CORE MATH®

Vocabulary in Math

Teaching Vocabulary from the Perspective of a Math Teacher

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Participant Handout
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Identify Challenging Words

Double Meanings: Words with a mathematical meaning and a nonmathematical meaning or connotation

table	fraction	even
base	volume	tangent
line	similar	odd
side	rational	variable
point	operation	mean
irrational	expression	term
angle	difference	mode
property	face	product
shape	altitude	factor
yard	radical	equal

Homophones: Math words that have a nonmath word with the same sound

cent	→	sent or scent
plane	→	plain
two	→	to or too
sum	→	some
sine	→	sign
four	→	for or fore
whole	→	hole
eight	→	ate
pi	→	pie
one	→	won
weigh	→	way
ten	→	tin

Multiple Terms for Same Idea: Words in math that overlap, or are often used interchangeably

- altitude, height or length
- base, width or length
- add, sum
- solve, determine the answer, compute
- justify, explain, prove
- multiply, determine the product

Small Words or Phrases: Words or phrases that students often struggle to interpret in math problems

or	fewer	increase
many	then	and
less than	decrease	left
more than	an	as many as
of	greater	all
any	off	take away

Unique Terms: Words that have meaning only in math

hypotenuse

parallelogram

coefficient

quadratic

Similar Sounding Words:

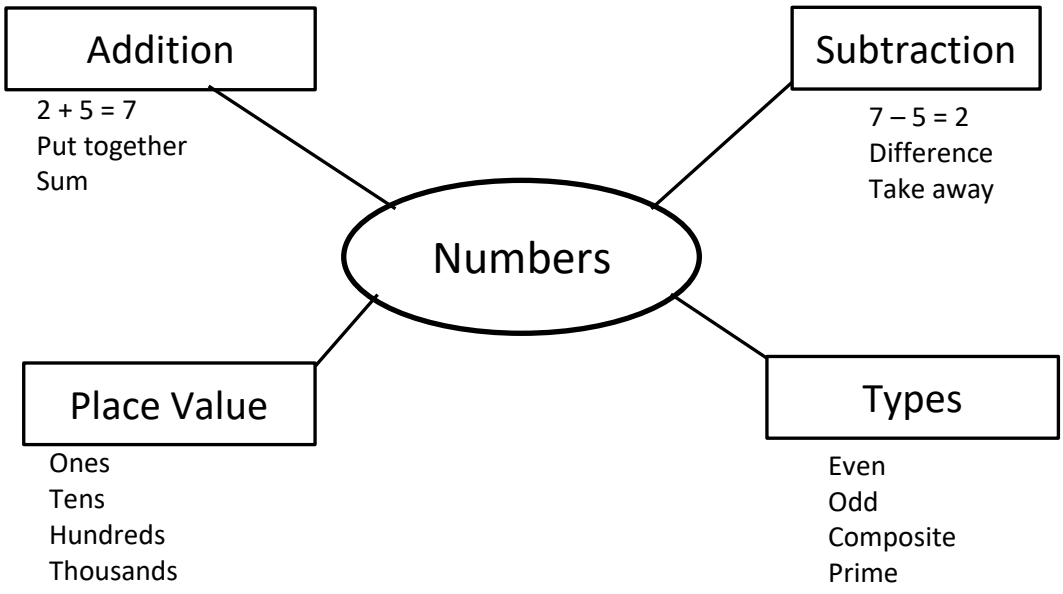
tens vs. tenths

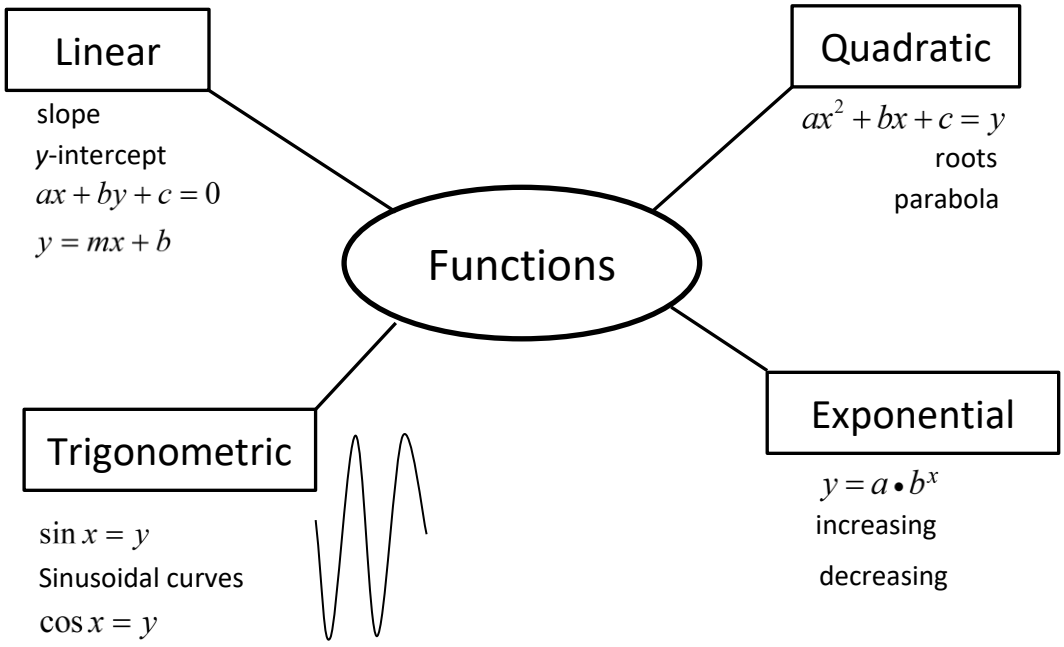
then vs. than

sixty vs. sixteen

Concept Map

Place the concept/term in the center and have branches out to other key connected ideas, terms, or concepts, and under each of these list associated words, expressions, or concepts. Two examples are shown below.



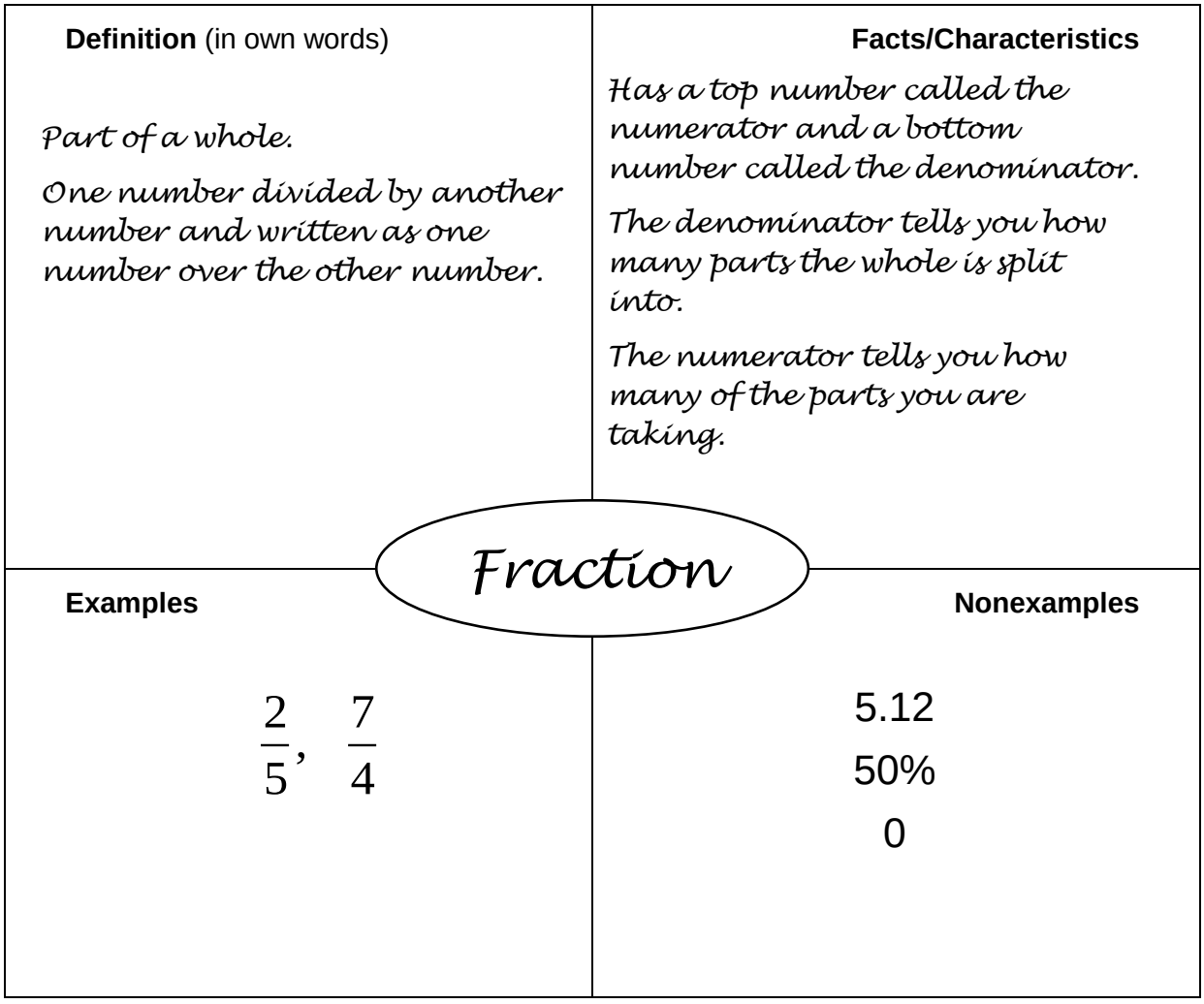


Frayer Model

(Frayer, Frederick, & Klausmeier, 1969)

1. Record the word in the center oval.
2. Write a definition of the word.
3. Enter facts or characteristics of the word.
4. Show examples of the word.
5. Show nonexamples of the word.

Example of a Frayer model:



CORE Word Knowledge Chart

1. Record the word in the top row.
2. Write a definition/meaning of the word.
3. Show examples of the word.
4. Make a drawing that represents the word.
5. Record other words that you associate with this word or characteristics of the word.

Word	
Fraction	
Meaning *Part of a whole.* *Write it as one number over the other number.* *One number divided by another number.*	**Visualization or Drawing** $\frac{2}{5} =$
Example $\frac{2}{5}, \frac{7}{4}$	**Other Characteristics or Related Words** *numerator* *denominator* *improper fractions*

CORE Word Knowledge Chart

Fill in the chart below for one of the following words (choose a different word than you used in the other charts):

- Add
- Multiply
- Subtract
- Divide
- Angle
- Circle
- Percent
- Mixed fraction
- Expression
- Volume
- Function
- Radical

Word	
Meaning	**Visualization or Drawing**
Example	**Other Characteristics or Related Words**

Symbol and Cue Cards

1. Create a set of *symbol cards* and matching *cue cards* as shown on the following pages.
    - **Symbol cards:** Cards containing math terms, expressions, equations, etc.
    - **Cue cards:** Cards containing phrases that match one or more of the symbol cards. You may have more than one cue card for the same symbol card.
2. Play the game:
    a. Give each student (or pair of students) a set of symbol cards.
    b. Have students match symbol cards to cue cards by one of the following methods. Always check for understanding (correct matching). Students can also be required to record matches.
        i. Option 1: Someone (teacher) reads a cue card and students hold up the corresponding symbol card.
        ii. Option 2: Hand out a set of the cue cards to each student (or pair of students) and have students match cards.

Symbol Cards

$8 - n$	$n < 8$	$8 + n$
$8n$	$n > 8$	$8(n)$
$n - 8$	$n = 8$	$n + 8$
$8 / n$	$n / 8$	$\frac{n}{8}$

Cue Cards

The product of *n* and 8	8 is greater than *n*	The sum of 8 and *n*
The product of 8 and *n*	8 is less than *n*	The sum of *n* and 8
8 less than *n*	*n* is greater than *8*	The difference between 8 and *n*
n less than 8	*n* is less than 8	The difference between *n* and 8
8 more than *n*	The quotient of 8 divided by *n*	8 out of *n* equal parts
n more than 8	The quotient of *n* divided by 8	*n* out of 8 equal parts
8 divided by *n*	8 *n*'s	*n* eighths
n divided by 8	8 times *n*	*n* and 8 are the same

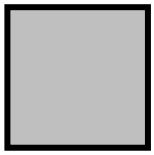
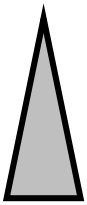
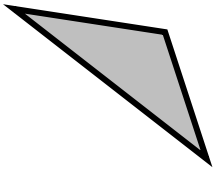
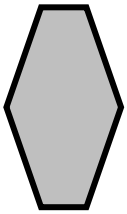
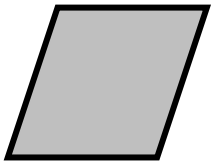
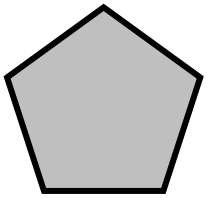
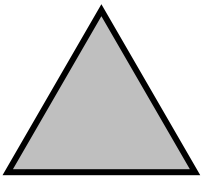
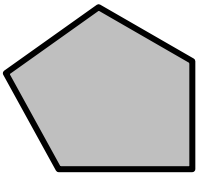
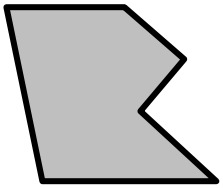
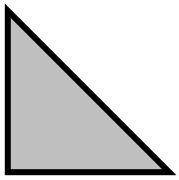
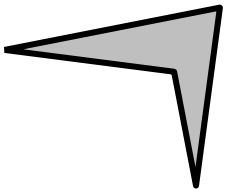
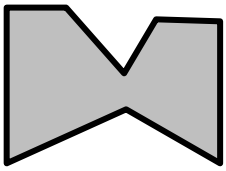
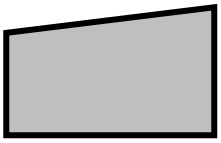
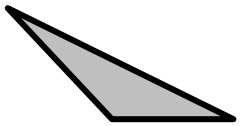
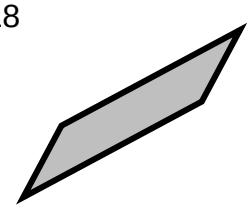
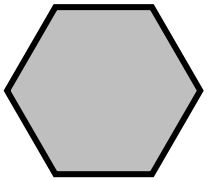
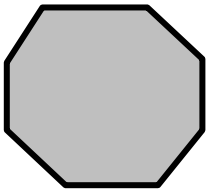
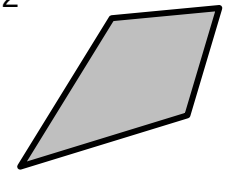
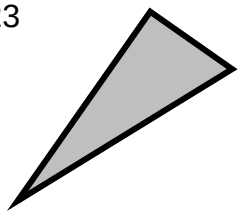
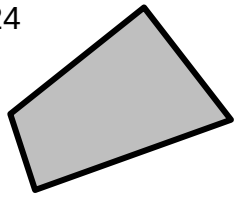
Guess My Polygon

1. Play the game two or three times.
    a. Work with a partner. Use the Polygon Chart on the next page.
    b. Player 1 picks a polygon from the chart but does not tell player 2 which polygon he/she chose.
    c. Player 2 asks yes/no questions to try and figure out which polygon player 1 chose. The goal is to be able to know within four or five questions.
    d. Option: Have a third player tally correctly used vocabulary on the chart below.
    e. Switch roles and play again.

Math Term	Tally Gm 1	Tally Gm 2	Tally Gm 3		Math Term	Tally Gm 1	Tally Gm 2	Tally Gm 3
Polygon					Vertices (vertex)			
Triangle					Sides			
Quadrilateral					Angles			
Pentagon					Parallel			
Hexagon					Right			
Heptagon					Obtuse			
Octagon					Acute			
Rectangle								
Square								
Rhombus								
Parallelogram								
Trapezoid								

2. **Team Play:** What strategies did you find most helpful and why? What types of questions were the most effective? If you were to coach a new player, what types of questions should he/she ask, and why?

Polygon Cards

1 	2 	3 	4
5 	6 	7	8 
9 	10 	11 	12 
13 	14	15 	16 
17 	18 	19	20 
21 	22 	23 	24 

Concept Sort

1. Divide students into pairs.
2. Give each pair of students a set of concept sorting cards (see the example page below for *Polygon Cards for Polygon Sort Activity* handout).
3. Students cut out the cards.
4. Students sort the cards/concepts into groups based on similar traits or properties.
5. Students explain the reasoning behind the groupings. It is recommended that each student record his/her work on an activity sheet such as the one provided in the sample Concept Sort Activity for polygons.
    - Although the activity sheet has space for sorting the cards into as many as five groups, students are not expected to sort the cards into exactly five groups. They may sort them into two to four groups, or in rare cases more than five groups.

Extension 1:

1. Students leave the concepts organized into the groups they have chosen at their desk/table.
2. Pairs from different table groups switch places and analyze the organization and grouping of another pair of participants. They are not to see each other's activity sheets describing the grouping criteria.
    - The new pair should record the criteria they believe were used by the original pair of students to make the groupings.
    - Check with the other group to verify the criteria.

Extension 2:

1. Pairs trade one of their activity sheets with another pair (the activity sheets should have an explanation for how the cards were sorted, but not a listing of which cards are sorted into which groups). Each pair will do the following:
    - Use the other pair's sorting criteria to re-sort their own set of cards.
    - Check with the original group/pair to see if their sorting matches that from the original pair of students.
    - Discuss whether the sorting criteria described on the activity sheet were complete and distinct.
        - Complete: Were all cards accounted for?
        - Distinct: Did each card fit in exactly one group, or did one or more cards fit into more than one of the groups?

Concept Sort Activity

1. Work with a partner.
2. Cut out the concept cards and spread out all the cards for the task.
3. Sort the cards/concepts into groups based on similar traits or properties.
4. Record the criteria for each group you create.

- **Criteria for each group of cards in our sort.** (Space is provided for five groupings of cards. You may use some, all, or more than these five spaces.)

Card/concept group 1:
Card/concept group 2:
Card/concept group 3:
Card/concept group 4:
Card/concept group 5:

- **Sorting criteria used by another team:**

Card/concept group 1:
Card/concept group 2:
Card/concept group 3:
Card/concept group 4:
Card/concept group 5:

Mathematical Language Routines

Routine 1: Stronger and Clearer Each Time

Students think and/or write individually about a response, use a structured pairing strategy to have multiple opportunities to refine and clarify the response through conversation, and then finally revise their original written response.

Routine 2: Collect and Display

The teacher listens for, and scribes, the language students use during partner, small group, or whole class discussions using written words, diagrams and pictures. This collected output can be organized, revoiced, or explicitly connected to other language in a display that all students can refer to, build on, or make connections with during future discussions or writing.

Routine 3: Critique, Correct, and Clarify

Students reflect, critique, clarify, and correct each other's' written work and oral expressions. Teachers can model how to effectively and respectfully critique the work of others with meta-think-alouds and press for details when necessary.

Routine 4: Information Gap

Students working with a partner or team, are given different pieces of necessary information that must be used together to solve a problem or play a game.

Routine 5: Co-Craft Questions and Problems

Students use conversation skills to generate, choose (argue for the best one), and improve questions, problems, and situations as well as develop meta-awareness of the language used in mathematical questions and problems.

Routine 6: Three Reads

Students are facilitated through reading a situation/problem/text/task three times, each time with a particular focus. For example, 1st read to understand the situation; 2nd read to create a diagram to represent the situation, 3rd read to plan a method to solve the given problem.

Routine 7: Compare and Connect

Students identify, compare, and contrast different mathematical approaches, representations, concepts, examples, and language.

Routine 8: Discussion Supports

Teachers use routines and techniques to support rich and inclusive discussions about mathematical ideas, representations, contexts, and strategies. For example, revoicing, think-alouds, think-pair-share, think-write-pair-share, and numbered heads together.

Adapted from J. Zwiers, Dieckmann, S. Rutherford-Quach, V. Daro, R. Skarin, S. Weiss, & J. Malamut (2017) *Principles for the Design of Mathematics Curricula: Promoting Language and Content Development*, Understanding Language/Stanford Center for Assessment, Learning, and Equity, Stanford University Graduate School of Education.

Strategies for Effective Reading

- **Tapping prior knowledge (or making connections):** Example: multiplication as repeated addition, the area of a field can be determined by multiplying the width by the length, etc.
- **Predicting:** Scan the section to be read to see (predict) what the overall point is and how the concept or procedure will be presented. Use titles, bold text, highlight, etc. to scan and predict what will be learned and how.
- **Questioning:** Example: ask questions of yourself while reading. For example, how does this example differ from the first example?
- **Visualizing:** Make diagrams and/or use manipulatives to illustrate relationships in math examples and problems. Tape diagrams are an excellent example of the types of diagrams students can use. Students should also use visual quantities, seeing five, seeing many vs. few, etc.
- **Summarizing:** Good readers continually summarize internally what they are reading. Periodically they ask themselves, What is the point? Or, How does this connect to the point of the lesson overall? Students summarize whole sections, taking a step back to see how the whole fits together and what the essential takeaways are.
- **Synthesizing:** Students must synthesize new ideas with prior knowledge, understand the connections between prior and new knowledge, and understand the connections between mathematical ideas.
- **Monitoring and repairing understanding:** Students should always be checking to see if the math is making sense. Tapping prior knowledge, questioning, visualizing, summarizing, and synthesizing are all part of making sense of mathematics.

—Adapted from *From Reading to Math,* 2009

Sample Anticipation Guide

Anticipation Guide for Unit Rates

Directions: In the column labeled *Me*, write T or F next to each statement based on whether you think the statement is true or false. After reading the text, under *Text* write T or F for your final opinion for each statement based on what you have learned from the reading. Be ready to explain how the text proves your final answer is correct.

Me	***Text***	***Anticipation Statements***
		1. A rate is a ratio.
		2. All rates are unit rates.
		3. All unit rates are rates.
		4. Unit rates can be written as fractions or decimals.
		5. Equal rates are like equal fractions.
		6. Unit rates are a good way to compare prices.

Create an Anticipation Guide

Anticipation Guide for Unit Rates

Directions: In the column labeled *Me*, write T or F next to each statement based on whether you think the statement is true or false. After reading the text, under *Text* write T or F for your final opinion for each statement based on what you have learned from the reading. Be ready to explain how the text proves your final answer is correct.

Me	***Text***	***Anticipation Statements***

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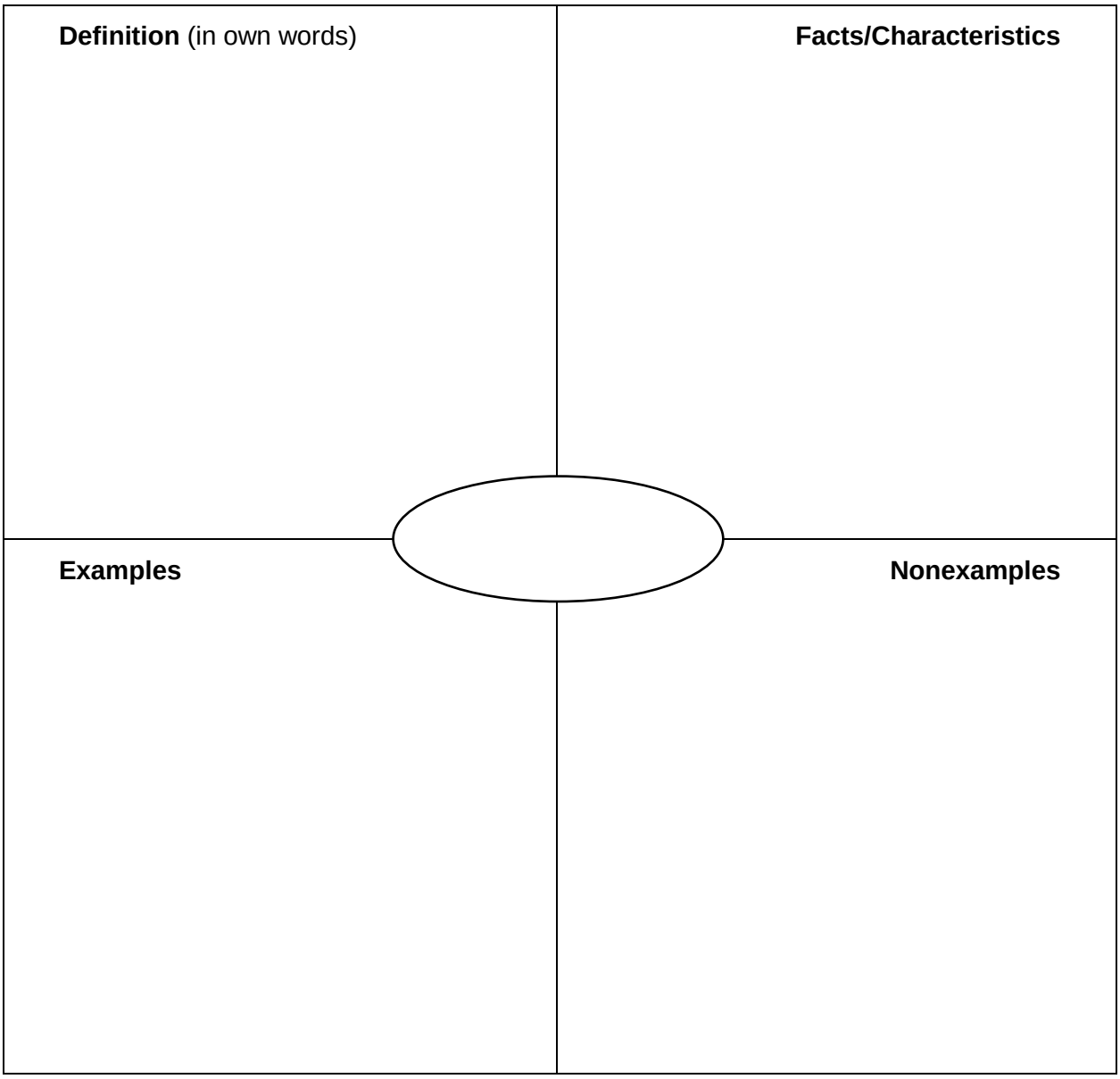
(Frayer, Frederick, & Klausmeier, 1969)



CORE Word Knowledge Chart

Word	
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Example	**Other Characteristics or Related Words**

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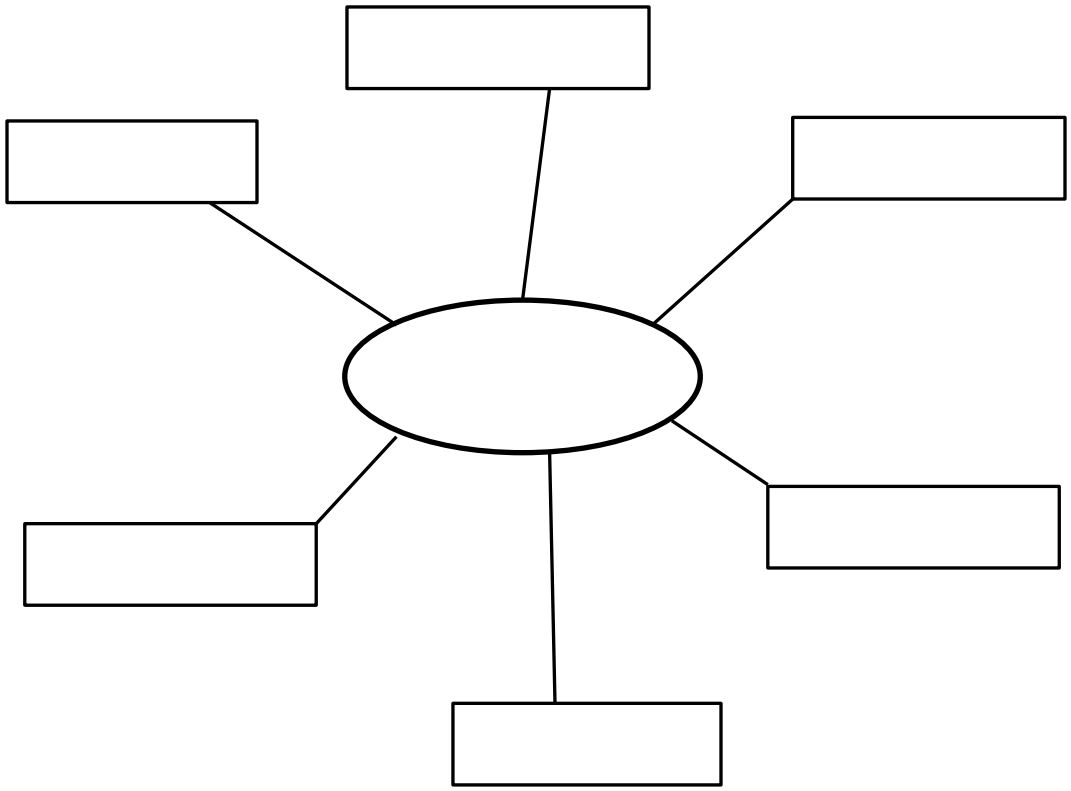

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        i. Option 1: Someone (teacher) reads a cue card and students hold up the corresponding symbol card.
        ii. Option 2: Hand out a set of the cue cards to each student (or pair of students) and have students match cards.

Symbol Cards

Cue Cards