Portfolio assignment 13

10 min: Do a bivariate analysis on the penguins dataset for the following combination of columns:

- species VS sex
- island VS sex

For this bivariate analysis, at least perform the following tasks:

- Do you expect their to be a correlation between the two columns?
- Create a contigency table. Do you observe different ratios between categories here?
- Create a bar plot for this contigency table. Do you observe different ratios between categories here?
- Do a chi-squared test. What does the result say? What's the chance of there being a correlation between the two columns?

In [1]:

```
import pandas as pd
import seaborn as sns
```

In [2]:

```
penguins = sns.load_dataset('penguins')
penguins.head()
```

Out[2]:

	species	island	bill_length_mm	bill_depth_mm	flipper_length_mm	body_mass_g	sex
0	Adelie	Torgersen	39.1	18.7	181.0	3750.0	Male
1	Adelie	Torgersen	39.5	17.4	186.0	3800.0	Female
2	Adelie	Torgersen	40.3	18.0	195.0	3250.0	Female
3	Adelie	Torgersen	NaN	NaN	NaN	NaN	NaN
4	Adelie	Torgersen	36.7	19.3	193.0	3450.0	Female

In [3]:

```
speciesTable = penguins.groupby(['species','sex']).size().unstack('species', fill_valu
speciesTable
```

Out[3]:

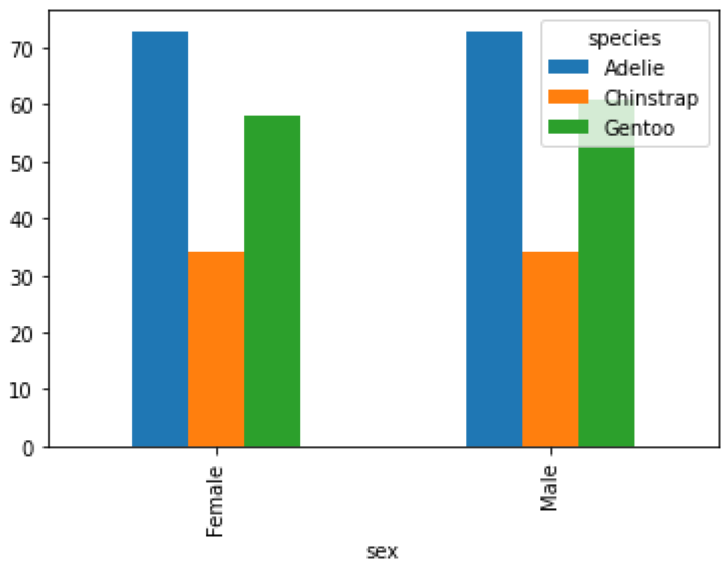
species	Adelie	Chinstrap	Gentoo
sex			
Female	73	34	58
Male	73	34	61

In [4]:

```
speciesTable.plot(kind='bar')
```

Out[4]:

```
<AxesSubplot:xlabel='sex'>
```



In [5]:

```
islandTable = penguins.groupby(['island','sex']).size().unstack('island', fill_value=
islandTable
```

Out[5]:

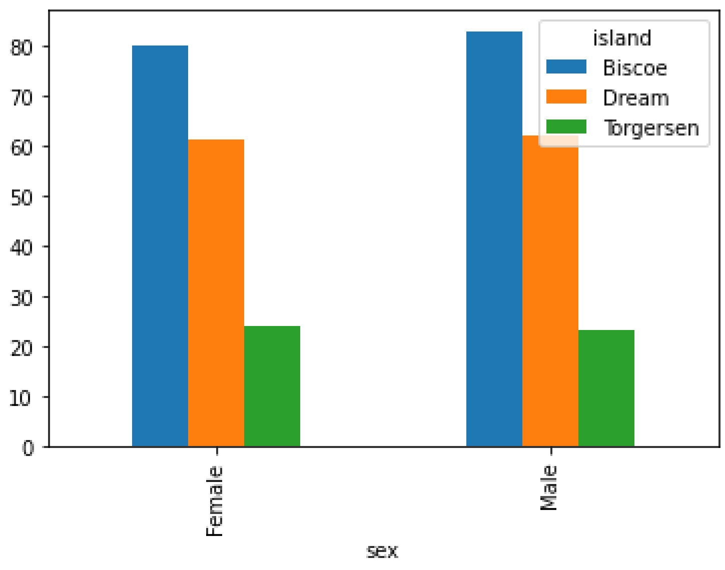
island	Biscoe	Dream	Torgersen
sex			
Female	80	61	24
Male	83	62	23

In [6]:

```
islandTable.plot(kind='bar')
```

Out[6]:

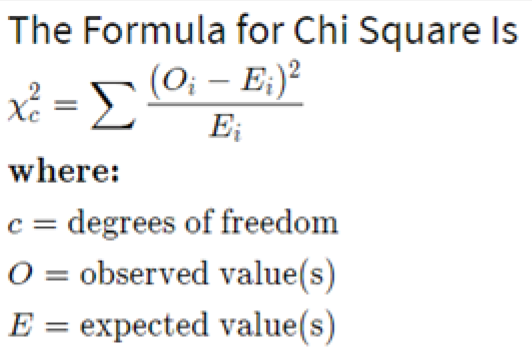
```
<AxesSubplot:xlabel='sex'>
```



Looking at both barplots, there is almost no difference between the female and male graphs. The Gentoo one in the islands table has a slight difference in height, but that's it.

In [7]:

```
from scipy.stats import chi2_contingency
```



The Formula for Chi Square Is

$$\chi^2_c = \sum \frac{(O_i - E_i)^2}{E_i}$$

where:

$c =$ degrees of freedom

$O =$ observed value(s)

$E =$ expected value(s)

In [8]:

```
chi2_contingency(speciesTable)
```

Out[8]:

```
(0.04860717014078319,
 0.9759893689765846,
 2,
 array([[72.34234234, 33.69369369, 58.96396396],
        [73.65765766, 34.30630631, 60.03603604]]))
```

In [9]:

```
chi2_contingency(islandTable)
```

Out[9]:

```
(0.05759904881286206,
 0.971611229281065,
 2,
 array([[80.76576577, 60.94594595, 23.28828829],
        [82.23423423, 62.05405405, 23.71171171]]))
```

For both tables, there is a ~5% chance there is a correlation between the two data types. This makes sense, since there shouldn't be any correlation in both comparisons.