Fundamental actions on data tables:

- choose rows — `filter()`
- choose columns — `select()`
- make new columns — `mutate()`
- arrange rows — `arrange()`
- calculate summary statistics — `summarize()`
- work on groups of data — `group_by()`
We can combine these verbs using the pipe operator: `%>%`

Standard R:
```r
> mean(iris$Sepal.Length)
[1] 5.843333
```

With pipe:
```r
> iris$Sepal.Length %>% mean()
[1] 5.843333
```
We can combine these verbs using the pipe operator: `%>%`

**Standard R:**

```
> head(iris)
        Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5          1.4         0.2  setosa
2          4.9         3.0          1.4         0.2  setosa
3          4.7         3.2          1.3         0.2  setosa
4          4.6         3.1          1.5         0.2  setosa
5          5.0         3.6          1.4         0.2  setosa
6          5.4         3.9          1.7         0.4  setosa
```
We can combine these verbs using the pipe operator: `%%`.

With pipe:

```r
> iris %>% head()

   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1       5.1       3.5        1.4       0.2  setosa
2       4.9       3.0        1.4       0.2  setosa
3       4.7       3.2        1.3       0.2  setosa
4       4.6       3.1        1.5       0.2  setosa
5       5.0       3.6        1.4       0.2  setosa
6       5.4       3.9        1.7       0.4  setosa
```
Combining pipe and assignment

These two lines do the same thing:

```r
> mean_length <- mean(iris$Sepal.Length)
> mean_length <- iris$Sepal.Length %>% mean()
> mean_length
[1] 5.843333
```
Pipe example 1: count how many herbivores of different orders there are in `msleep`
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```r
msleep %>%
  filter(vore == "herbi")
```
Pipe example 1: count how many herbivores of different orders there are in msleep

```r
msleep %>%
  filter(vore == "herbi") %>%
  group_by(order)
```
Pipe example 1: count how many herbivores of different orders there are in msleep

```r
msleep %>%
  filter(vore == "herbi") %>%
  group_by(order) %>%
  summarize(count = n())
```
Pipe example 1: count how many herbivores of different orders there are in msleep

```r
msleep %>%
  filter(vore == "herbi") %>%
  group_by(order) %>%
  summarize(count = n()) %>%
  arrange(desc(count))
```
Pipe example 1: count how many herbivores of different orders there are in `msleep`

```r
msleep %>%
  filter(vore == "herbi") %>%
  group_by(order) %>%
  summarize(count = n()) %>%
  arrange(desc(count))
```

<table>
<thead>
<tr>
<th>order</th>
<th>count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rodentia</td>
<td>16</td>
</tr>
<tr>
<td>Artiodactyla</td>
<td>5</td>
</tr>
<tr>
<td>Perissodactyla</td>
<td>3</td>
</tr>
<tr>
<td>Hyracoidea</td>
<td>2</td>
</tr>
<tr>
<td>Proboscidea</td>
<td>2</td>
</tr>
<tr>
<td>Diprotodontia</td>
<td>1</td>
</tr>
<tr>
<td>Lagomorpha</td>
<td>1</td>
</tr>
<tr>
<td>Pilosa</td>
<td>1</td>
</tr>
<tr>
<td>Primates</td>
<td>1</td>
</tr>
</tbody>
</table>
Pipe example 2: What is total day time for each animal in msleep?
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```r
msleep %>%
  mutate(total_day_time = awake + sleep_total)
```
Pipe example 2: What is total day time for each animal in `msleep`?

```r
msleep %>%
  mutate(total_day_time = awake + sleep_total) %>%
  select(name, total_day_time)
```
Pipe example 2: What is total day time for each animal in msleep?

```r
msleep %>%
  mutate(total_day_time = awake + sleep_total) %>%
  select(name, total_day_time)
```

<table>
<thead>
<tr>
<th>name</th>
<th>total_day_time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheetah</td>
<td>24.00</td>
</tr>
<tr>
<td>Owl monkey</td>
<td>24.00</td>
</tr>
<tr>
<td>Mountain beaver</td>
<td>24.00</td>
</tr>
<tr>
<td>Greater short-tailed shrew</td>
<td>24.00</td>
</tr>
<tr>
<td>Cow</td>
<td>24.00</td>
</tr>
<tr>
<td>Three-toed sloth</td>
<td>24.00</td>
</tr>
<tr>
<td>Northern fur seal</td>
<td>24.00</td>
</tr>
<tr>
<td>Vesper mouse</td>
<td>24.00</td>
</tr>
<tr>
<td>Dog</td>
<td>24.00</td>
</tr>
<tr>
<td>Roe deer</td>
<td>24.00</td>
</tr>
</tbody>
</table>
Pipe example 3: What is the median awake time of different orders in `msleep`?
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```r
msleep %>%
  group_by(order)
```
Pipe example 3: What is the median awake time of different orders in `msleep`?

```r
msleep %>%
  group_by(order) %>%
  summarize(med_awake = median(awake))
```
Pipe example 3: What is the median awake time of different orders in `msleep`?

```r
msleep %>%
  group_by(order) %>%
  summarize(med_awake = median(awake)) %>%
  arrange(med_awake)
```
Pipe example 3: What is the median awake time of different orders in `msleep`?

```r
msleep %>%
  group_by(order) %>%
  summarize(med_awake = median(awake)) %>%
  arrange(med_awake)
```

<table>
<thead>
<tr>
<th>order</th>
<th>med_awake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiroptera</td>
<td>4.20</td>
</tr>
<tr>
<td>Didelphimorphia</td>
<td>5.30</td>
</tr>
<tr>
<td>Cingulata</td>
<td>6.25</td>
</tr>
<tr>
<td>Afrosoricida</td>
<td>8.40</td>
</tr>
<tr>
<td>Pilosa</td>
<td>9.60</td>
</tr>
<tr>
<td>Rodentia</td>
<td>11.10</td>
</tr>
<tr>
<td>Diprotodontia</td>
<td>11.60</td>
</tr>
<tr>
<td>Soricomorpha</td>
<td>13.70</td>
</tr>
<tr>
<td>Carnivora</td>
<td>13.75</td>
</tr>
<tr>
<td>Erinaceomorpha</td>
<td>13.80</td>
</tr>
</tbody>
</table>