In [37]:

```
from sklearn.cluster import KMeans
from sklearn.datasets import load_iris
import matplotlib.pyplot as plt
import pandas as pd
```

In [4]:

```
iris = load_iris()
dir(iris)
```

Out[4]:

```
['DESCR', 'data', 'feature_names', 'filename', 'target', 'target_names']
```

In [39]:

```
# we will only observe the pattern between petal length and width features for this clust
ering problem
data = pd.DataFrame(data = iris.data, columns = iris.feature_names)
data.head()
```

Out[39]:

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2

In [42]:

```
# removing sepal length and sepal width
data.drop(['sepal length (cm)', 'sepal width (cm)'], axis = 'columns', inplace = True)
data
```

Out[42]:

	petal length (cm)	petal width (cm)
0	1.4	0.2
1	1.4	0.2
2	1.3	0.2
3	1.5	0.2
4	1.4	0.2
...	...	...
145	5.2	2.3
146	5.0	1.9
147	5.2	2.0
148	5.4	2.3
149	5.1	1.8

150 rows × 2 columns

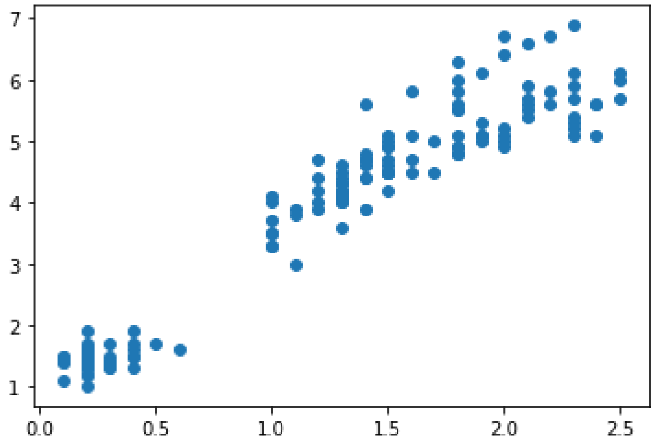
In [43]:

```
# plotting the data
```

```
plt.scatter(data['petal width (cm)'], data['petal length (cm)'])
```

Out[43]:

```
<matplotlib.collections.PathCollection at 0xd789d3e208>
```



In [44]:

```
# using elbow methods to find best number of clusters
k_list = range(1,11)
sse = []

for k in k_list:
    km = KMeans(n_clusters = k)
    km.fit(data)
    sse.append(km.inertia_)
sse
```

Out[44]:

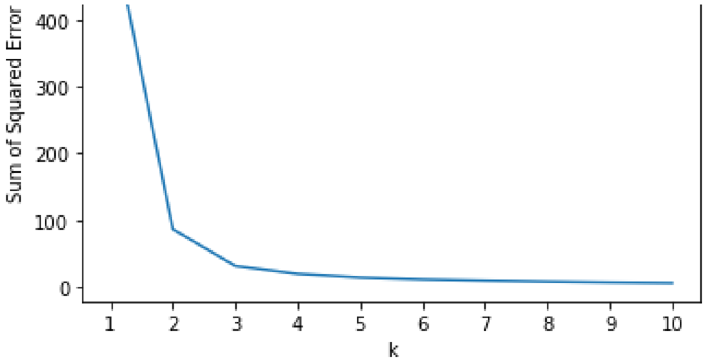
```
[550.8953333333334,
 86.39021984551397,
 31.371358974358973,
 19.48300089968511,
 13.916908757908757,
 11.07065234189628,
 9.244938551786376,
 7.745948930296759,
 6.545263125763126,
 5.704365024006968]
```

In [45]:

```
# plotting the elbow
plt.plot(k_list, sse)
plt.xlabel("k")
plt.ylabel("Sum of Squared Error")
plt.xticks(k_list)
# we can see the best number of clusters are 3
```

Out[45]:

```
([<matplotlib.axis.XTick at 0xd789da3668>,
  <matplotlib.axis.XTick at 0xd789d919b0>,
  <matplotlib.axis.XTick at 0xd789d91e48>,
  <matplotlib.axis.XTick at 0xd789dcb320>,
  <matplotlib.axis.XTick at 0xd789dcb7f0>,
  <matplotlib.axis.XTick at 0xd789dcbcc0>,
  <matplotlib.axis.XTick at 0xd789dd2240>,
  <matplotlib.axis.XTick at 0xd789dd27b8>,
  <matplotlib.axis.XTick at 0xd789dd2d30>,
  <matplotlib.axis.XTick at 0xd789dd92e8>],
 <a list of 10 Text xticklabel objects>)
```



In [46]:

```
# clustering with 3 clusters
km = KMeans(n_clusters = 3)
y_pred = km.fit_predict(data)
y_pred
```

Out[46]:

```
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 0, 2, 2, 2, 2, 2, 0, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

In [48]:

```
# adding cluster predictions to our data
data['cluster'] = y_pred
data.head()
```

Out[48]:

	petal length (cm)	petal width (cm)	cluster
0	1.4	0.2	1
1	1.4	0.2	1
2	1.3	0.2	1
3	1.5	0.2	1
4	1.4	0.2	1

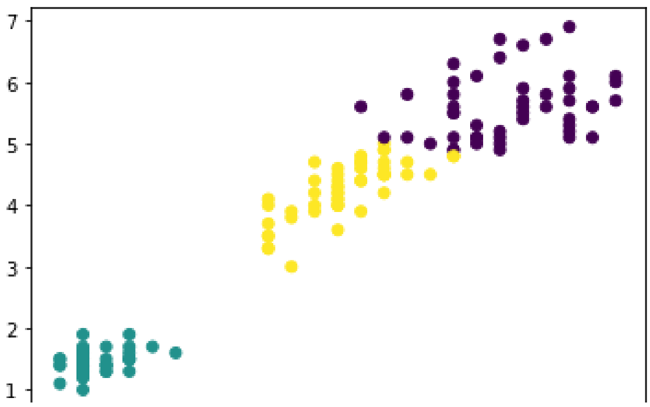
In [55]:

```
# plotting the data according to clusters
plt.scatter(data['petal width (cm)'], data['petal length (cm)'], c = data.cluster)

# we can see that the data has been clustered well
```

Out[55]:

```
<matplotlib.collections.PathCollection at 0xd78a0da048>
```



In [59]:

```
# cross checking clustering using available target in the iris data
data['target'] = iris.target
plt.scatter(data['petal width (cm)'], data['petal length (cm)'], c = data.target)

# both the plots show similar grouping thus we can conclude clustering is good
# we can say that the three classes can be correctly differentiated using clustering
```

Out[59]:

```
<matplotlib.collections.PathCollection at 0xd78a137ac8>
```