IMPORTANT FIRST STEPS:

1. **Form a group of 2 students.**
2. **Clearly put your names and IDs on 1 copy of this worksheet.**
3. **Be sure to turn this exercise in at the end of class.**
4. **Do not attempt to prove the inductive step until you have completed all other steps for each question.**

Mathematical Induction

1. Using mathematical induction, prove the following:

$$1^2+2^2+3^2+...+n^2 = n(n+1)(2n+1) / 6$$

S(n): $1^2+2^2+3^2+...+n^2 = n(n+1)(2n+1) / 6$

Claim: $\forall n > 0$, $S(n)$ holds.

Base Case, express and prove:

Inductive Hypothesis: Assume S(n), that is $1^2+2^2+3^2+...+n^2 = n(n+1)(2n+1) / 6$

What is to be proven using the Inductive Step? Write this out explicitly:

Prove S(n+1) is also true: $1^2+2^2+3^2+...+(n+1)^2 = (n+1)((n+1)+1)(2(n+1)+1) / 6$

Now, prove the Inductive Step:

Statement that you've proven your claim:

QED.

2. Using mathematical induction, prove the following:

$$1^3+2^3+3^3+...+n^3 = n^2(n+1)^2 / 4$$

S(n):

Claim:

Base Case, express and prove:

Inductive Hypothesis:

What is to be proven using the Inductive Step? Write this out explicitly:

Now, prove the Inductive Step:

Statement that you've proven your claim:

QED.

3. Using mathematical induction, prove that the distributed property of OR can be extended to a disjunction with a conjunction of *n* sentences. ie.

$$(a \mathbf{v} (b \wedge c \wedge ... \wedge n)) = (a \mathbf{v} b) \wedge (a \mathbf{v} c) \wedge ... \wedge (a \mathbf{v} n)$$

S(n):

Claim:

Base Case, express and prove:

Inductive Hypothesis:

What is to be proven using the Inductive Step? Write this out explicitly:

Now, prove the Inductive Step:

Statement that you've proven your claim:

QED.

4. Prove that the sum of the interior angles of a convex polygon of n sides is (n-2) * 180 degrees.

S(n):

Claim:

Base Case, express and prove:

Inductive Hypothesis:

What is to be proven using the Inductive Step? Write this out explicitly:

Now, prove the Inductive Step:

Statement that you've proven your claim:

QED.