In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
df=pd.read_csv(r"C10_loan1.csv")
df
```

Out[2]:

	Home Owner	Marital Status	Annual Income	Defaulted Borrower
0	Yes	Single	125	No
1	No	Married	100	No
2	No	Single	70	No
3	Yes	Married	120	No
4	No	Divorced	95	Yes
5	No	Married	60	No
6	Yes	Divorced	220	No
7	No	Single	85	Yes
8	No	Married	75	No
9	No	Single	90	Yes

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 #   Column              Non-Null Count  Dtype 
---  ------              --------------  ----- 
 0   Home Owner          10 non-null     object
 1   Marital Status      10 non-null     object
 2   Annual Income       10 non-null     int64 
 3   Defaulted Borrower  10 non-null     object
dtypes: int64(1), object(3)
memory usage: 448.0+ bytes
```

In [4]:
```
df.describe()
```

Out[4]:

	Annual Income
count	10.000000
mean	104.000000
std	45.631373
min	60.000000
25%	77.500000
50%	92.500000
75%	115.000000
max	220.000000

In [5]:
```
df.columns
```

Out[5]:
```
Index(['Home Owner', 'Marital Status', 'Annual Income', 'Defaulted Borrower'], dtype='ob
ject')
```

In [6]:
```
df['Defaulted Borrower'].value_counts()
```

Out[6]:
```
No     7
Yes    3
Name: Defaulted Borrower, dtype: int64
```

In [7]:
```
g1={'Defaulted Borrower':{'No':1,'Yes':2}}
g2={'Home Owner':{'No':1,'Yes':2}}
g3={'Marital Status':{'Divorced':0,'Single':1,'Married':2}}
df=df.replace(g1)
df=df.replace(g2)
df=df.replace(g3)
print(df)
```

	Home Owner	Marital Status	Annual Income	Defaulted Borrower
0	2	1	125	1
1	1	2	100	1
2	1	1	70	1
3	2	2	120	1
4	1	0	95	2
5	1	2	60	1
6	2	0	220	1
7	1	1	85	2
8	1	2	75	1
9	1	1	90	2

In [8]:
```
x=df[['Home Owner','Annual Income','Defaulted Borrower']]
y=df['Marital Status']
```

In [9]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,train_size=0.70)
```

In [10]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[10]:
```
RandomForestClassifier()
```

In [11]:
```
parameters={'max_depth':[1,2,3,4,5],
            'min_samples_leaf':[5,10,15,20,25],
            'n_estimators':[10,20,30,40,50]}
```

In [12]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rfc,param_grid=parameters,cv=2,scoring="accuracy")
grid_search.fit(x_train,y_train)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\model_selection\_split.py:666: UserWa
rning: The least populated class in y has only 1 members, which is less than n_splits=2.
  warnings.warn(("The least populated class in y has only %d"
```

Out[12]:
```
GridSearchCV(cv=2, estimator=RandomForestClassifier(),
             param_grid={'max_depth': [1, 2, 3, 4, 5],
                         'min_samples_leaf': [5, 10, 15, 20, 25],
                         'n_estimators': [10, 20, 30, 40, 50]},
             scoring='accuracy')
```

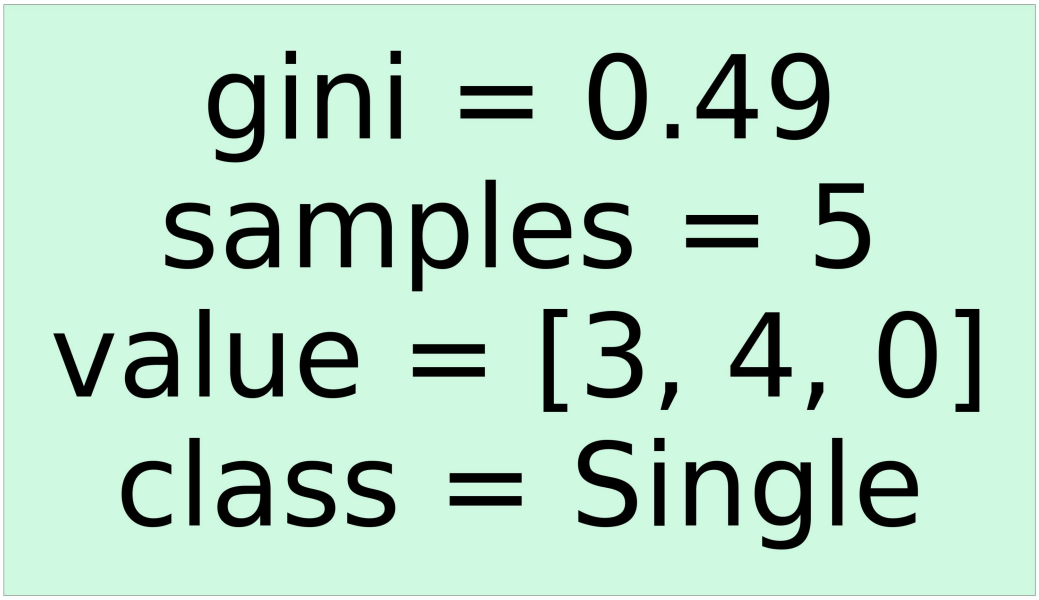
In [13]:
```
grid_search.best_score_
```

Out[13]:
```
0.5833333333333333
```

In [14]:
```
rfc_best=grid_search.best_estimator_
```

In [15]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rfc_best.estimators_[5],feature_names=x.columns,class_names=['Divorced','Single
```

Out[15]:
```
[Text(2232.0, 1087.2, 'gini = 0.49\nsamples = 5\nvalue = [3, 4, 0]\nclass = Single')]
```



In [ ]:
```
```