Precalculus: Section 8.4 Notes
Mathematical Induction

Difference between a_n and S_n:

Why do we need mathematical induction (proof)?:

Mathematical Induction: Let P_n be a statement involving the positive integer *n*. If…

1. P_1 is true AND
2. The truth of P_k implies the truth of P_{k+1} for all positive *k*

Then P_k must be true for all positive integers *n*.

Examples:

1. $2 + 4 + 6 + 8 + \cdots + 2n = n(n + 1)$
   a. What is the formula for a_n?
   b. What is the formula for S_n?
   c. Show that the formula is true for $n = 1$.
   d. Assume that the formula is true for $n = k$.
      a. Assume $S_k =$
   e. Show that the formula is true for S_{k+1}.
      a. Show that $S_{k+1} =$
      b. $S_{k+1} = S_k + a_{k+1}$

2. $3 + 8 + 13 + 18 + \cdots + (5n - 2) = \frac{n}{2}(5n + 1)$

a. What is the formula for a_n?

b. What is the formula for S_n?

c. Show that the formula is true for $n = 1$.

d. Assume that the formula is true for $n = k$.

  a. Assume $S_k =$

e. Show that the formula is true for S_{k+1}.

  a. Show that $S_{k+1} =$

  b. $S_{k+1} = S_k + a_{k+1}$

3. $2 + 6 + 18 + 54 + \cdots + 2 \cdot 3^{n-1} = 3^n - 1$

   a. What is the formula for a_n?

   b. What is the formula for S_n?

   c. Show that the formula is true for $n = 1$.

   d. Assume that the formula is true for $n = k$.

      a. Assume $S_k =$

   e. Show that the formula is true for S_{k+1}.

      a. Show that $S_{k+1} =$

      $b.\ S_{k+1} = S_k + a_{k+1}$

4. $\sum_{i=1}^{n} i^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30}$

   a. What is the formula for a_n?

   b. What is the formula for S_n?

   c. Show that the formula is true for $n = 1$.

   d. Assume that the formula is true for $n = k$.

      a. Assume $S_k =$

   e. Show that the formula is true for S_{k+1}.

      a. Show that $S_{k+1} =$

      b. $S_{k+1} = S_k + a_{k+1}$

HW: pg. 592 #'s 8, 10, 11, 19-22