# Linear Algebra

[KOMS119602] - 2022/2023

# 1 - Introduction to Linear Algebra

Dewi Sintiari

Computer Science Study Program
Universitas Pendidikan Ganesha

Week 1 (September 2022)

# Dewi Sintiari


**B.A.Ed. in Math Education Univ. Pendidikan Ganesha (2010 - 2014)**
**M.Sc. in Computer Science ENS de Lyon, France (2016 - 2018)**
**Ph.D. in Computer Science ENS de Lyon, France (2018 - 2021)**

Interest:

- Theoretical Computer Science
- Discrete Mathematics
- Graph Theory and Algorithms

**email:**
LUH.DEWI.SINTIARI@UNDIKSHA.AC.ID

# Practical matters

- **Credit:** 3 SKS
- **Lecturer:** Dewi Sintiari
  - email: luh.dewi.sintiari@undiksha.ac.id
  - webpage: `https://dewisintiari.github.io/`
- **Assessment:**
  - Presence ($\geq 75\%$) + attitude + quiz: 20%
  - Assignments: 40%
  - Midterm exam (written/project): 15%
  - Final exam (written): 25%
  - Bonus: writing a wikipedia article/scribe

**Grade** = 20% Attitude + 40% Assignments + 15% Midterm + 25% Final + Bonus

# What is your responsibility?

1 SKS equivalence:

- 50 minutes class activities
- 60 minutes independent learning
- 60 minutes structured assignment

3 SKS $\equiv 150 + 180 + 180 = 510$ minutes $= 8.5$ hours/week

Grade rule :
20% Attitude + 40% Assignments + 15% Midterm + 25% Final

- MIDTERM & FINAL EVALUATION **MANDATORY** !

# What grade that you expect?

Grade rule :
20% Attitude + 40% Assignments + 15% Midterm + 25% Final

## Example

Suppose that your grade:

- Attitude: 100
- Assignment: 100
- $\Rightarrow$ Your grade = (20% * 100) + (40% * 100) = 60 $\rightarrow$ **C**

$\rightarrow$ You cannot get 100 in Attitude if you do not attend the exams!

# Agreement

# Agreement


- I'm not dictating you to study. I'm helping to direct you to stay in the learning path.
- You study not for grades, but to gain competencies that you can use to support your study, and after you graduate.

  My job is to assess your seriousness in learning and how much competencies you gain during this course.

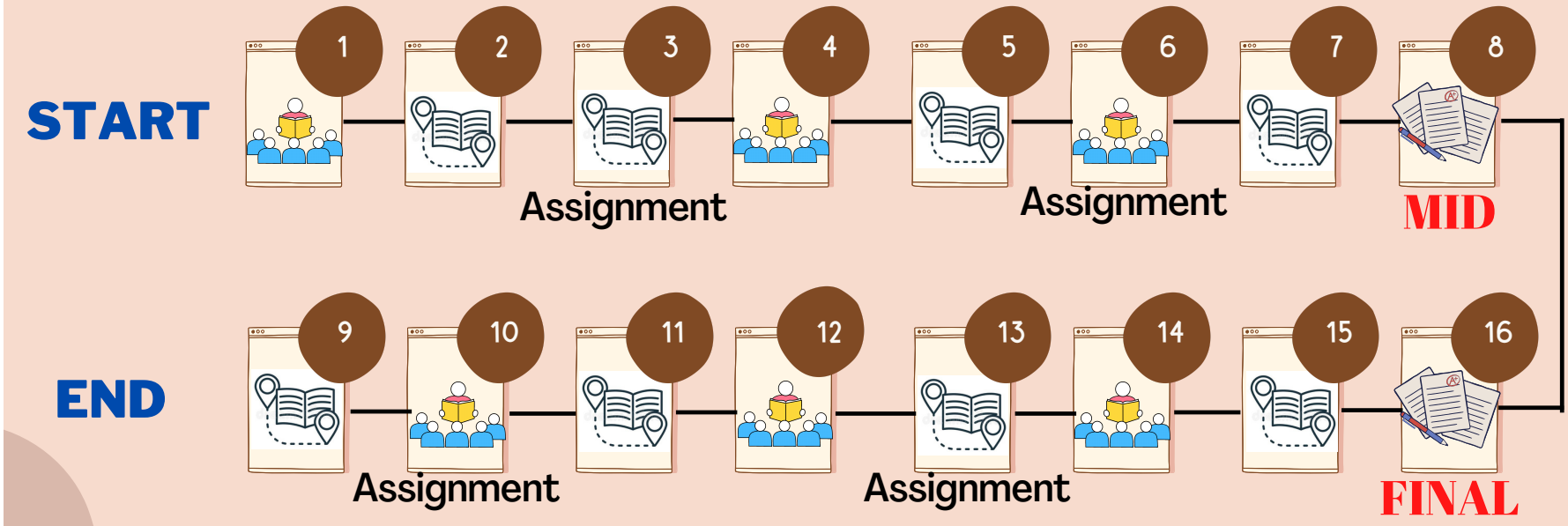
# Undiksha study guideline

k. Mahasiswa yang terbukti melakukan kegiatan yang tercela dalam kegiatan akademik.

1) Mahasiswa yang terbukti melakukan *kegiatan menyontek*, yaitu perbuatan curang yang dilakukan oleh mahasiswa ketika mengikuti ujian seperti bekerjasama saat ujian dan berusaha menggunakan bahan informasi atau alat bantu lainnya tanpa seizin pengawas diberi sanksi berupa: (a) Peringatan secara lisan atau tulisan dan peringatan dengan percobaan; atau (b) Tidak lulus dalam mata kuliah atau kegiatan akademik yang bersangkutan.

2) Mahasiswa yang terbukti melakukan praktek *perjokian*, yaitu perbuatan yang dilakukan oleh mahasiswa untuk menggantikan kedudukan atau melakukan tugas atau kegiatan baik untuk kepentingan diri sendiri maupun orang lain dalam kegiatan akademik diberi sanksi oleh Dekan atau Rektor atas usul

# Lesson plan




Self-paced / collaborative learning synchronous/asynchronous vie e-learning Undiksha → Students learn independently/cooperatively through teaching materials (slides, videos) and assignments prepared in e-learning

Class activities on-site → Face-to-face lectures with group discussions, etc. according to the learning model used

# Introduction to Linear Algebra

# **What do you know** about Linear Algebra?

Fill the blank with as much information as possible that you can think of.

- ...
- ...
- ...
- ...
- ...
- ...

# **Why** do you have to take Linear Algebra course?

Fill the blank with as much information as possible that you can think of.

- ...
- ...
- ...
- ...
- ...
- ...

# Refreshment

# Take time to review the following subjects!

- **Number set hierarchy**

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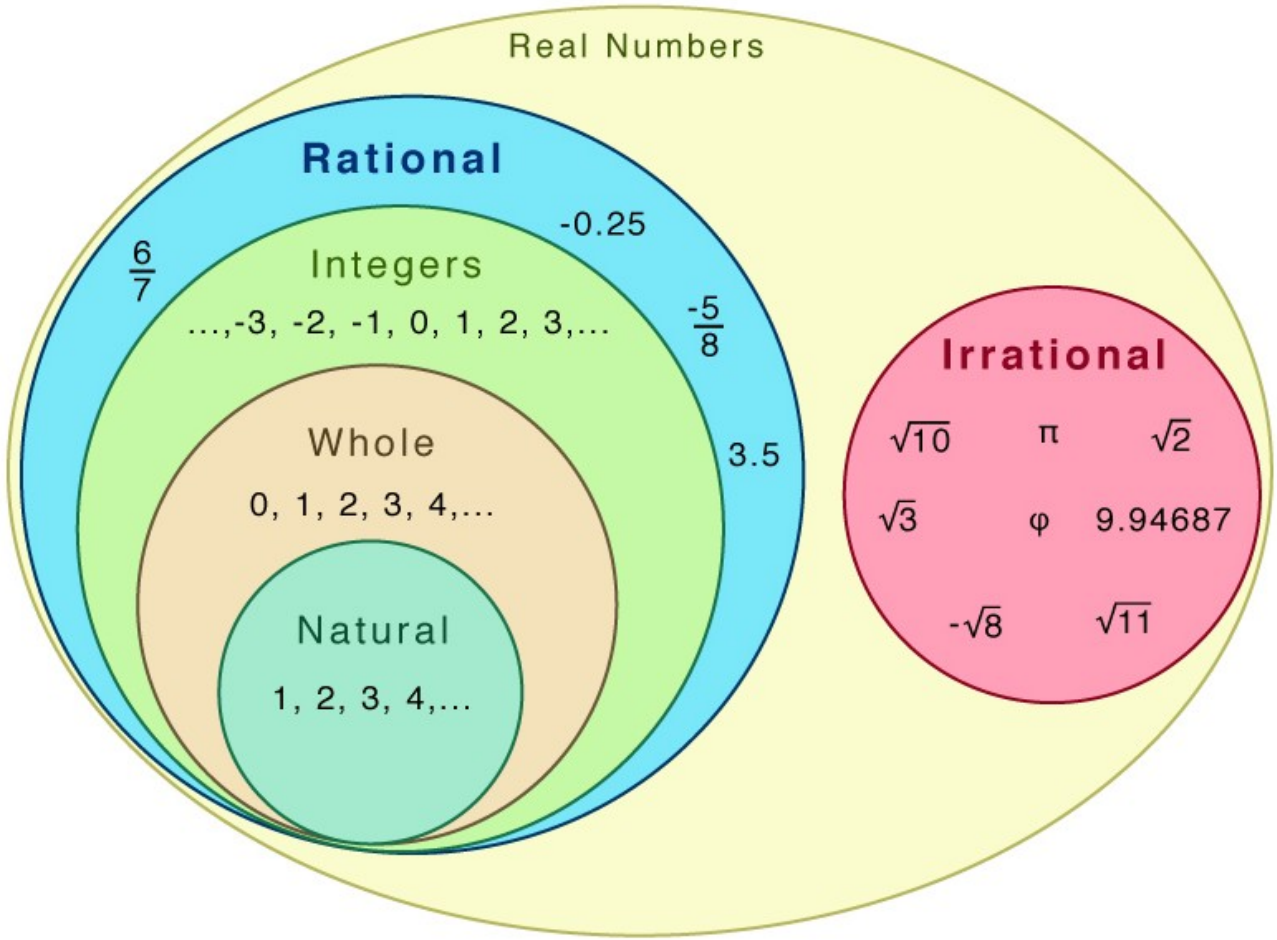


 

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- **Cartesian coordinate**

 

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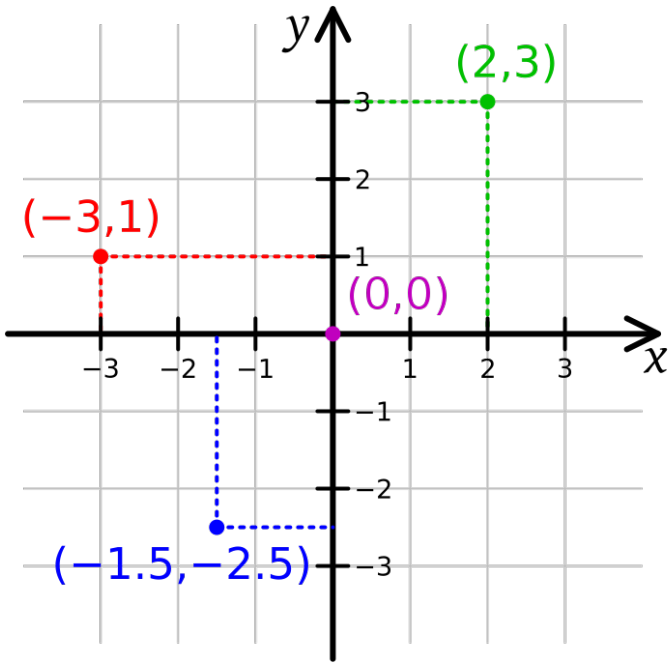


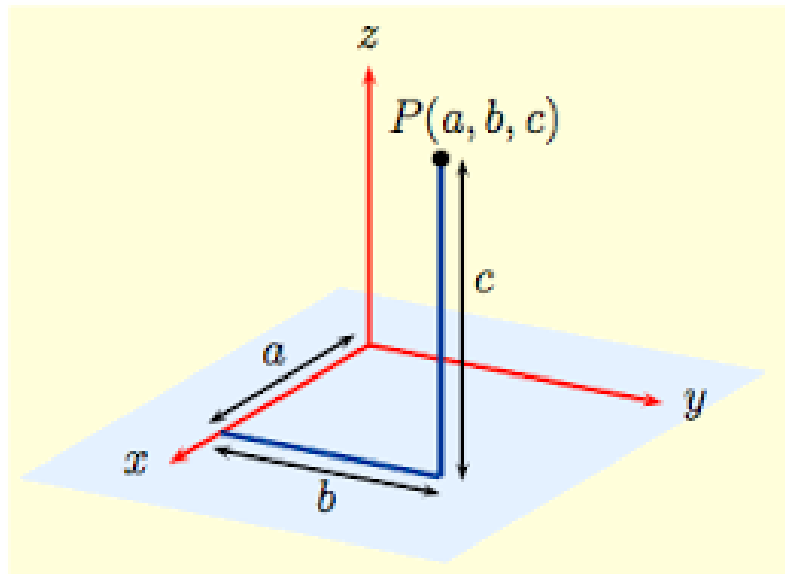


 

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- **Function**

 

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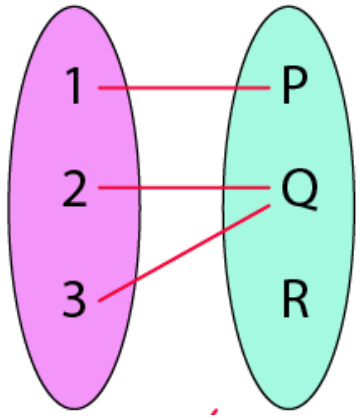
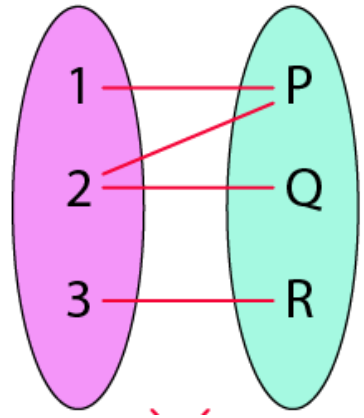
- **Function**

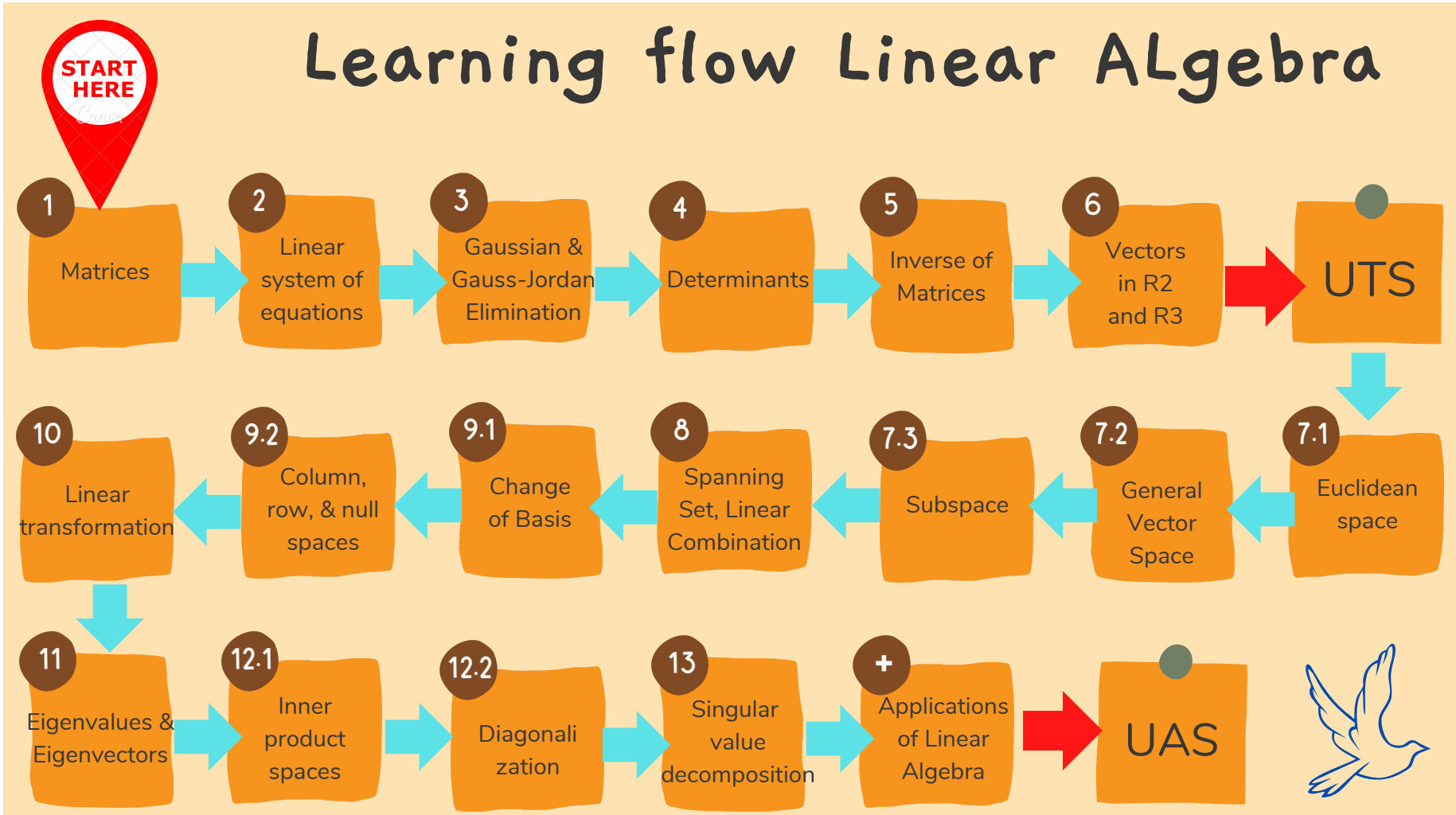



**Polynomial expresion**

$$a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \cdots + a_1 x + a_0$$

- $ax + b$
- $ax^2 + bx + c$
- ...



# Assignment: inquiry/exploratory learning (**deadline 1 week**, September 13th, 2022, 23:59)

- Divide yourselves into 12 groups
- Each group discusses one topic

## Guide for the exploratory activities

1. Describe the definition and fundamental concept of the topic **as simple as possible**, so that your fellows can understand it.
2. Draw the scheme of the learning path of the topic (sub-topics, what you need to learn, etc...)
3. Describe why the topic is important in Computer Science

## Submission

- The summary is about 1-2 pages + 1 page for the scheme
- Make a short presentation video (5-7 minutes) to explain your exploratory result (everyone in the group must speak).
- Upload your video on Youtube, and include the link in your report.
- Submit the report on e-learning.

# List of topics

1. Matrices
2. Linear system of equations
3. Gaussian elimination & Gauss-Jordan
4. Matrix determinant
5. Matrix invers
6. Vectors in $\mathbb{R}^2$, $\mathbb{R}^3$, $\mathbb{R}^n$
7. Euclidean space, general linear space, and subspace
8. Spanning set, linear combination
9. Change of basis, column/row/null space
10. Linear transformation
11. Eigenvalues & eigenvectors
12. Inner product spaces & diagonalization, Singular value decomposition

# References

**Main:**

1. Elementary Linear Algebra Applicatios Version - Howard Anton, Shris Rorres (2013)

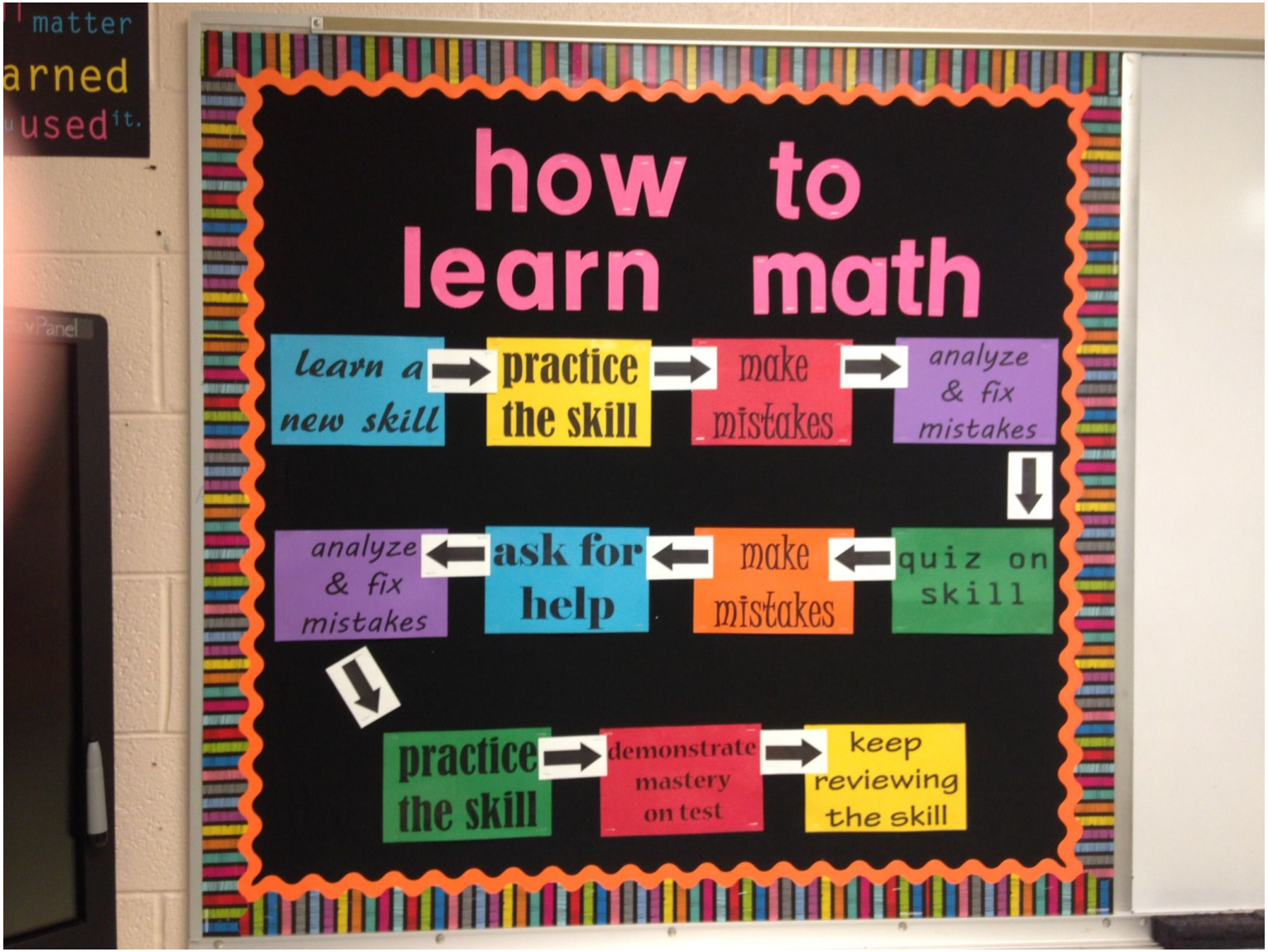
**Supporting:**

1. Schaum's outlines of Linear Algebra, 4th ed (Seymour Lipschutz & Marc Lars Lipson)
2. Lecture slides (Dewi Sintiari)

Related Youtube videos are available in the e-learning.

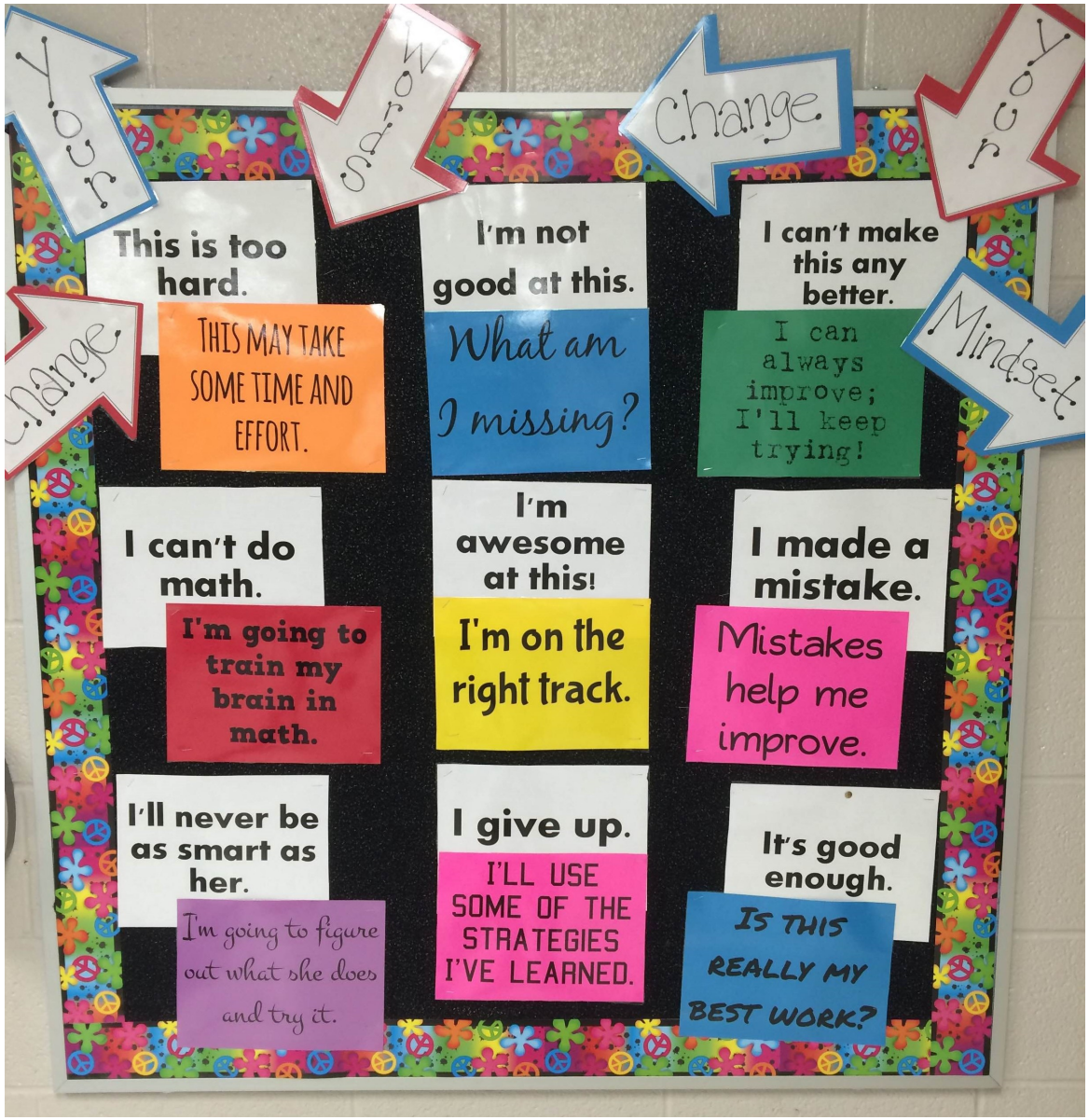
 

# How to learn MATHEMATICS ???



# Love it first, then you will love it more!



*The hard work puts you where the GOOD LUCK can find you...*

-anonymous