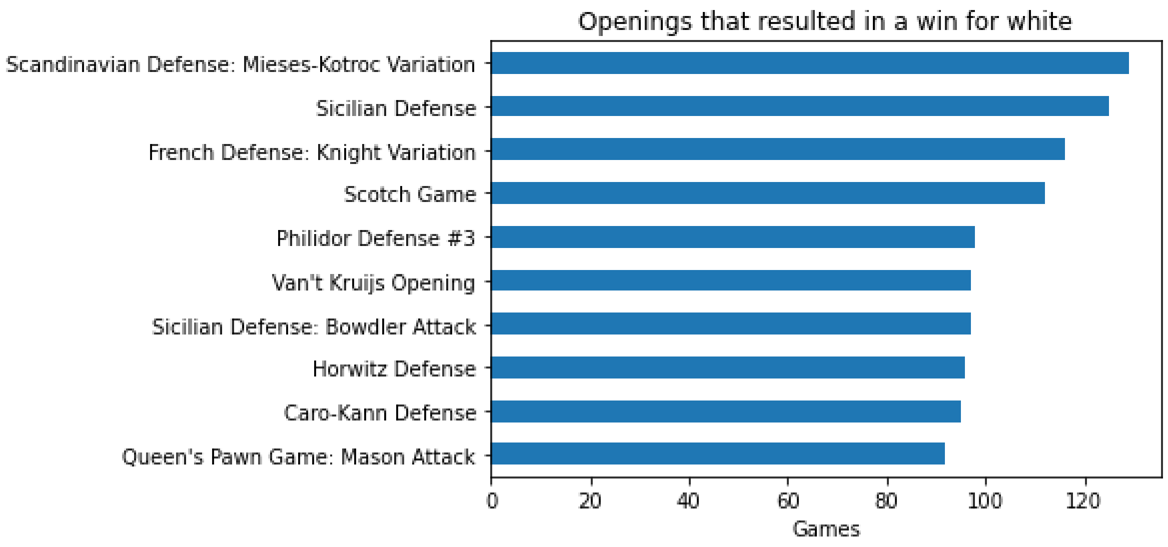
In [50]:
```
#Importing libraries for analysis
import pandas as pd
import numpy as np
```

In [51]:
```
#Importing the csv for chess games and filtering to only rated games
chess_games = pd.read_csv('games.csv')
chess_games = chess_games.loc[(chess_games['rated'] == True)]
```

In [53]:
```
#Creating new dataframes for games where white won and black won
white_wins = chess_games.loc[(chess_games['winner'] == 'white')]
black_wins = chess_games.loc[(chess_games['winner'] == 'black')]
```

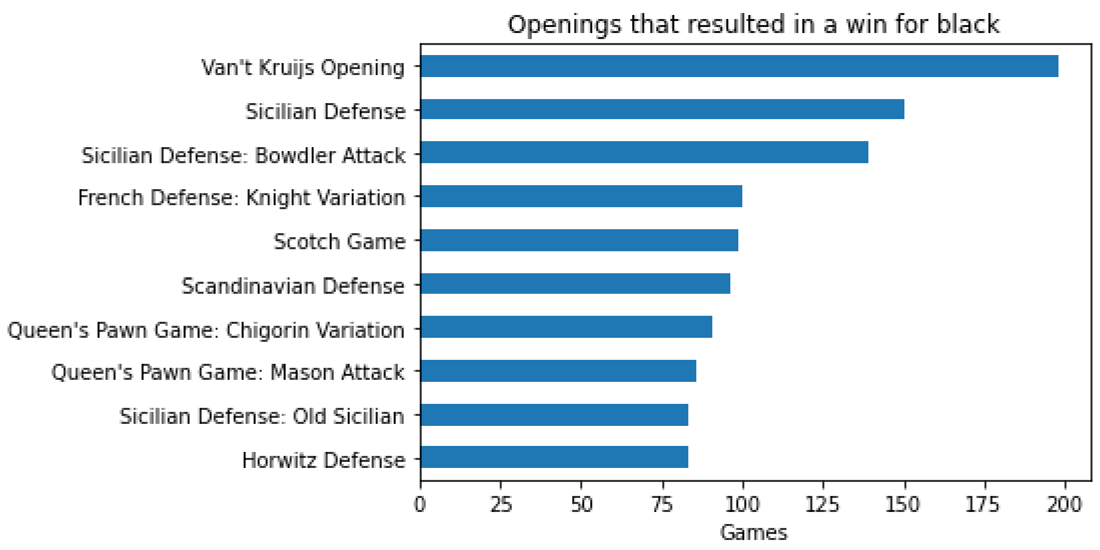
In [54]:
```
#Creating a graph of white opening wins
ax = white_wins.opening_name.value_counts().nlargest(10).sort_values().plot(kind = 'bar
ax.title.set_text('Openings that resulted in a win for white')
ax.set_xlabel('Games')
```

Out[54]:
```
Text(0.5, 0, 'Games')
```



In [55]:
```
#Creating a graph of black opening wins
ax = black_wins.opening_name.value_counts().nlargest(10).sort_values().plot(kind = 'bar
ax.title.set_text('Openings that resulted in a win for black')
ax.set_xlabel('Games')
```

Out[55]:
```
Text(0.5, 0, 'Games')
```



In [56]:
```
#Adding new tier column in the dataframe based on white ELO rating
#Creating a list of conditions based on ELO ranges
conditions = [
    (chess_games['white_rating'] <= 1200),
    (chess_games['white_rating'] > 1200) & (chess_games['white_rating'] <= 1400),
    (chess_games['white_rating'] > 1400) & (chess_games['white_rating'] <= 1600),
    (chess_games['white_rating'] > 1600) & (chess_games['white_rating'] <= 1800),
    (chess_games['white_rating'] > 1800) & (chess_games['white_rating'] <= 2000),
    (chess_games['white_rating'] > 2000) & (chess_games['white_rating'] <= 2200),
    (chess_games['white_rating'] > 2200) & (chess_games['white_rating'] <= 2300),
    (chess_games['white_rating'] > 2300) & (chess_games['white_rating'] <= 2400),
    (chess_games['white_rating'] > 2400) & (chess_games['white_rating'] <= 2500),
    (chess_games['white_rating'] > 2500) & (chess_games['white_rating'] <= 2700),
    (chess_games['white_rating'] > 2700)
    ]

#Create a list of ELO labels based on the conditions above
values = ['novices', 'class D', 'class C', 'class B', 'class A', 'CM', 'NM', 'FM', 'IM'

#Applying the information above to the tier column in the dataframe
chess_games['tier'] = np.select(conditions, values)
```

In [57]:
```
#Creating a new dataframe for opening counts to count the different openings by tier
Opening_Counts = chess_games.groupby(['tier']).opening_name.value_counts()
```

In [58]:
```
#Creating another new dataframe for openings in order to display the opening names and
Openings = pd.DataFrame(Opening_Counts)
Openings = Openings.rename(columns={"opening_name": "opening_counts"})
Openings = Openings.reset_index()
idx = Openings.groupby(['tier'])['opening_counts'].transform(max) == Openings['opening_
Openings[idx]
```

Out[58]:

	tier	opening_name	opening_counts
0	CM	Sicilian Defense	12
510	FM	Giuoco Piano	2
511	FM	Latvian Gambit Accepted | Main Line	2
512	FM	Nimzo-Indian Defense: Panov Attack | Main Line	2

	tier	opening_name	opening_counts
513	FM	Queen's Pawn Game: Zukertort Variation	2
514	FM	Saragossa Opening	2
515	FM	Sicilian Defense: Closed #2	2
516	FM	Sicilian Defense: Delayed Alapin	2
572	GM	King's Indian Attack: Symmetrical Defense	1
573	GM	Nimzowitsch Defense | Declined Variation	1
574	GM	Pirc Defense #4	1
575	GM	Zukertort Opening: Sicilian Invitation	1
576	IM	Italian Game: Giuoco Pianissimo | Italian Fou...	2
577	IM	Nimzo-Indian Defense: Normal Variation | Rago...	2
600	NM	Queen's Pawn Game: Mason Attack	7
794	class A	Queen's Pawn Game: Mason Attack	40
1564	class B	French Defense: Knight Variation	68
2333	class C	Sicilian Defense: Bowdler Attack	109
3076	class D	Van't Kruijs Opening	137
3634	novices	Van't Kruijs Opening	74

In [59]:
```
#Splitting off the time and increment columns in the dataset so that we can get with th
chess_games[['Time', 'Increment']] = chess_games['increment_code'].str.split('+', 1, ex
chess_games['Time'] = chess_games['Time'].astype('int64')
```

In [60]:
```
#Based on the game time we will assign the game type to each game

conditions = [
    (chess_games['Time'] < 3),
    (chess_games['Time'] >= 3) & (chess_games['Time'] < 10),
    (chess_games['Time'] >= 10)]

value = ['bullet', 'blitz', 'rapid']

#Creating a new column game type and applying the above information to the dataframe
chess_games['Game Type'] = np.select(conditions, value)
```

In [61]:
```
#Creating a dataframe of game openings count grouping by game type to display the most
Game_Openings_Count = chess_games.groupby(['Game Type']).opening_name.value_counts()
Game_Openings = pd.DataFrame(Game_Openings_Count)
Game_Openings = Game_Openings.rename(columns={"opening_name": "Game_Openings_Count"})
Game_Openings = Game_Openings.reset_index()
idx = Game_Openings.groupby(['Game Type'])['Game_Openings_Count'].transform(max) == Gam
Game_Openings[idx]
```

Out[61]:

	Game Type	opening_name	Game_Openings_Count
0	blitz	Van't Kruijs Opening	86

	Game Type	opening_name	Game_Openings_Count
717	bullet	Scandinavian Defense	7
792	rapid	Sicilian Defense	237

In [62]:
```
#Creating separate dataframes for white and black wins grouping each dataframe by playe
White_winning_count = chess_games.groupby(['white_id']).winner.value_counts()
White_winning = pd.DataFrame(White_winning_count)
White_winning = White_winning.rename(columns={"winner": "white_winning count", "white_i
White_winning = White_winning.reset_index()
White_winning = White_winning.loc[White_winning['winner'] == 'white']
White_winning = White_winning.rename(columns={"white_id": "player_id", "winner": "white
Black_winning_count = chess_games.groupby(['black_id']).winner.value_counts()
Black_winning = pd.DataFrame(Black_winning_count)
Black_winning = Black_winning.rename(columns={"winner": "black_winning count", "black_i
Black_winning = Black_winning.reset_index()
Black_winning = Black_winning.loc[Black_winning['winner'] == 'black']
Black_winning = Black_winning.rename(columns={"black_id": "player_id", "winner": "black
```

In [63]:
```
#Joining the two dataframes together for white and black wins based on player id
Combined_Wins = White_winning.join(Black_winning.set_index('player_id'), on='player_id'
```

In [64]:
```
#Filling in 0's for entries where one player had won only games with white or black
Combined_Wins["white_winning count"] = Combined_Wins["white_winning count"].fillna(0)
Combined_Wins["black_winning count"] = Combined_Wins["black_winning count"].fillna(0)
```

In [65]:
```
#Summing the wins of white winning and black winning column and totalling up the wins
Combined_Wins["Total Wins"] = Combined_Wins["white_winning count"] + Combined_Wins["bla
```

In [66]:
```
#Creating a new dataframe of top wins and getting the player with the most total wins
Top_Wins = Combined_Wins.sort_values("Total Wins", ascending=False).head(1)
Top_Player = Top_Wins["player_id"].values[0]
Top_Wins
```

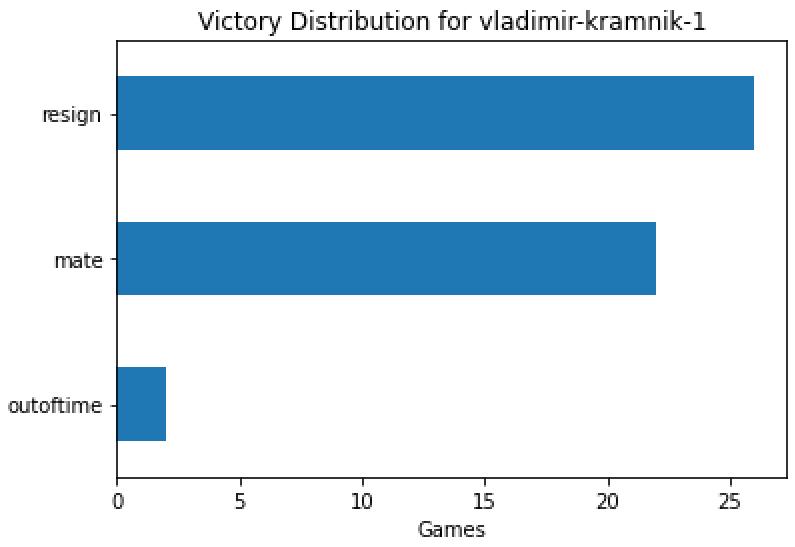
Out[66]:

	player_id	white_wins	white_winning count	black_wins	black_winning count	Total Wins
8597.0	vladimir-kramnik-1	white	22.0	black	28.0	50.0

In [67]:
```
#Creating a new dataframe of most wins which will pull the games for the top win player
Most_Wins = chess_games[(chess_games["white_id"]==Top_Player) & (chess_games["winner"]=
                        (chess_games["black_id"]==Top_Player) & (chess_games["winner"]==
```

In [68]:
```
#Creating a plot to show victory distribution for the top player
ax = Most_Wins.victory_status.value_counts().sort_values().plot(kind = 'barh')
ax.title.set_text('Victory Distribution for %s' %Top_Player)
ax.set_xlabel('Games')
```

Out[68]:
```
Text(0.5, 0, 'Games')
```


Victory Distribution for vladimir-kramnik-1
resign
mate
outoftime
0
5
10
15
20
25
Games

```
In [ ]:
```