

Assignment #3—Due via Canvas by 10pm on Sunday 9/13
PHIL 422
Woodbridge

1. Using **mathematical induction** as employed on the Mathematical Induction Handout, prove the following claim, “Every positive integer n is such that the sum of it and all the positive integers before it in the sequence of positive integers is equal to $n(n+1)/2$. [Hints: Make the “next” arbitrary level you want to prove the claim for in part two of the Induction Step be $k + 1$. You will then be comparing two arbitrarily long sums of $1 + 2 + \dots + k$ and $1 + 2 + \dots + k + (k+1)$. Notice the overlap between them and what the induction hypothesis lets us substitute for the overlapping part. Then do the math. Be sure to put all the pieces together explicitly in a conclusion statement.]

2. Using **mathematical induction** as employed on the Mathematical Induction Handout, prove the following claim, “Every polygon with $n+2$ sides (where n is any positive integer) has angles that sum to a total of $(n \times 180)$ degrees.” [Hints: while this appears to be about polygons, the induction set is still the positive integers. You may appeal to the geometric facts that the angles of any triangle sum to 180 degrees and that adding one additional side to any polygon to form a new polygon is equivalent to tacking a triangle onto one of its sides. In the Induction Step, make the arbitrary “next” level that you want to prove this holds for after assuming the Induction Hypothesis $k + 1$. Again, be sure to put all the pieces together explicitly in a conclusion statement.]

3. Using Ex. 2 on the Mathematical Induction Handout as a starting “template”, expand the proof of the Parentheses Symmetry Theorem (PST) given there to cover all the wffs of full FOL. [Hints: you need to consider all the ways atomic wffs of FOL can be formed in the Basis, so the point there about names must be expanded to include all individual terms, and you need to cover the identity predicate explicitly. (Note: there is a **new** version of the Formation Rules Handout that has updated details about forming wffs with the identity predicate.) In the Induction Step, remember that you have to do **strong** MI here. Also, there are now **seven** ways that a wff can be a $k+1$ -level wff of FOL, but ways ii)-v) can be covered all at once, if you appeal to the metalanguage variable “*” that can be filled in with any of the binary connectives of FOL.]