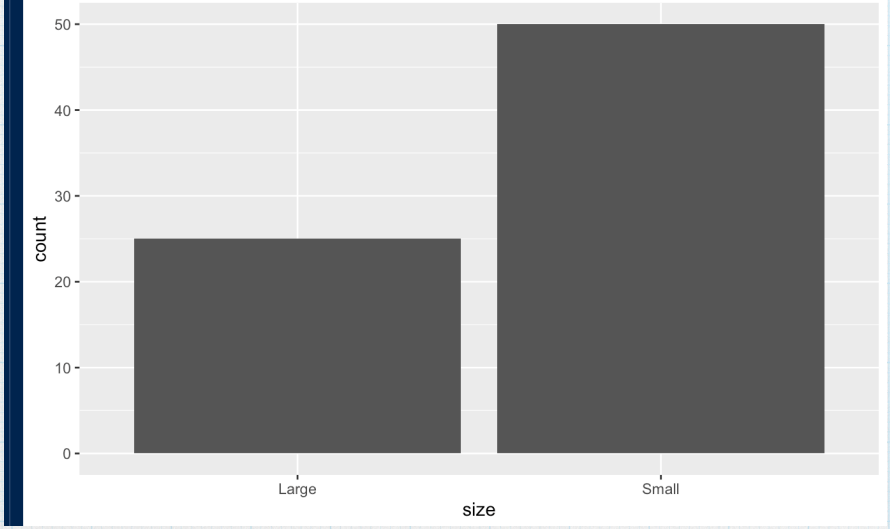
Description: df [1 × 4]

| response <chr> | prop_City <dbl> | prop_DUPLO® <dbl> | prop_Friends <dbl> |
|---|---|---|---|
| theme | 0.3333333 | 0.3333333 | 0.3333333 |

1 row

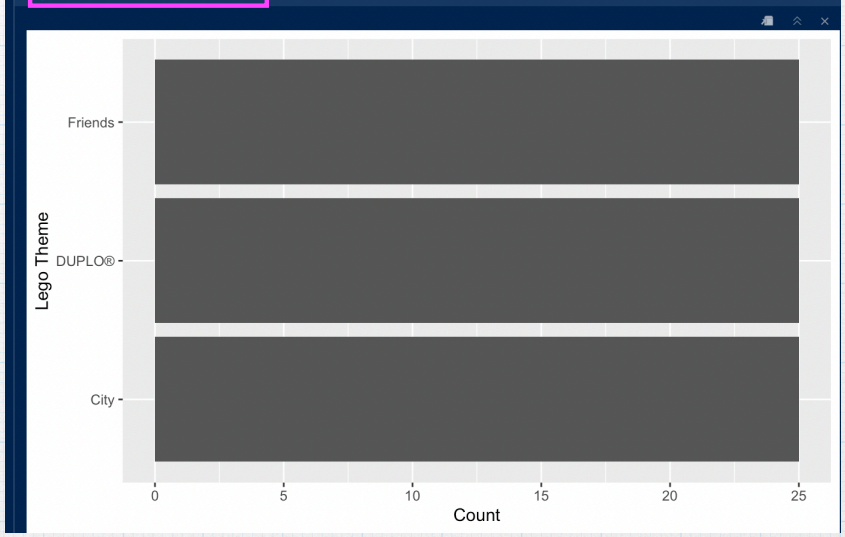
# Graphs for Categorical Data

```r
gf_counts(
  ~size, data = lego
  )
```




Vertical Bar Chart for Size Box

```r
gf_countsh(
  ~theme, data = lego,
  xlab = "Count",
  ylab = "Lego Theme"
  )
```




Horizontal Bar Chart for Theme

# Other Graphs for Categorical Data

- Pie Charts
- Donut Charts

# Quantitative Data

# Summary Statistics for Quantitative Data

- Mean
- Median
- Mode

```r
df_stats(~price, data = lego)
```

Description: df [1 × 10]

| respo... <chr> | min <dbl> | Q1 <dbl> | median <dbl> | Q3 <dbl> | max <dbl> | mean <dbl> | sd <dbl> | n <int> |
|---|---|---|---|---|---|---|---|---|
| price | 4.99 | 9.99 | 19.99 | 39.99 | 149.99 | 32.13... | 27.74... | 75 |

1 row | 1–9 of 10 columns

```r
df_stats(~pieces, data = lego)
```

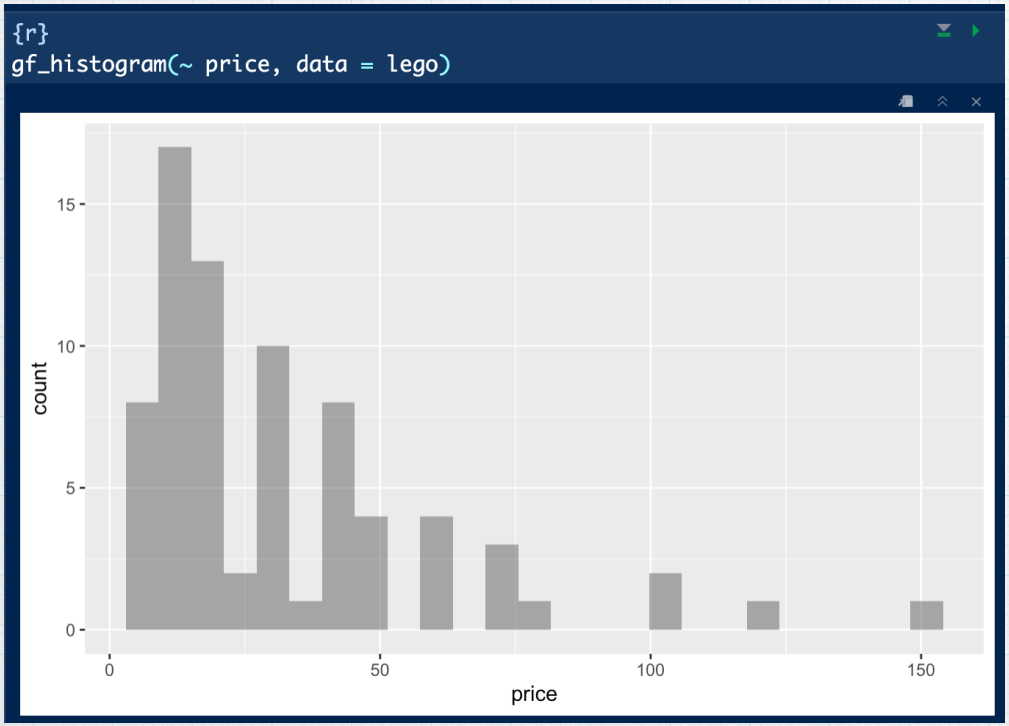
Description: df [1 × 10]

| respo... <chr> | min <dbl> | Q1 <dbl> | median <dbl> | Q3 <dbl> | max <dbl> | mean <dbl> | sd <dbl> | n <int> |
|---|---|---|---|---|---|---|---|---|
| pieces | 6 | 37 | 93 | 323.5 | 897 | 196.4... | 213.9... | 75 |

1 row | 1–9 of 10 columns

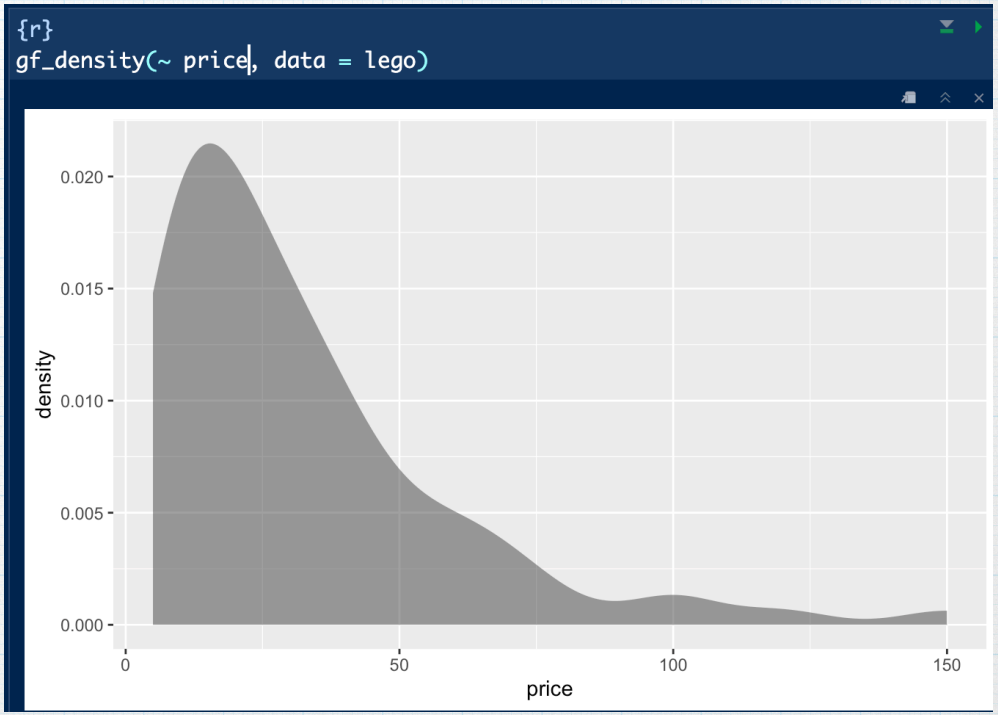
# Graphs for Quantitative Data

```r
gf_histogram(~ price, data = lego)
```




Histogram of Price

```r
gf_density(~ price, data = lego)
```




Density Plot of Price

# Other Graphs for Quantitative Data

- Boxplots
- Dotplots
- Density Plots

# Variables and Graphs Activity

# Summary

- Data is made up of cases (rows) and attributes (columns)
- Our attributes are either categorical (a word) or quantitative (a number)
- We can create graphs for each variable type
- We can create summary statistics for each variable type