UTM
UNIVERSITI TEKNOLOGI MALAYSIA

GLOBAL LEARNING PROGRAM (GLP) AT ITS SURABAYA

ITS Institut Teknologi Sepuluh Nopember

GLOBAL LEARNING PROGRAM

"MATHEMATICS FOR LIFE"

Prof. Dr. Nor Haniza Sarmin

Department of Mathematical Sciences, Faculty of Science,
Universiti Teknologi Malaysia, Johor, Malaysia.

nhs@utm.my

22 March 2021

GLP

Global Learning Program

For IUP Students taking Mathematics course

SPEAKER

Prof. Nor Haniza Sarmin

Universiti Teknologi Malaysia - UTM

MODERATOR

Drs. Lukman Hanafi, M.Sc

Institut Teknologi Sepuluh Nopember - ITS

Topic:

"Mathematics for Life"

Monday, 22 March 2021
11.00 - 12.40 pm (GMT+7)
for Class IUP M-5 (75 and 80)

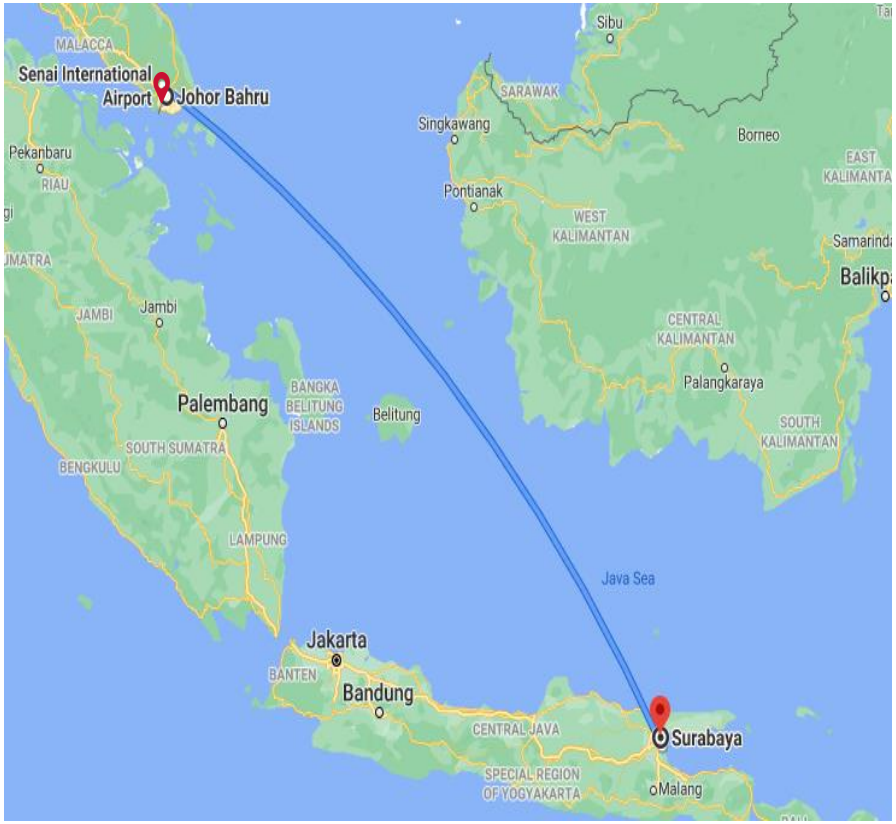
Synchronous

Zoom Meeting

contact person : Ms.Vivi (+62 857 0685 4749)

its.ac.id/international

MALAYSIA - INDONESIA

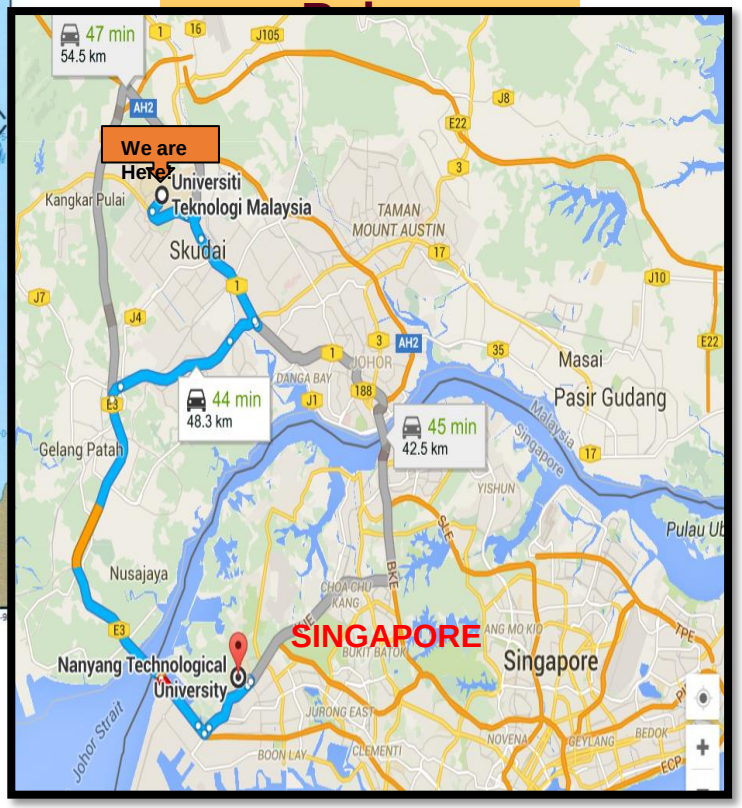


1,391.13 km

Distance from Johor Bahru to Surabaya

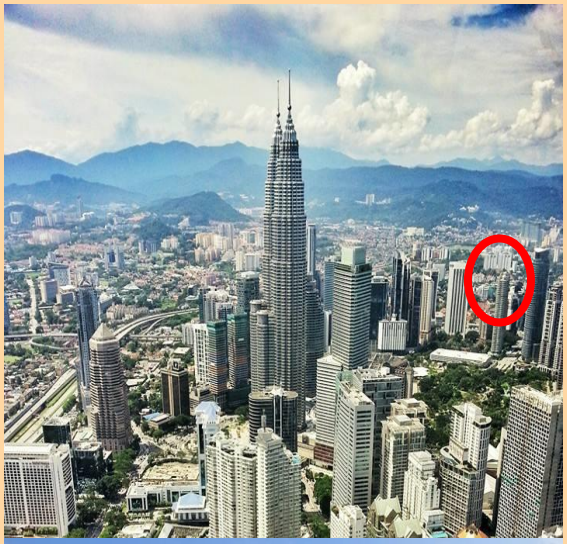
innovative • entrepreneurial • global

UTM Location



UNIVERSITI TEKNOLOGI MALAYSIA (UTM)
MAIN CAMPUSES

UTM Johor Bahru
(1145 hectares) – main campus



UTM Kuala Lumpur Campus –
branch (19 hectares)

International Students

Student from Indonesia	916	PhD	Master	Degree
		152	58	706

4807 Students from 77 Countries

No	Country	Gender		Total	No	Country	Gender		Total	No	Country	Gender		Total
		M	F				M	F				M	F	
1	INDONESIA	591	325	916	27	QATAR	7	4	11	53	CHAD REPUBLIK	2		2
2	BANGLADESH	367	72	439	28	CAMEROON	7	3	10	54	DJIBOUTI	1	1	2
3	CHINA	146	253	399	29	THAILAND	7	3	10	55	ETHOPIA	2		2
4	NIGERIA	309	38	347	30	UNITED STATES OF AMERICA	5	5	10	56	GAMBIA	2		2
5	EGYPT	316	27	343	31	MALDIVES	7	2	9	57	RUSSIA	2		2
6	PAKISTAN	220	69	289	32	MOROCCO	6	2	8	58	ST. VINCENT GRENADIES	1	1	2
7	IRAQ	222	50	272	33	VIETNAM	6	2	8	59	SWITZERLAND	2		2
8	YEMEN	236	16	252	34	PHILIPINES	2	5	7	60	UZBEKISTAN	2		2
9	ARAB SAUDI	178	69	247	35	CAMBODIA	2	4	6	61	ZAMBIA	1	1	2
10	LIBYA	171	30	201	36	KENYA	3	3	6	62	AZERBAIJAN	1		1
11	SUDAN	145	39	184	37	MYANMAR	5	1	6	63	CANADA	1		1
12	IRAN	88	37	125	38	TURKEY	5		5	64	COMOROS	1		1
13	INDIA	64	25	89	39	MAURITANIA	4		4	65	FINLAND	1		1
14	AFGHANISTAN	68	19	87	40	MAURITIUS	3	1	4	66	GERMANY	1		1
15	UNITED ARAB EMIRATE	77	8	85	41	TANZANIA	3	1	4	67	GUYANA	1		1
16	SOMALIA	78	2	80	42	TUNISIA	3	1	4	68	KAZAKHSTAN	1		1
17	SYRIA	52	4	56	43	UGANDA	4		4	69	KOREA SELATAN		1	1
18	JORDAN	40	10	50	44	UNITED KINGDOM	4		4	70	KOSOVO	1		1
19	OMAN	35	8	43	45	ERITREA	3		3	71	NAMIBIA		1	1
20	PALESTIN	29	2	31	46	KYRGYZSTAN	2	1	3	72	PORTUGAL		1	1
21	ALGERIA	15	7	22	47	LEBANON	2	1	3	73	SENEGAL	1		1
22	SINGAPORE	14	8	22	48	RWANDA	1	2	3	74	SEYCHELLES	1		1
23	KUWAIT	15	2	17	49	TURKMENISTAN	3		3	75	SIERRA LEONE	1		1
24	SRI LANKA	10	3	13	50	AFRIKA SELATAN	1	1	2	76	TAIWAN	1		1
25	JAPAN	6	6	12	51	BAHRAIN	2		2	77	UNION DES COMORES	1		1
26	GHANA	9	2	11	52	BRUNEI	1	1	2		**Total**	**3627**	**1180**	**4807**

Faculties

7 Faculties

200 Postgraduate programs

55 Bachelor programs

Engineering

- School of Chemical & Energy Eng.
- School of Electrical Eng.
- School of Civil Eng
- School of Mechanical Eng
- School of Biomedical Eng & Health Sciences
- School of Computing

Social Sciences & Humanities

- School of Education
- School of Human Resource Dev. & Psychology
- Islamic Civilization Academy
- Language Academy
- Raja Zarith Sofiah Center for Advanced Studies on Islam, Science and Civilization

Built Environment & Surveying

- Geoinformation
- Real Estate
- Quantity Surveying
- Architecture
- Landscape Architecture
- Urban Regional Planning

Science

- Physics
- Chemistry
- Mathematical Sciences
- Biosciences

Azman Hashim International Business School

- Business Administration
- Accounting and Finance
- Information System
- School of Computing

Razak Technology & Informatics

- Engineering & Technology
- Science Management and Design
- Advanced Informatics
- Perdana Center

Malaysia-Japan International Institute of Technology

- Electronic Systems Engineering
- Mechanical Precision Engineering
- Chemical Process Eng. & Sustainable Systems
- Technology & Innovation Management
- Disaster Risk Management
- Sustainability and Environmental Sciences

MY BACKGROUND

- B.Sc (Hons) Math (Minor in Economics) 1986-1989
- MA Math 1989-1990
- PhD Math 1995-1998 (40 months)

from State University of New York at Binghamton (now known as Binghamton University), New York, USA

https://people.utm.my/nizasarmin/

CURRENT POSITION IN UTM

Professor of Mathematics

Department of Mathematical Sciences, Faculty of Science

Associate Director (Global Strategy & Engagement)

UTM International

THE YOUNGEST PHD HOLDER

Malaysia Book of Record, 2014

(24 years and 2 months old)

Metro Ahad
Setempat 23

Dr Hazzirah Izzati ingin terokai bidang Matematik

KAMPUS

Dr falsafah termuda

Doa, fokus petua kejayaan

Terima PhD selepas tiada

Dr. Hazzirah Izzati Mat Hassim

WHAT IS MATHEMATICS?

Mathematics (from Greek: ***máthēma***, 'knowledge, study, learning')

It includes the study of such topics as :-

> quantity (number theory)
> structure (algebra)
> space (geometry)
> change (analysis)

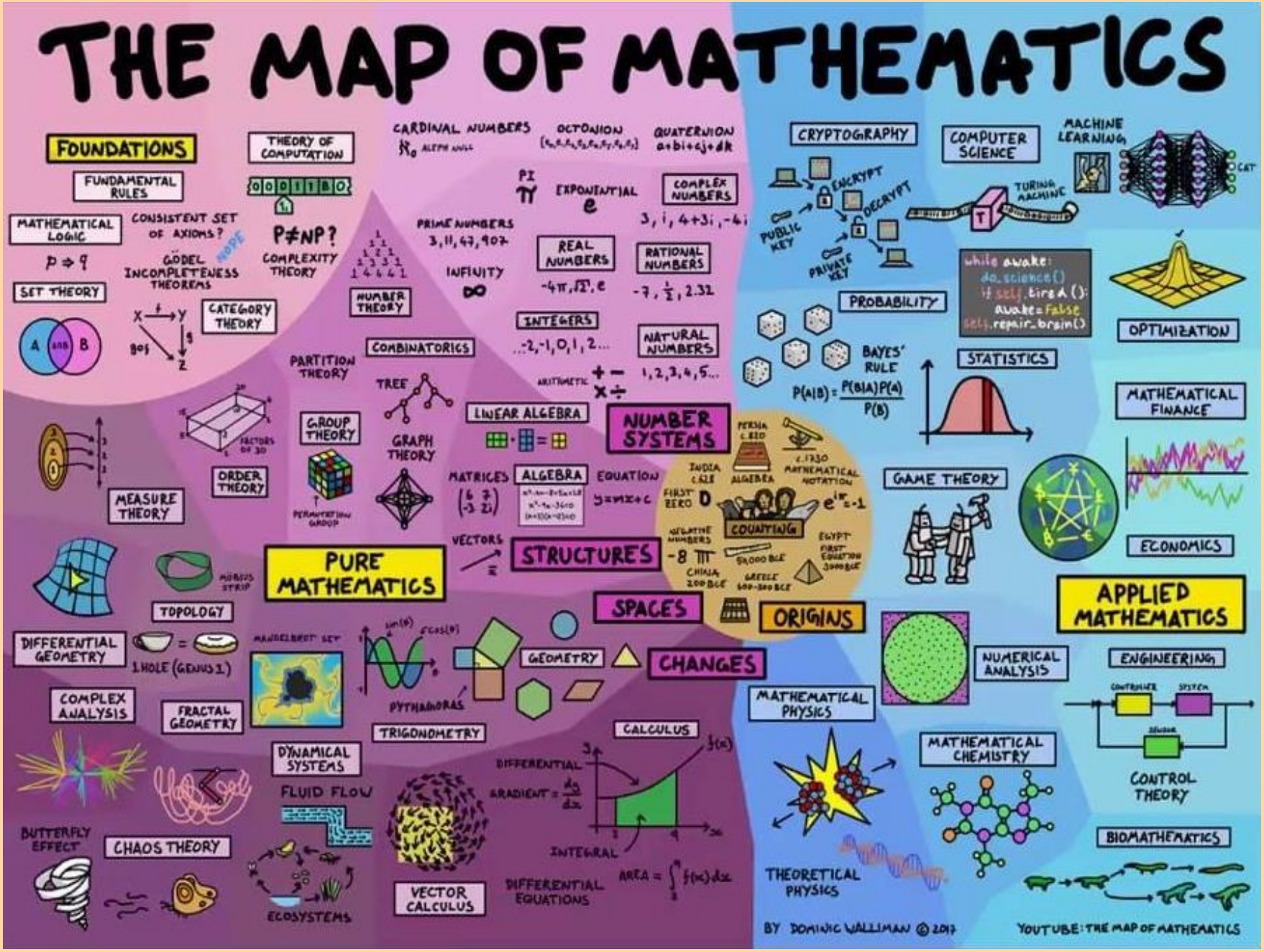
Mathematicians seek and use patterns to formulate **new conjectures**;

They resolve the truth or falsity of such by **mathematical proof**.

When mathematical structures are good **models** of real phenomena, mathematical reasoning can be used to provide insight or predictions about nature.

Through the use of **abstraction and logic**, mathematics developed from **counting**, **calculation**, **measurement**, and the systematic study of the **shapes** and **motions** of physical objects.

The research required to solve mathematical problems can take **years** or even **centuries**.


THE MAP OF MATHEMATICS
FOUNDATIONS
FUNDAMENTAL RULES
MATHEMATICAL LOGIC
SET THEORY
CONSISTENT SET OF AXIOMS?
GÖDEL INCOMPLETENESS THEOREMS
CATEGORY THEORY
THEORY OF COMPUTATION
P≠NP?
COMPLEXITY THEORY
NUMBER THEORY
PRIME NUMBERS
INFINITY
CARDINAL NUMBERS
OCTONION
QUATERNION
PI
EXPONENTIAL
COMPLEX NUMBERS
REAL NUMBERS
RATIONAL NUMBERS
INTEGERS
NATURAL NUMBERS
COMBINATORICS
PARTITION THEORY
TREE
GRAPH THEORY
GROUP THEORY
ORDER THEORY
MEASURE THEORY
LINEAR ALGEBRA
NUMBER SYSTEMS
MATRICES
ALGEBRA
EQUATION
VECTORS
STRUCTURES
PURE MATHEMATICS
TOPOLOGY
DIFFERENTIAL GEOMETRY
1 HOLE (GENUS 1)
COMPLEX ANALYSIS
FRACTAL GEOMETRY
DYNAMICAL SYSTEMS
FLUID FLOW
BUTTERFLY EFFECT
CHAOS THEORY
ECOSYSTEMS
PYTHAGORAS
TRIGONOMETRY
GEOMETRY
SPACES
CHANGES
CALCULUS
DIFFERENTIAL
GRADIENT
INTEGRAL
VECTOR CALCULUS
DIFFERENTIAL EQUATIONS
ORIGINS
EGYPT
GREECE
CHINA
INDIA
PERSIA
ALGEBRA
COUNTING
CRYPTOGRAPHY
ENCRYPT
DECRYPT
PUBLIC KEY
PRIVATE KEY
COMPUTER SCIENCE
TURING MACHINE
MACHINE LEARNING
CAT
PROBABILITY
BAYES' RULE
STATISTICS
OPTIMIZATION
MATHEMATICAL FINANCE
GAME THEORY
ECONOMICS
APPLIED MATHEMATICS
NUMERICAL ANALYSIS
ENGINEERING
CONTROL THEORY
MATHEMATICAL PHYSICS
THEORETICAL PHYSICS
MATHEMATICAL CHEMISTRY
BIOMATHEMATICS
BY DOMINIC WALLIMAN © 2017
YOUTUBE: THE MAP OF MATHEMATICS

Mathematics is used in all fields/areas:

- Science
- Engineering
- Finance & Economy
- Information Technology
- Human Resource
- and many others

Mathematics Courses/Subjects for Engineering Students:

- linear algebra, calculus, statistics, differential equations, numerical analysis

Used in:

- fluid mechanics, heat transfer, electric circuits, mechanics of materials

WHAT IF THERE ARE NO NUMBERS IN THIS WORLD?

MATHEMATICS OPERATION

- Can solve daily activities (buy and sell)

Addition	Subtraction
Multiplication	Division

VOLUME AND TIME

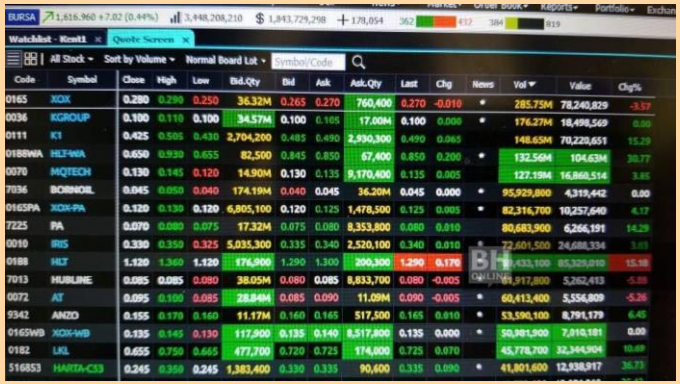
- Apply in cooking and baking.
- The right volume and time is very important to make sure the dish/cake is well-cooked and delicious.

GEOMETRY

- Very useful in painting.
- The art drawings also uses the concept of geometry in mathematics, which is to draw a combination of shapes and make an interesting drawing.

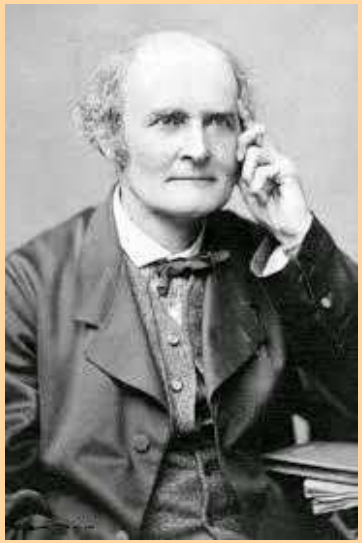
STATISTICS

- Very useful in analyzing the economy and also in trading.



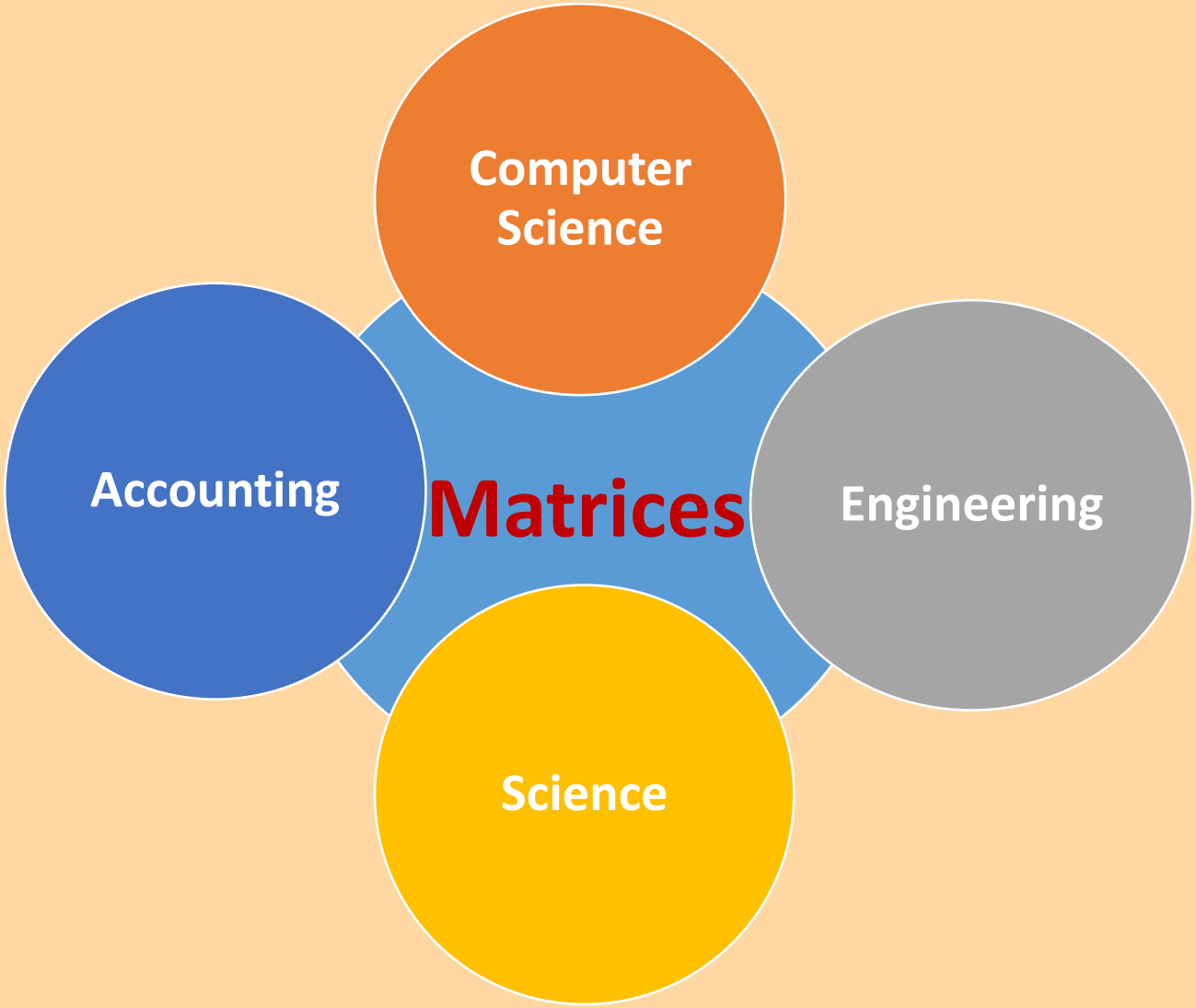
MATRICES

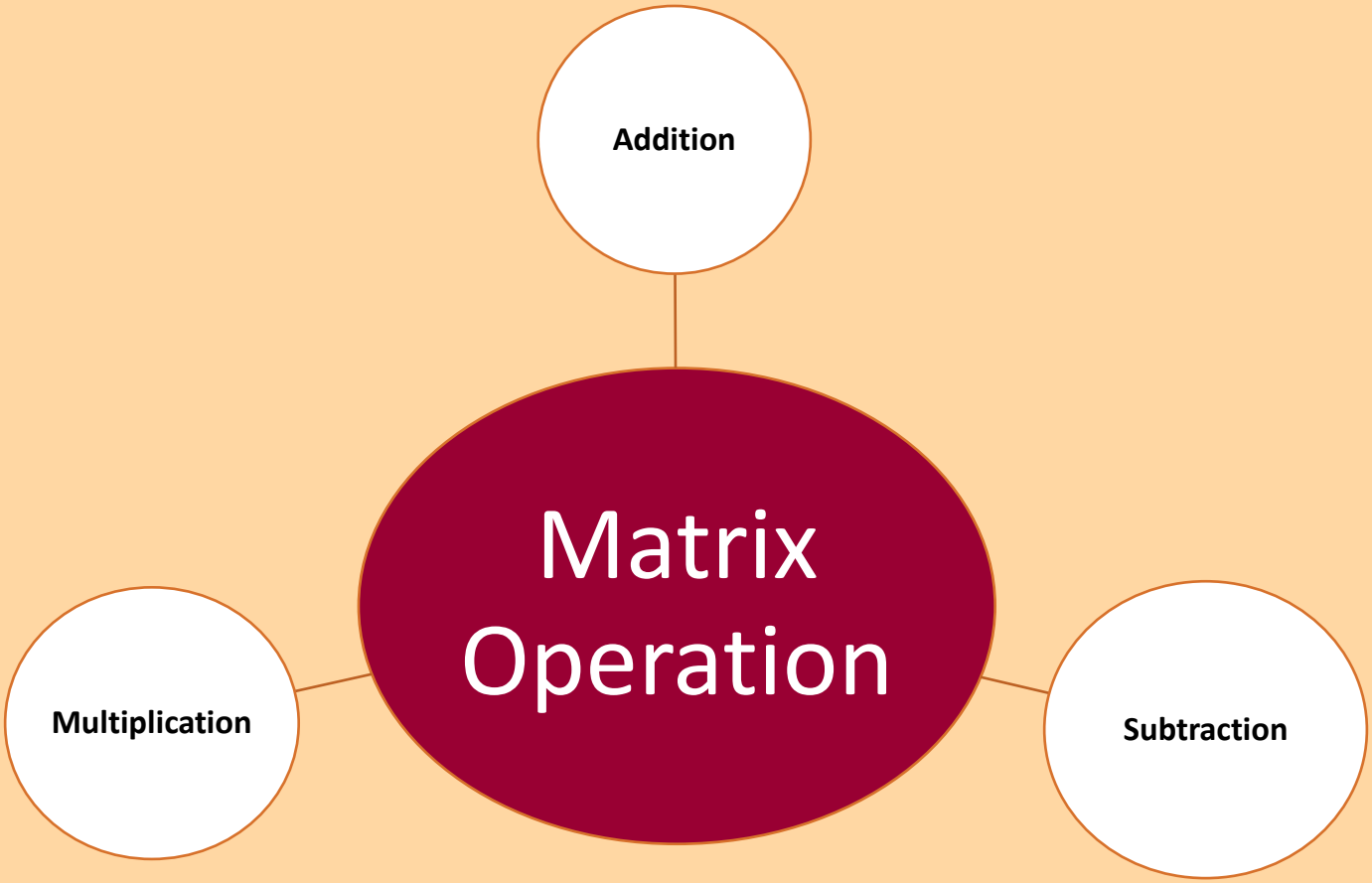
What is a matrix ?



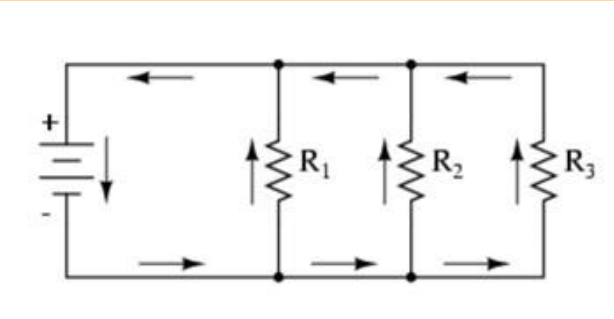
Arthur Cayley is a mathematician who introduced the Matrix formula in 1859 which is used in solving linear equation.

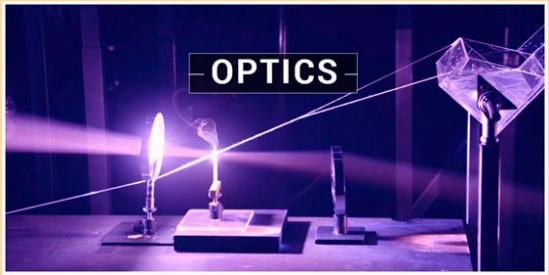
A matrix is a rectangular array or table of numbers, symbols, or expressions, arranged in n rows and m columns.


Computer Science
Accounting
Matrices
Engineering
Science


Addition
Matrix Operation
Multiplication
Subtraction

Application of Matrices





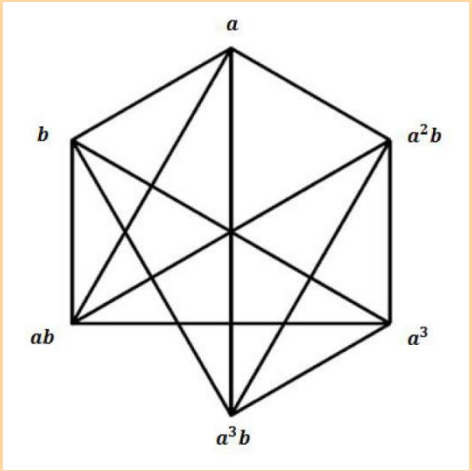
Physics

Adobe Photoshop

Adobe Photoshop use matrices to process the linear transformation and to produce picture.

Computer Science

- **Matrices can also be used in finding the "energy of graphs"**



$$A = \begin{bmatrix} 0 & 1 & 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$

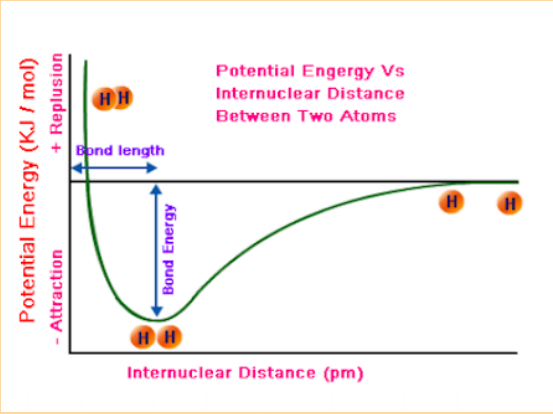
Adjacency matrix

Eigenvalues :

$\lambda_1 = 4,$

$\lambda_2 = \lambda_3 = -2$

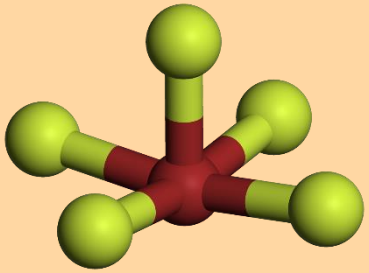
$\lambda_4 = \lambda_5 = \lambda_6 = 0$



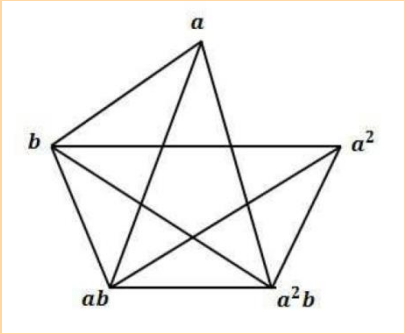
Energy of graph : $\varepsilon(\Gamma) = \sum_{i=1}^{n} |\lambda_i|$

$$\varepsilon(\Gamma) = 4 + 2|-2| + 3|0| = 8.$$

Matrices can also be used in determining the **topological index** where the index is used to predict the **physio-chemical properties** of some **molecular structures**.



BrF_5



Non-commuting graph of Dihedral Group of order 8

- The point group of BrF_5 is isomorphic with dihedral groups of order 8.

$$D = \begin{bmatrix} 0 & 2 & 1 & 1 & 1 \\ 2 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 \end{bmatrix}$$

Distance Matrix

Wiener Index:

$$W(\Gamma) = \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} d(i,j),$$

$d(i,j)$ is the distance between two vertices and n is the number of vertices in a graph.

$$W(\Gamma) = \frac{1}{2}(22) = 11.$$

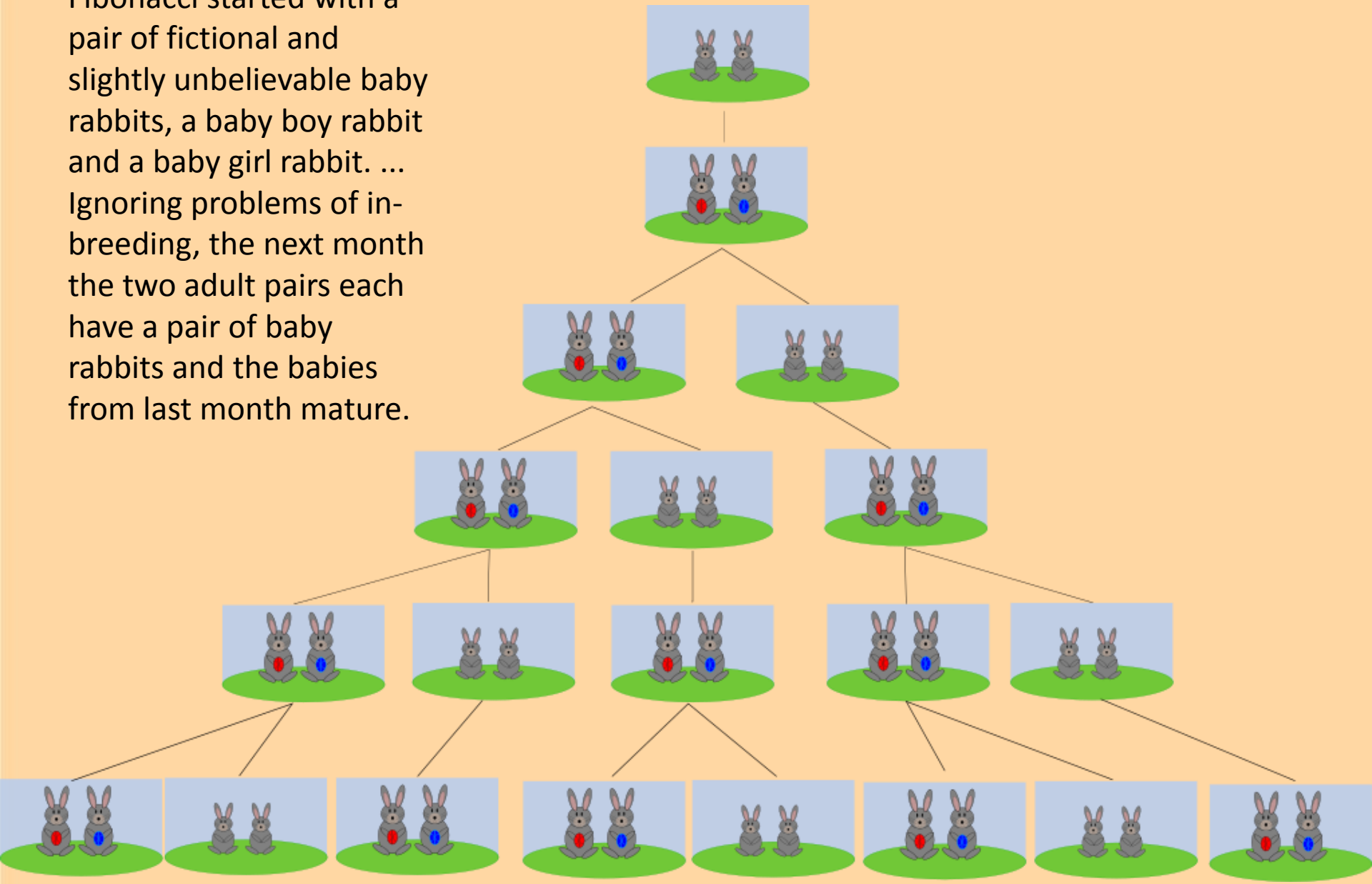
FIBONACCI NUMBERS

1, 1, 2, 3, 5, 8, 13…

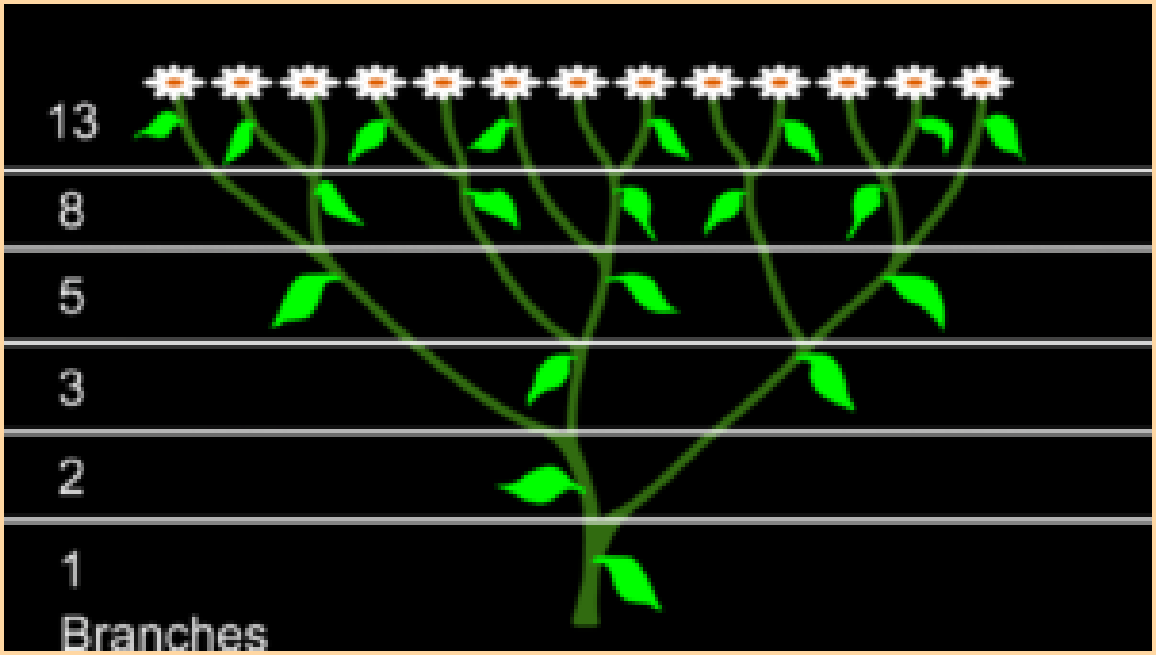
HISTORY

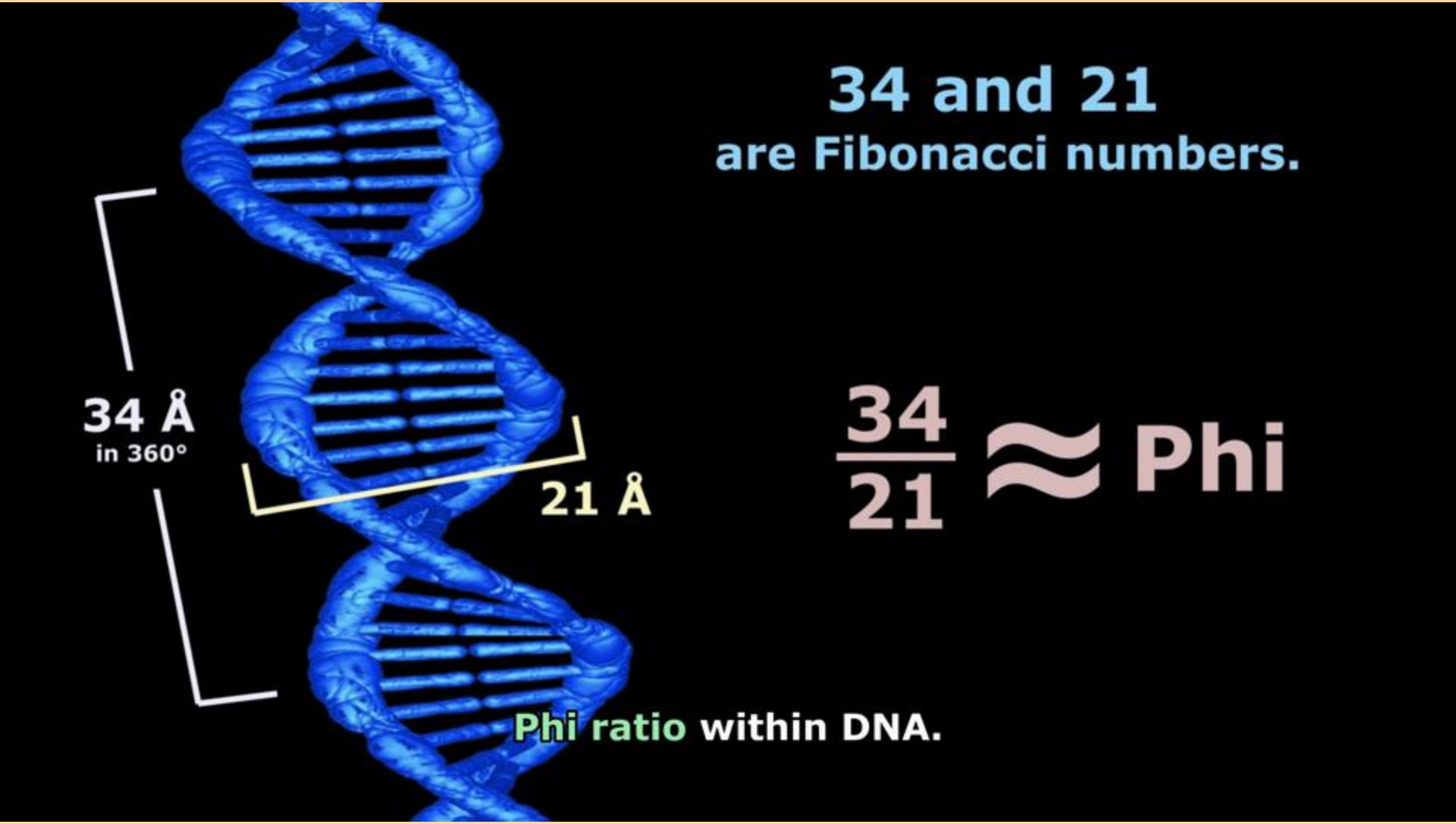
The Fibonacci sequence first appears in the book *Liber Abaci* (1202) by Fibonacci using it to calculate the growth of rabbit populations.

Fibonacci started with a pair of fictional and slightly unbelievable baby rabbits, a baby boy rabbit and a baby girl rabbit. ... Ignoring problems of in-breeding, the next month the two adult pairs each have a pair of baby rabbits and the babies from last month mature.

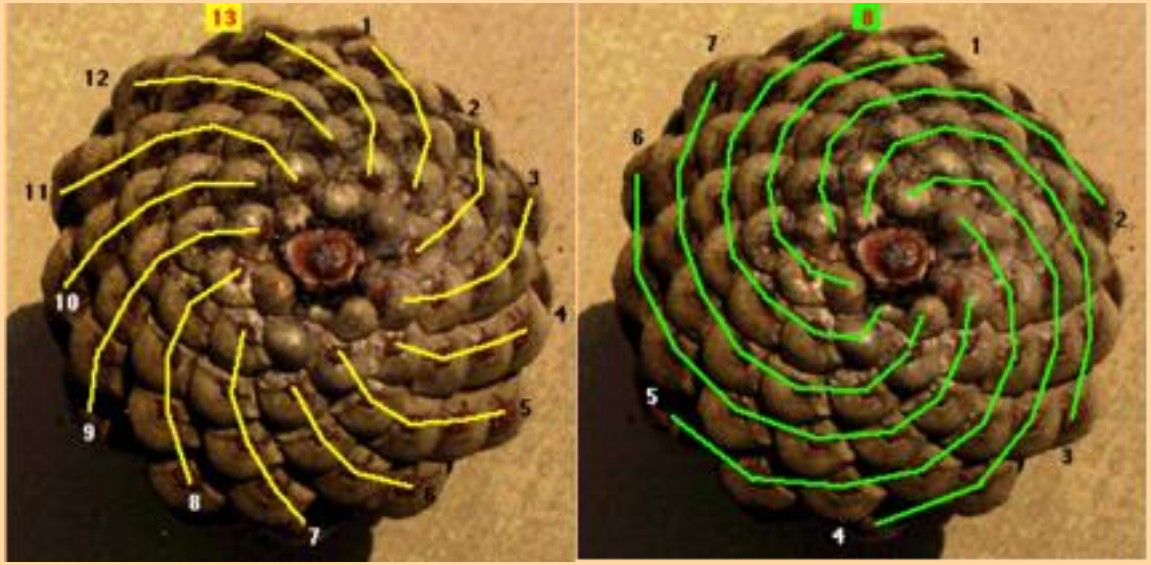


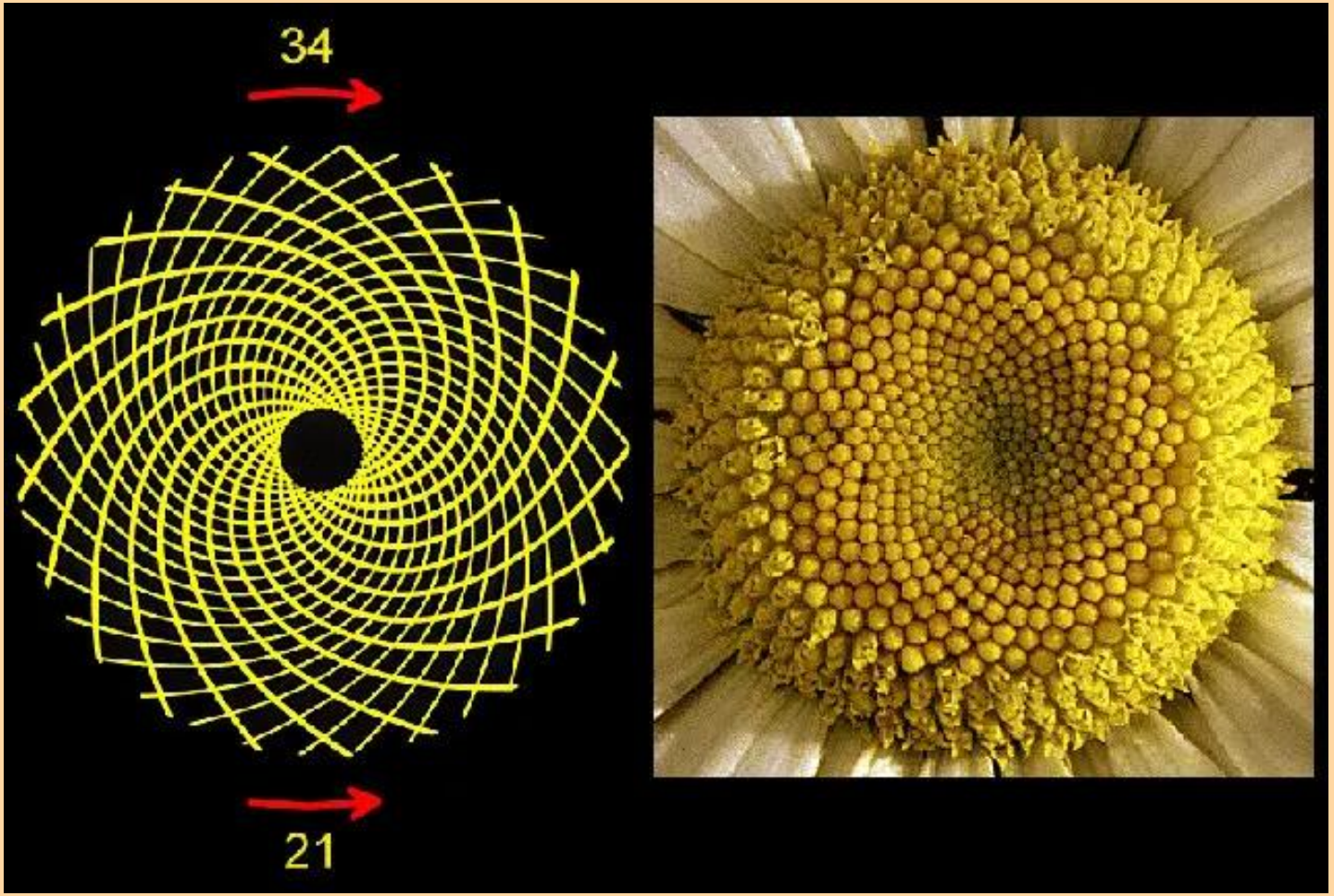
BODY PARTS

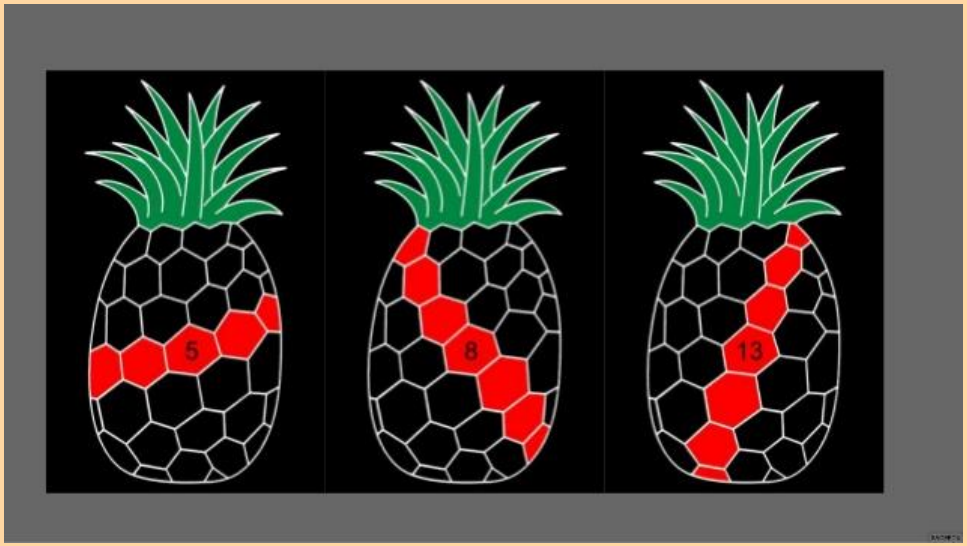

13
8
5
3
2
1
Branches

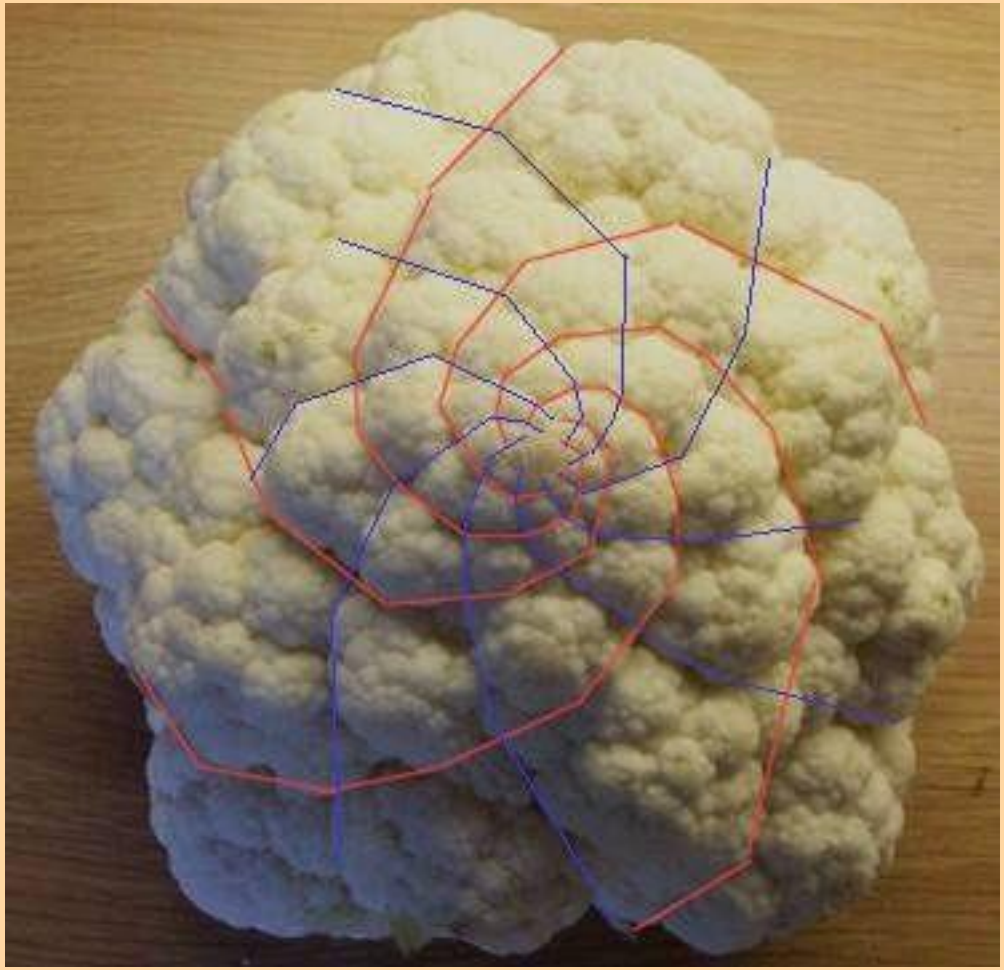


The DNA molecule measures 34 angstroms long by 21 angstroms wide for each full cycle of its double helix spiral.

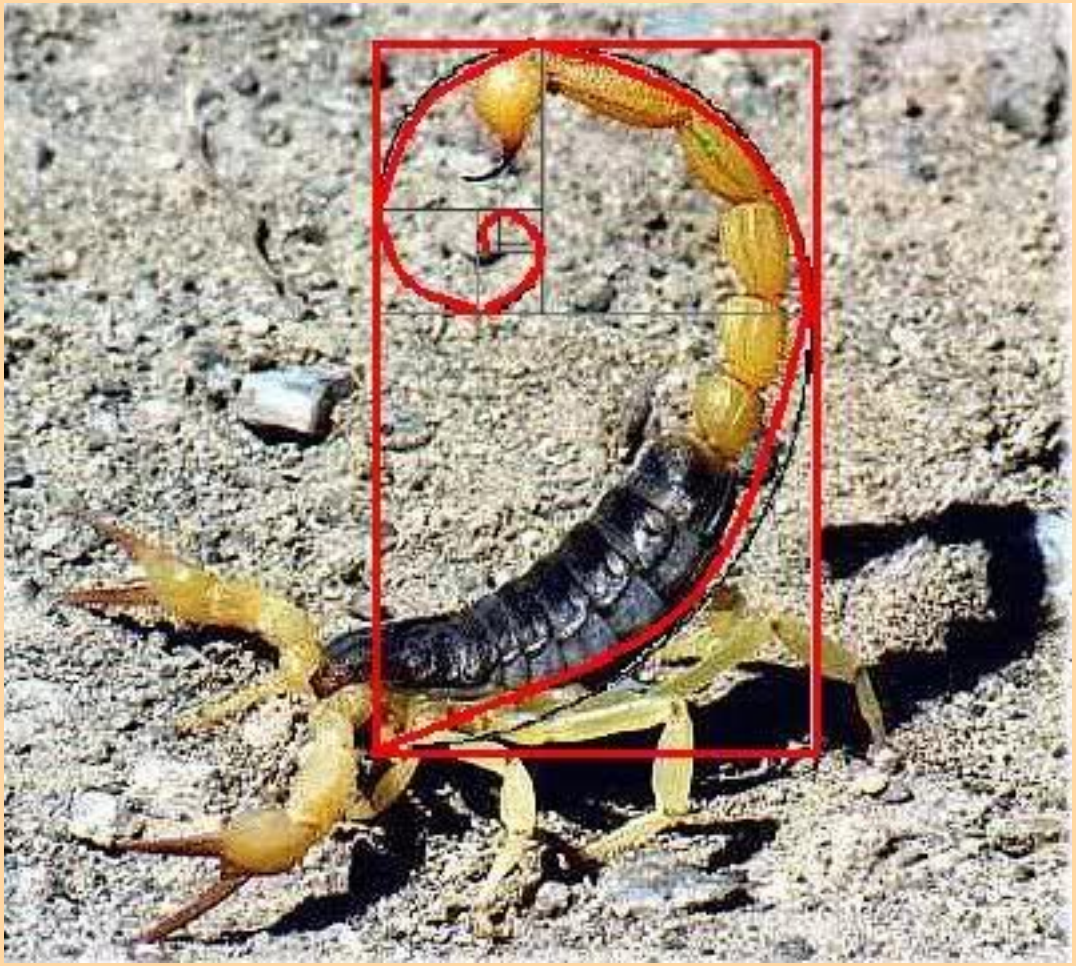

13
1
12
2
11
3
10
4
9
5
8
6
7
8
7
1
6
2
5
3
4

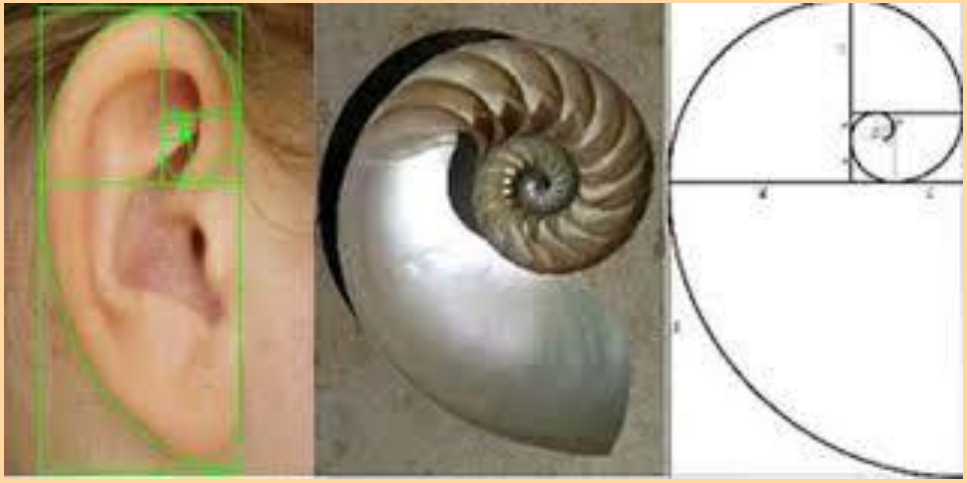

34
21

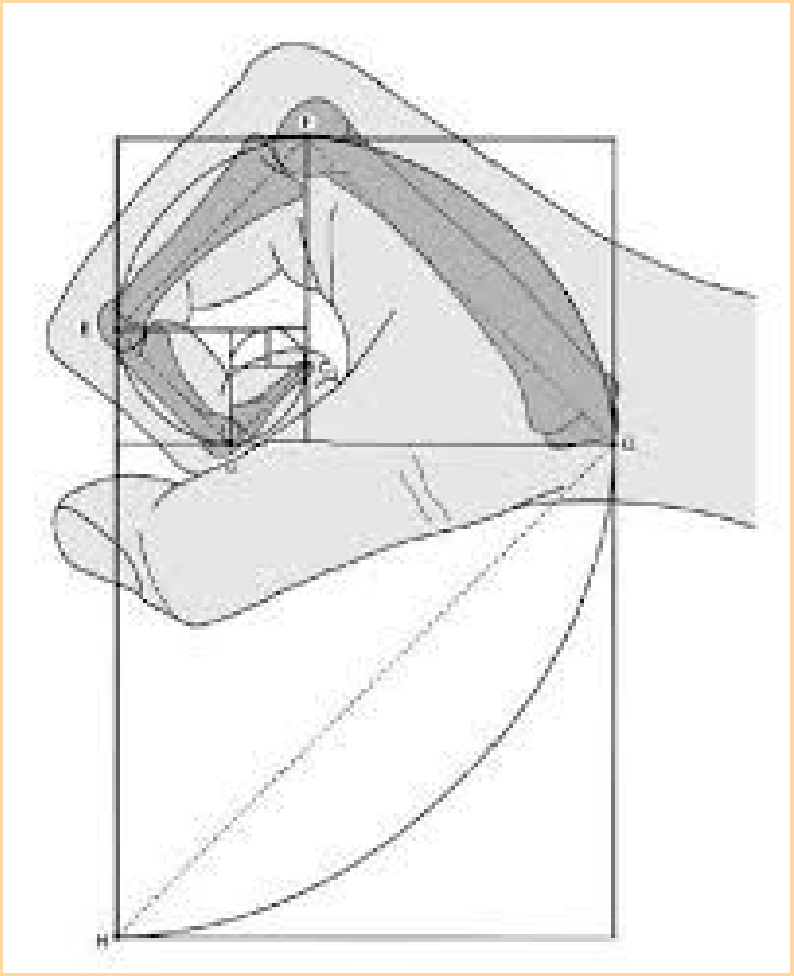

5
8
13



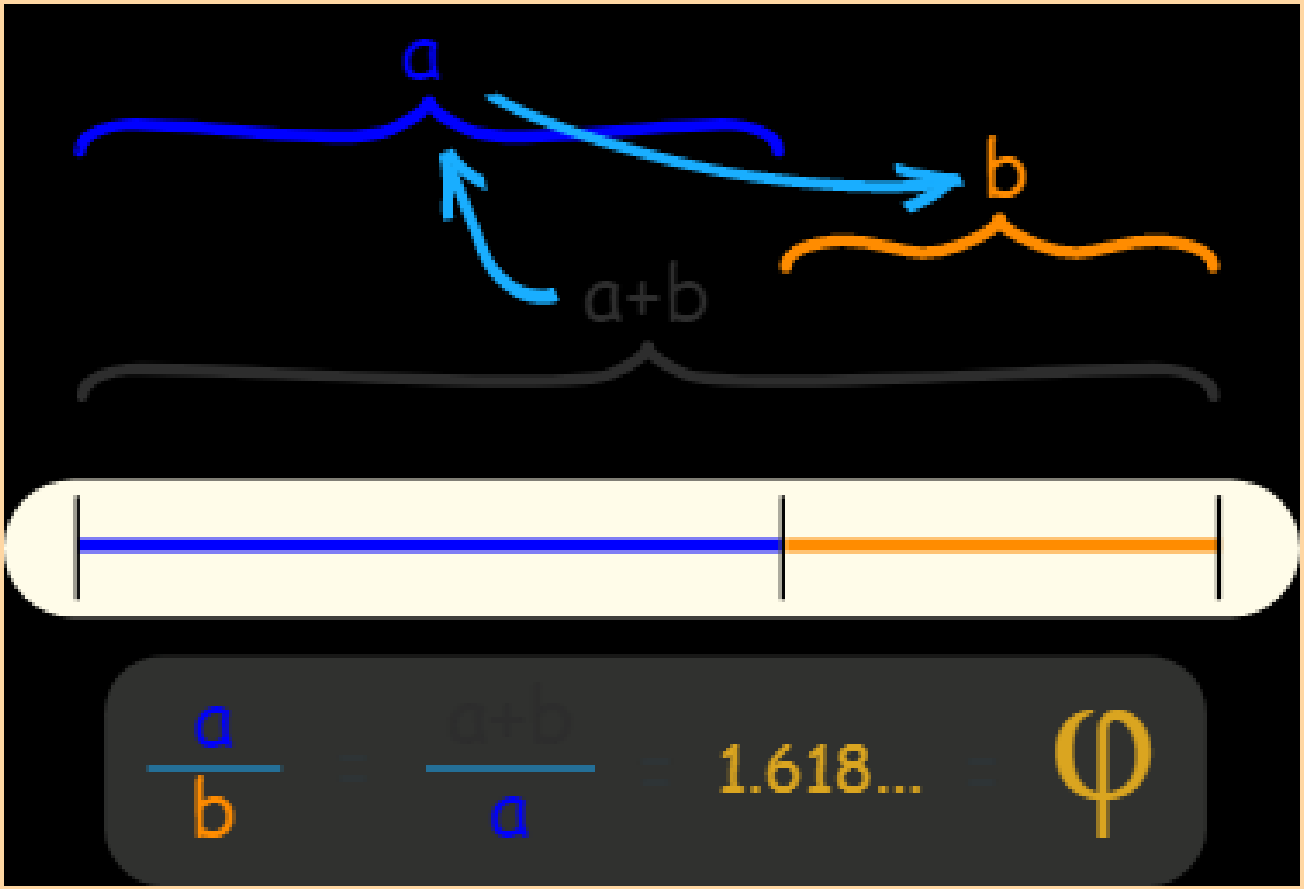
FIBONACCI SPIRAL



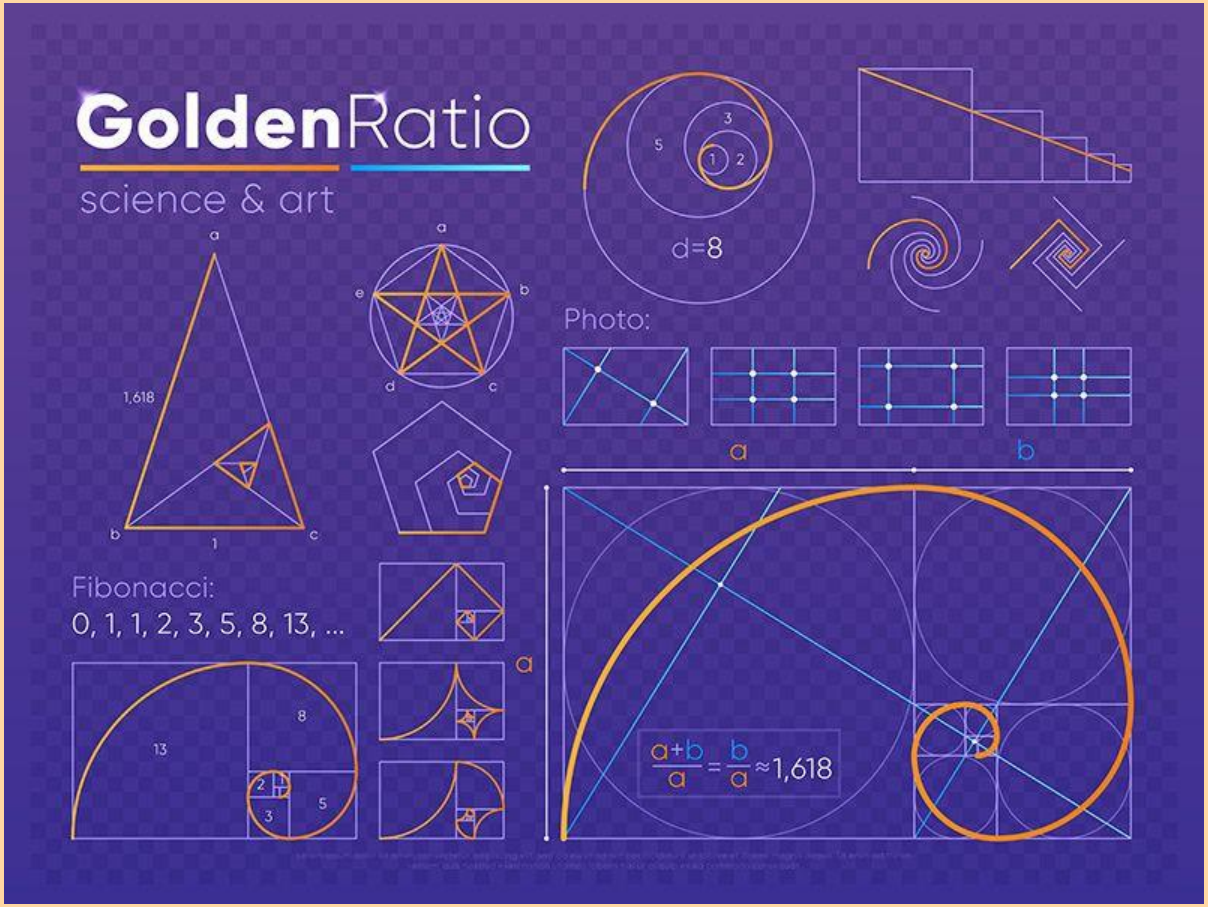


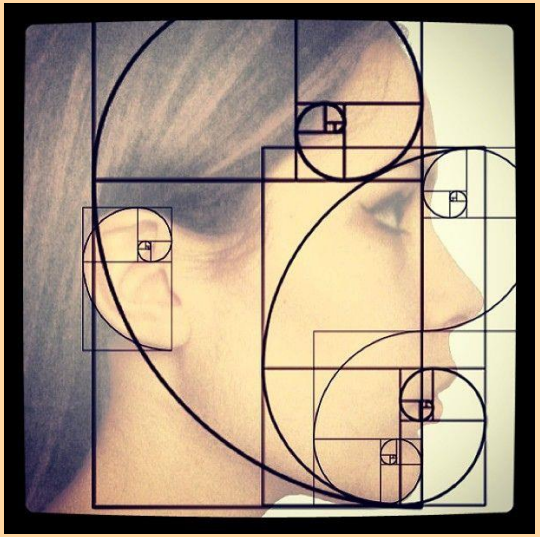


GOLDEN RATIO



GOLDEN RATIO



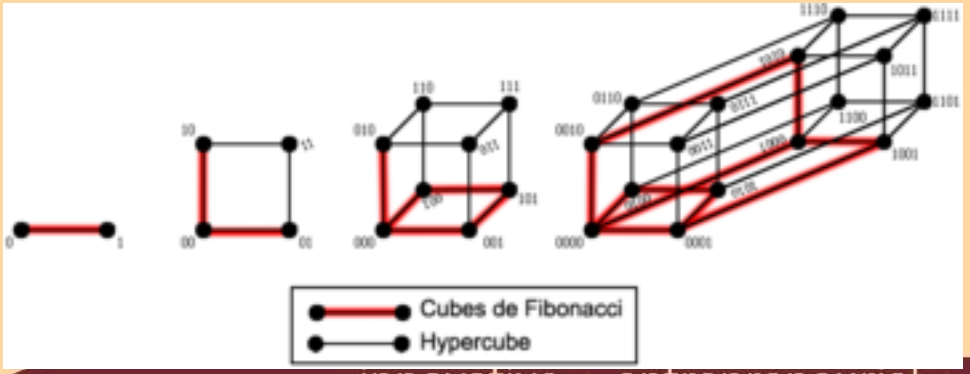


GOLDEN RATIO

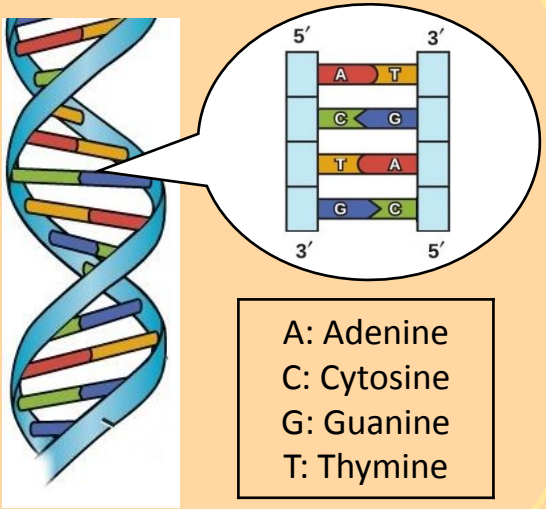
OTHER APPLICATIONS

OF FIBONACCI NUMBERS

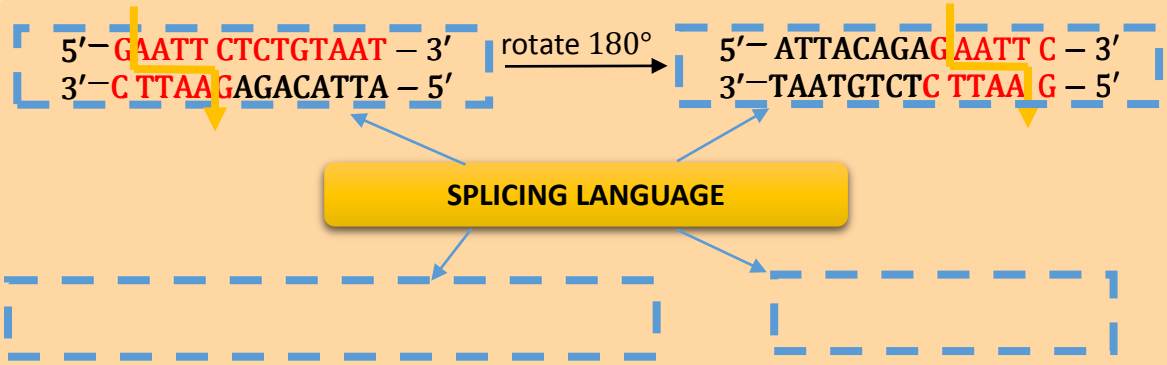
- Computer algorithms such as the Fibonacci search technique and the Fibonacci heap data structure
- Graphs called Fibonacci cubes used for interconnecting parallel and distributed systems.

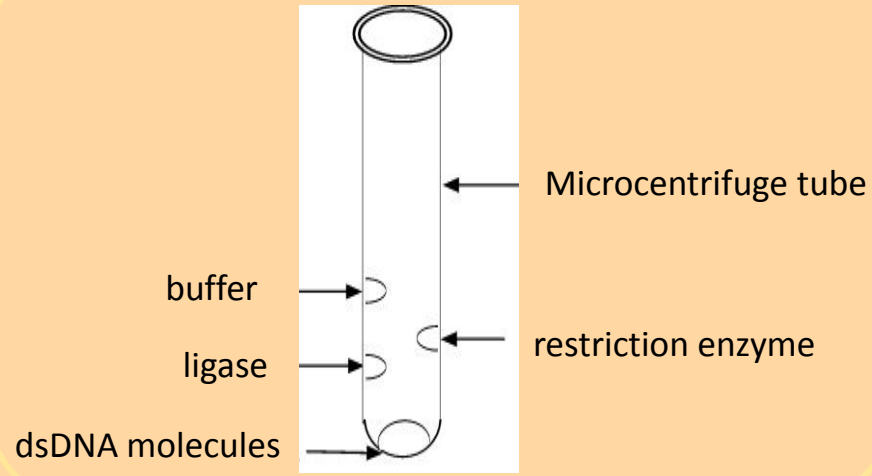


DNA COMPUTATIONS



A: Adenine
C: Cytosine
G: Guanine
T: Thymine





STUDENT MOBILITY ACTIVITIES

UTM – Indonesia
2015 - 2020

3118 Inbound Students

Academic Visit	2280
Research Internship	206
Student Exchange	295
UTM Summer School	337
Total	3118

UTM – ITS
2009 - 2020

272 Inbound Students

Academic Visit	198
Research Internship	20
Student Exchange	4
UTM Summer School	50
Total	272

PROF. DR. NOR HANIZA SARMIN

https://people.utm.my/nizasarmin/

nhs@utm.my

Niza Sarmin

Niza Sarmin

Niza Sarmin

GOOD LUCK & ALL THE BEST!!!

THANK YOU! ☺

Credit :

Nur Idayu Alimon