

Developing Mathematical Language for the ELL Student

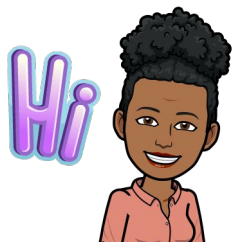
NCTM Annual Conference -- April 2019

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Introductions



Marlene Collins, NBCT

14 Year Veteran

North Palos School District 117 in Palos Park, IL

Math and Science Team Leader

70% of the students in my district speak a language other than English

Linda Lichter Sumita, NBCT

14 Year Veteran

Chicago Public Schools

Middle School Math Teacher

81% Asian students with 31% considered Limited English



Goals

(Learning Intentions)

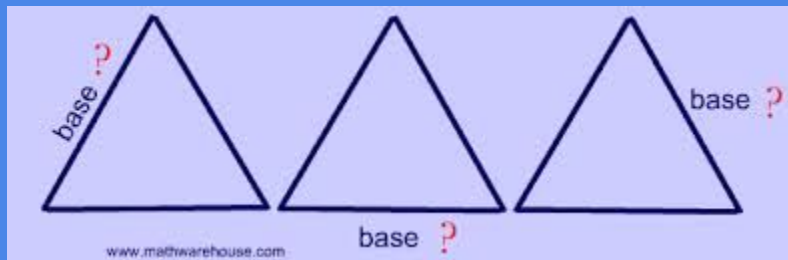
1. To share strategies that support language development and math achievement
2. To share the importance and rationale for including these strategies

Let's Get Started!

Really--Base?

- The basis of
 - My headquarters
 - Really vile
 - Acid vs. base (pH)
 - That thing that ballplayers run to
 - And don't forget bass guitar
-

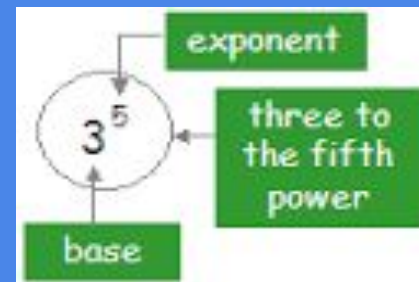
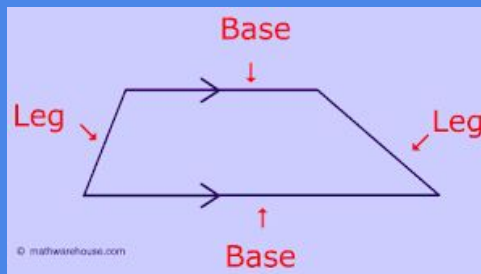
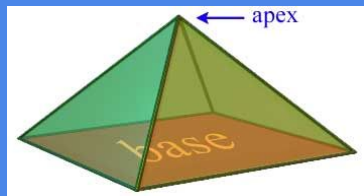
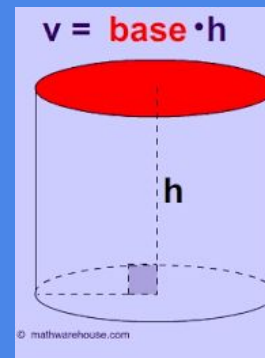
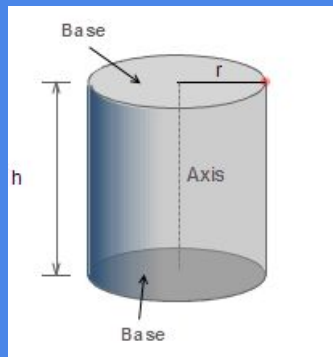
But I'm Talking Math!



decimals									
whole numbers					decimal fractions				
Thousands	Hundreds	Tens	Ones	Decimal Point	Tenths	Hundredths	Thousandths	Ten-thousandths	
6	9	4	5	.	3	7	2	8	

Each place is 10 times larger than the place to its right.

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Imagine...

- Being a student whose first language is not English
- You've transitioned out of your bilingual classroom or it's your first year in an American school
- Your teacher does not speak your language

Vocabulary Strategies

Math Yappers

- 1. Area**
- 2. Perimeter**
- 3. Square**

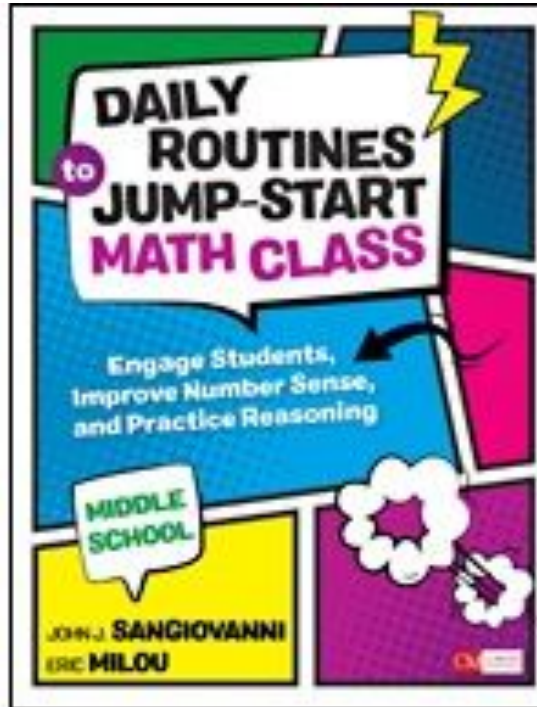
Math Yappers

- 1. Expression**
- 2. Factor**
- 3. Median**

A Lively Classroom



Math Yappers



Reading Strategies

Three Reads Strategy (my variation!)

Let a = any rational number. Is the absolute value of a different if a is a positive number or a negative number?

Explain.

1	Launch Routine		THINKING GOAL Read like a mathematician	
2	First Read: Understand the Context	Individual Think Time 	Share & Record 	
3	Second Read: Interpret the Question	Individual Think Time 	Pairs 	Share, Discuss, & Record
4	Third Read: Identify Important Information	Pairs 	Share, Discuss, & Record 	
5	Reflect on Your Thinking	Individual Write Time 	Pairs 	Share & Record

Collaborative Strategies



Sage 'N Scribe

In pairs, Person A is the Sage; Person B is the Scribe.

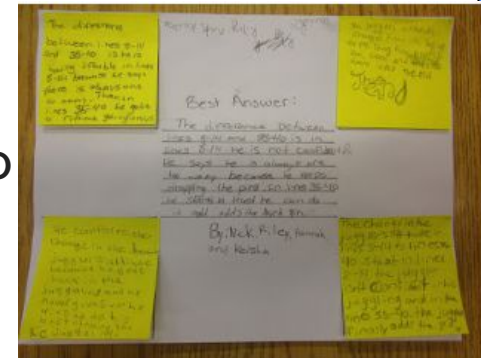
- The Sage gives the Scribe step-by-step instructions how to perform a task or solve a problem.
- The Scribe records the Sage's **solution** step-by-step in writing/typing, coaching if necessary
- The roles reverse and the Sage becomes the Scribe
And the Scribe becomes the Sage.



Collaborative Problem Solving

- Students solve the problem independently.
- Students collaborate with a partner or group to create the best solution to the problem.

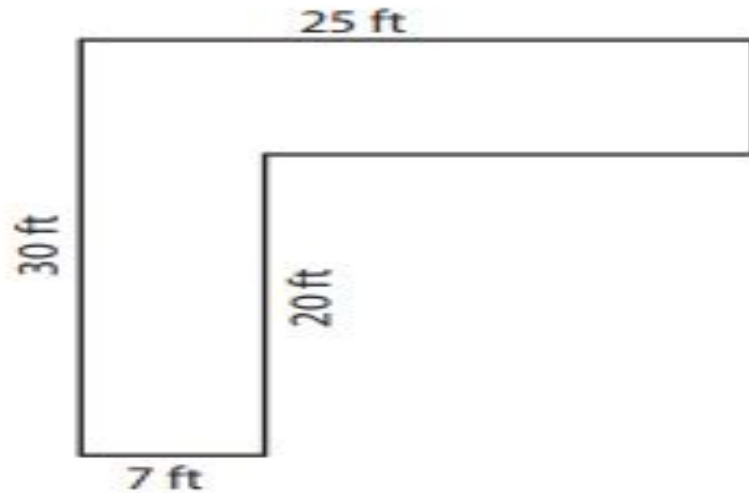
Benefits: Students get to first work independently to clarify their own understanding then share their understandings with other to determine a complete solution.



SHOWDOWN

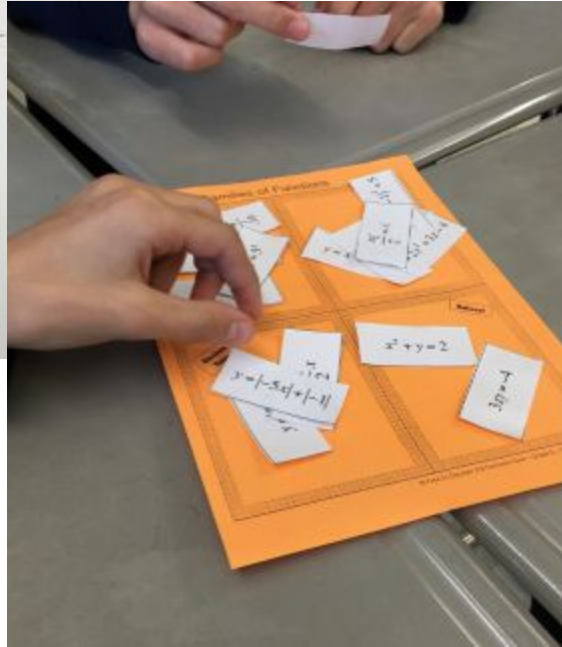
What are the length and width of a rectangle with an area of 24 square feet and a perimeter of 22 feet?

SHOWDOWN



Area = _____

Card Sorts



Benefits of Card Sorts

1. Promote discourse
2. Requires categorization/ higher order thinking skills
3. Allows students relate various representations

Writing

Student Created Problems

There are 9 whole numbers in a data set. The lowest number is 4 and the highest number is 8 greater than that. The mode and median is 8. The mean of the set is 8 as well. What are the missing numbers?

$$\underline{4, 5, 6, 8, 8, 8, 10, 11, 12} = 8$$

9

has to total 72.

- Initial numbers
- Second numbers added
- Third numbers added

*Not the only answer

I started by first writing out nine spaces because there are nine numbers in the data set. Then for the first number I wrote four because that's the lowest and 12 for the last number because the problem says the highest number is greater than that. $4+8=12$. Then I placed 8 in space 4, 5, and 6. I did this because the mode was 8 so I made it the seen the most. Also it is the median so it had to be in space 5. Then I added the numbers that I had so I know how much I would have left over. To consider it as a algebra equation. My data set should total 72. So I added $4+8+8+8+12=40$. $72-40=32$. The numbers I have left has to total 32. In my 2 and 3 spaces I placed 5 and 6. I did this because it has to be lower than 8 and greater than 4. These are the first two number that fit the requirements. Now I added the numbers I have now to see how much they total. I added $4+5+6+8+8+8+12=51$. $72-51=21$. Now the space 7 and 8 have to total 21. It also has to be greater than 8 and lower than 12. I placed 10 and 11 in these spaces. Now I checked my answer. I added $4+5+6+8+8+8+10+11+12=72$. $72 \div 9 = 8$. Then I checked to make sure 8 was in the middle and it is in space 5. Also it is repeated 8 times making it the mode. My answer is correct.

Student Created Problems

There are 7 numbers in the number set. If the lowest number is 7 and the highest number is 30. And the mean, mode, and median is 20. What are the numbers in the number set?

$\frac{?}{?}, \frac{?}{?}, \frac{?}{?}, \frac{?}{?}, \frac{?}{?}, \frac{?}{?}, \frac{?}{?}$

First step: Put down what I already know.

$\frac{7}{\uparrow \text{Lowest \#}}, _, _, \frac{20}{\uparrow \text{Median}}, \frac{20}{\uparrow \text{Mode}}, _, \frac{30}{\uparrow \text{Highest \#}}$

Second step: Try to figure out what the mean will be with the (the number) (mean) step.
 $7(20) = 140$
 $\uparrow \text{\# in mean} \quad \uparrow \text{total}$
 $\uparrow \text{\# set}$

Third step: add the numbers that I know that are in the number set the subtract it from the total.

$$\begin{array}{r} 20 \\ 20 \\ 7 \\ 30 \\ \hline 77 \end{array} \quad \begin{array}{r} 20 \\ 20 \\ 7 \\ 30 \\ \hline 67 \end{array}$$

Fourth step: Put In numbers that fit in the number set.

I, $\frac{20}{?}, \frac{20}{?}, \frac{20}{?}, \frac{20}{?}, \frac{23}{?}, \frac{30}{?}$

$$\begin{array}{r} 63 \\ -23 \\ \hline 40 \\ 4 \\ \hline 10 \end{array}$$

Student Reflection and Metacognition

I think I deserve a 80% because I understand the questions and what they are asking me but I made careless mistakes by forgetting to answer some problems or forgetting some concepts of this unit.

Thank you for being a awesome teacher!

I think I got 67%-70%, I did bad! Ms. Sumita told us a lot about scale factor, and on second and third pages I didn't understand the languages like the words, I didn't get it but I did know it's comparing with scale factor by perimeter and area. And "Come on Xiaobing, I forgot what's Copier size factor, I should remember that, it isn't that hard. On the page about Polygons, I got most of the problems wrong except the last problem about scale factor, on 'a', I put ~~no~~ Yes because to me it's enough information and realize I didn't have the angles measure. On the page about the frame, I don't even know what I did and I should have double check, in the flag page which is this, I ~~have~~ didn't put the work!"

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Student Reflection and Metacognition

I think I ~~shoud~~ should get a score in the range of 64-70 because for my test I forgot some vocabulary in the Problems 4 and 8 which is the ~~add~~ copier size factor and that it is pretty much kind of difficult for me in those problems. I ^{also} think I should get that score because I have alot of problems wrong and that I didn't practice / study for the ~~test~~ test at all. I also had the issue on remembering the rule and forgetting ALL about the flag pole problem.

Technology

Formative/Padlet

[<](#) IAR Practice

[Edit](#) [Assign](#) [View Responses](#)

Guest Code: EXDRWD [i](#) [🔖](#) [👤](#) [Preview](#) [LS](#)

[show names](#) [export](#) [A Z sort](#)

Totals 1 **2**

+ On which question/topic did you struggle (if any)? Feel free to state more than one.

✓ Guest Students	open	<div><div></div></div> 0/1 (0%)
✓ 301-6	open	<div><div></div></div> 0/20 (0%)
✓ 302-6	open	<div><div></div></div> 0/22 (0%)
✓ 303-6	open	<div><div></div></div> 0/22 (0%)
^ 304-7	open	<div><div></div></div> 0/33 (0%)

The question I struggled was about a problem that talks about mean change. Another question I'm struggling with questions that have an equation that says, "-48xyz-24xy+40xyz."

I struggled on when the problem asked me to find anything like "how many foot does she need to cut to get to another specific foot", but they gave me a fraction that's less than one as the unit rate. As I tried to do the problem by using logical thinking, I realize how to solve it, but I still don't know whether if there's an easier method. I also struggled on question one which was about the pine tree and maple tree. I understood how to graph but it got very confusing because of the way they made me plot the graph, which I still don't know how to plot it.

I struggle on the question on 11. It asks me how many small length of 0.25 inch cubes fit inside a right rectangular prism.

I struggled in question 2, because i wasn't good at fractions, and talked about James board was $\frac{3}{4}$ foot long and he cut the board to pieces and each are $\frac{1}{8}$ foot long, and they wanted me to find how many pieces

The dividing with big numbers such as 59324 divided by 138 or something, it just got confusing for me for all the numbers there are in the quotient. I think the 6th Grade topic 1 practice test, I could only put a 5 digit

I struggle nothing but focus on what method I should use to get myself right with the question.

Formative/Padlet

I struggle on question number three and question number six in 5th-grade Unit 3, because of all the language that they use on the question. All those words make the question hard not the math just I need to understand the questions.

I think is question number 1, and 11, because I don't very understand how to do it, it asks me if it has how many mystery books and how many nonfiction books, also it gave me some number which was 2,3,4,6 and I select 6 on mystery books and 3 on nonfiction books. Question number 11 is the fraction question it confuses me because it is about the area of a cube, I don't very understand how to calculate it so I confuse of it.

Formative/Padlet

nothing it is just that usually people put the formula in lowercase

Big B is area of base in geometry while little b is not the base and is something else like variable?

Desmos--Polygraph

How Polygraph Works:



+



1. Practice

Each student plays a practice round against the computer to learn how the game works.



+



2. Play

Next, students are paired with a classmate to play polygraph with mathematical cards. One person chooses a card; their partner asks yes/no questions in order to narrow a field of cards down to one.



+



3. Reflect

Between rounds, students answer questions that focus their attention on vocabulary and strategy.

Desmos--Polygraph

Hey, students!

Go to student.desmos.com

and type in:

D8S9BF

Desmos

Questions Asked: 2

Your partner: Kaylee

YOU ASKED
Is the slope greater than 0?

KAYLEE CHOSE
No

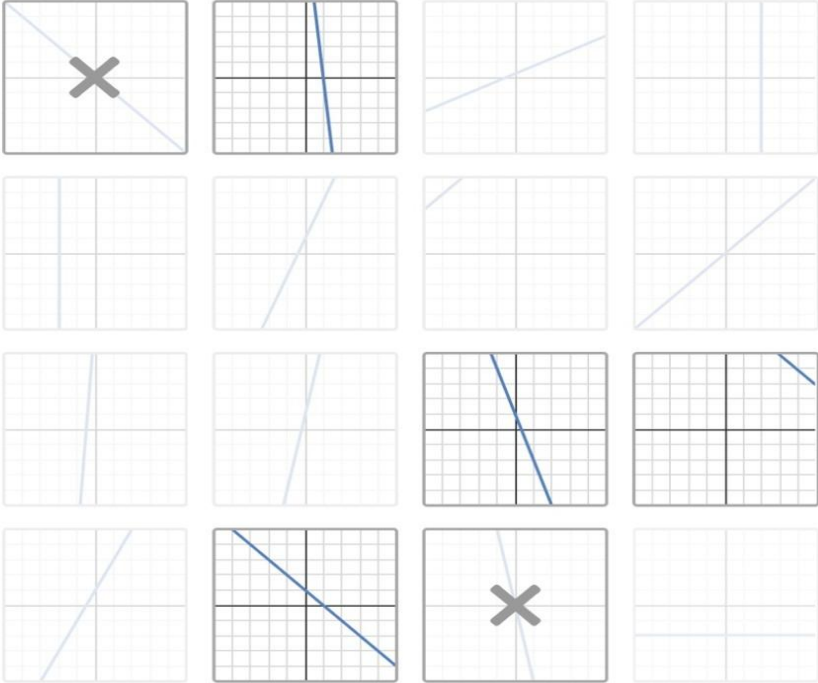
YOU ELIMINATED

YOU ASKED
Does it cross the origin?

KAYLEE CHOSE
No

Select graphs to eliminate based on Kaylee's answer. Then press the button below.

Eliminate Selected



Games

Games

- Promote **Math** Talk.
- Develop Strategic Thinking.
- Provide an Alternative Way to Review.
- Encourage Cooperative Learning.
- Increase Student Engagement and Motivation. ...

General Strategies

Avoid Cold Calls

- Don't call on one student. Instead ask the question of all students allowing a turn and talk. This allows students to rehearse their speak and clarify their understanding before you direct the question to a single student.
- Use technology to allow all students to answer.
 - Padlet (written language)
 - Flipgrid (oral language)
 - GoFormative (written language)

Student Suggestions

- Support Sense Making
- Optimize Output
- Cultivate Conversation
- Maximize linguistic and meta-awareness

Use Vocabulary Anchor Charts

- Using anchor charts makes the vocabulary readily accessible for the students.



Questions





Comments: ~~Ms.~~ Ms. Sumifa
thanks for bring it
up the talk I learn
a lot and I wish
~~to~~ we can do it
every day but (thank
you god for ms. Sumifa
as math teacher)

**Get
them
talking!**