PioneeringEd Strategies

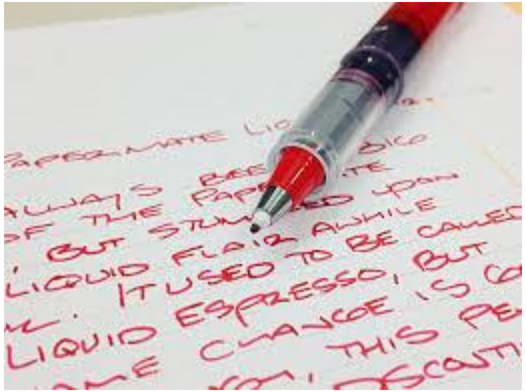
Applicable to most subjects

Highlighting and Using Colors

- Use red pens or markers to highlight key terminologies and definitions that need to be remembered

Examples


Education is
knowledge
systematic training
development of
One of the most

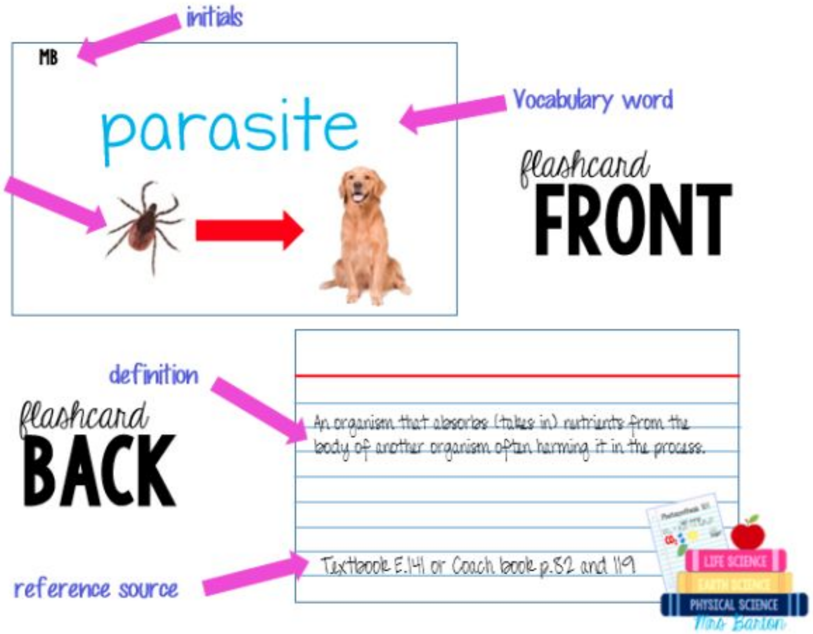


Flashcards

- Write a question on one side and the answer on the other
- Write out math formulas or concepts on one side with explanation and related details on the other

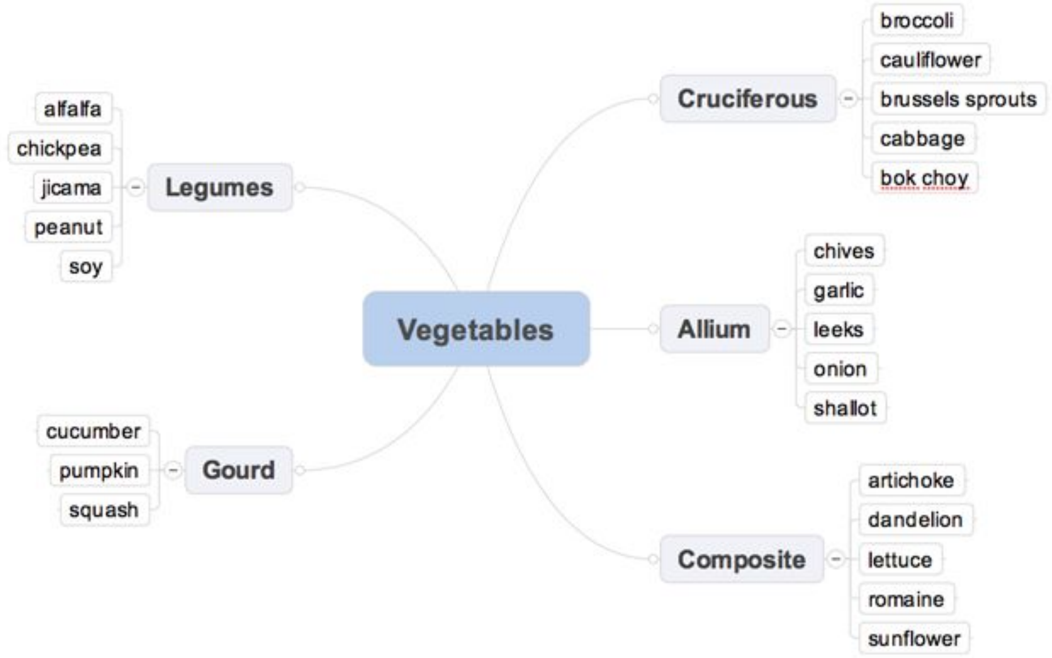
Examples

Present Simple I go Used to describe permanent or regular activities. Subject + Verb	**Using present simple tense** 1.) We live in Paris. 2.) She practises every day. 3.) I like chocolate. tes resources
Present Continuous I am going Used to describe activities happening in the present moment. Subject + IS + Verb (continuous)	**Using present continuous tense** 1.) I am training to be a teacher. 2.) The rain is falling. 3.) We're driving home. tes resources

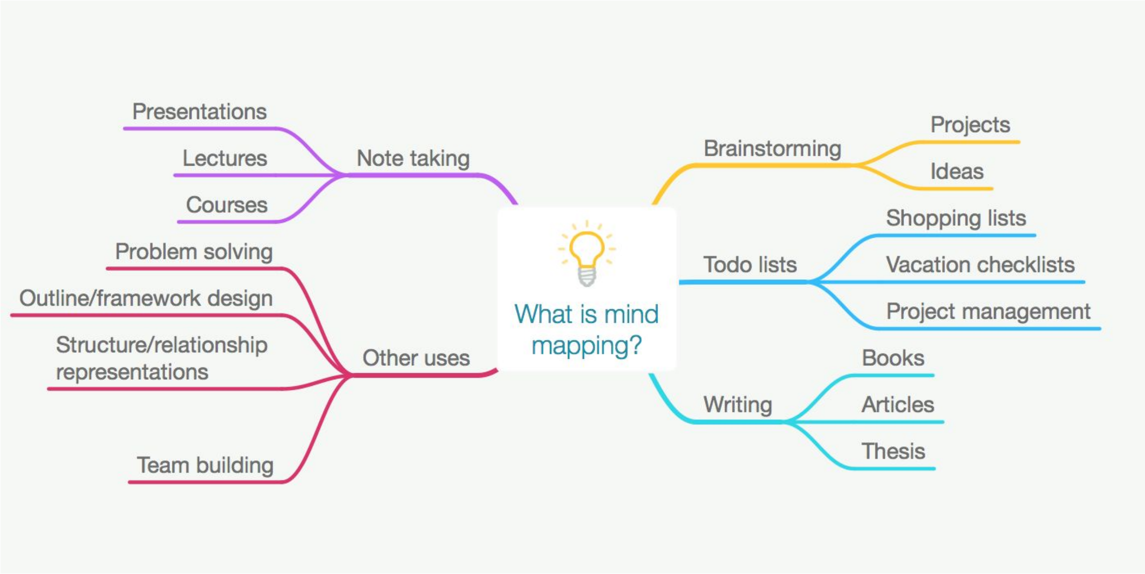


Mind-Mapping

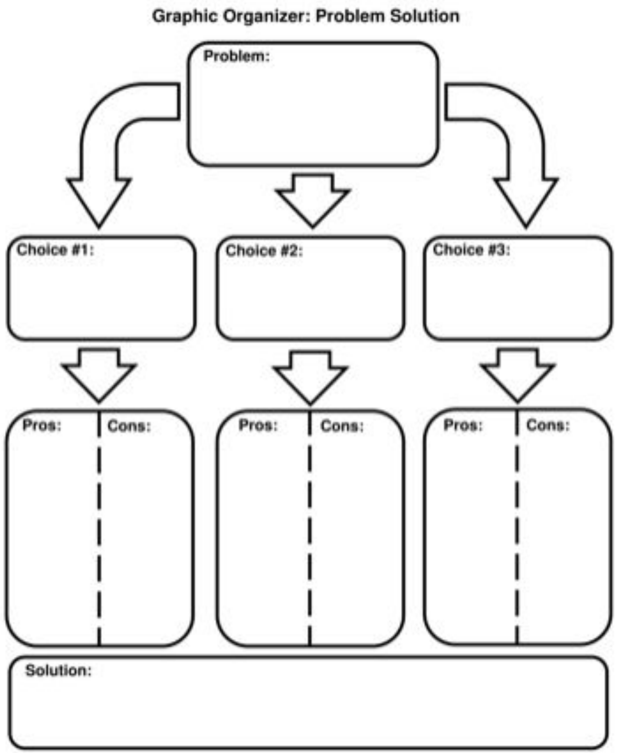
- Start with a central idea in the middle with related details branching out



Examples



What is mind mapping?
Note taking
Presentations
Lectures
Courses
Other uses
Problem solving
Outline/framework design
Structure/relationship representations
Team building
Brainstorming
Projects
Ideas
Todo lists
Shopping lists
Vacation checklists
Project management
Writing
Books
Articles
Thesis



Graphic Organizer: Problem Solution
Problem:
Choice #1:
Choice #2:
Choice #3:
Pros:
Cons:
Pros:
Cons:
Pros:
Cons:
Solution:

Note-Taking Enhancements

- Divide notes into 3 sections to help simplify complex topics
- Summarize concepts when possible
- Use abbreviations and symbols
- Use red pens

Example

CUE COLUMN	NOTE-TAKING COLUMN
- Key words - Key questions	- Key ideas - Important dates, people, and places - Diagrams and pictures - Formulas - Repeated (stressed) information
SUMMARY	
- Summary of your notes in your own words	

Pre-Tests

- Bank of questions self-created in a study-guide format to help prepare for exams
  - Structure questions ranging from easy to hard
  - Must be inclusive of complex concepts

Acrostics and Acronyms

- Fossil - to learn about fossils
  - **F**ound underground
  - **O**lder fossils founder lower down
  - **S**ome are imprints
  - **S**edimentary rocks hold fossils
  - **I**nsects have gold coloring
  - **L**imestone helps preserve fossils

- IPMAT - learn the stages of cell division
  - **I**nterphase
  - **P**rophase
  - **M**etaphase
  - **A**naphase
  - **T**elephase

Summary Guide

- Student creates a one-page checklist comprising of formulas, key terminologies, important dates, short notes, etc. to quickly review before an exam

Examples

Calculus Cheat Sheet

Limits

Definitions

Precise Definition : We say $\lim_{x \to a} f(x) = L$ if for every $\varepsilon > 0$ there is a $\delta > 0$ such that whenever $0 < |x - a| < \delta$ then $|f(x) - L| < \varepsilon$.

"Working" Definition : We say $\lim_{x \to a} f(x) = L$ if we can make $f(x)$ as close to L as we want by taking x sufficiently close to a (on either side of a) without letting $x = a$.

Right hand limit : $\lim_{x \to a^+} f(x) = L$. This has the same definition as the limit except it requires $x > a$.

Left hand limit : $\lim_{x \to a^-} f(x) = L$. This has the same definition as the limit except it requires $x < a$.

Limit at Infinity : We say $\lim_{x \to \infty} f(x) = L$ if we can make $f(x)$ as close to L as we want by taking x large enough and positive.

There is a similar definition for $\lim_{x \to -\infty} f(x) = L$ except we require x large and negative.

Infinite Limit : We say $\lim_{x \to a} f(x) = \infty$ if we can make $f(x)$ arbitrarily large (and positive) by taking x sufficiently close to a (on either side of a) without letting $x = a$.

There is a similar definition for $\lim_{x \to a} f(x) = -\infty$ except we make $f(x)$ arbitrarily large and negative.

Relationship between the limit and one-sided limits

$\lim_{x \to a} f(x) = L \Rightarrow \lim_{x \to a^+} f(x) = \lim_{x \to a^-} f(x) = L$ $\qquad$ $\lim_{x \to a^+} f(x) = \lim_{x \to a^-} f(x) = L \Rightarrow \lim_{x \to a} f(x) = L$

$\lim_{x \to a^+} f(x) \neq \lim_{x \to a^-} f(x) \Rightarrow \lim_{x \to a} f(x)$ Does Not Exist

Properties

Assume $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist and c is any number then,

1. $\lim_{x \to a} [c f(x)] = c \lim_{x \to a} f(x)$
2. $\lim_{x \to a} [f(x) \pm g(x)] = \lim_{x \to a} f(x) \pm \lim_{x \to a} g(x)$
3. $\lim_{x \to a} [f(x) g(x)] = \lim_{x \to a} f(x) \lim_{x \to a} g(x)$
4. $\lim_{x \to a} \left[\frac{f(x)}{g(x)}\right] = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$ provided $\lim_{x \to a} g(x) \neq 0$
5. $\lim_{x \to a} [f(x)]^n = \left[\lim_{x \to a} f(x)\right]^n$
6. $\lim_{x \to a} \left[\sqrt[n]{f(x)}\right] = \sqrt[n]{\lim_{x \to a} f(x)}$

Basic Limit Evaluations at $\pm\infty$

Note : $\operatorname{sgn}(a) = 1$ if $a > 0$ and $\operatorname{sgn}(a) = -1$ if $a < 0$.

1. $\lim_{x \to \infty} \mathbf{e}^x = \infty$ & $\lim_{x \to -\infty} \mathbf{e}^x = 0$
2. $\lim_{x \to \infty} \ln(x) = \infty$ & $\lim_{x \to 0^-} \ln(x) = -\infty$
3. If $r > 0$ then $\lim_{x \to \infty} \frac{b}{x^r} = 0$
4. If $r > 0$ and x^r is real for negative x then $\lim_{x \to -\infty} \frac{b}{x^r} = 0$
5. n even : $\lim_{x \to \pm\infty} x^n = \infty$
6. n odd : $\lim_{x \to \infty} x^n = \infty$ & $\lim_{x \to -\infty} x^n = -\infty$
7. n even : $\lim_{x \to \pm\infty} a x^n + \cdots + b x + c = \operatorname{sgn}(a)\infty$
8. n odd : $\lim_{x \to \infty} a x^n + \cdots + b x + c = \operatorname{sgn}(a)\infty$
9. n odd : $\lim_{x \to -\infty} a x^n + \cdots + c x + d = -\operatorname{sgn}(a)\infty$

Visit http://tutorial.math.lamar.edu for a complete set of Calculus notes.

Exponents and Monomials — Quick Reference

4^2	This expression is read as "4 to the second power" OR "4 squared".
$4^2 = 4 \cdot 4$	It means that we multiply 4 by itself 2 times.
$4^2 = 16$	$4 \cdot 4 = 16$

Tip!

Whenever you have a **negative base** and the **exponent** is **even**, your answer will always be **positive**!

Whenever you have a **negative base** and the **exponent** is **odd**, your answer will always be **negative**!

$(-3)^3$	This expression is read as -3 to the third power.
$(-3)^3 = -3 \cdot -3 \cdot -3$	It means that we multiply -3 by itself 3 times.
$(-3)^3 = -27$	$-3 \cdot -3 \cdot -3 = -27$ $9 \cdot (-3) = -27$

LAWS of EXPONENTS

Multiplying Powers with the Same Base

Property: When multiplying powers with the same base, **add the exponents.**

$y^3 \cdot y^4 = \mathbf{y^7}$ — Since the bases are the same (y), you can add the exponents: 3+4 = 7.

Power of a Power Property

Property: To find the power of a power, **multiply the exponents.**

$(a^3)^5 = \mathbf{a^{15}}$ — Multiply the exponents.

Power of a Product Property

Property: To find the power of a product, **find the power of each factor and multiply.**

Think of it as distributing the exponent to each factor!

$(2xy)^3 = 2^3x^3y^3 = \mathbf{8\,x^3y^3}$ ($8\,x^3y^3$)

$2^3 = 8$. x^3y^3 cannot be combined because the bases are not the same.

Power of Quotient Property

Property: To find the power of a quotient, **raise the numerator to the power, and the denominator to the power. Then divide.**

$\left(\frac{2}{3}\right)^2 = \frac{2^2}{3^2} = \frac{4}{9}$

Zero Exponents

Any number (except 0) to the zero power is equal to 1.

$4^0 = 1$ $\quad 10^0 = 1$ $\quad 22^0 = 1$ $\quad y^0 = 1$

The Rule for Negative Exponents:

The expression a^{-n} is the reciprocal of a^n

$3x^{-2} = \frac{3}{x^2}$

**In this problem, only the x contains the negative exponent, so we only take the reciprocal of x^2.

Multiplying Monomials Example

$(3x^2y^3z)^2(-3xy^4z)$	Original Problem
$(3x^2y^3z)^2(-3xy^4z)$ $(9x^4y^6z^2)(-3xy^4z)$	The first monomial is raised to the second power. Every constant and variable must be raised to the second power. **The second monomial is not raised to a power, so leave it as is!
$(9x^4y^6z^2)(-3xy^4z) = -27$	Multiply your coefficients.
$(9x^4y^6z^2)(-3xy^4z) = -27x^5y^{10}z^3$	Multiply the variables with like bases. (Add the exponents.)
$(3x^2y^3z)^2(-3xy^4z) = \mathbf{-27x^5y^{10}z^3}$	Final Answer.

Simplifying Monomials Example

$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$		Original Problem
$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$	$\frac{18x^4y^5}{\square}$	Step 1: Multiply the numerators. Add the exponents of like bases.
$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$	$\frac{18x^4y^5}{3xy^4}$	Step 2: Multiply the denominators. **There are no like bases, so we can't add the exponents.
$\frac{18x^4y^5}{3xy^4} =$	$\frac{6}{\square}$	Step 3: Divide the coefficients, if possible.
$\frac{18x^4y^5}{3xy^4} =$	$\frac{6x^3y}{\square}$	Step 4: Subtract the exponents of like bases. $\frac{x^4}{x} = x^3$ and $\frac{y^5}{y^4} = y$
$\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^2}{y^4} =$	$6x^3y$	Final Answer!

Scientific notation must always be written with the same components as the following model:

1.5876×10^6

A number in the ones' place. — decimal — As many numbers as necessary after the decimal — x10? (Any positive or negative exponent.)

Mnemonics

- Linking new information to things they already know, in order to improve the memory of key information.

- These strategies include using verbal and visual cues to trigger memory and make associations.

Example

- Kings play chess on fine glass sets

Kings	Play	Chess	On	Fine	Glass	Sets
K	P	C	O	F	G	S
I	H	L	R	A	E	P
N	Y	A	D	M	N	E
G	L	S	E	I	U	C
D	U	S	R	L	S	I
O	M			Y		E
M						S

Speech in Color

- Assign a particular color to each of the eight parts of speech
  - noun - red
  - verb - blue
  - adjective - green
  - adverb - orange
  - preposition - purple
  - pronoun - pink
  - interjection - brown
  - conjunction - black
- Have the students underline each of the words in the sentence according to its function.

Example

- The fuzzy cat walked quickly around the room.
- The girl sat quietly in her desk.

Percentage to Fraction

- To convert a percentage to a fraction, first convert to a decimal (divide by 100), then use the steps for converting decimal to fractions.

Example

- Convert 80% to a fraction
- Steps
  - Convert 80% to a decimal (=80/100): 0.8
  - Write down the decimal "over" the number 1: 0.8/1
  - Multiply top and bottom by 10 for every number after the decimal point (10 for 1 number, 100 for 2 numbers, etc): $0.8 \times 10 / 1 \times 10 = 8/10$
  - Then Simplify the fraction: **4/5**

Fraction to Percentage

- The easiest way to convert a fraction to a percentage is to divide the top number by the bottom number, then multiply the result by 100, and add the "%" sign.

Example

- Convert 3/8 to a percentage
    - First divide 3 by 8: 3 ÷ 8 = 0.375,
    - Then multiply by 100: 0.375 x 100 = 37.5
    - Add the "%" sign: **37.5%**

Table

Percent	Decimal	Fraction
1%	0.01	1/100
5%	0.05	1/20
10%	0.1	1/10
12½%	0.125	1/8
20%	0.2	1/5
25%	0.25	1/4
331/3%	0.333	1/3
50%	0.5	1/2
75%	0.75	3/4
80%	0.8	4/5
90%	0.9	9/10
99%	0.99	99/100
100%	1.0	100/100
125%	1.25	5/4
150%	1.5	3/2
200%	2.0	200/200