In [12]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import KFold
from sklearn.model_selection import train_test_split,cross_val_score
from sklearn.model_selection import cross_val_score
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import accuracy_score,classification_report,confusion_matrix
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import GridSearchCV
```

In [13]:

```
zoo_data = pd.read_csv("Zoo.csv")
zoo_data
zoo_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 101 entries, 0 to 100
Data columns (total 18 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   animal name  101 non-null    object
 1   hair         101 non-null    int64 
 2   feathers     101 non-null    int64 
 3   eggs         101 non-null    int64 
 4   milk         101 non-null    int64 
 5   airborne     101 non-null    int64 
 6   aquatic      101 non-null    int64 
 7   predator     101 non-null    int64 
 8   toothed      101 non-null    int64 
 9   backbone     101 non-null    int64 
 10  breathes     101 non-null    int64 
 11  venomous     101 non-null    int64 
 12  fins         101 non-null    int64 
 13  legs         101 non-null    int64 
 14  tail         101 non-null    int64 
 15  domestic     101 non-null    int64 
 16  catsize      101 non-null    int64 
 17  type         101 non-null    int64 
dtypes: int64(17), object(1)
memory usage: 14.3+ KB
```

In [2]:

```
zoo_data.dtypes
```

Out[2]:

```
animal name    object
hair            int64
feathers        int64
eggs            int64
milk            int64
airborne        int64
aquatic         int64
predator        int64
toothed         int64
backbone        int64
breathes        int64
venomous        int64
fins            int64
legs            int64
tail            int64
domestic        int64
catsize         int64
type            int64
dtype: object
```

In [3]:

```
zoo_data.isnull().sum()
```

Out[3]:

```
animal name    0
hair           0
feathers       0
eggs           0
milk           0
airborne       0
aquatic        0
predator       0
toothed        0
backbone       0
breathes       0
venomous       0
fins           0
legs           0
tail           0
domestic       0
catsize        0
type           0
dtype: int64
```

In [4]:

```
zoo_data.duplicated().sum()
```

Out[4]:

```
0
```

In [5]:

```
zoo_data.describe()
```

Out[5]:

	hair	feathers	eggs	milk	airborne	aquatic	predator	
count	101.000000	101.000000	101.000000	101.000000	101.000000	101.000000	101.000000	10
mean	0.425743	0.198020	0.584158	0.405941	0.237624	0.356436	0.554455	
std	0.496921	0.400495	0.495325	0.493522	0.427750	0.481335	0.499505	
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
25%	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	
50%	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	1.000000	
75%	1.000000	0.000000	1.000000	1.000000	0.000000	1.000000	1.000000	
max	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	

In [6]:

```
zoo_data['type'].unique()
```

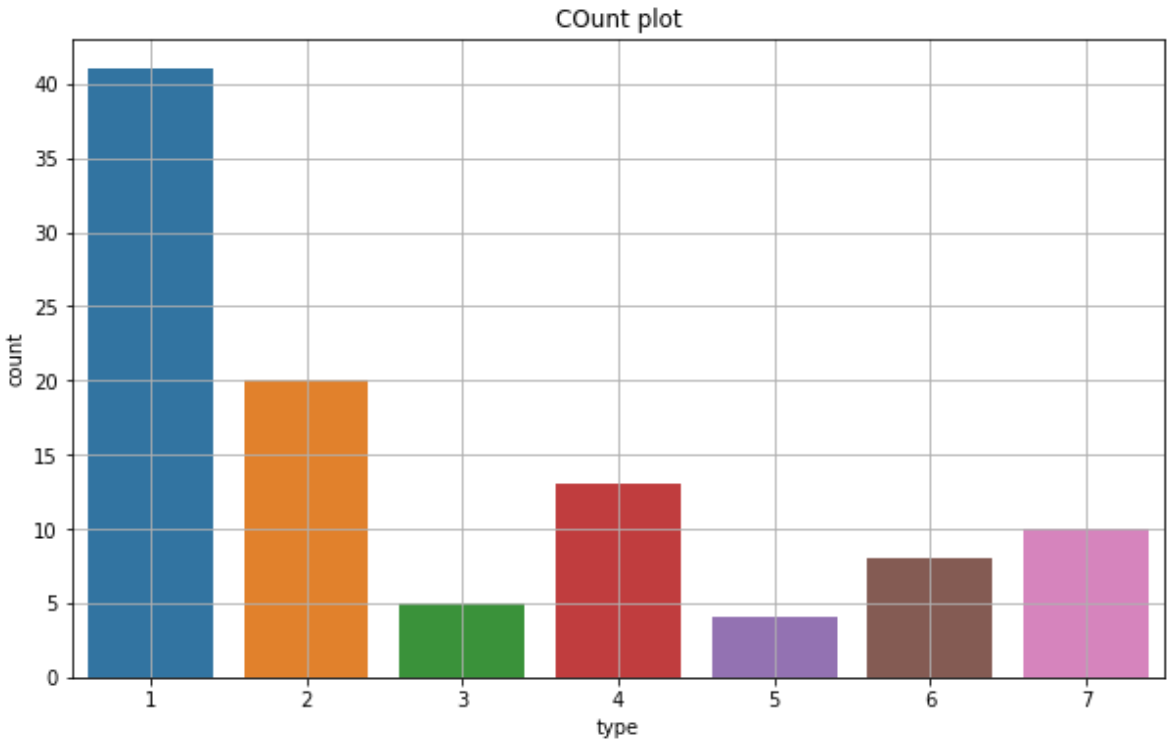
Out[6]:

```
array([1, 4, 2, 7, 6, 5, 3], dtype=int64)
```

In [7]:

```
plt.figure(figsize=(10,6))
sns.countplot(zoo_data['type'])
plt.title('COunt plot')
plt.grid(True)
plt.show()
```

```
C:\Users\sowmya sandeep\anaconda3\lib\site-packages\seaborn\_decorators.py:3
6: FutureWarning: Pass the following variable as a keyword arg: x. From vers
ion 0.12, the only valid positional argument will be `data`, and passing oth
er arguments without an explicit keyword will result in an error or misinter
pretation.
  warnings.warn(
```



In [8]:

```
zoo_data.drop('animal name',axis=1,inplace=True)
```

In [9]:

```
zoo_data.head()
```

Out[9]:

	hair	feathers	eggs	milk	airborne	aquatic	predator	toothed	backbone	breathes	venom
0	1	0	0	1	0	0	1	1	1	1	
1	1	0	0	1	0	0	0	1	1	1	
2	0	0	1	0	0	1	1	1	1	0	
3	1	0	0	1	0	0	1	1	1	1	
4	1	0	0	1	0	0	1	1	1	1	

In [10]:

```
X=zoo_data.drop('type',axis=1)
y=zoo_data[['type']]
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.20,random_state=10)
print('X_train_shape :',X_train.shape , '\ny_train_shape :',y_train.shape)
print('X_test_shape :',X_test.shape , '\ny_test_shape :',y_test.shape)
```

```
X_train_shape : (80, 16)
y_train_shape : (80, 1)
X_test_shape : (21, 16)
y_test_shape : (21, 1)
```

In [11]:

```
model = KNeighborsClassifier(n_neighbors=1)
model.fit(X_train,y_train)
```

```
C:\Users\sowmya sandeep\anaconda3\lib\site-packages\sklearn\neighbors\_class
ification.py:200: DataConversionWarning: A column-vector y was passed when a
1d array was expected. Please change the shape of y to (n_samples,), for exa
mple using ravel().
  return self._fit(X, y)
```

Out[11]:

KNeighborsClassifier

KNeighborsClassifier(n_neighbors=1)

In [14]:

```
pred_y= model.predict(X_train)
```

In [15]:

```
accuracy_score(y_train,pred_y)
```

Out[15]:

```
1.0
```

In [16]:

```
confusion_matrix(y_train,pred_y)
```

Out[16]:

```
array([[34,  0,  0,  0,  0,  0,  0],
       [ 0, 17,  0,  0,  0,  0,  0],
       [ 0,  0,  4,  0,  0,  0,  0],
       [ 0,  0,  0,  9,  0,  0,  0],
       [ 0,  0,  0,  0,  3,  0,  0],
       [ 0,  0,  0,  0,  0,  6,  0],
       [ 0,  0,  0,  0,  0,  0,  7]], dtype=int64)
```

In [17]:

```
print(classification_report(y_train,pred_y))
```

```
              precision    recall  f1-score   support

           1       1.00      1.00      1.00        34
           2       1.00      1.00      1.00        17
           3       1.00      1.00      1.00         4
           4       1.00      1.00      1.00         9
           5       1.00      1.00      1.00         3
           6       1.00      1.00      1.00         6
           7       1.00      1.00      1.00         7

    accuracy                           1.00        80
   macro avg       1.00      1.00      1.00        80
weighted avg       1.00      1.00      1.00        80
```

In [18]:

```
y_pred=model.predict(X_test)
#accuracy score for test data
accuracy_score(y_test,y_pred)
```

Out[18]:

```
0.9523809523809523
```

In [19]:

```
#confusion Matrix
confusion_matrix(y_test,y_pred)
```

Out[19]:

```
array([[7, 0, 0, 0, 0, 0, 0],
       [0, 3, 0, 0, 0, 0, 0],
       [0, 0, 1, 0, 0, 0, 0],
       [0, 0, 0, 4, 0, 0, 0],
       [0, 0, 0, 0, 1, 0, 0],
       [0, 0, 0, 0, 0, 2, 0],
       [0, 0, 0, 0, 1, 0, 2]], dtype=int64)
```

In [20]:

```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           1       1.00      1.00      1.00         7
           2       1.00      1.00      1.00         3
           3       1.00      1.00      1.00         1
           4       1.00      1.00      1.00         4
           5       0.50      1.00      0.67         1
           6       1.00      1.00      1.00         2
           7       1.00      0.67      0.80         3

    accuracy                           0.95        21
   macro avg       0.93      0.95      0.92        21
weighted avg       0.98      0.95      0.96        21
```

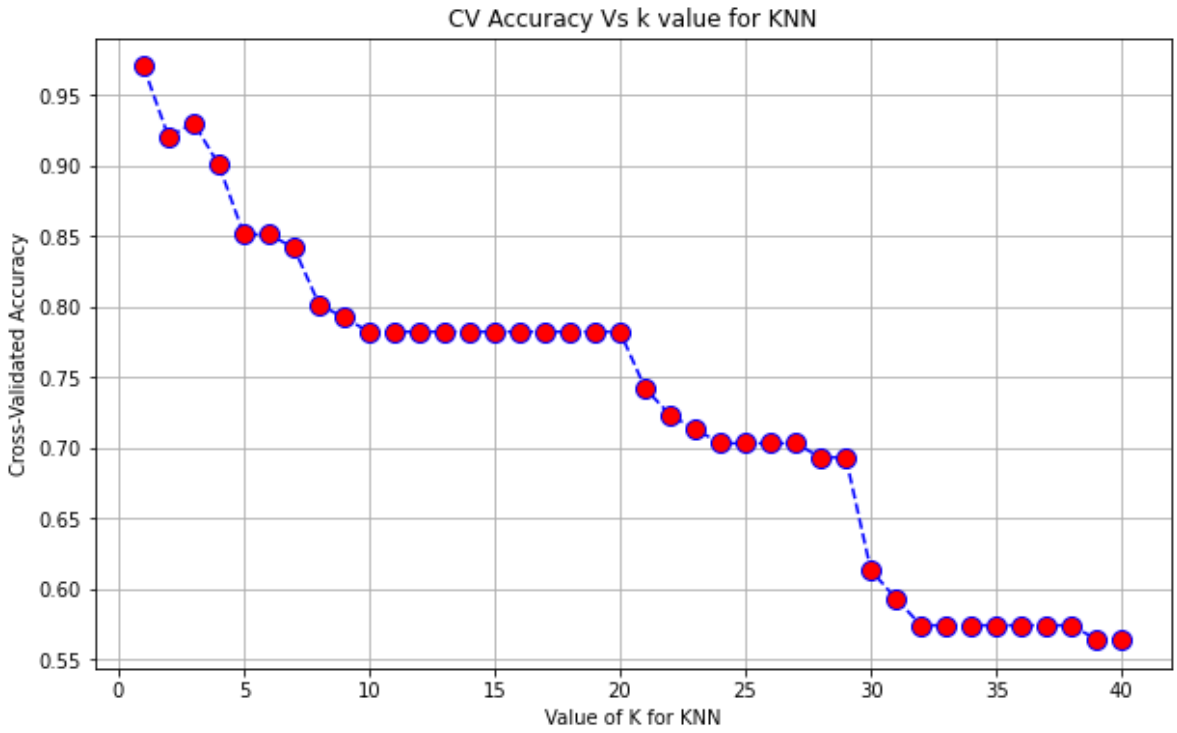
In [21]:

```
import matplotlib.pyplot as plt
%matplotlib inline
# choose k between 1 to 41
k_range = range(1, 41)
k_scores = []
# use iteration to caclulator different k in models, then return the average accuracy based
for k in k_range:
    knn = KNeighborsClassifier(n_neighbors=k)
    scores = cross_val_score(knn, X, y, cv=5)
    k_scores.append(scores.mean())
```

```
C:\Users\sowmya sandeep\anaconda3\lib\site-packages\sklearn\model_selectio
n\_split.py:680: UserWarning: The least populated class in y has only 4 me
mbers, which is less than n_splits=5.
  warnings.warn(
C:\Users\sowmya sandeep\anaconda3\lib\site-packages\sklearn\neighbors\_cla
ssification.py:200: DataConversionWarning: A column-vector y was passed wh
en a 1d array was expected. Please change the shape of y to (n_samples,),
for example using ravel().
  return self._fit(X, y)
C:\Users\sowmya sandeep\anaconda3\lib\site-packages\sklearn\neighbors\_cla
ssification.py:200: DataConversionWarning: A column-vector y was passed wh
en a 1d array was expected. Please change the shape of y to (n_samples,),
for example using ravel().
  return self._fit(X, y)
C:\Users\sowmya sandeep\anaconda3\lib\site-packages\sklearn\neighbors\_cla
ssification.py:200: DataConversionWarning: A column-vector y was passed wh
en a 1d array was expected. Please change the shape of y to (n_samples,),
for example using ravel().
  return self._fit(X, y)
```

In [22]:

```
# plot to see clearly
plt.figure(figsize=(10,6))
plt.plot(k_range, k_scores,color='blue',linestyle='dashed',marker='o',markerfacecolor='red'
plt.grid(True)
plt.title('CV Accuracy Vs k value for KNN')
plt.xlabel('Value of K for KNN')
plt.ylabel('Cross-Validated Accuracy')
plt.show()
```



In [ ]:

```
```