

University of Bahrain
 Bahrain Teachers College
 TC2MA324: History of Mathematics
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 Spring 2015



Quiz 8

Name: _____

1. (5 points) Use the following properties of the voting systems to match with their definition:

Always A Winner (AAW) Condorcet's Winner Criterion (CWC)
 Monotonicity
 Independent of Irrelevant Alternatives (IIA) Paerto Condition

- (1) _____ is the property that if some candidate A is a winner and a new election is held in which the only ballot change made is for some voter who move A higher on his ballot, then A will remain a winner.
- (2) _____ is the property that it is impossible for a candidate A to move from non-winner state to a winner state unless at least one voter reverses the order of A .
- (3) _____ is the property that there will be always a winner.
- (4) _____ is the property that in every election in which every voter prefer A over B , then B shouldn't be among the winners.
- (5) _____ is the property that the winner is the same winner if the Condorcet's voting system is used.

2. (3 points) Use the following preference ballot lists to show that Hare system, and plurality voting system don't satisfy independence of irrelevant alternatives (IIA).

	6	4	3	4
1st choice	A	B	C	D
2nd choice	B	A	B	C
3rd choice	C	C	A	B
3rd choice	D	D	D	A

3. (3 points) Find each of the following quantities:

1. $190 \pmod{11}$.

2. $219 \pmod{11}$.

3. $407 \pmod{11}$.

4. $407^{22} \pmod{11}$.

5. $190 \cdot 219 \pmod{11}$.

6. $219^{120} \pmod{11}$.

4. (2 points) State Arrow's impossibility theorem.