Homework 7
RBE595
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Ex. 2
Q1) The voter individual rankings for all 4 alternatives:

$$B \succ_1 C \succ_1 D \succ_1 A$$
$$C \succ_2 D \succ_2 A \succ_2 B$$
$$D \succ_3 A \succ_3 B \succ_3 C$$

We get following 6 cases for individual competitions between each pair of alternatives:
Using **Majority Rule Tournament:**

Alternative pair	Winner by majority
(A,B)	A
(A,C)	C
(A,D)	D
(B,C)	B
(B,D)	D
(C,D)	C

As we can see above,
A can win against only B
B can win against only C
C can win against both A and D
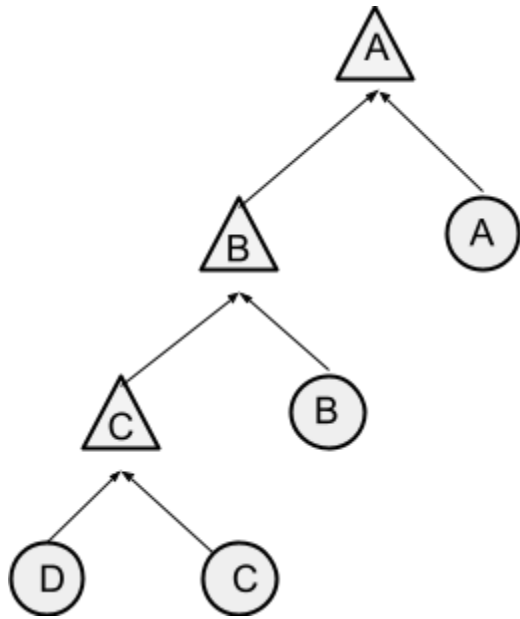D can win against both A and B

Using this data we can create following agenda for different winners:
1) For **A** as a winner:
A can only beat B. Thus it has to meet B in final.
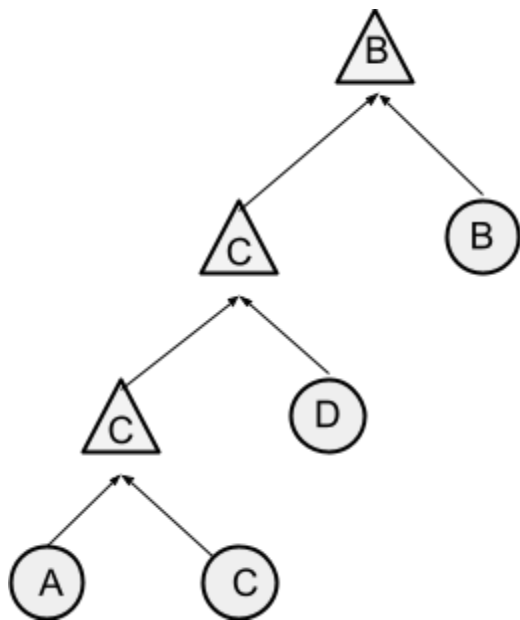B can only beat C. Thus B has to face off C before going to final
Thus we get following structure:
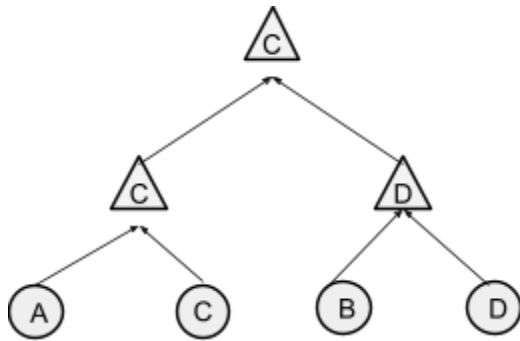
2) For **B** as a winner:

B can only beat C. Thus it has to meet C in final.

C can only beat A or D. Thus C has to face off D or A before going to final
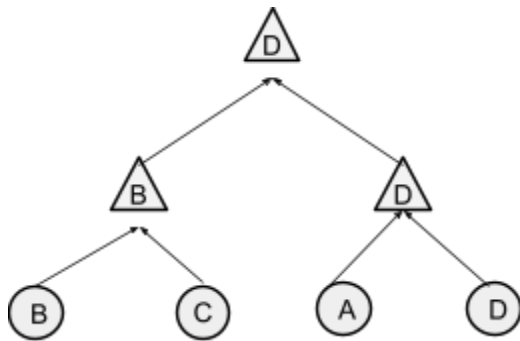
3) For **C** as a winner:
C can beat D and A. Thus it has to meet A or D in the final.

```
                    C
                   / \
                  /   \
                 C     D
                / \   / \
               A   C B   D
```

4) For **D** as a winner:
D can beat B and A. Thus it has to meet A or B in the final.

```
                    D
                   / \
                  /   \
                 B     D
                / \   / \
               B   C A   D
```

Q2) The voter individual rankings for all 4 alternatives:

$$B \succ_1 C \succ_1 D \succ_1 A$$
$$C \succ_2 D \succ_2 A \succ_2 B$$
$$D \succ_3 A \succ_3 C \succ_3 B$$

We get following 6 cases for individual competitions between each pair of alternatives:
Using **Majority Rule Tournament:**

Alternative pair	Winner by majority
(A,B)	A
(A,C)	C
(A,D)	D
(B,C)	C
(B,D)	D
(C,D)	C

As we can see above,
A can win against only B
B can not win against anyone
C can win against all
D can win against both A and B

Using this data we can create following agenda for different winners:
A as a winner - As no one in the possible structures of tournament can beat C, we can never get A as a winner

B as a winner - As no one in the possible structures of tournament can beat C, we can never get B as a winner

D as a winner - As no one in the possible structures of tournament can beat C, we can never get D as a winner

3) For **C** as a winner:
C can beat anyone and thus will arise as an eventual winner.