

**HIGHER DOK
PROBLEMS THAT WILL
GET YOUR STUDENTS
TALKING**

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- ▶ Learn how to find rich resources and facilitate students talking.
- ▶ Specifically, construct viable arguments and critique the reasoning of others.

SESSION GOAL

At your table,

- ▶ Introduce yourself
- ▶ Tell your group your favorite candy
- ▶ Try and convince your group your favorite candy is, in fact, the BEST
- ▶ And/or why the others' choice of candy is NOT the best

How does this differ if I were to change the directions to:

Which candy was chosen as America's favorite?

Explain

WHICH CANDY IS THE BEST?

Then...

- ▶ Focus was on the solution
- ▶ Students were expected to solve the problem using the MOST efficient method to find that solution, which the teacher showed.
- ▶ Once I found my solution, I moved on to the next problem
- ▶ My reasoning was not valued as much as the solution

Now...

- ▶ Focus is on the reasoning
- ▶ Encourage students to find multiple paths to the solution
- ▶ Understand how those paths are connected
- ▶ MP3: Construct viable arguments and critique the reasoning of others

BACK IN THE DAY: HOW DID YOU
LEARN MATH?

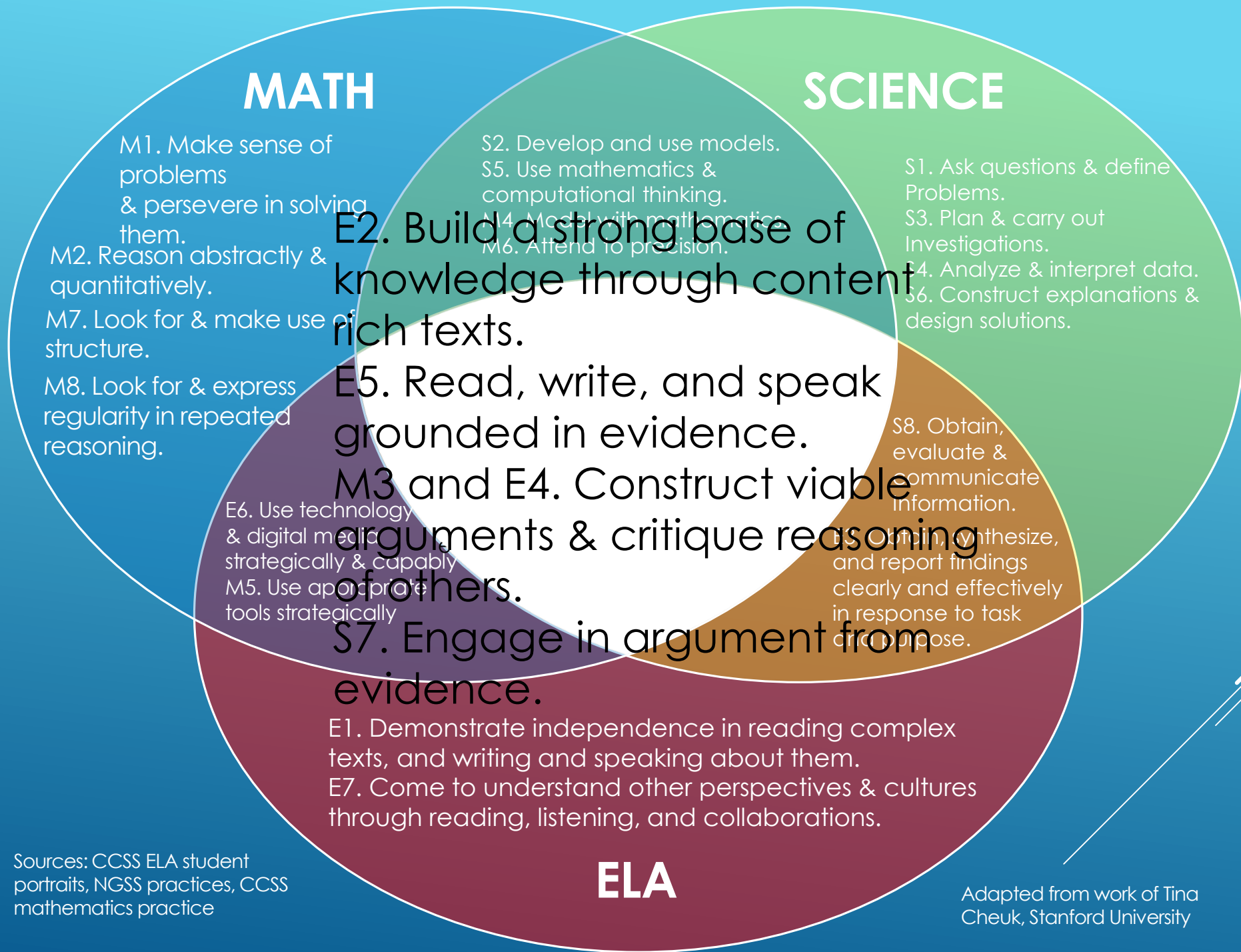
Productive student talk looks like...

- ▶ Students CONVINCING each other that they are right, or the other is wrong
- ▶ Students explaining how their method is connected to another student's method
- ▶ Student explaining why the method works
- ▶ The How's and the Why's

Productive student talk does NOT look like...

- ▶ Students explaining the steps of a procedure
- ▶ Students explaining their solution using a trick (nixthetricks.com)
- ▶ Students off task =)
- ▶ The What's

WHAT DOES PRODUCTIVE STUDENT TALK LOOK LIKE?



MATH

- M1. Make sense of problems & persevere in solving them.
- M2. Reason abstractly & quantitatively.
- M7. Look for & make use of structure.
- M8. Look for & express regularity in repeated reasoning.

- E6. Use technology & digital media strategically & capably
- E5. Use appropriate tools strategically

SCIENCE

- S1. Ask questions & define Problems.
- S3. Plan & carry out Investigations.
- S4. Analyze & interpret data.
- S6. Construct explanations & design solutions.

- S8. Obtain, evaluate & communicate information.

- S9. Obtain, synthesize, and report findings clearly and effectively in response to task and purpose.

ELA

E2. Build a strong base of knowledge through content rich texts.

E5. Read, write, and speak grounded in evidence.

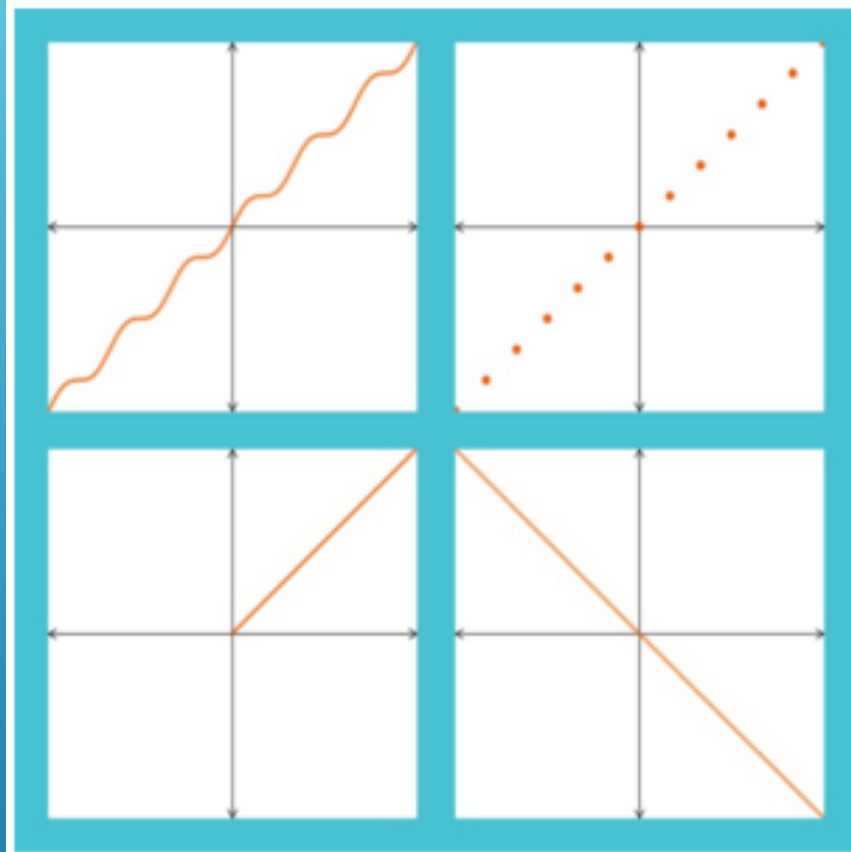
M3 and E4. Construct viable arguments & critique reasoning of others.

S7. Engage in argument from evidence.

- E1. Demonstrate independence in reading complex texts, and writing and speaking about them.
- E7. Come to understand other perspectives & cultures through reading, listening, and collaborations.

Sources: CCSS ELA student portraits, NGSS practices, CCSS mathematics practice

Adapted from work of Tina Cheuk, Stanford University



WHICH ONE DOESN'T BELONG?

WODB.CA @WODBMATH BY @MARYBOURASSA

circle: The set of points in a plane that are a given distance from a given point in the plane. The given point is the *center*, and the given distance is the *radius*.

triangle: The figure formed by three segments joining three noncollinear points. Each of the three points is a *vertex* of the triangle and the segments are the *sides*.

polygon: A plane figure formed by coplanar segments (*sides*) such that (1) each segment intersects exactly two other segments, one at each endpoint; and (2) no two segments with a common endpoint are collinear. (p. 101)

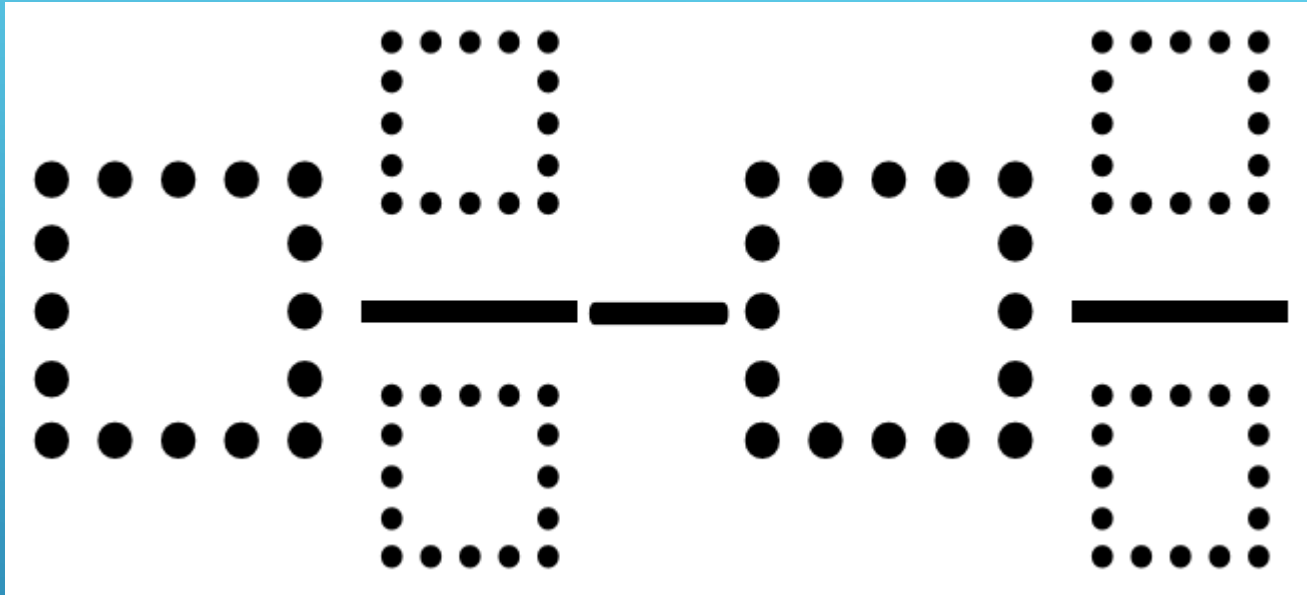
- ▶ With you
- ▶ Triangle
- ▶ Circle
- ▶ Polygon

VOCABULARY WITH SAM SHAH
SAMJSHAH.COM @SAMJSHAH

Directions:

Write at least two linear equations so that the solution of the system of equations of that line and $4x + y = 8$ is $(3, -4)$

OPEN MIDDLE PROBLEM
OPENMIDDLE.COM



DIRECTIONS: MAKE THE SMALLEST DIFFERENCE BY FILLING IN THE BOXES USING THE WHOLE NUMBERS 1-9 NO MORE THAN ONE TIME EACH.

Directions:

What is the least number of geometric markings needed to demonstrate that a quadrilateral is a square?

OPEN MIDDLE PROBLEM
OPENMIDDLE.COM

A decorative graphic consisting of several parallel white lines of varying lengths, slanted diagonally from the bottom right towards the top right, located in the lower right quadrant of the slide.

- ▶ Find Rich tasks that encourage math fights
 - ▶ Ask the HOW's and the WHY's
 - ▶ Steve Leinwand says make the following mantras in your class
 - ▶ Why?
 - ▶ How do you know?
 - ▶ Can you explain?
 - ▶ Matt Larson added: Do you agree? Disagree?
 - ▶ Get students to connect their strategies
-
- ▶ Be Gentle with yourself. If this is something new, it takes time to adjust

IMPLEMENTING STRATEGIES

- ▶ OpenMiddle.com - Robert Kaplinsky @robertkaplinsky and Nanette Johnson
- ▶ Which One Doesn't Belong: WODB.ca Mary Bourassa
- ▶ Estimation180.com - Andrew Stadel @mr_stadel
- ▶ FawnNguyen.com – Fawn Nguyen @fawnpnguyen
- ▶ Would You Rather? wyrmath.wordpress.com – John Stevens @Jstevens009
- ▶ MathMistakes.org – Michael Pershan @mpershan
- ▶ Nixthetricks.com – Tina Cardone @crstn85
- ▶ TONS MORE ON TWITTER!!! #MTBoS

RESOURCES

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 [@Math_M_Addicts](https://twitter.com/Math_M_Addicts)

OpenMiddle.com

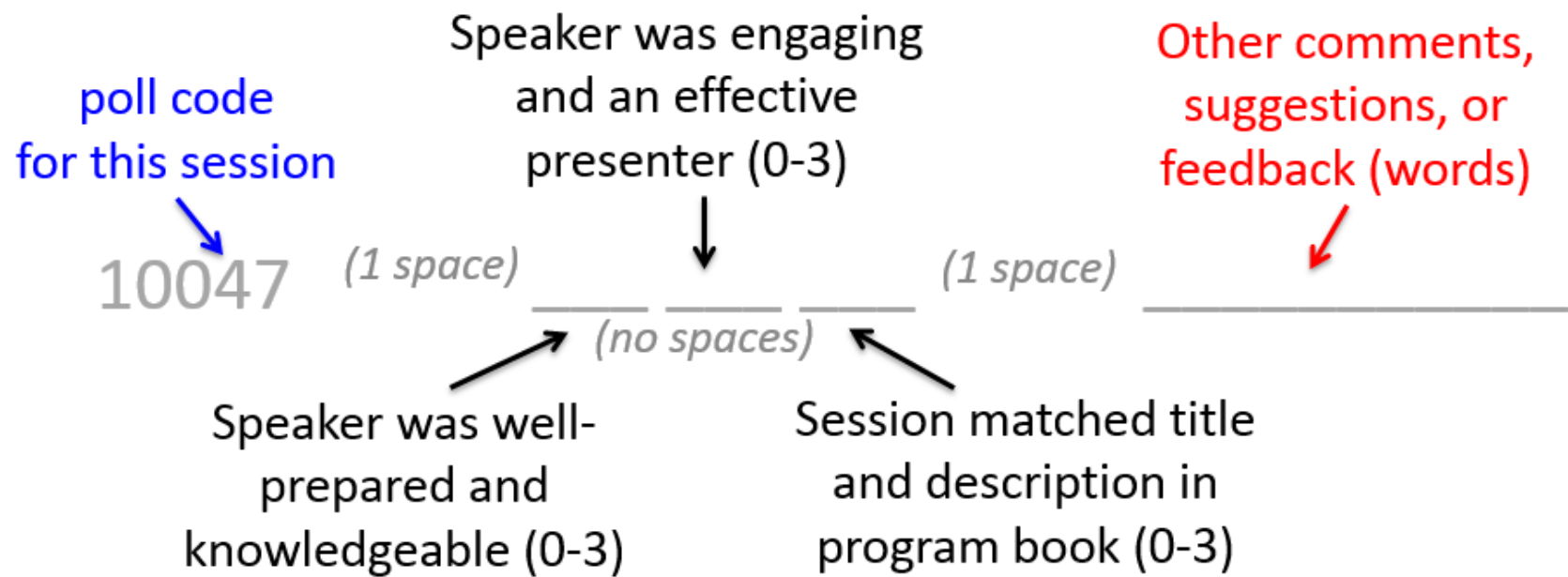
MathMAddicts.net

THANK YOU!



Strongly Disagree	Disagree	Agree	Strongly Agree
0	1	2	3

Send your text message to this Phone Number: 37607



Example: 38102 323 **Inspiring, good content**

Non-Example: 38102 3 2 3 Inspiring, good content

Non-Example: 38102 3-2-3Inspiring, good content