Notes Section 9.1
Sequences and Summation Notation

- Find the terms of a sequence
- Find the terms of a recursive sequence
- Find the partial sums of a sequence
- Find the sum of a sequence with Sigma Notation

Describe a pattern in the sequence of numbers. Predict the next two numbers.

2, 6, 18, 54, ...

1, 4, 7, 10, ...

1, 1, 2, 3, 5, 8, 13, ...

1-10 Find the first four terms and the 100^{th} term of the sequence.

4. $a_n = n^2 + 1$

8. $a_n = (-1)^{n+1}\frac{n}{n+1}$

Recursive Sequence:
Recursion is the process of choosing a starting term and repeatedly applying the same process to each term to arrive at the following term. Recursion requires that you know the value of the term immediately before the term you are trying to find.

A recursive formula always has two parts:

1.

2.

11-16 Find the first five terms of the given recursively defined sequence.

12- $a_n = \frac{a_{n-1}}{2}$ and $a_1 = -8$

16- $a_n = a_{n-1} + a_{n-2} + a_{n-3}$ and $a_1 = a_2 = a_3 = 1$

The 'nth' term is a formula that enables one to find any term of a sequence.

23-30 Find the *nth* of a sequence whose first several terms are given.

24- $-\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}, \cdots$

28- $\frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \cdots$

31-34 Find the first six partial sums $s_1, s_2, s_3, s_4, s_5, s_6$ of the sequence

32- $1^2, 2^2, 3^2, 4^2, \ldots$

35-38 Find the first four partial sums and the *nth* partial sum of the sequence a_n

36- $a_n = \frac{1}{n+1} - \frac{1}{n+2}$

Sigma Notation: $(sigma)$ Σ *this symbol* means, "sum"

$$\sum_{i=1}^{n} x_i -$$

39-46 Find the sum:

40- $\sum_{k=1}^{4} k^2$

46- $\sum_{i=1}^{3} i2^i$

Notes Section 9.1
Sequences and Summation Notation

- Find the terms of a sequence
- Find the terms of a recursive sequence
- Find the partial sums of a sequence
- Find the sum of a sequence with Sigma Notation

Describe a pattern in the sequence of numbers. Predict the next two numbers.

2, 6, 18, 54, ... (x 3) 162, 486

1, 4, 7, 10, ... (+3) 13, 16

1, 1, 2, 3, 5, 8, 13, ... 21, 34
next number is sum of two previous numbers.

1-10 Find the first four terms and the 100th term of the sequence.

4. $a_n = n^2 + 1$ 1, 5, 10, 17 ..., 10,001

8. $a_n = (-1)^{n+1}\frac{n}{n+1}$ $\frac{1}{2}, -\frac{2}{3}, \frac{3}{4}, -\frac{4}{5}$

Recursive Sequence:
Recursion is the process of choosing a starting term and repeatedly applying the same process to each term to arrive at the following term. Recursion requires that you know the value of the term immediately before the term you are trying to find.

A recursive formula always has two parts:

1. The starting value for a_1.

2. The recursion equation for a_n as a function of a_{n-1} (the term before it)

11-16 Find the first five terms of the given recursively defined sequence.

12- $a_n = \frac{a_{n-1}}{2}$ and $a_1 = -8$ $-8, -4, -2, -1, -\frac{1}{2}$

$a_2 = \frac{-8}{2} = -4$ $a_3 = -\frac{4}{2}$ $a_4 = \frac{-2}{2}$ $a_5 = \frac{-1}{2}$

16- $a_n = a_{n-1} + a_{n-2} + a_{n-3}$ and $a_1 = a_2 = a_3 = 1$ 1, 1, 1, 3, 5

$a_4 = a_3 + a_2 + a_1$

$= 3$ $a_5 = a_4 + a_3 + a_2 = 5$

The 'nth' term is a formula that enables one to find any term of a sequence.

23-30 Find the *nth* of a sequence whose first several terms are given.

24- $-\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}, \ldots$ $a_n = \frac{(-1)^n}{(3)^n}$ or $\left(-\frac{1}{3}\right)^n$

28- $\frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}, \ldots$ $a_n = \frac{n+2}{n+3}$

31-34 Find the first six partial sums $s_1, s_2, s_3, s_4, s_5, s_6$ of the sequence $S_5 = S_4 + 25 = 64$, $S_6 = S_5 + 36 = 100$

32- $1^2, 2^2, 3^2, 4^2, \ldots$

$S_1 = 1$ $S_2 = 1+4 = 5$ $S_3 = 1+4+9 = 14$ $S_4 = 1+4+9+16 = 39$

35-38 Find the first four partial sums and the *nth* partial sum of the sequence a_n

36- $a_n = \frac{1}{n+1} - \frac{1}{n+2}$

$S_1 = \frac{1}{2} - \frac{1}{3} = \frac{1}{6}$ $S_2 = \frac{1}{6} + \left(\frac{1}{3} - \frac{1}{4}\right) = \frac{1}{4}$ $S_3 = \frac{1}{4} + \left(\frac{1}{4} - \frac{1}{5}\right) = \frac{3}{10}$ $S_4 = \frac{3}{10} + \left(\frac{1}{5} - \frac{1}{6}\right) = \frac{1}{3}$

$\frac{1}{6}, \frac{2}{8}, \frac{3}{10}, \frac{4}{12}$ $S_n = \frac{n}{(n+2)2}$

Sigma Notation: (*sigma*) Σ *this symbol* means, "sum"

$\sum_{i=1}^{n} x_i$ — upper limit; summation sign; element; index; lower limit

39-46 Find the sum:

40- $\sum_{k=1}^{4} k^2$ $S_1 = 1^2$ $S_2 = 1 + 2^2 = 5$ $S_3 = 5 + 3^2 = 14$ $S_4 = 14 + 4^2 = 30$

46- $\sum_{i=1}^{3} i2^i$ $S_1 = 1 \cdot 2^1 = 2$ $S_2 = 2 + 2 \cdot 2^2 = 10$ $S_3 = 10 + 3 \cdot 2^3 = 34$