

BOWDOIN COLLEGE

MATH 2020: INTRODUCTION TO MATHEMATICAL REASONING

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HOMEWORK 1A

For each induction proof you write, make sure to:

- (1) Clearly state $P(n)$.
- (2) Clearly state the smallest possible value of n for your base case. This is the value of n at which the pattern begins. Usually $n = 1$.
- (3) Do not equate expressions before you know they are equal.
- (4) In the induction step, clearly state what you are trying to prove true, that is, $P(k + 1)$.
- (5) End your proof with a conclusion.

We will be doing induction problems for much of the next few weeks. Don't hesitate to come to office hours or the LA sessions to ask questions about mathematical induction.

1. Book problems: Page 106 #2, 6
2. Find out two interesting things about each of your group members; one should be mathematical and the other can be anything! Write them as your answer to problem 2.

1. EXTRA CREDIT

- A. Solve the two problems about mathematicians and physicists from the first day of classes.
- B. This is a special challenge problem - you have until spring break to work on it. (Because it's really fun!) You can turn in your solution directly to me.

The twelve coin weighing problem. Suppose you have 12 coins, all of which look exactly alike. One of the coins, however, is counterfeit, weighing either slightly more or slightly less than the others. Using only a balance scale (no weights available), how could you identify the counterfeit coin and indicate whether it is lighter or heavier than the rest, in no more than 3 weighings? (For practice, see if you could do this in at most 3 weighings, if you knew that the counterfeit coin was heavier than the other coins.)

Here's a warmup problem - no extra credit, but you might try it first.

The eight marble weighing problem. Eight marbles all have the same color, size and shape. Only one marble differs in weight from the others. Using a balance scale (no weights available), find the heavy marble using no more than 2 weighings.