PRACTISE EXERCISE REMARKS

It went in general well.

I list some observations that you will find useful.

Please study the examples I gave in the notes, paying attention to the layout of my solutions that properly identifies *Basis, I.H.* and *I.S.*

Also be mindful of arithmetic and complete your sentences. Symbols are wonderful but we still need english prose (a little bit only) to explain what we are doing.

(1) In the I.H. assume for *fixed n* (must be stressed). A statement like "I assume $P(n)$" may sound like I assume it <u>for all n</u>. But that is what I want to **prove**: $P(n)$ *for all n*!

(2) Induction was requested. Some papers (I counted at least two) used a formula (without proof!) to find the sum of an "arithmetical progression". Such an answer gets no credit even if the formula quoted is correct, and even if it is correctly used.

(3) Be sure you get the *Basis* case right. I saw verifications for more than the needed values of n (should be just $n = 0$; not $n = 0, 1, 2$)

(4) I saw some papers that went from n=1 directly to n=k+1.
Not right! <u>You do need I.H.</u>

(5) A number of papers got bogged down in arithmetic.
<u>We cannot afford to forget arithmetic!</u>

(6) Some gave just some kind of verification up to 64. (Why 64??!!) **No induction** done, but also not proved!

(7) Some suggested that the statement is false. I assure you it is true! Many proved it. See my solution on our course page.

(8) Some gave two I.H. **but no I.S. step**! ("assume for $n = x$?then **assume** for $n = x + 1$?")

(9) *Basis, I.H.* and *I.S.* must be clear and must be done. I saw a 3-line submission that has no words, and also misses the keywords above. Not clear what was happening.

(10) also "Basis: $1 = n^2$". This is meaningless. And then immediately follows the "inductive step" with **no I.H. stated**! This is wrong.

(11) Use brackets when needed! E.g. $\sum_{i=0}^{n} 2i + 1$ is NOT the same as $\sum_{i=0}^{n}(2i + 1)$. The latter is the correct one in our exercise.

(12) Induction is NOT to verify n=1, 2, 3, and then just say "**so on, so it must be true**"! must it?

(13) Take care of your arithmetic! I saw a paper that said the "Basis is false"! Then went on and did strange things: concluded $2k + 1 = (k + 1)^2$. But **this** is false.

(14) One correctly identifies the need to do the "boundary case" (Basis) but then offers $2n + 1 = (n + 1)^2$ as THE boundary case! It is not! The LHS in the question is not $2n + 1$.

(15) There is no need to use "P(x)" or "S(n)" or whatever to name the "property to prove". But if you do, make sure the name stays being a "property"! I saw a paper that lets "S(n)" to be the statement of the exercise, but then **in the I.S.** the paper says "$S(n) = (n+2)^2$". $(n+2)^2$ is a **number**; not a property.