4. In the world series the first team to win four games in a row wins the series. How many ways can a world series be played if no team wins two games in a row? Suppose the two teams are called N and A. There are two ways either N wins first ANANANAN or A wins first ANANANA

5. True or False. If true, prove it. If false, then give a counterexample. If \( n \) is an integer with \( 1 \leq n \), then

\[
\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \ldots + \frac{1}{n \cdot (n+1)} = \frac{n}{n+1}.
\]

True \( \) Proof by induction.

When \( n = 1 \) the proposed identity is \( \frac{1}{1 \cdot 2} = \frac{1}{1+1} \), which is true.

Induction Hypothesis Assume \( \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \ldots + \frac{1}{n \cdot (n+1)} = \frac{n}{n+1} \)

We must show that \( \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \ldots + \frac{1}{n \cdot (n+1)} + \frac{1}{n+1 \cdot (n+2)} = \frac{n+1}{n+2} \)

The left side is \( \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \ldots + \frac{1}{n \cdot (n+1)} + \frac{1}{(n+1)(n+2)} \)

\[
= \frac{1}{n+1} \left[ n + \frac{1}{n+2} \right] = \frac{1}{n+1} \left[ \frac{n(n+2)+1}{n+2} \right] = \frac{n^2 + 2n + 1}{(n+1)(n+2)} = \frac{1}{(n+1)(n+2)} = \frac{n+1}{n+2}
\]

which is the right side of \( \). The proof is complete.