

# BOWDOIN COLLEGE

MATH 2020: INTRODUCTION TO MATHEMATICAL REASONING  
PROF. THOMAS PIETRAHO  
SPRING 2026

---

## 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.