

# Review of Proofs and Mathematical Induction

## A Sample Assignment

1. Consider the following **claim**: For every integer  $n$  such that  $n \geq 8$ , there exist nonnegative integers  $a_n$  and  $b_n$  such that  $3a_n + 5b_n = n$ .

Suppose you want to write a **proof** of the this claim, using mathematical induction — specifically, induction on  $n$ , using the *strong* form of mathematical induction with the integer 10 as breakpoint — so that the cases that  $n = 8$ ,  $n = 9$  and  $n = 10$  would all be considered in the basis.

- (a) Write down the **result** that you need to prove in the **basis**.  
(b) Now consider the **inductive step**. This should begin a sentence like the following:

Let  $k$  be an integer such that  $k \geq 10$ .

Write down the **Inductive Hypothesis** that can be assumed during the inductive step. (*Note*: This should have something to do with the case that  $8 \leq n \leq k$ .)

- (c) Now write down the **Inductive Claim** that you must *prove* in the inductive step. (*Note*: This should have something to do with the case that  $n = k + 1$ .)  
(d) If you have answered the above questions then you have mapped out the *structure* of a proof of the above claim.  
Fill in the details, in order to produce a complete *proof* of the claim using mathematical induction on  $n$ .