

In [55]:

```
1 def win(curlist,curplayer):
2     for i in range(0,9,3):
3         if (curlist[i] == curplayer):
4             if(curlist[i] == curlist[i+1]):
5                 if(curlist[i] == curlist[i+2]):
6                     print (str(curplayer)+" WINS!!!")
7                     return True
8     for i in range(3):
9         if (curlist[i] == curplayer):
10            if(curlist[i] == curlist[i+3]):
11                if(curlist[i] == curlist[i+6]):
12                    print (str(curplayer)+" WINS!!!")
13                    return True
14    if (curlist[0] == curplayer):
15        if(curlist[0] == curlist[4]):
16            if(curlist[0] == curlist[8]):
17                print (str(curplayer)+" WINS!!!")
18                return True
19    if (curlist[2] == curplayer):
20        if(curlist[2] == curlist[4]):
21            if(curlist[2] == curlist[6]):
22                print (str(curplayer)+" WINS!!!")
23                return True
24    return False
```

In [37]:

```
1 def printmat(curlist):
2     for i in range(1,len(curlist)+1):
3         if i%3 == 0:
4             print(str(curlist[i-1])+'|')
5         else:
6             print(str(curlist[i-1])+'|',end='')
```

In [95]:

```

1 import random
2 def evenComp(count, afteruserstate, afteruserstateOriginal):
3     #print("Computer turn number",count)
4     while True:
5         i = random.randint(0,8)
6         temp = count + 1
7         if str(statedict.keys()).find(str(temp)) == -1:
8             #print("Keys not found when i = ",count)
9             return i
10        else:
11            #code below this point is buggy\n",
12            #print("@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@")
13            #print("Count number found")
14            dic2 = statedict[temp]
15            #print("dic2",dic2)
16            if str(dic2.keys()).find(afteruserstate) == -1:
17                #print("Afteruserstate not found for",afteruserstate)
18                return i
19            else:
20                if str(dic2[afteruserstate]).find(str(i)) > 0 :
21                    # print("i repeated")
22                    i = random.randint(0,8)
23                    if(afteruserstateOriginal[i]!=0):
24                        return i
25                    continue
26                else:
27                    # print("else in else in else worked")
28                    return i

```

In [38]:

```

1 statedict = {}
2 #count = current state - 1, curstate = position which wrong step was taken (rep.
3 ## prevstate = state where to fix shit\n",
4 def store(count,prevstate,curstate,statedict):
5     if str(statedict.keys()).find(str(count)) == -1:
6         statedict[count] = {prevstate:[curstate]}
7     else:
8         dic2 = statedict[count]
9         if str(dic2.keys()).find(prevstate) == -1:
10            dic2[prevstate] = [curstate]
11        else:
12            dic2[prevstate].append(curstate)

```

## This code is for PC vs PC for training

In [93]:

```

1 %%time
2 from IPython.display import clear_output
3 for k in range(500):
4     clear_output()
5     hjh = 0
6     count = 0
7     winbool = False
8     curlist = [0,0,0,0,0,0,0,0,0,0]
9     cur = 1
10    other = 2
11    curstate = None
12    afteruserstate = ""
13    while True and hjh<100:
14        a=None
15        h = True
16        while h and hjh<100:
17            temp_str = str(afteruserstate).replace(str(cur),'0')
18            temp_str = temp_str.replace(str(other),'1')
19            #print("Temp_str:",temp_str)
20            a = evenComp(count,temp_str)
21            #print("IM PASSING:",count,temp_str)
22            if curlist[a] == 0:
23                if cur == 2:
24                    curlist[a] = cur
25                    curstateother = a
26                else:
27                    curlist[a] = cur
28                    curstatecur = a
29                printmat(curlist)
30            else:
31                h = True
32                hjh = hjh + 1
33                print("Enter again:")
34                continue
35            print("Player ",cur)
36            count = count + 1
37            h = False
38        print(curlist,cur)
39        winbool = win(curlist,cur)
40        if winbool == True:
41            print("THIS CODE JUST RAN")
42            strmain = str(afteruserstate).replace(str(other),'0')
43            strmain = strmain.replace(str(cur),'1')
44            if cur == 1:
45                store(count-1,strmain,curstateother,dict)
46            else:
47                store(count-1,strmain,curstatecur,dict)
48            print("Just broke$$$$$$$$$$$$$$$$$$$$")
49            break
50        else:
51            pass
52        curstr = str(curlist)
53        if curstr.find('0') == -1 and winbool == False:
54            print('\nDRAW\n')
55            printmat(curlist)
56            break
57        else:
58            if(cur == 1):
59                cur = 2

```

```

60         other = 1
61     else:
62         cur = 1
63         other = 2
64     afteruserstate = str(curlist)
65     print("The game is over")
66     #print(statedict, 'COUNT = ', k)
67     print("_____ ", k)
68

```

```

1|0|0|
0|0|0|
0|0|0|
Player 1
[1, 0, 0, 0, 0, 0, 0, 0, 0] 1
1|0|0|
0|0|0|
0|2|0|
Player 2
[1, 0, 0, 0, 0, 0, 0, 2, 0] 2
1|0|0|
0|0|1|
0|2|0|
Player 1
[1, 0, 0, 0, 0, 1, 0, 2, 0] 1
1|0|0|
0|2|1|
0|2|0|
Player 2
[1, 0, 0, 0, 2, 1, 0, 2, 0] 2
1|1|0|
0|2|1|
0|2|0|
Player 1
[1, 1, 0, 0, 2, 1, 0, 2, 0] 1
Enter again:
1|1|0|
0|2|1|
2|2|0|
Player 2
[1, 1, 0, 0, 2, 1, 2, 2, 0] 2
Enter again:
Enter again:
Enter again:
Enter again:
Enter again:
Enter again:
Enter again:
1|1|1|
0|2|1|
2|2|0|
Player 1
[1, 1, 1, 0, 2, 1, 2, 2, 0] 1
1 WINS!!!
THIS CODE JUST RAN
The game is over
_____ 499
CPU times: user 9.41 s, sys: 15.8 s, total: 25.2 s
Wall time: 24.2 s

```

In [92]:

```
1 statedict
```

Out[92]:

```
{4: {'[0, 0, 0, 0, 0, 0, 0, 1, 1]': [2, 3, 0, 1, 4, 5],
      '[0, 0, 0, 0, 0, 0, 1, 0, 1]': [3, 0, 2, 5, 1, 4],
      '[0, 0, 0, 0, 0, 0, 1, 1, 0]': [2, 1, 4, 5, 0],
      '[0, 0, 0, 0, 0, 1, 0, 0, 1]': [1, 6, 4, 7, 3, 0],
      '[0, 0, 0, 0, 1, 0, 0, 0, 1]': [6, 5, 1, 3, 7, 2],
      '[0, 0, 0, 0, 1, 0, 0, 1, 0]': [0, 8, 3, 6, 2, 5],
      '[0, 0, 0, 0, 1, 0, 1, 0, 0]': [7, 3, 8, 1, 0, 5],
      '[0, 0, 0, 0, 1, 1, 0, 0, 0]': [6, 1, 2, 0, 7],
      '[0, 0, 0, 1, 0, 0, 1, 0, 0]': [5, 1, 7, 8, 4],
      '[0, 0, 0, 1, 0, 1, 0, 0, 0]': [6, 1, 8, 0, 7, 2],
      '[0, 0, 0, 1, 1, 0, 0, 0, 0]': [0, 8, 7, 6, 2, 1],
      '[0, 0, 1, 0, 0, 0, 0, 0, 1]': [1, 0, 3, 4, 7, 6],
      '[0, 0, 1, 0, 0, 0, 1, 0, 0]': [3, 8, 0, 1, 7, 5],
      '[0, 0, 1, 0, 0, 1, 0, 0, 0]': [7, 1, 4, 0, 3, 6],
      '[0, 0, 1, 0, 1, 0, 0, 0, 0]': [5, 0, 1, 8, 3, 7],
      '[0, 1, 0, 0, 0, 0, 0, 1, 0]': [6, 5, 8, 0, 3, 2],
      '[0, 1, 0, 0, 1, 0, 0, 0, 0]': [6, 2, 8, 3, 5, 0],
      '[0, 1, 1, 0, 0, 0, 0, 0, 0]': [4, 7, 8, 3, 5, 6]}}
```

In [50]:

```
1 s = "1|2|2|1|1|1|2|2|1|"
2 s.replace("|", ",")
3
```

Out[50]:

```
'1,2,2,1,1,1,2,2,1,'
```

In [52]:

```
1 win([1,2,2,1,1,1,2,2,1],2)
```

Out[52]:

```
False
```

In [100]:

```

1  k =0
2  count = 0
3  winbool = False
4  curlist = [0,0,0,0,0,0,0,0,0]
5  cur = 1
6  other = 2
7  curstate = None
8  afteruserstate = ""
9  t = True
10 while True and t:
11     #print(afteruserstate)
12     a=None
13     h = True
14     print("_____")
15     while h:
16         try:
17             if cur == 1:
18                 a= eval(input())
19             else:
20                 a = evenComp(count,str(afteruserstate).replace('2','0'),afteruserstate)
21             if curlist[a] == 0:
22                 if cur == 2:
23                     curlist[a] = cur
24                     curstate = a
25                     printmat(curlist)
26                 else:
27                     curlist[a] = cur
28                     printmat(curlist)
29             else:
30                 h = True
31                 print("Already filled ")
32                 continue
33             count = count + 1
34             h = False
35         except:
36             t = False
37             print("Incorrect input sorry ")
38             break
39             print("Enter again : ")
40     print("Player :",cur)
41     winbool = win(curlist,cur)
42     #print("parameters passed to win:",curlist,cur)
43     if winbool == True:
44         #print (afteruserstate,'statefinal')
45         store(count-1,afteruserstate.replace('2','0'),curstate,statedict)
46         break
47     else:
48         pass
49     curstr = str(curlist)
50     if curstr.find('0') == -1:
51         print('Draw')
52         printmat(curlist)
53         break
54     else:
55         if(cur == 1):
56             cur = 2
57             other = 1
58         else:
59             cur = 1

```

```

60         other = 2
61         afteruserstate = str(curlist)
62     print(" The game is over ")

```

---

```

0
1|0|0|
0|0|0|
0|0|0|
Player : 1

```

---

```

1|2|0|
0|0|0|
0|0|0|
Player : 2

```

---

```

4
1|2|0|
0|1|0|
0|0|0|
Player : 1

```

---

```

1|2|0|
0|1|0|
0|0|2|
Player : 2

```

---

```

6
1|2|0|
0|1|0|
1|0|2|
Player : 1

```

---

```

Already filled
Already filled
1|2|2|
0|1|0|
1|0|2|
Player : 2

```

---

```

3
1|2|2|
1|1|0|
1|0|2|
Player : 1
1  WINS!!!
The game is over

```

In [97]:

```

1  print("0|1|2\n3|4|5\n6|7|8\n")

```

```

0|1|2
3|4|5
6|7|8

```

In [101]:

1	statedict
---	-----------

Out[101]:

```
{4: {'[0, 0, 0, 0, 0, 0, 0, 1, 1]': [2, 3, 0, 1, 4, 5],
      '[0, 0, 0, 0, 0, 0, 1, 0, 1]': [3, 0, 2, 5, 1, 4],
      '[0, 0, 0, 0, 0, 0, 1, 1, 0]': [2, 1, 4, 5, 0],
      '[0, 0, 0, 0, 0, 1, 0, 0, 1]': [1, 6, 4, 7, 3, 0],
      '[0, 0, 0, 0, 1, 0, 0, 0, 1]': [6, 5, 1, 3, 7, 2],
      '[0, 0, 0, 0, 1, 0, 0, 1, 0]': [0, 8, 3, 6, 2, 5],
      '[0, 0, 0, 0, 1, 0, 1, 0, 0]': [7, 3, 8, 1, 0, 5],
      '[0, 0, 0, 0, 1, 1, 0, 0, 0]': [6, 1, 2, 0, 7],
      '[0, 0, 0, 1, 0, 0, 1, 0, 0]': [5, 1, 7, 8, 4, 2],
      '[0, 0, 0, 1, 0, 1, 0, 0, 0]': [6, 1, 8, 0, 7, 2],
      '[0, 0, 0, 1, 1, 0, 0, 0, 0]': [0, 8, 7, 6, 2, 1],
      '[0, 0, 1, 0, 0, 0, 0, 0, 1]': [1, 0, 3, 4, 7, 6],
      '[0, 0, 1, 0, 0, 0, 1, 0, 0]': [3, 8, 0, 1, 7, 5],
      '[0, 0, 1, 0, 0, 1, 0, 0, 0]': [7, 1, 4, 0, 3, 6],
      '[0, 0, 1, 0, 1, 0, 0, 0, 0]': [5, 0, 1, 8, 3, 7],
      '[0, 1, 0, 0, 0, 0, 0, 1, 0]': [6, 5, 8, 0, 3, 2],
      '[0, 1, 0, 0, 1, 0, 0, 0, 0]': [6, 2, 8, 3, 5, 0],
      '[0, 1, 1, 0, 0, 0, 0, 0, 0]': [4, 7, 8, 3, 5, 6]}}
```

In [ ]:

1	""
---	----