Sequences

UNIVERSITY OF MINNESOTA

Preliminaries and Objectives

Preliminaries

- Recursion

Objectives

- Develop notation for sequences

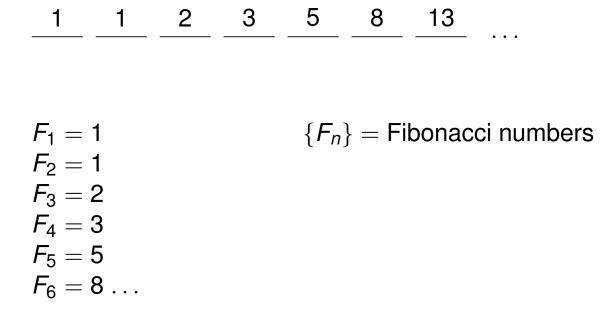# Example 1 - Powers of 2

$$\underline{\quad 2 \quad} \quad \underline{\quad 4 \quad} \quad \underline{\quad 8 \quad} \quad \underline{\quad 16 \quad} \quad \underline{\quad 32 \quad} \quad \underline{\quad 64 \quad} \quad \underline{\quad 128 \quad} \quad \ldots \quad \underline{\quad 65536 \quad}$$

1st   2nd   3rd   4th   5th   6th   7th

Tables

Position	Number
1	2
2	4
3	8
4	16
5	32
6	64
7	128
⋮	⋮
16	65536
⋮	⋮

Example 2 - Fibonacci Numbers

$$1 \quad 1 \quad 2 \quad 3 \quad 5 \quad 8 \quad 13 \quad \ldots$$

$F_1 = 1$

$F_2 = 1$

$F_3 = 2$

$F_4 = 3$

$F_5 = 5$

$F_6 = 8 \ldots$

$\{F_n\}$ = Fibonacci numbers

Example 3 - Even Numbers

n	E_n
1	2
2	4
3	6
4	8
5	10
6	12
7	14

$$E_n = 2n$$

Example 4 - Odd Numbers

n	D_n
1	1
2	3
3	5
4	7
5	9
6	11
7	13

$$D_1 = 1, \qquad D_{next} = D_{prev} + 2$$

Example 4 - Odd Numbers

n	D_n
1	1
2	3
3	5
4	7
5	9
6	11
7	13

$$D_1 = 1, \qquad D_{n+1} = D_n + 2$$

Example 2 - Fibonacci Numbers

$$\underline{\quad 1 \quad} \quad \underline{\quad 1 \quad} \quad \underline{\quad 2 \quad} \quad \underline{\quad 3 \quad} \quad \underline{\quad 5 \quad} \quad \underline{\quad 8 \quad} \quad \underline{\quad 13 \quad} \quad \ldots$$

$$F_1 = 1 \qquad\qquad F_2 = 1 \qquad\qquad F_{n+2} = F_{n+1} + F_n$$

Recap

A **sequence** is an ordered list of numbers

- Explicit Formula - a_n is given by a formula involving n
- Recursive Formula - Give the value of the first term, then give a formula for the next term based on previous terms.
- The subscript indicates the location in the sequence