Mathematics in the Modern World

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Contents

Prelim

L-2 - Patterns

- Visible regularity in world or man-made design.

G. H. Hardy

- British mathematician.
- Characterized mathematics as the study of patterns.

Logic Patterns

- Deals with characteristics of similar attribute with the following various:
  - objects (eg: shapes)
  - order (eg: placement)
  - sequence (eg: array)

Geometric Patterns

- Deals with a motif or design typically repeating like a wallpaper that depicts the following:
  - shapes,
  - lines,
  - polygons,
    - circles.

Word Patterns

- Deals with metrical patterns of poems and syntatic patterns of how we make:
  - noun plurality,
  - past tense of verbs,
  - also supports mathematics,
  - also supports natural language understanding.
- Examples:
  - Letter jumbling (cryptography)
    - Encryption: making the message not readable but keeps the meaning.
    - Decryption: process of finding the meaning of the encrypted message.
  - Word associations

Number Patterns

- Deals with predition of the next term in a sequence.
- Leads directly to the concept of functions in mathematics.
  - **Functions** are formal descriptions of the relationships among different quantities

L-2-A Fibonacci Sequence

Leonardo of Pisa

- Also known as:
  - **Leonardo Bigollo Pisano** *(Leonardo, traveller of Pisa)*,
  - Leonardo Bonacci,
  - Leonardo Fibonacci.
- European Mathematician.
  - Italian, from the Republic of Pisa.
- **Date** lived: *1175-1250*
- **Discovered** the Fibonacci Sequence from:
  - how fast **rabbits breed** *under ideal circumstances.*

Fibonacci Sequence

- Series of numbers where **the next term is found by adding the two previous terms**

1^{st} - term	2^{nd} - term	3^{rd} - term	4^{th} - term	5^{th} - term	6^{th} - term	7^{th} - term	8^{th} - term	9^{th} - term	10^{th} - term
1	1	2	3	5	8	13	21	34	55

11^{st} - term	12^{nd} - term	13^{rd} - term	14^{th} - term	15^{th} - term	16^{th} - term	17^{th} - term	18^{th} - term	19^{th} - term	20^{th} - term
89	144	233	377	610	987	1,597	2,584	4,181	6,765

21^{st} - term	22^{nd} - term	23^{rd} - term	24^{th} - term	25^{th} - term	26^{th} - term	27^{th} - term	28^{th} - term	29^{th} - term	30^{th} - term
10,946	17,711	28,657	46,368	75,025	121,393	196,418	317,811	514,229	832,040

31^{st} term	32^{nd} term	33^{rd} term	34^{th} term	35^{th} term
1,346,269	1,346,269	3,524,578	5,702,887	9,227,465

36^{th} term	37^{th} term	38^{th} term	39^{th} term	40^{th} term
14,930,352	24,157,817	39,088,169	63,245,986	102,334,155

41^{st} term	42^{nd} term	43^{rd} term	44^{th} term	45^{th} term
165,580,141	267,914,296	433,494,437	701,408,733	1,134,903,170

46^{th} term	47^{th} term	48^{th} term	49^{th} term	50^{th} term
1,836,311,903	2,971,215,073	4,807,526,976	7,778,742,049	12,586,269,025

Fibonacci Rule

$x_n = x_{n-1} + x_{n-2}$

Where:

x_n is the term number "n"

x_{n-1} is the previous term "n-1"

x_{n-2} is the previous 2 terms "n-2"

L-2-B Lucas Number

1^{st} - term	2^{nd} - term	3^{rd} - term	4^{th} - term	5^{th} - term	6^{th} - term	7^{th} - term	8^{th} - term	9^{th} - term	10^{th} - term
2	1	3	4	7	11	18	29	76	123

11^{st} - term	12^{nd} - term	13^{rd} - term	14^{th} - term	15^{th} - term	16^{th} - term	17^{th} - term	18^{th} - term	19^{th} - term	20^{th} - term
199	322	521	843	1,364	2,207	3,571	5,778	9,349	15,127

21^{st} - term	22^{nd} - term	23^{rd} - term	24^{th} - term	25^{th} - term	26^{th} - term	27^{th} - term	28^{th} - term	29^{th} - term	30^{th} - term
24,476	39,603	64,079	103,682	167,761	271,443	439,204	710,647	1,149,851	1,860,498

31^{st} term	32^{nd} term	33^{rd} term	34^{th} term	35^{th} term
3,010,349	4,870,847	7,881,196	12,752,043	20,633,239

36^{th} term	37^{th} term	38^{th} term	39^{th} term	40^{th} term
33,385,282	54,018,521	87,403,803	141,422,324	228,826,127

41^{st} term	42^{nd} term	43^{rd} term	44^{th} term	45^{th} term
370,248,451	599,074,578	969,323,029	1,568,397,607	2,537,720,636

46^{th} term	47^{th} term	48^{th} term	49^{th} term	50^{th} term
4,106,118,243	6,643,838,879	10,749,957,122	17,393,796,001	28,143,753,123

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There are three parts to this solution.

1. write the equations to solve the problem in R-readable strings.
2. loop over the list and `eval(parse())` the equation strings
3. wrap strings in `$$ $$` with `cat(paste0())`

Chunks should be set to `echo=FALSE` and `results="asis`. You may need to suppress some function output with `invisible()`.