In [15]:
```
target
```

Out[15]:
```
array(['yes', 'yes', 'no', 'yes'], dtype=object)
```

In [14]:
```
concepts
```

Out[14]:
```
array([['Sunny', 'Warm', 'Normal', 'Strong', 'Warm', 'Same'],
       ['Sunny', 'Warm', 'High', 'Strong', 'Warm', 'Same'],
       ['Rainy', 'Cold', 'High', 'Strong', 'Warm', 'Change'],
       ['Sunny', 'Warm', 'High', 'Strong', 'Cold', 'Change']],
      dtype=object)
```

In [13]:
```
data.iloc[0:,0:]
```

Out[13]:

	Outlook	Temp	Humidity	Wind	Water	Forecast	Play
0	Sunny	Warm	Normal	Strong	Warm	Same	yes
1	Sunny	Warm	High	Strong	Warm	Same	yes
2	Rainy	Cold	High	Strong	Warm	Change	no
3	Sunny	Warm	High	Strong	Cold	Change	yes

In [20]:
```
np.array(data.iloc[:,:])
```

Out[20]:
```
array([['Sunny', 'Warm', 'Normal', 'Strong', 'Warm', 'Same', 'yes'],
       ['Sunny', 'Warm', 'High', 'Strong', 'Warm', 'Same', 'yes'],
       ['Rainy', 'Cold', 'High', 'Strong', 'Warm', 'Change', 'no'],
       ['Sunny', 'Warm', 'High', 'Strong', 'Cold', 'Change', 'yes']],
      dtype=object)
```

In [19]:
```
np.array(data.iloc[:,:-1])
```

Out[19]:
```
array([['Sunny', 'Warm', 'Normal', 'Strong', 'Warm', 'Same'],
       ['Sunny', 'Warm', 'High', 'Strong', 'Warm', 'Same'],
       ['Rainy', 'Cold', 'High', 'Strong', 'Warm', 'Change'],
       ['Sunny', 'Warm', 'High', 'Strong', 'Cold', 'Change']],
      dtype=object)
```

In [8]:
```
import numpy as np
import pandas as pd
data=pd.DataFrame(data=pd.read_csv('dataset1.csv'))
concepts=np.array(data.iloc[:,:])
target=np.array(data.iloc[:,0])
```

In [10]:
```
specific_h=concepts[0].copy()
specific_h
```

Out[10]:
```
array(['Sunny', 'Warm', 'Normal', 'Strong', 'Warm', 'Same'], dtype=object)
```

In [6]:
```
general_h=[["?" for i in range(6)]for i in range(6)]
general_h
```

Out[6]:
```
[['?', '?', '?', '?', '?', '?'],
 ['?', '?', '?', '?', '?', '?'],
 ['?', '?', '?', '?', '?', '?'],
 ['?', '?', '?', '?', '?', '?'],
 ['?', '?', '?', '?', '?', '?'],
 ['?', '?', '?', '?', '?', '?']]
```

In [2]:

```
import numpy as np
import pandas as pd
data=pd.DataFrame(data=pd.read_csv('dataset1.csv'))
concepts=np.array(data.iloc[:,0:-1])
target=np.array(data.iloc[:,-1])

def learn(concepts,target):
    specific_h=concepts[0].copy()
    general_h=[["?" for i in range(len(specific_h))]for i in range(len(specific_h))]
    for i,h in enumerate(concepts):
        if target[i]=="yes":
            for x in range(len(specific_h)):
                if h[x]!=specific_h[x]:
                    specific_h[x]='?'
                    general_h[x][x]='?'

        if target[i]=="no":
            for x in range(len(specific_h)):
                if h[x]!=specific_h[x]:
                    general_h[x][x]=specific_h[x]
                else:
                    general_h[x][x]='?'

    indices=[i for i,val in enumerate(general_h) if val==['?','?','?','?','?','?']]

    for i in indices:
        general_h.remove(['?','?','?','?','?','?'])
    return specific_h,general_h

s_final,g_final=learn(concepts,target)

print("Final S:",s_final,sep="\n")
print("Final G:",g_final,sep="\n")
```

```
Final S:
['blond' '?' 'yes' '?' '?' 'no']
Final G:
[['?', '?', 'yes', '?', '?', '?'], ['?', '?', '?', '?', '?', 'no']]
```

In [3]:

```
import numpy as np
import pandas as pd
data=pd.DataFrame(data=pd.read_csv('Candidate.csv'))
concepts=np.array(data.iloc[:,0:-1])
target=np.array(data.iloc[:,-1])

def learn(concepts,target):
    specific_h=concepts[0].copy()
    general_h=[["?" for i in range(len(specific_h))]for i in range(len(specific_h))]
    for i,h in enumerate(concepts):
        if target[i]=="Yes":
            for x in range(len(specific_h)):
                if h[x]!=specific_h[x]:
                    specific_h[x]='?'
                    general_h[x][x]='?'

        if target[i]=="No":
            for x in range(len(specific_h)):
                if h[x]!=specific_h[x]:
                    general_h[x][x]=specific_h[x]
                else:
                    general_h[x][x]='?'

    indices=[i for i,val in enumerate(general_h) if val==['?','?','?','?','?','?']]

    for i in indices:
        general_h.remove(['?','?','?','?','?','?'])
    return specific_h,general_h

s_final,g_final=learn(concepts,target)

print("Final S:",s_final,sep="\n")
print("Final G:",g_final,sep="\n")
```

```
Final S:
['Sunny' 'Warm' '?' 'Strong' '?' '?']
Final G:
[['Sunny', '?', '?', '?', '?', '?'], ['?', 'Warm', '?', '?', '?', '?']]
```