

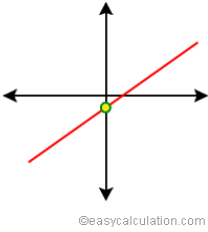
10 Literacy Strategies for the Mathematical Classroom

1 JOURNAL WRITING

Students have opinions of their own, especially about math. Yet they are seldom able to express these feelings in a productive way. Journal writing can be a way for students to express their feelings and emotions without being judged by their peers. Journals, or exit cards, can also be a way to provide the teacher with useful knowledge on how the class and lessons are being received by individual students. Research suggests that journal writing become a regular part of the classroom environment for 5-10 minutes per class period. Also, that teachers should model journal writing and share a few entries with the class. Journals should not go unread. I plan on reading and responding to entries, randomly, a few times per student per semester.

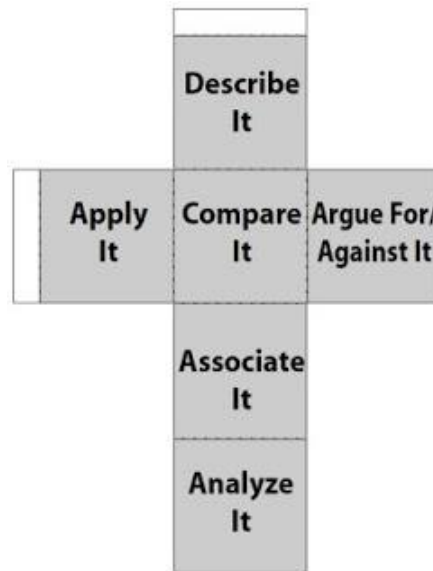
2 VERBAL AND VISUAL WORD ASSOCIATION

Connecting visual and verbal clues in one meaningful place can be very effective in helping struggling readers and second language learners learn and retain new general and technical vocabulary. Step one is for the students to draw a square with four boxes in it. The new vocabulary word is written in the top left box and its definition should be written in the bottom left hand box. The right side contains both a positive personal association (top box) and a negative personal association (bottom box). This word association box can be easily modified by inserting a picture and a word example in lieu of the personal associations. This would be highly useful in a classroom of students that struggle with reading (or at least with reading English). People respond well to pictures. They like to be able to “see” what something is and/or how it relates to themselves. I would include grids like these on homework and bell-work, so that the students (and I) can see their understanding of the concepts we are covering. I like the idea of also including this type of technique as a problem on a test.

Linear Equation	
An equation that makes a straight line when graphed.	$y = 3x - 1$

3 CUBING

Cubing uses the concrete visual of a cube to serve as a starting point for discussion on the various aspects of a topic. Using small groups, the students consider the concept at hand from the following six directions: describe it (colors, shape, size, etc.), compare it (similar to what? different from what?), associate with it (what does it make you think of?), analyze it (how is it made? what is it made of?), apply it (what can you do with it? how is it used?), argue for or against it (take a stand and list for supporting your ideas). The idea is for the students to do this fast, not to dwell on what they know or don't know. Each side of the cube should be filled out in 5-10 minutes. By starting with a cube, students will be better able to organize their thoughts and better prepared to compose a descriptive paragraph about the topic. I think this would be a great way to bridge from small group work to a full class discussion. Small groups can start by finding the information to fit on each side of the cube. Then, we can roll a die, with each side assigned to a number, and have each small group share what they have discovered about the given topic with the class as a whole.



4 MATRIXES

Matrixes are ways to introduce small bits of writing into the classroom, as well as differentiate the lesson based on a student's ability. In a matrix, students answer each problem listed in the left hand column by filling in one or more of the columns to the right using the guidelines suggested on the top row. Various methods can be used to solve the problems, and each method must be used at least once. The literacy content comes in the justification portion that is required with every problem to be solved. Students must put into words why they used the method that they did, and/or how they solved that particular dilemma.

Example of page 1 of 2 page matrix:

Properties of Quadrilaterals
Matrix

Name _____
Date _____ Per _____

Directions: For each statement in column I, diagram and label the quadrilateral(s) in column II and determine whether the statement is true or false. If the statement is **true**, complete either column III, VI, or V AND column VI. If the statement is **false**, complete column VII. You must fill in columns III-VI at least once.

<u>Column I</u> Statements	<u>Column II</u> Diagram and label	<u>Column III</u> Justify using sides	<u>Column IV</u> Justify using angles	<u>Column V</u> Justify using diagonals	<u>Column VI</u> Explain your reasoning from col. III, IV, or V	<u>Column VII</u> Re-write the statement so that it is true
<i>A trapezoid is a triangle.</i>	True or False					
<i>Parallelograms are quadrilaterals.</i>	True or False					
<i>A square is a rectangle.</i>	True or False					

5 GRAPHIC ORGANIZERS

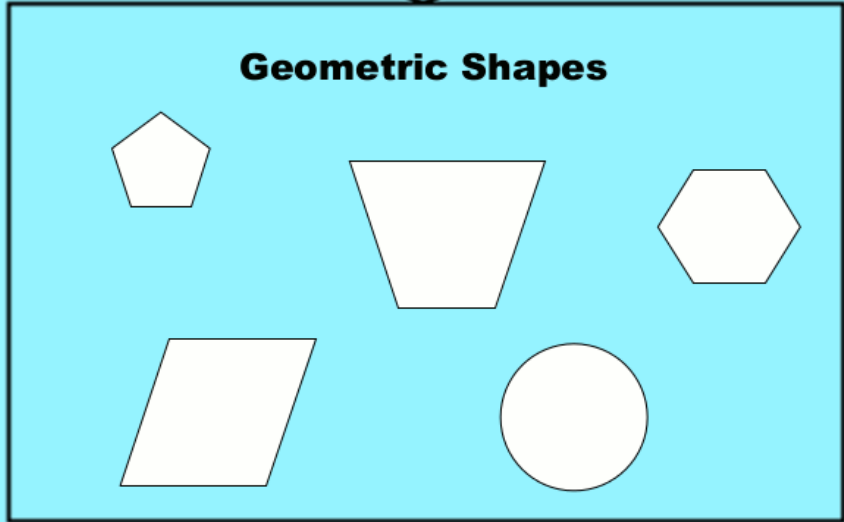
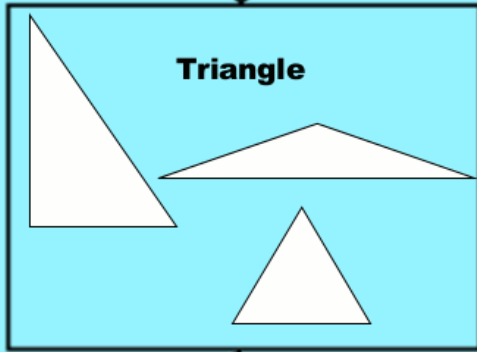
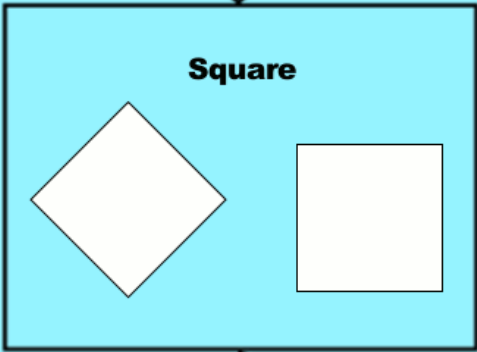
There are many types of graphic organizers that can help students develop and sort out the pieces of complex information. Graphic organizers allow students to see the relationships between the bits of information that they have gathered. I can see using this as the first step to starting a new unit by having the students walk through what will be taught in the unit. We can then add in the details to the chart as we go through the unit. I find that I, personally, always work best if I know where I am supposed to be when I am finished with a unit. By giving the students a “map” of the most important aspects of the unit, I am hoping to lessen some of the confusion and stress that the students may have over “what do I need to know for the test?”

Properties
4 equal sides
4 angles
Each angle 90°

Formulas
Area:
 $A = bh$
Perimeter:
 $P = 4s$

Properties
3 sides
3 angles
Angles add to
 180°

Formulas
Area:
 $A = \frac{1}{2}bh$
Perimeter:
 $P = a + b + c$



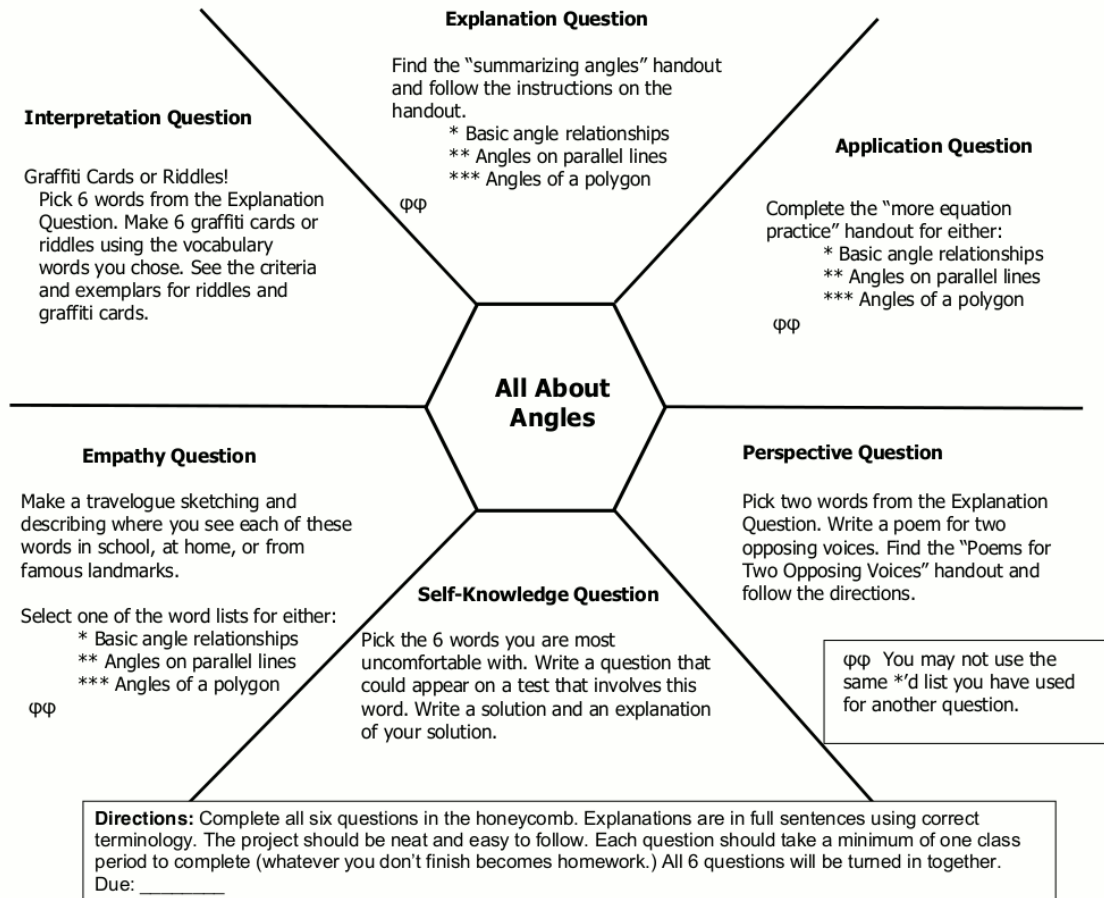
6 MORPHEMIC ANALYSIS

A morphemic analysis is where students break up words into smaller parts in order to better understand the full meaning of the larger term. This is especially helpful in the sciences and in most literature where use of 'context clues' is not helpful. There are two types on morphemes. The free morpheme is a word in its own right, and can stand alone. For example, 'any' and 'one' are free morphemes. The bound morpheme only has meaning if it is connected to words or other morphemes. This includes most suffixes and prefixes, such as 'micro-' and '-ion.' Learning to use morphemic analysis consists of a four step process. First, the student must realize that they don't know the word. Second, the student needs to analyze the word for parts that they do know. Third, they generate a possible meaning for the word based on the parts that they have deduced. The last step is to check if what the student thinks the word is fits the context. This analysis can be very useful in helping students determine the meaning of the many complex vocabulary terms in mathematics. I would use this type of vocabulary analysis when I first introduce a new term, or come across a term that the students should know but don't, such as 'simplify' or 'analyze.'

Quotient	Divisor	Irrational
<ul style="list-style-type: none">• From Latin: quotiens• 'quo-': something received or given for something else• '-ient': kind of agent, indication	<ul style="list-style-type: none">• 'di-': apart, separate, two, opposite, not• '-vis-': see• '-or': condition or activity	<ul style="list-style-type: none">• 'ir-': not, in• 'ration': fixed amount allocated to someone• '-al': quality, relation

7 HONEY COMB GRID

The Honey Comb Questionnaire grid incorporates six different sections with a different type of question in each. The first question requires interpreting concepts to prove understanding. The second should hold an accurate explanation of theories and knowledge. The third requires students to use their current knowledge in a new situation or with diverse content. The fourth has students shift their critical point of view. The fifth section has the students using their wisdom of their own ignorance and/or pattern of thought to prove their own understanding. The last section has the students attempting to identify with another person's feelings or worldview. Each question is attached to a quadrant of the Honey Comb grid, with the main topic of the section written in the center. This type of grid can be used in combination with Graffiti Cards and Riddles in order to increase student learning. I would use this type of technique in a review for the unit or as bell-work questions throughout the unit. Students will have the opportunity to put their thoughts and understanding on paper in a way that works well for students that are word orientated.



8 GRAFFITI CARDS

Graffiti cards are index cards that provide students with a quick way to put a vocabulary word into graphics using word play and pictures. The cards must convey the meaning of the vocabulary word, use few or no words or have a picture that includes important relationships implied by the word. The answer and a brief explanation of the graffiti should be on the back of the card. I think these are awesome ways to allow students to share their artistic talents and creative abilities. I plan on using them regularly in my classroom, including putting some of the most creative ones up on a bulletin board (with student permission) to inspire and remind students of important tools.

Examples:

Para||e| |ines
BIS ECT



(Horizontal Line)

9 RIDDLES

Having students use the properties of their vocabulary words to create riddles with the vocabulary word as the answer forces students to truly explore their own understanding and think creatively. The rules of the project are simple. The riddle must be written in first person and must use illustrative language which provides natural imagery. The riddle should reveal information slowly, use precise and engaging vocabulary, and use as many mathematical terms as possible. The answer to the riddle is then written on back of the card. As part of my math vocabulary bulletin board, I would tape the top of the cards to the wall and have it so the students can flip them over and find the answers.

Who am I? <ul style="list-style-type: none">• I have my own special symbol.• I measure the amount of turn between two rays.• I love it when people complement me.• I am always correct.• I am formed by perpendicular lines.	Who am I? <ul style="list-style-type: none">• I am not a “regular guy.”• I am a three-sided polygon.• At least two of my angles are congruent.• I am not equilateral.
Answer: Right Angle	Answer: Isosceles Triangle

10 TRAVELOGUE

Travelogues also use creative writing to explain a mathematical concept. The rules are similar to the ones used for writing riddles. The travelogue must include as many mathematical terms as possible, be written in first person, and use illustrative language to provide natural imagery. It must also be written as if the student were visiting another place. Each unit, I will be giving students the opportunity to add to our math vocabulary board by doing a travelogue which pertains to the vocabulary which we are covering in class.

5/12/12
Today I visited the Eiffel Tower and saw so many of my long-lost relatives! There was a marvelous tessellation of isosceles triangles surrounding the base of the tower. The tessellation was possible because of the congruence of base angles and sides. Isosceles right triangles were formed from the squares along the legs of the tower by cutting a square into eight congruent triangles. The view from the top was glorious as I peered down over my many cousins and uncles.