Problem 1

Come up with
3 requirements
a king chicken
should meet.

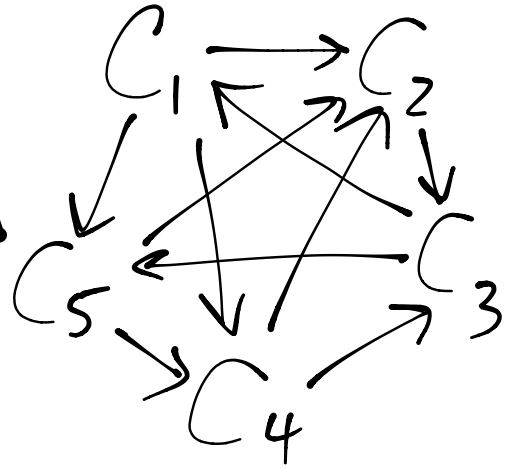
We will compare
each group's
requirements.

Problem 2

We shall declare a chicken K to be a king if for any other chicken C, either K pecks C or K pecks a chicken F which pecks C...

So, $K \to C$ or $K \to F \to C$.

Find all of the king chickens in the pecking order below:



Goal:

Find all possible king counts for each flock size.

The rest of the problems lead you through this.

Go get problem 3!

Problem 3

For each chicken in a flock, count the number of chickens which that particular chicken pecks. Call this the chicken's peck count.

Explain why the chickens with the highest peck count must be kings.

(To get started check that the chickens with highest peck count in the previous example are kings.)

This shows that with our definition every flock has a king (even though there could be many).

Problem 4

How can we arrange for a flock of any size to have exactly one king?

(Try flocks with four and five chickens first.)

Problem 5

- How many kings will a "flock" of two chickens have?

- How many kings will a flock of 3 chickens have? Can there be exactly one, two, or three?

Problem 6

Find a way for a flock of four chickens to have exactly one or three kings.

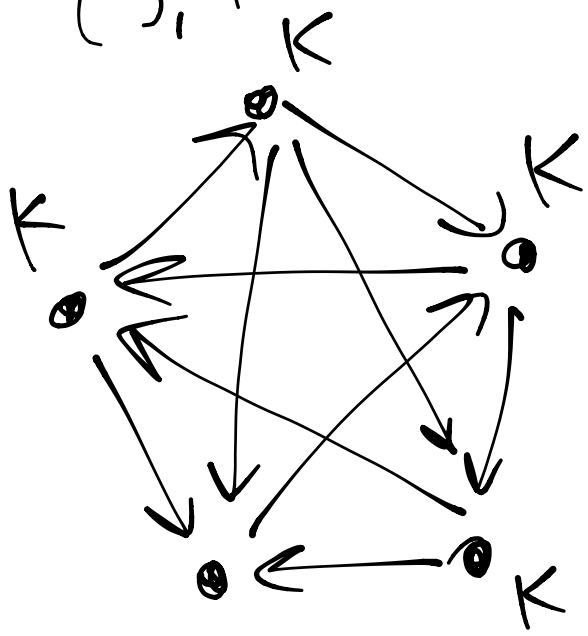
Show it is impossible to have exactly two or four kings in a flock of four.

Problem 7

Can a flock of 5 have exactly 4 kings?

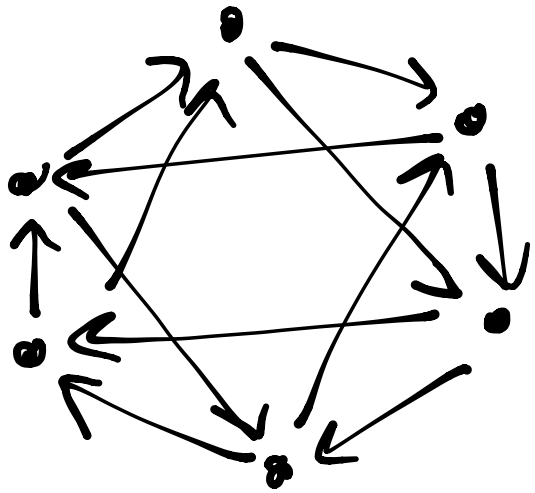
Can a flock of 6 have 6 kings?

(5, 4)



Answer

(6, 6)



Problem 8

Show how to bring a new chicken into a flock without changing the number of kings.

Problem 9

Construct a pecking order for a flock with an odd number of chickens so that every chicken is a king.

(Try this for 3, 5, or 7 chickens first if you get stuck.)

Problem 10

Suppose we have a flock where every chicken is a king

Explain how to introduce 2 new chickens so that every chicken is still a king.

Problem 11

Prove the following: given a particular chicken C, if C is pecked by at least one chicken, then C is pecked by a king.

Problem 12:

Use problem 11 to prove no flock can have exactly 2 kings.

Problem 13

What are the possible flock number / # of kings combinations?

flock size	possible king count
2	1
3	1, 3
4	1, 3
5	?
6	?
7	?
8	?
⋮	