In [1]:
```
import matplotlib
import networkx as nx
import urllib
import csv
import matplotlib.pyplot as plt
import pandas as pd
```

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

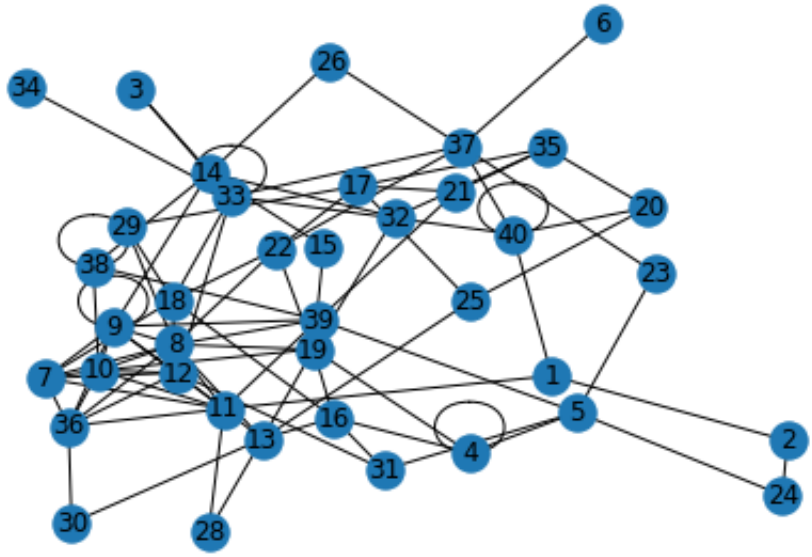
In [3]:
```
display(df)
```

	FromNodeId	ToNodeId
0	1	2
1	1	40
2	4	5
3	7	8
4	7	9
...	...	...
193	31	5
194	29	18
195	8	39
196	36	30
197	20	35

198 rows × 2 columns

In [4]:
```
graph = nx.from_pandas_edgelist(df, source="FromNodeId", target="ToNodeId")
```

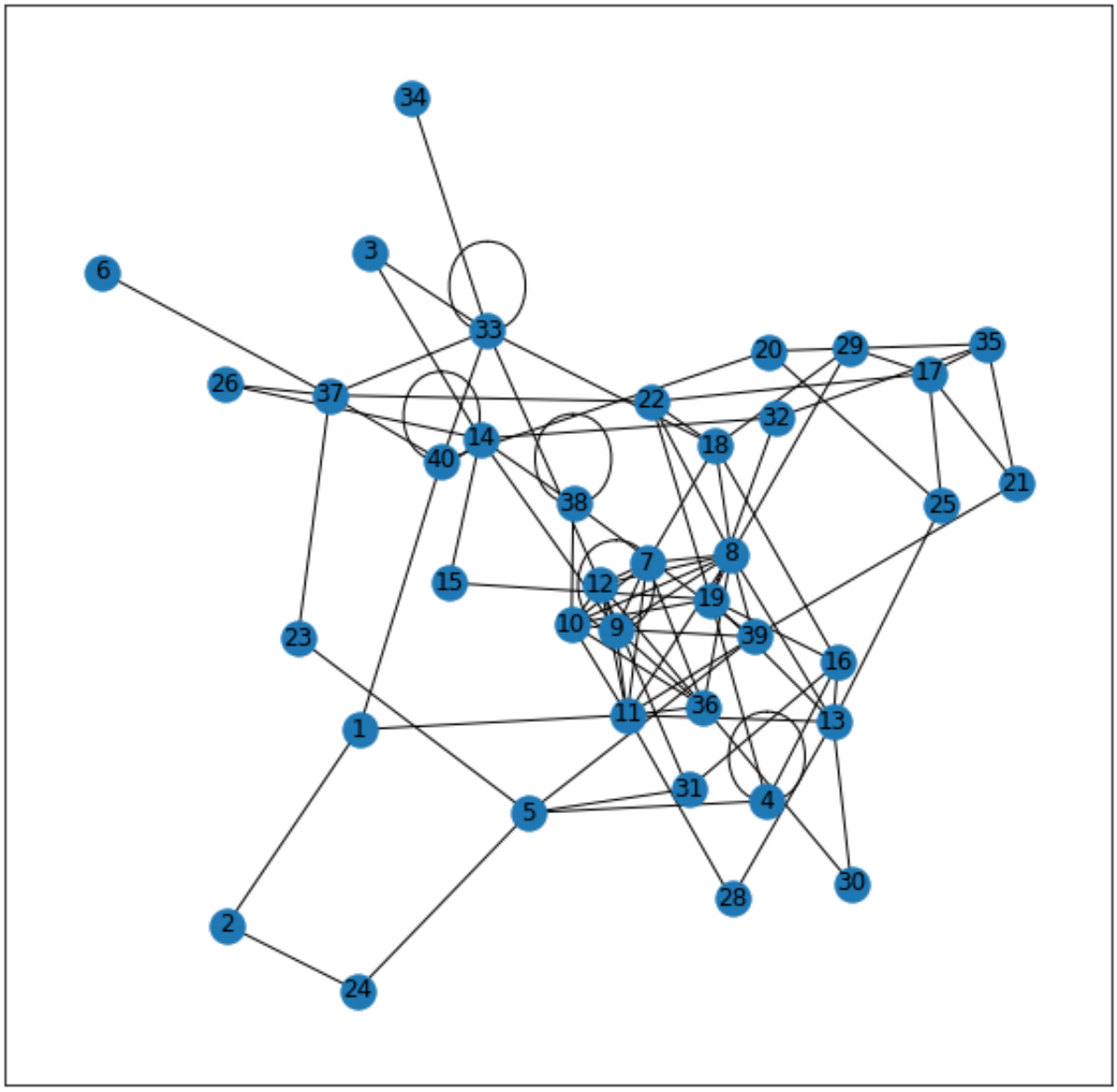
In [5]:
```
nx.draw(graph,with_labels=True)
```



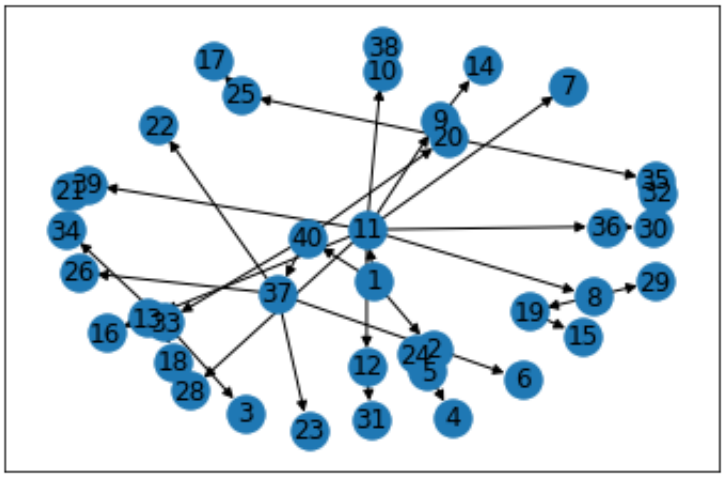
In [6]:
```
# number of connections (vertex: connection)
nx.degree(graph)
```

Out[6]:
```
DegreeView({1: 3, 2: 2, 40: 6, 4: 5, 5: 5, 7: 7, 8: 12, 9: 10, 10: 8, 11: 10
, 12: 8, 14: 6, 15: 2, 13: 7, 30: 2, 38: 5, 39: 6, 36: 7, 21: 3, 17: 5, 29:
3, 37: 6, 6: 1, 33: 8, 3: 2, 18: 6, 22: 5, 32: 3, 35: 4, 19: 8, 16: 5, 23: 2
, 20: 3, 26: 2, 25: 3, 34: 1, 28: 2, 31: 3, 24: 2})
```

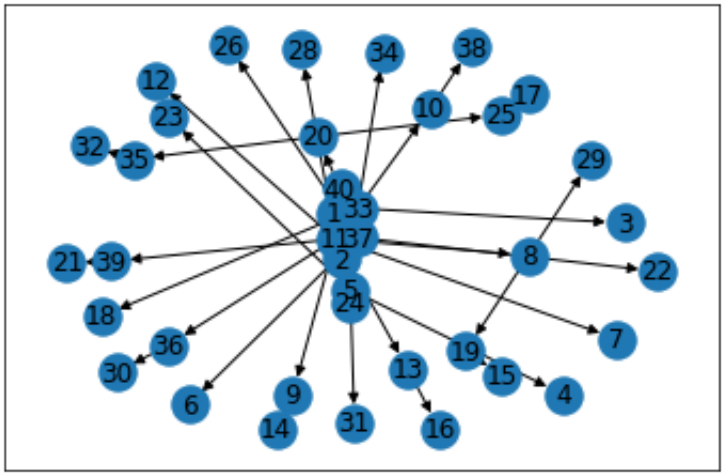
In [8]:
```
plt.figure(figsize=(10,10))
nx.draw_networkx(graph)
plt.show()
```



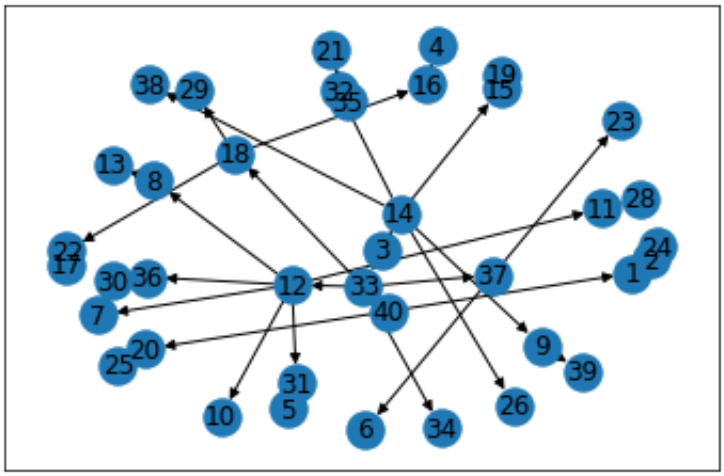
In [9]:
```
# breath-first-search
g1 = nx.bfs_tree(graph,1)
nx.draw_networkx(g1)
```



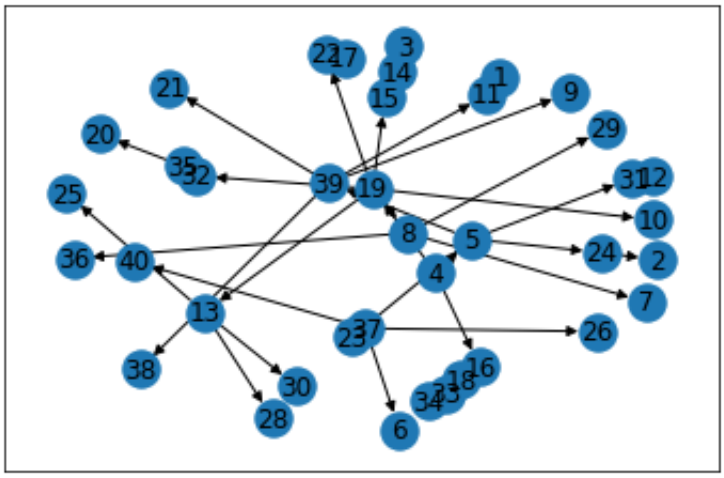
In [10]:
```
g2 = nx.bfs_tree(graph,2)
nx.draw_networkx(g2)
```



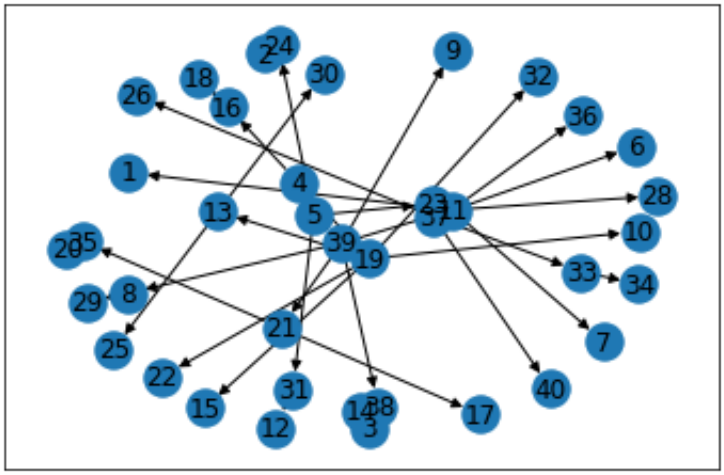
In [11]:
```
g3 = nx.bfs_tree(graph,3)
nx.draw_networkx(g3)
```



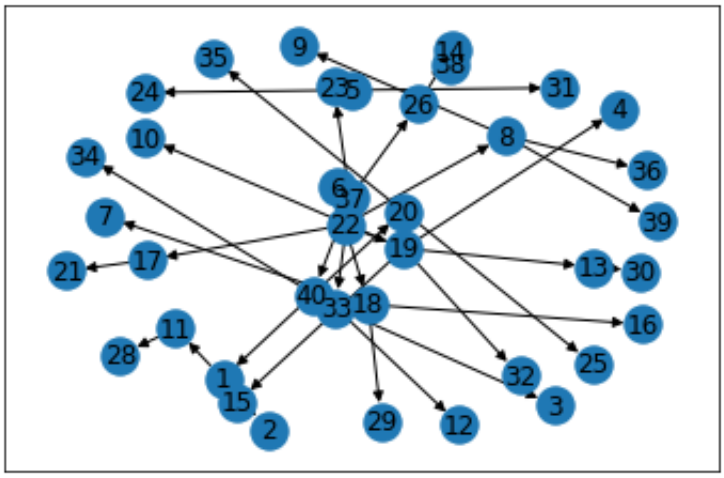
In [12]:
```
g4 = nx.bfs_tree(graph,4)
nx.draw_networkx(g4)
```



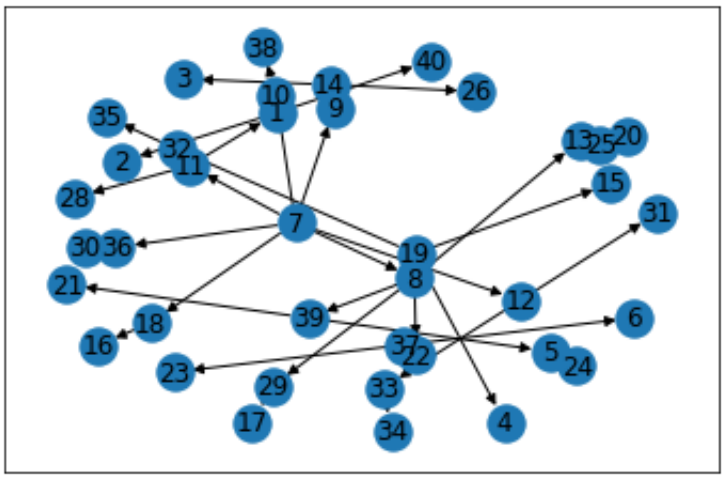
In [13]:
```
g5 = nx.bfs_tree(graph,5)
nx.draw_networkx(g5)
```



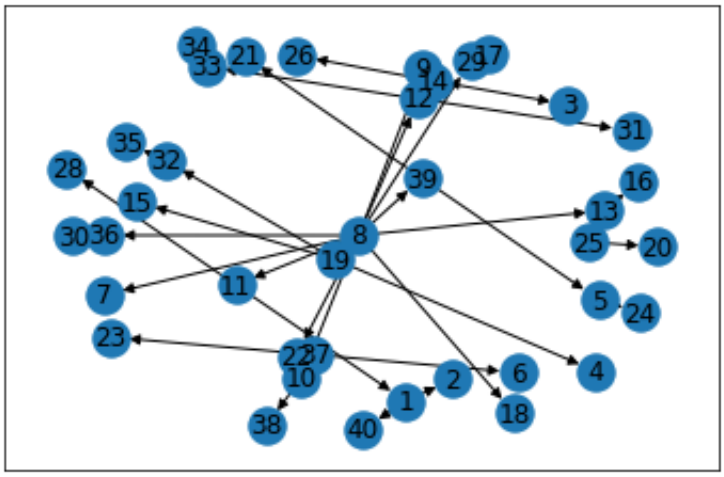
In [14]:
```
g6 = nx.bfs_tree(graph,6)
nx.draw_networkx(g6)
```



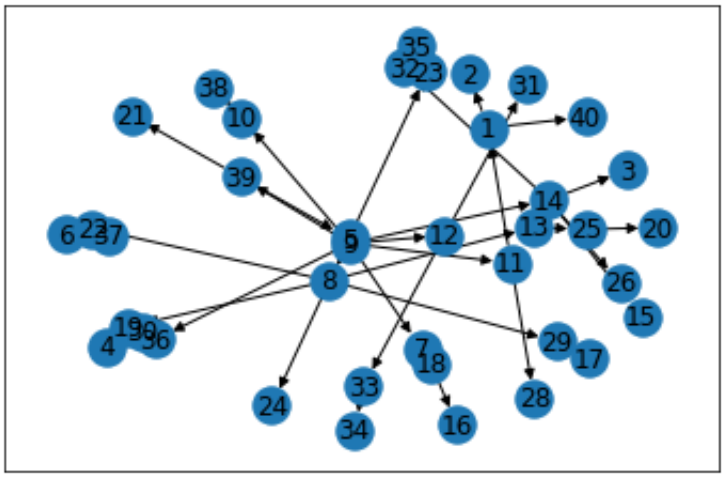
In [15]:
```
g7 = nx.bfs_tree(graph,7)
nx.draw_networkx(g7)
```



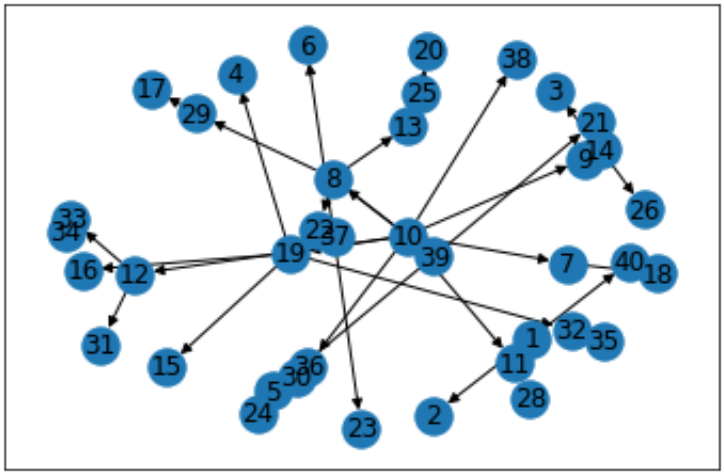
In [16]:
```
g8 = nx.bfs_tree(graph,8)
nx.draw_networkx(g8)
```



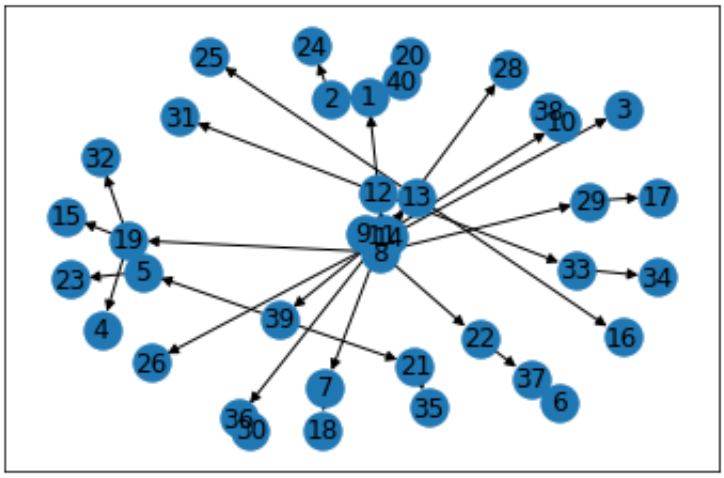
In [17]:
```
g9 = nx.bfs_tree(graph,9)
nx.draw_networkx(g9)
```



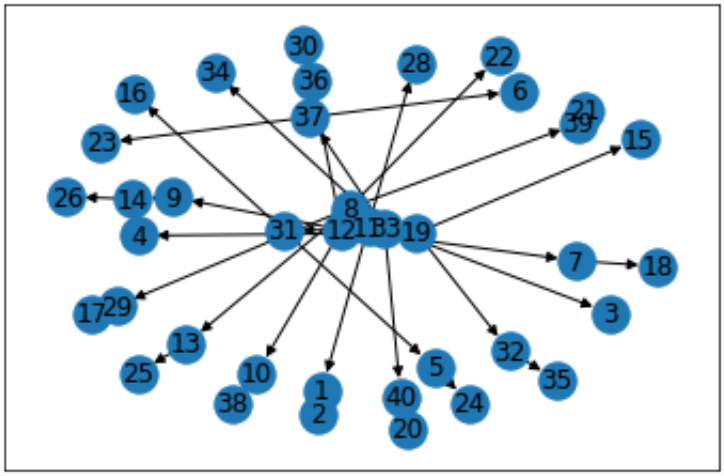
In [18]:
```
g10 = nx.bfs_tree(graph,10)
nx.draw_networkx(g10)
```



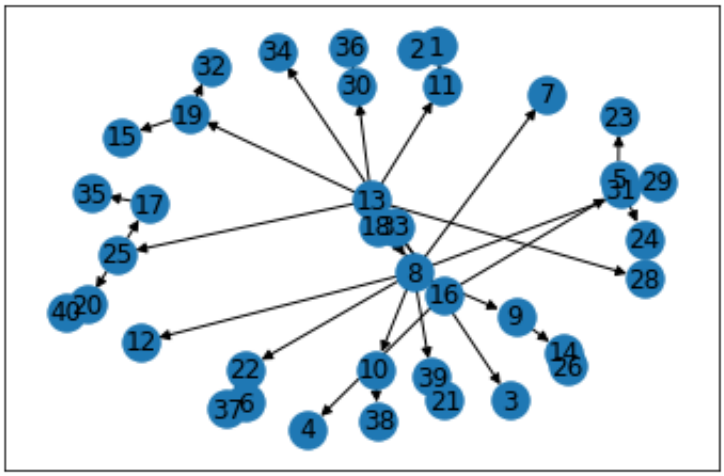
In [19]:
```
g11 = nx.bfs_tree(graph,11)
nx.draw_networkx(g11)
```



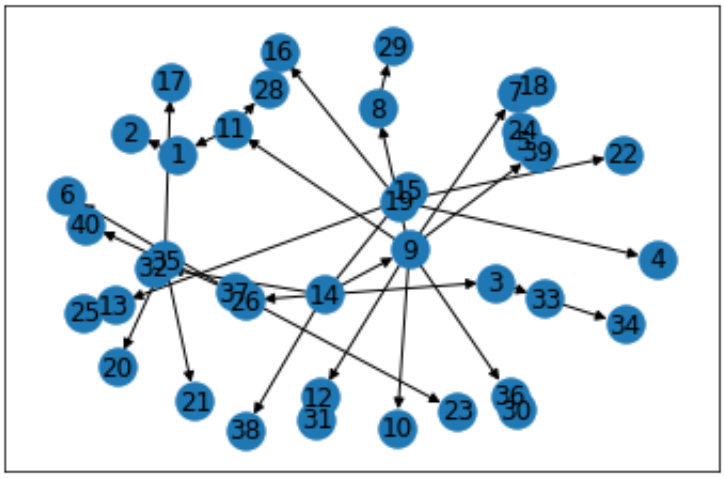
In [20]:
```
g12 = nx.bfs_tree(graph,12)
nx.draw_networkx(g12)
```



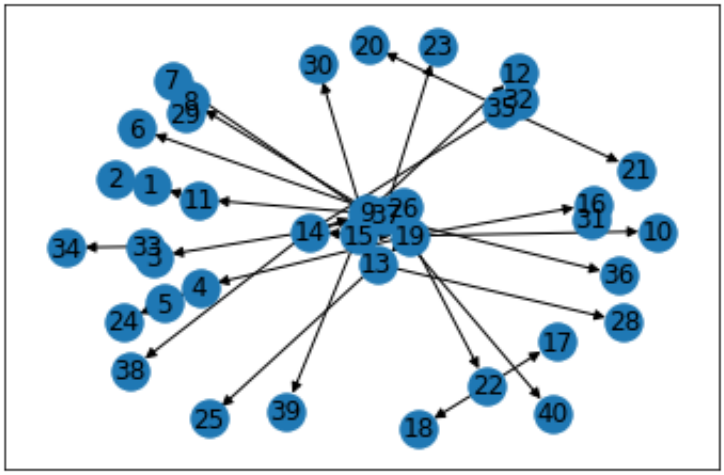
In [21]:
```
g13 = nx.bfs_tree(graph,13)
nx.draw_networkx(g13)
```



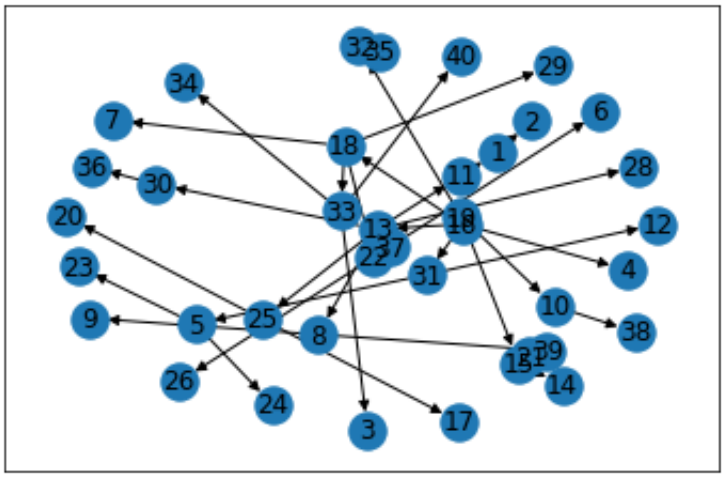
In [22]:
```
g14 = nx.bfs_tree(graph,14)
nx.draw_networkx(g14)
```



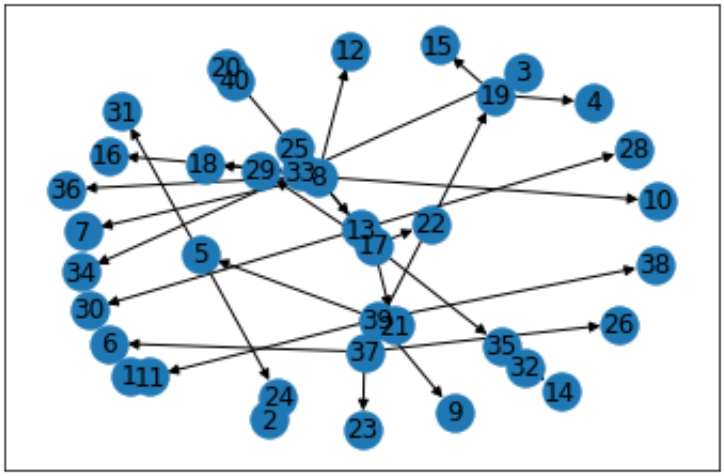
In [23]:
```
g15 = nx.bfs_tree(graph,15)
nx.draw_networkx(g15)
```



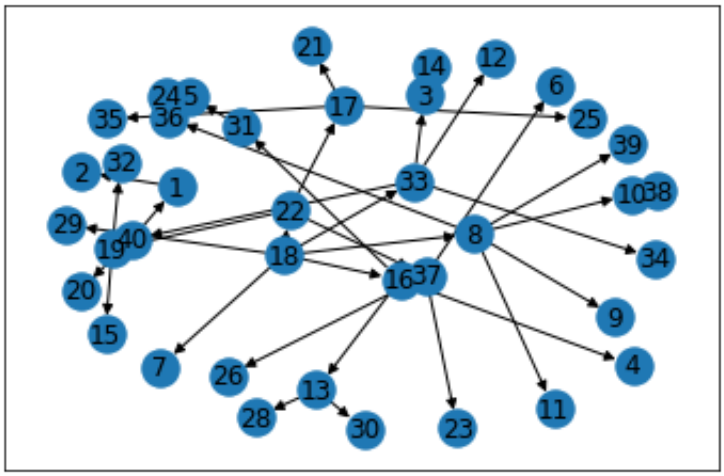
In [24]:
```
g16 = nx.bfs_tree(graph,16)
nx.draw_networkx(g16)
```



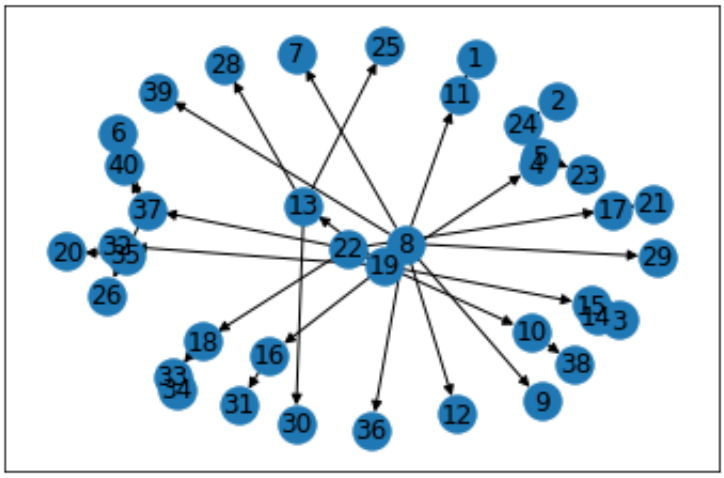
In [25]:
```
g17 = nx.bfs_tree(graph,17)
nx.draw_networkx(g17)
```



In [26]:
```
g18 = nx.bfs_tree(graph,18)
nx.draw_networkx(g18)
```



In [27]:
```
g19 = nx.bfs_tree(graph,19)
nx.draw_networkx(g19)
```



In [28]:
```
g20 = nx.bfs_tree(graph,20)
nx.draw_networkx(g20)
```