Practice with mathematical induction frameworks

MTH 225, 2023-09-29

Activity 1

You just made a conjecture that for all natural numbers n,

$1 + 2 + 4 + 8 + \cdots + 2^n = 2^{n+1} - 1$

1. What is the predicate in this conjecture? Write it out: $P(n)$ is....

2. What value of n is the base case?

3. Show that the base case holds, by a direct computation or demonstration.

4. Write out the inductive hypothesis in precise terms, without using the notation "$P(n)$" . (Start with the phrase "Assume that...")

5. State what you would need to prove next, in the inductive step.

Then watch the board for an actual proof. Later in the course you will be learning how to write one of these yourself.

Activity 2

Here's another conjecture: **For all natural numbers $n \geq 4$, $2^n \geq n^2$.**

1. What is the predicate in this conjecture? Write it out: $P(n)$ is....

2. What value of n is the base case?

3. Show that the base case holds, by a direct computation or demonstration.

4. Write out the inductive hypothesis in precise terms, without using the notation "$P(n)$" . (Start with the phrase "Assume that...")

5. State what you would need to prove next, in the inductive step.

Then watch the board for an actual proof. Later in the course you will be learning how to write one of these yourself.