In [2]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from warnings import filterwarnings
filterwarnings('ignore')
```

In [3]:

```
df = pd.read_csv('heart.csv')
```

In [5]:

```
df.head()
```

Out[5]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
2	41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
3	56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
4	57	0	0	120	354	0	1	163	1	0.6	2	0	2	1

In [6]:

```
df.columns
```

Out[6]:

```
Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
       'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
      dtype='object')
```

Data Dictionary ¶

- age: age in years
- sex: sex
  - 1 = male
  - 0 = female
- cp: chest pain type
  - Value 0: typical angina
  - Value 1: atypical angina
  - Value 2: non-anginal pain
  - Value 3: asymptomatic
- trestbps: resting blood pressure (in mm Hg on admission to the hospital)-
- chol: serum cholestoral in mg/dl
- fbs: (fasting blood sugar > 120 mg/dl)
  - 1 = true;
  - 0 = false
- restecg: resting electrocardiographic results
  - Value 0: normal
  - Value 1: having ST-T wave abnormality (T wave inversions and/or ST elevation or depression of > 0.05 mV)
  - Value 2: showing probable or definite left ventricular hypertrophy by Estes' criteria
- thalach: maximum heart rate achieved
- exang: exercise induced angina
  - 1 = yes
  - 0 = no
- oldpeak = ST depression induced by exercise relative to rest
- slope: the slope of the peak exercise ST segment
  - Value 0: upsloping
  - Value 1: flat
  - Value 2: downsloping
- ca: number of major vessels (0-3) colored by flourosopy
- thal:
  - 0 = error (in the original dataset 0 maps to NaN's)
  - 1 = fixed defect
  - 2 = normal
  - 3 = reversable defect
- target (the lable):
  - 0 = no disease,
  - 1 = disease

In [8]:

```
df.shape
```

Out[8]:
```
(303, 14)
```

In [9]:
```
df.describe()
```

Out[9]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak
count	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000
mean	54.366337	0.683168	0.966997	131.623762	246.264026	0.148515	0.528053	149.646865	0.326733	1.039604
std	9.082101	0.466011	1.032052	17.538143	51.830751	0.356198	0.525860	22.905161	0.469794	1.161075
min	29.000000	0.000000	0.000000	94.000000	126.000000	0.000000	0.000000	71.000000	0.000000	0.000000
25%	47.500000	0.000000	0.000000	120.000000	211.000000	0.000000	0.000000	133.500000	0.000000	0.000000
50%	55.000000	1.000000	1.000000	130.000000	240.000000	0.000000	1.000000	153.000000	0.000000	0.800000
75%	61.000000	1.000000	2.000000	140.000000	274.500000	0.000000	1.000000	166.000000	1.000000	1.600000
max	77.000000	1.000000	3.000000	200.000000	564.000000	1.000000	2.000000	202.000000	1.000000	6.200000

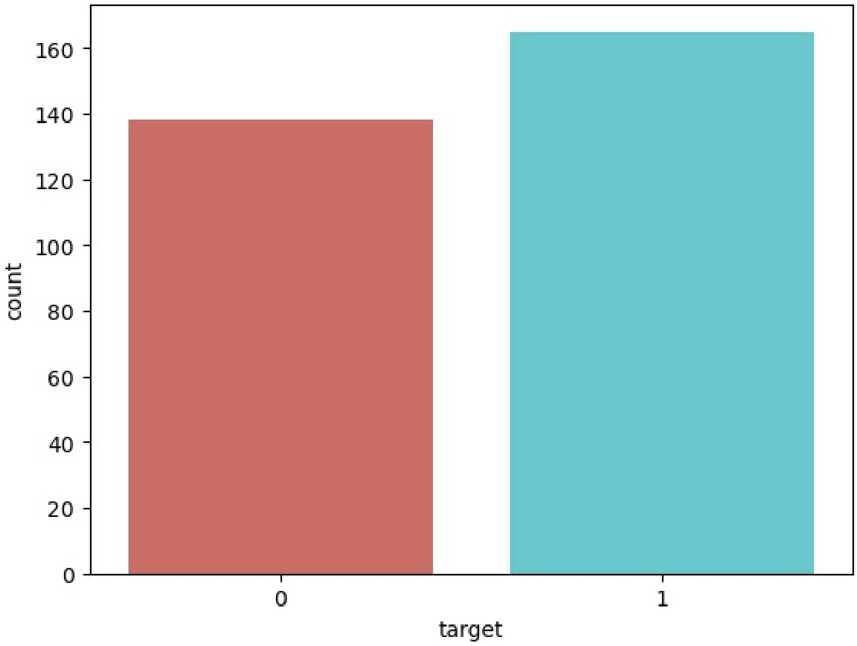
In [11]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 303 entries, 0 to 302
Data columns (total 14 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   age       303 non-null    int64  
 1   sex       303 non-null    int64  
 2   cp        303 non-null    int64  
 3   trestbps  303 non-null    int64  
 4   chol      303 non-null    int64  
 5   fbs       303 non-null    int64  
 6   restecg   303 non-null    int64  
 7   thalach   303 non-null    int64  
 8   exang     303 non-null    int64  
 9   oldpeak   303 non-null    float64
 10  slope     303 non-null    int64  
 11  ca        303 non-null    int64  
 12  thal      303 non-null    int64  
 13  target    303 non-null    int64  
dtypes: float64(1), int64(13)
memory usage: 33.3 KB
```

In [20]:
```
df['target'].value_counts(normalize=True)*100
```

Out[20]:
```
target
1    54.455446
0    45.544554
Name: proportion, dtype: float64
```

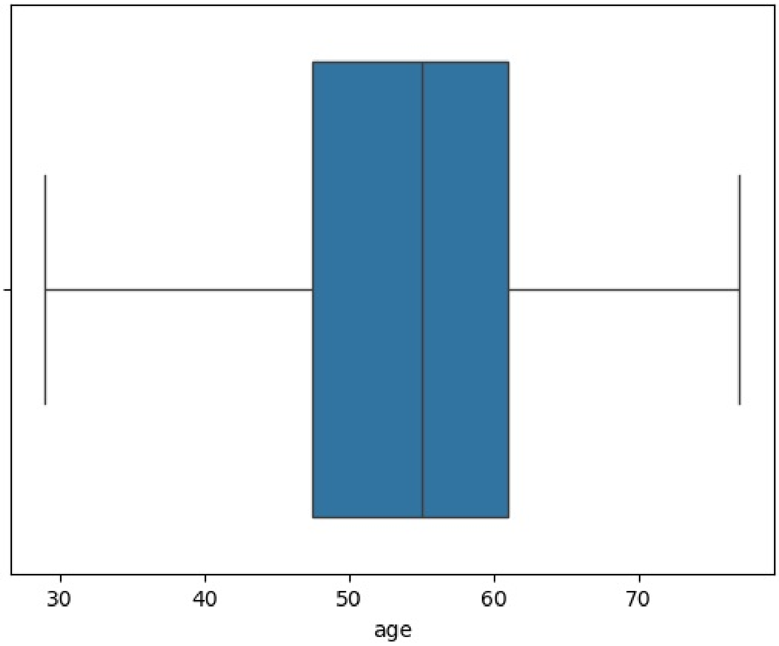
In [27]:
```
sns.countplot(x ='target',data=df,palette='hls')
plt.show()
```



In [28]:
```
sns.boxplot(data =df,x= 'age')
```

Out[28]:

```
<Axes: xlabel='age'>
```



In [30]:

```python
df.isnull().sum()
```

Out[30]:

```
age         0
sex         0
cp          0
trestbps    0
chol        0
fbs         0
restecg     0
thalach     0
exang       0
oldpeak     0
slope       0
ca          0
thal        0
target      0
dtype: int64
```

In [34]:

```python
df.dtypes
```

Out[34]:

```
age           int64
sex           int64
cp            int64
trestbps      int64
chol          int64
fbs           int64
restecg       int64
thalach       int64
exang         int64
oldpeak     float64
slope         int64
ca            int64
thal          int64
target        int64
dtype: object
```

In [36]:

```python
X = df.drop('target',axis =1)
y = df['target']
```

In [37]:

```python
X.head(2)
```

Out[37]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2

In [38]:

```python
y.head(2)
```

Out[38]:

```
0    1
1    1
Name: target, dtype: int64
```

In [39]:

```python
#splitting the data
from sklearn.model_selection import train_test_split
```

In [49]:

```
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.2,random_state=1)
```

In [55]:

```
print(f"X_Train :Shape: {X_train.shape}")
print(f"y_train :Shape: {y_train.shape}")

print("--"*30)

print(f"X_Test :Shape: {X_test.shape}")
print(f"y_test :Shape: {y_test.shape}")
```

```
X_Train :Shape: (242, 13)
y_train :Shape: (242,)
------------------------------------------------------------
X_Test :Shape: (61, 13)
y_test :Shape: (61,)
```

In [50]:

```
#fit the model / Build the model
from sklearn.linear_model import LogisticRegression
```

In [51]:

```
model = LogisticRegression()
model.fit(X_train,y_train)
```

Out[51]:

```
▾ LogisticRegression ⓘ ?
LogisticRegression()
```

In [52]:

```
y_pred = model.predict(X_test)
```

In [53]:

```
y_pred
```

Out[53]:

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

In [ ]:

```
#Evaluation matrics here we use confusion matics
```

In [60]:

```
from sklearn.metrics import confusion_matrix,classification_report,ConfusionMatrixDisplay
```

In [57]:

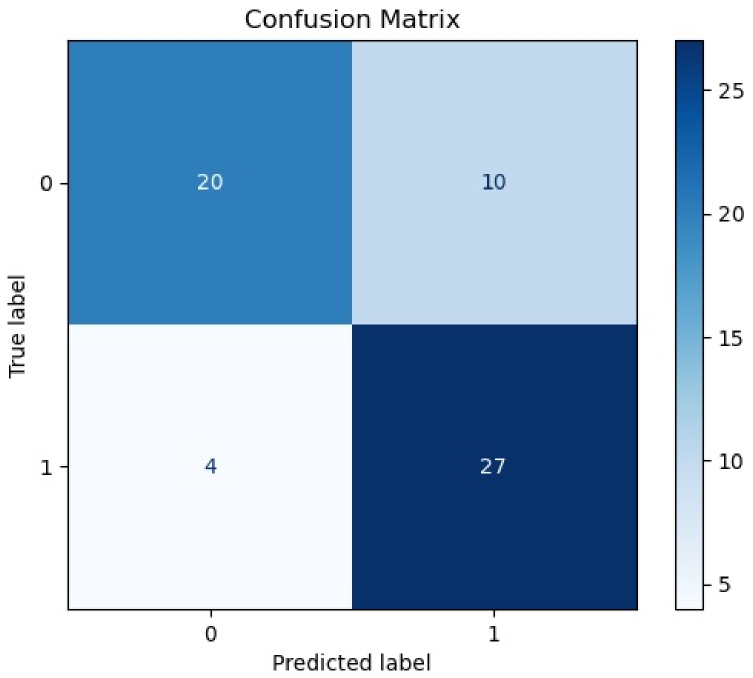
```
confusion_matrix(y_test,y_pred)
```

Out[57]:

```
array([[20, 10],
       [ 4, 27]])
```

In [61]:

```
cm = confusion_matrix(y_test, y_pred)  # get confusion matrix
disp = ConfusionMatrixDisplay(confusion_matrix=cm)
disp.plot(cmap=plt.cm.Blues)           # optional color map
plt.title("Confusion Matrix")
plt.show()
```



In [62]:

```
print("Classification Report : ",classification_report(y_test,y_pred))
```

```
Classification Report :                precision    recall  f1-score   support

           0       0.83      0.67      0.74        30
           1       0.73      0.87      0.79        31

    accuracy                           0.77        61
   macro avg       0.78      0.77      0.77        61
weighted avg       0.78      0.77      0.77        61
```

In [ ]: