In [8]:

```
import pandas as pd
import numpy as np
import seaborn as sns
from sklearn import datasets
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score,confusion_matrix
```

In [12]:

```
df = sns.load_dataset('iris')
df.head()
```

Out[12]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In [13]:

```
encoder = LabelEncoder()
df['species']=encoder.fit_transform(df['species'])
```

In [14]:

```
df.head()
```

Out[14]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	0
1	4.9	3.0	1.4	0.2	0
2	4.7	3.2	1.3	0.2	0
3	4.6	3.1	1.5	0.2	0
4	5.0	3.6	1.4	0.2	0

In [15]:

```
df = df[['sepal_length','petal_length','species']]
df.head()
```

Out[15]:

	sepal_length	petal_length	species
0	5.1	1.4	0
1	4.9	1.4	0
2	4.7	1.3	0
3	4.6	1.5	0
4	5.0	1.4	0

In [16]:

```
x =df.iloc[:,0:2]
y =df.iloc[:,-1]
```

In [21]:

```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.2)
```

In [22]:

```
clf = LogisticRegression(multi_class='multinomial')
```

In [23]:

```
clf.fit(x_train,y_train)
```

Out[23]:

```
LogisticRegression(multi_class='multinomial')
```

In [24]:

```
y_pred = clf.predict(x_test)
```

In [25]:

```
print(accuracy_score(y_test,y_pred))
```

```
0.9666666666666667
```

In [26]:

```
pd.DataFrame(confusion_matrix(y_test,y_pred))
```

Out[26]:

	0	1	2
0	12	0	0
1	0	12	1
2	0	0	5

In [29]:

```
# prediction
query = np.array([[3.4,2.7]])
clf.predict_proba(query)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py:450: UserWarnin
g: X does not have valid feature names, but LogisticRegression was fitted
with feature names
  warnings.warn(
```

Out[29]:

```
array([[7.82845922e-01, 2.16888169e-01, 2.65909205e-04]])
```

In [30]:

```
clf.predict(query)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py:450: UserWarnin
g: X does not have valid feature names, but LogisticRegression was fitted
with feature names
  warnings.warn(
```

Out[30]:

```
array([0])
```

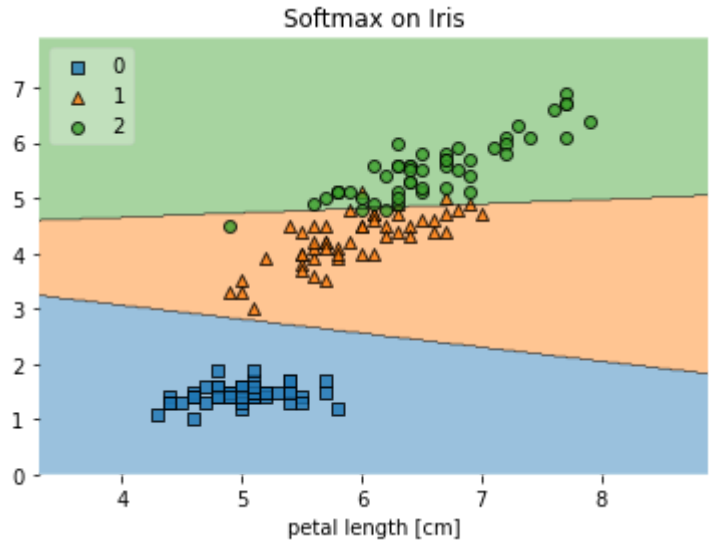
In [32]:

```
from mlxtend.plotting import plot_decision_regions
plot_decision_regions(x.values,y.values,clf,legend=2)

# Adding axes annoatations
plt.xlabel('sepal length [cm]')
plt.xlabel('petal length [cm]')
plt.title('Softmax on Iris')

plt.show()
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py:450: UserWarnin
g: X does not have valid feature names, but LogisticRegression was fitted
with feature names
  warnings.warn(
```



In [ ]: