Homework 2

A car dealership wants to understand their customers and their buying habbits. The data (`cardealership.csv`) represents a randsome sample of their sales.

VARIABLE	DESCRIPTION
Gender	gender for customer
marital status	is the customer 'Married' or 'Single'?
age	age of the customer
country	country make of the car
size	the size of the car they bought ('Small', 'Medium', 'Large')
type	the type of the car they bought ('Family', 'Sporty', 'work')

In [49]:

```python
# gives 5 random lines in it
carDealer.sample(5)
```

Out[49]:

	Gender	marital status	age	country	size	type
293	Female	Married	35	Japanese	Medium	Family
29	Male	Married	35	American	Small	Sporty
288	Female	Single	34	Japanese	Small	Family
225	Female	Married	35	Japanese	Small	Family
105	Male	Married	33	European	Small	Family

In [50]:

```python
carDealer.shape[1]
```

Out[50]:

```
6
```

1. (1 point) Select all the married customers in the given dataset, and save it in a variable (`married_customers`). What is the percentage of married customers in the sample?

In [3]:

```python
import pandas as pd

carDealer = pd.read_csv("cardealership.csv")

married_customers = carDealer["marital status"]
married_customers_count = married_customers.value_counts("Married")[0]
print(married_customers_count)
```

```
0.6468646864686468
```

2. (1 point) Use a list comprehension to create a list with two age categories. The category is `Below or equal to 30` if `age <= 30`, otherwise the category is `Above 30`. Use the result from this question to compute the number of customers in each category.

```
In [54]: ages = ["Below or equal to 30" if age <30 else "Above 30" for age in carDeal

         pd.Series(ages).value_counts()
```

```
Out[54]: Above 30                159
         Below or equal to 30    144
         Name: count, dtype: int64
```

3. (2 points) The current version of `Pandas` has 142 methods including (`DataFrame()`, `Series()`, `value_counts()`, etc.). In this question, you are expected to learn about the `cut()` method which allows you to categorize a numerical vector into user-defined categories. Click here to learn more about the `cut` method.

   - Use the `cut()` method to categorize the `age` variable into three buckets: `(0,30]`, `(30, 34]`, and `(34,60]`. (For this exercise, you don't have to add the new column to the original dataframe. You can save it in a seperate variable instead)
   - Rename the labels of the buckets to the ones shown in the table below.
   - How many element are there in each category?

bucket	label
(0,30]	Below 30
(30, 34]	Between 30 and 34
(34,60]	Above 34

```
In [10]: buckets = pd.cut(carDealer["age"], bins=[0,30,34,60], labels=["Below 30", "E
         elements = buckets.value_counts()
         print(elements)
```

```
age
Below 30             159
Above 34              76
Between 30 and 34     68
Name: count, dtype: int64
```

4. (1 point) `Pandas` has another method called `qcut`, which allows you to categorize a numerical variable into equal-sized buckets based on quantiles. Use the `qcut()` method to categorize `age` into quartiles (4 buckets). Click here to learn more about the `cut` method

In [43]:

```
buckets = pd.qcut(carDealer["age"], q=4)
quartiles = buckets.value_counts()
print(quartiles)
```

```
age
(17.999, 26.0]    85
(34.5, 60.0]      76
(26.0, 30.0]      74
(30.0, 34.5]      68
Name: count, dtype: int64
```

5. (1 point) Using `pandas`, summarize the customer characteristics: `Gender`, `marital status` (using relative frequency tables) and `age` (using the `describe()` method).

In [41]:

```
maritalStatus = carDealer["marital status"].value_counts(normalize=True)*100
print(maritalStatus)
```

```
marital status
Married    64.686469
Single     35.313531
Name: proportion, dtype: float64
```

In [40]:

```
gender = carDealer["Gender"].value_counts(normalize=True)*100
print(gender)
```

```
Gender
Male      54.455446
Female    45.544554
Name: proportion, dtype: float64
```

In [29]:

```
age = carDealer["age"].describe()
print(age)
```

```
count    303.000000
mean      30.719472
std        5.984294
min       18.000000
25%       26.000000
50%       30.000000
75%       34.500000
max       60.000000
Name: age, dtype: float64
```

6. (1 point) Using `pandas`, summarize the data on the cars sold: `country`, `size`, and `type` (using relative frequency tables).

In [30]:

```
country = carDealer["country"].value_counts(normalize=True)*100
print(country)
```

```
country
Japanese    48.844884
American    37.953795
European    13.201320
Name: proportion, dtype: float64
```

In [31]:

```
size = carDealer["size"].value_counts(normalize=True)*100
print(size)
```

```
size
Small     45.214521
Medium    40.924092
Large     13.861386
Name: proportion, dtype: float64
```

In [32]:

```
type = carDealer["type"].value_counts(normalize=True)*100
print(type)
```

```
type
Family    51.155116
Sporty    33.003300
Work      15.841584
Name: proportion, dtype: float64
```

7. (1 point) Write a summary paragraph describing the customers and cars sold data. Round all numbers in this paragraph to nearest integers.

In [ ]:

```
# Customers
There are 303 total customers in this data.
About 65% of those customers are married, and about 34% of them are single.
Around 54% of customers are Male, and about 46% are female.
The average age of a customer is around 31 years old, and the youngest car b

# Cars Sold
Japanese cars are sold the most, around 49%. American cars are second, with
Most (45%) of customers buy small cars, 41% buy medium cars, and a small por
The majority of the cars, 51%, purchased are family cars. Sporty and work ca
```

8. (2 points) Create a bargraph that shows the distribution of car `type`. Your bargraph should be similar to the attached bargraph picture on blackboard ('CarsTypeDistribution.png'). In particular, make sure to:

- Use default matplotlib plot style
- Use % for the labels of the y-axis ticks
- Use `lightgrey` for the bars color
- Overlay a horizontal line (y=25). The line's style is "dashed", and the color is "blue"

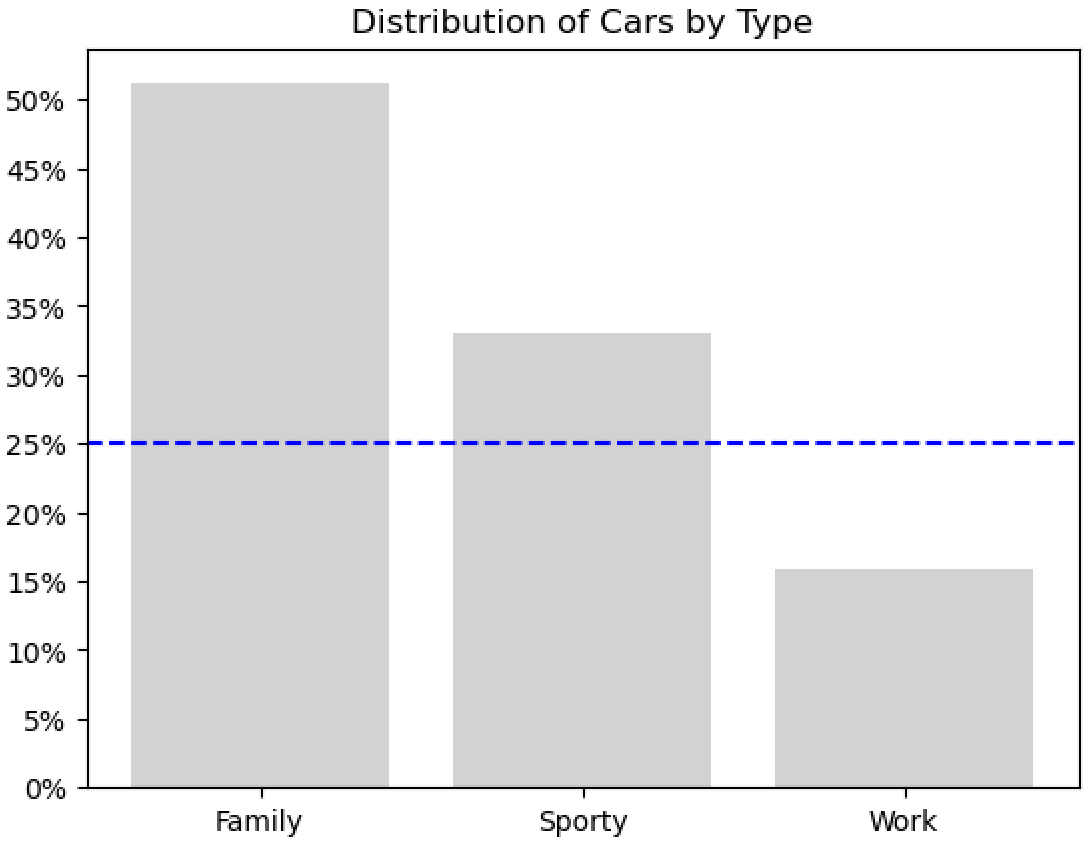
In [45]:

```
import matplotlib.pyplot as plt

carType = carDealer["type"].value_counts(normalize=True)*100
plt.bar(carType.index, carType, color="lightgrey")
plt.title("Distribution of Cars by Type")
```

```
yLabel = ["0%", "5%", "10%", "15%", "20%", "25%", "30%", "35%", "40%", "45%"
plt.yticks(range(0,51,5), yLabel)
plt.axhline(y=25, color="blue", linestyle="dashed")

plt.show()
```


Distribution of Cars by Type
Family
Sporty
Work