

PROBLEM SET 1

*Assigned: January 24, 2020**Due: February 7, 2020*

Always provide explanations and show as much work as possible. Solutions to odd-numbered exercises are available at [http://www.algorist.com/algowiki/index.php/The_Algorithms_Design_Manual_\(Second_Edition\)](http://www.algorist.com/algowiki/index.php/The_Algorithms_Design_Manual_(Second_Edition)). If you are stuck on an even problem, try to find a similar odd-numbered exercise.

1. Exercise 1-2 from Skiena.
2. 1-5.
3. Your classmate claims that all jelly beans are the same color. They give the following proof:

Proof. (By induction.) Base case: when we have a single jelly bean it can only be one color.

Inductive hypothesis: Assume that all sets of n jelly beans are the same color. Consider a set of $n + 1$ jelly beans. Choose a subset A of size n from this set; these beans must be the same color by our inductive hypothesis.

Now consider the bean you did not pick. Swap this bean with any bean from the set A . This forms a set B of n beans, and so must be the same color by our inductive hypothesis.

Sets A and B share $n - 1$ beans, hence each set must be the same color. In other words, all $n + 1$ beans are the same color. \square

What is wrong with this proof?

4. 1-8
5. 1-12
6. 1-20. Interviewers love to ask estimation questions like this. The important part here is your *process*, not the actual answer you get. Make some simplistic assumptions and ballpark it.
7. 2-2
8. 2-6
9. 2-8
10. 2-12
11. 2-18
12. 2-23
13. 2-36