Emperor Penguins, Part 2

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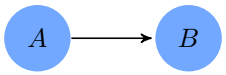
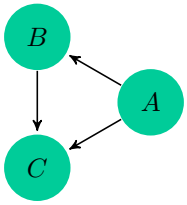
Part 2 will go over the solutions to Part 1, and those solutions will be extremely useful in the problems that will be listed below, so better get bright-eyed and bushy-tailed!

With one penguin, obviously there is one emperor; that penguin pecks 0 other penguins, which in this case, is all other penguins.

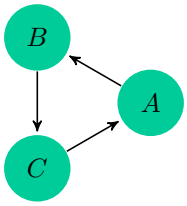
With two penguins, there can only be one emperor penguin. Either penguin A pecks penguin B, or vice versa.



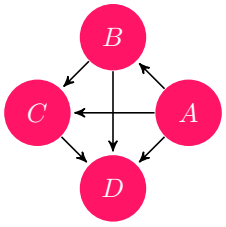
With three penguins, there can be 1 or 3 emperors. It can look like this (where A is emperor):



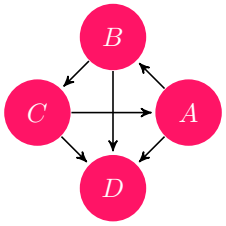
or this (where all 3 are emperors):



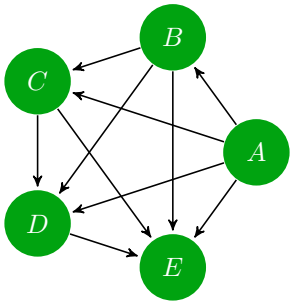
For 4 penguins, there can also be 1 or 3 emperors. It can be this (with A as emperor):



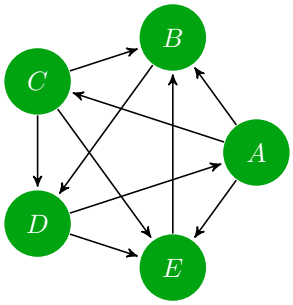
or this (where A, B, and C are emperor penguins):



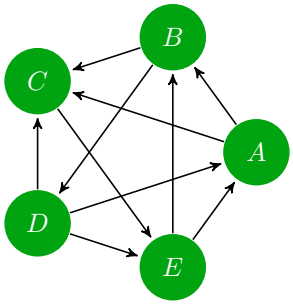
For 5 penguins, there can be 1, 3, 4, or 5 emperor penguins. penguin A is the one emperor penguin:



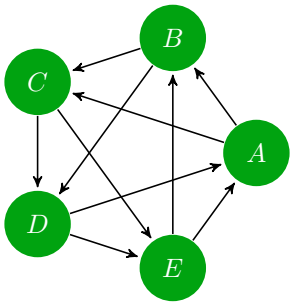
Penguins A, E, and C are the three emperor penguins:



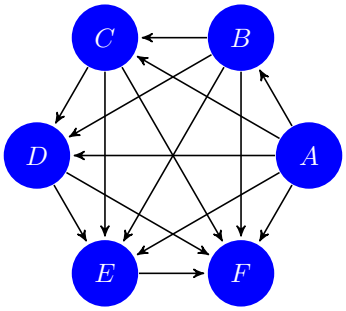
B, A, E, and D are emperors:



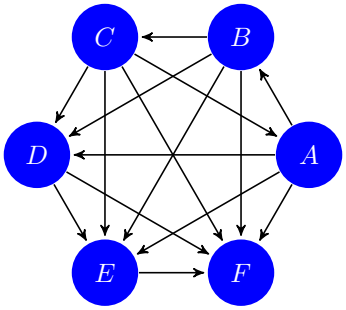
All penguins are emperors:



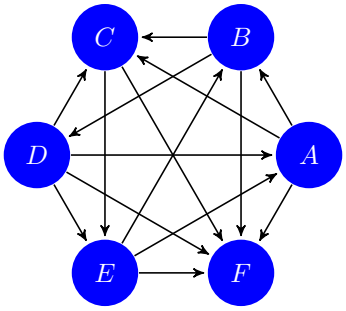
For a six flock, there can be one emperor, aka penguin A:



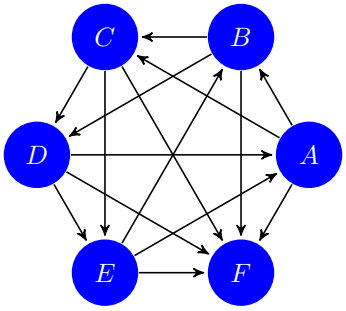
A, B, C are emperor penguins:



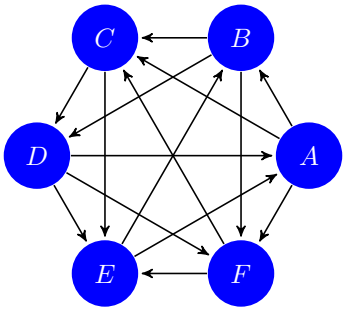
A, B, D, E are emperors:



A, B, C, D, E are emperors:



All six are emperors:



1. Give an intuition/explanation as to why the penguin who pecks the most penguins directy is a emperor penguin.

2. How come no penguin flock can have two emperors?

3. How can you build a n-flock with k kings given that there is an $n-1$-flock with k kings?