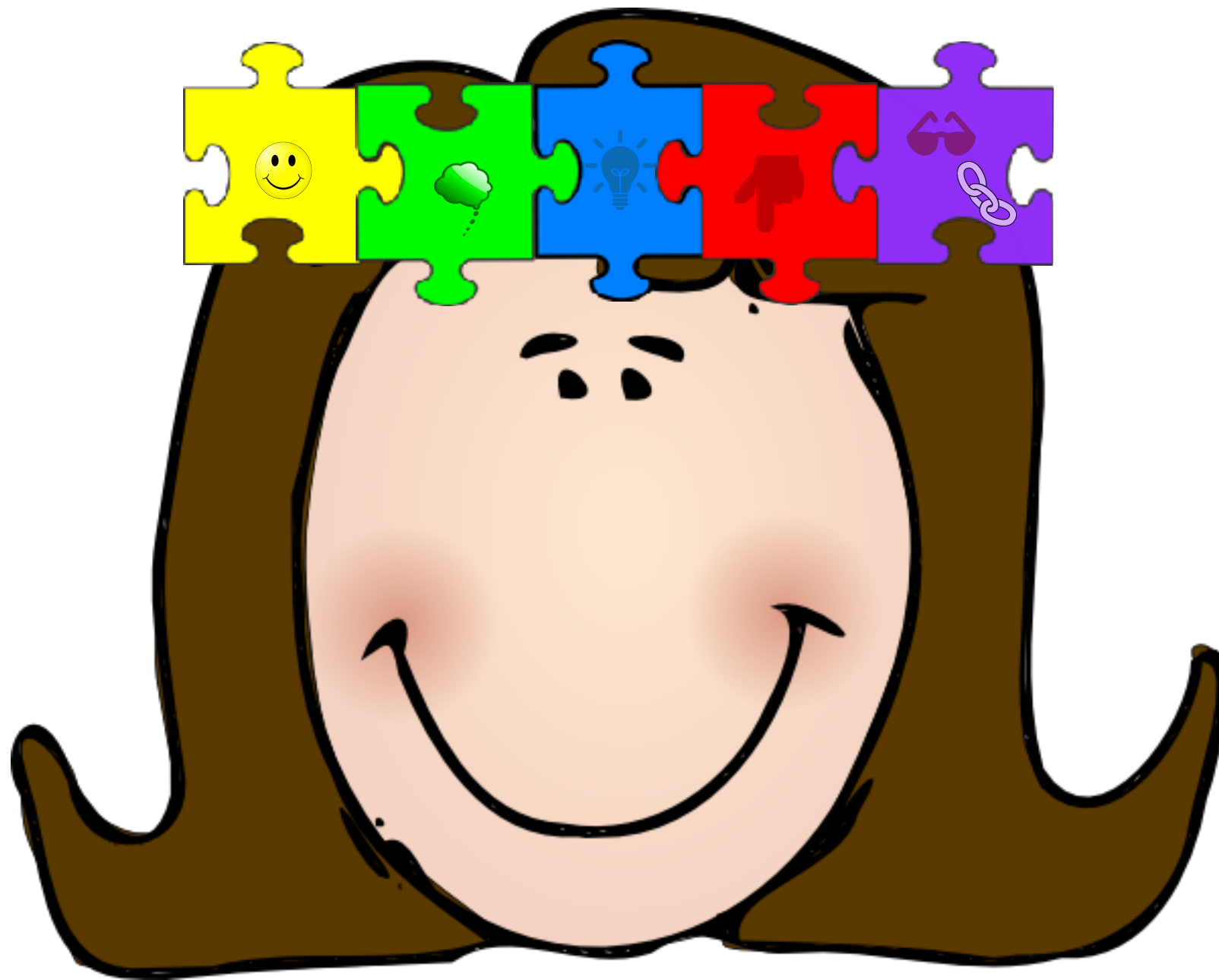


What does it mean to be a Young MATHEMATICIAN?



UBC ~ November 23th 2016
Presented by Jennifer Barker

A little about Me...

- I teach in Surrey as an Early Numeracy Teacher
- Have 18 years experience in classrooms K - 5
- Mom to M&M, aged 13 and 11
- Twitter: @BarkerJbarker
- www.meaningfulmathmoments.com
- Email: barker_jennifer@surreyschools.ca
- Believe Math should be meaningful, authentic, engaging and build conceptual understanding



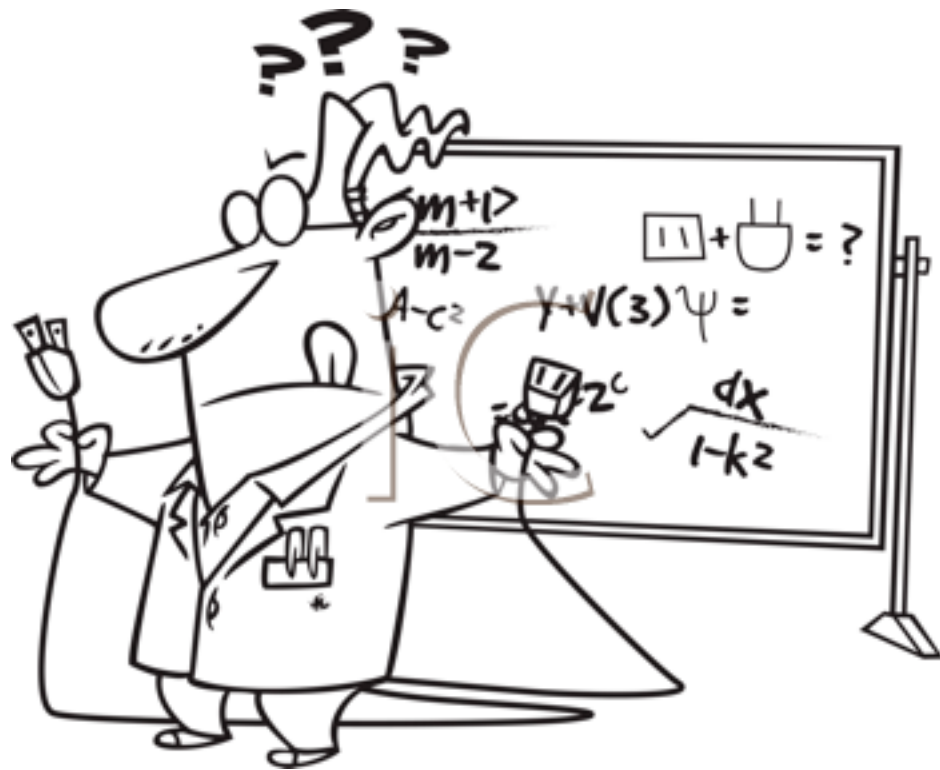
Learning Intentions

- I understand what it means to be a Mathematician.
- I understand the importance of assisting my students to see themselves as Mathematicians.
- I know how to plan learning intentions that connect the curricular competencies to the content, ultimately leading to understanding the big math ideas.
- I have some ideas I would like try!



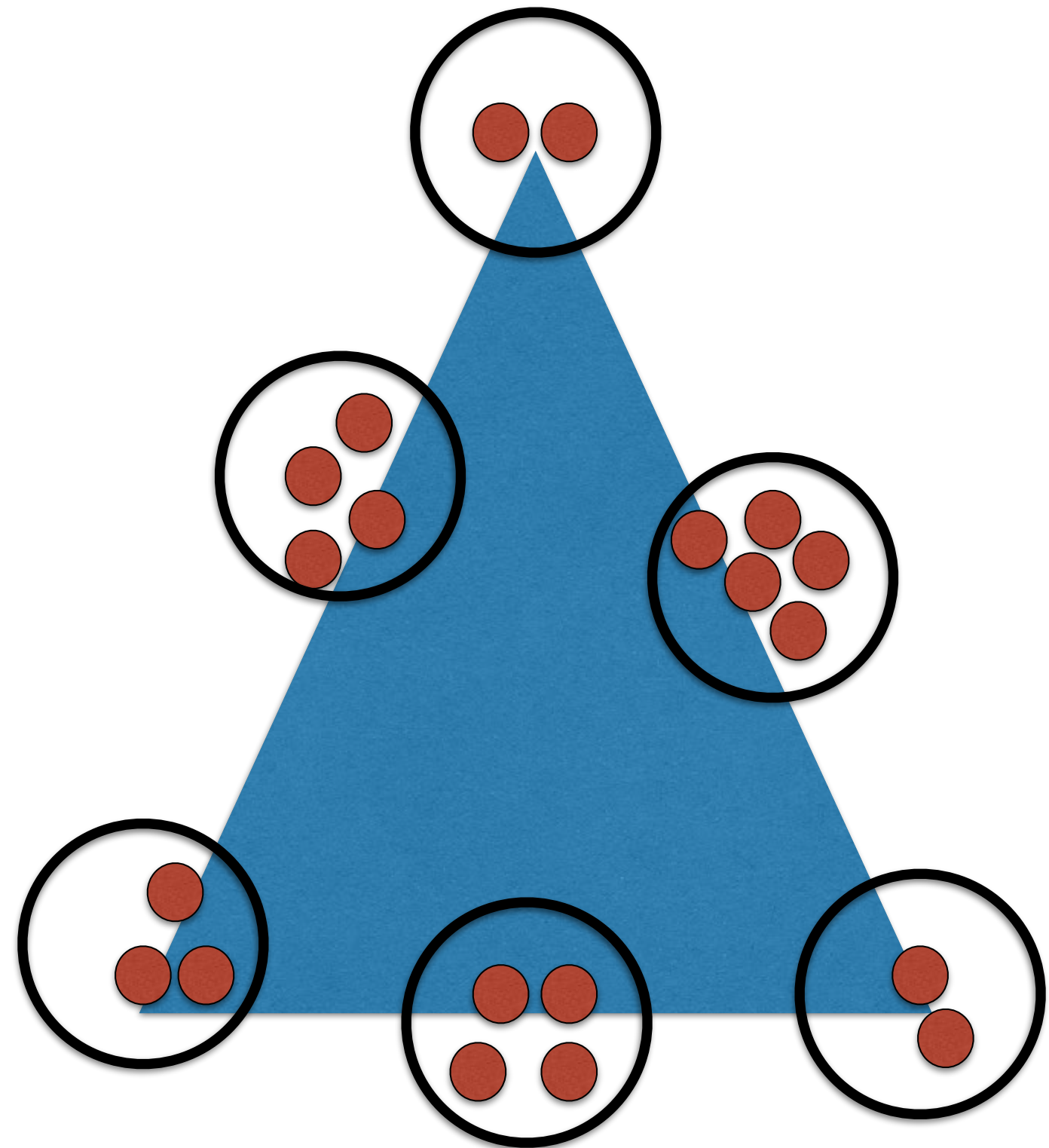
60 Second Write

- What is your definition of a Mathematician?



Let's engage as Mathematicians!

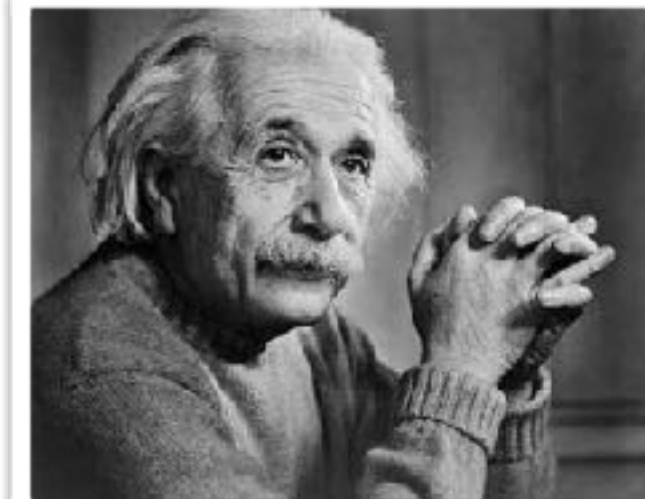
- At your tables you have some triangles with six different piles of counters.
- Each side of the triangle has a total of nine counters.
- Add 1 more counter to ONE of the piles so that the total number of counters on each side remains 9. You are allowed to move the counters from circle to circle but not remove any entirely.



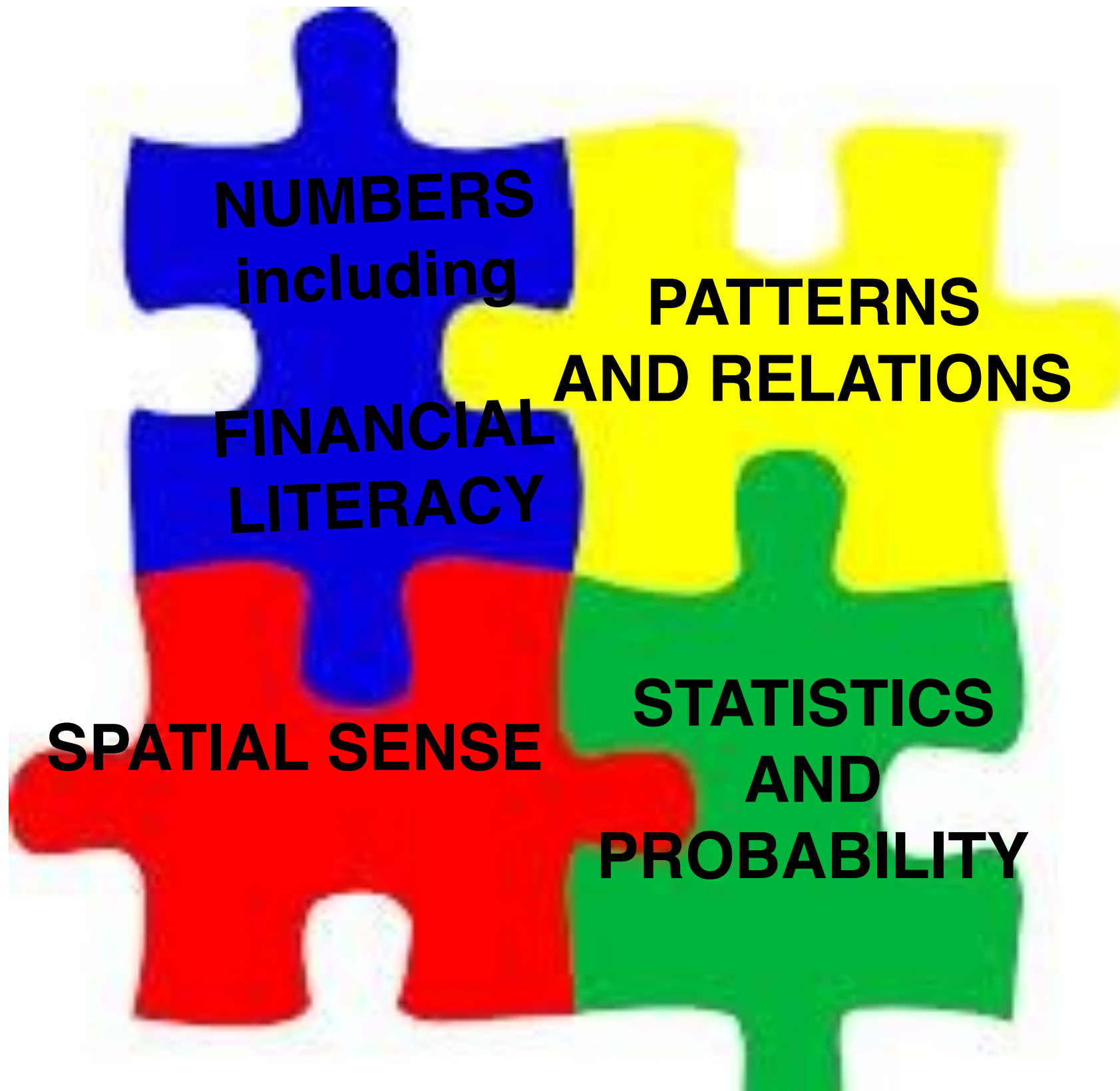
What “powers” did you just use
as a Mathematician?

Great Mathematicians are
NOT determined by how
many answers they know...
but how they behave when
they don't know.

- Anonymous



How does this relate to the
new curriculum?



Competency Driven

Herein lies the shift!



Communication -The communication competency encompasses the set of abilities that students use to impart and exchange information, experiences and ideas, to explore the world around them, and to understand and effectively engage in the use of digital media.

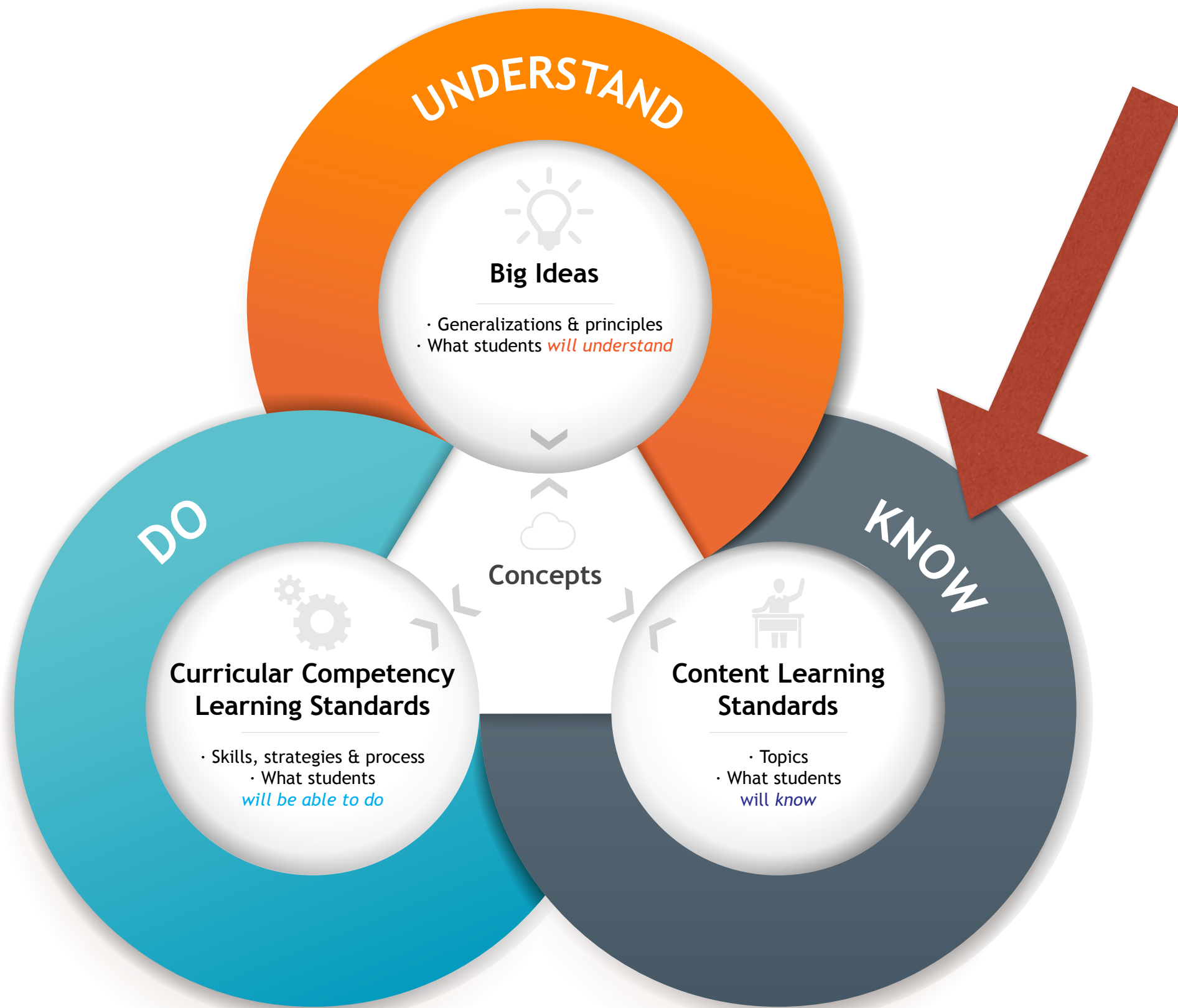


Thinking - The thinking competency encompasses the knowledge, skills and processes we associate with intellectual development. It is through their competency as thinkers that students take subject-specific concepts and content and transform them into a new understanding. Thinking competence includes specific thinking skills as well as habits of mind, and metacognitive awareness.



Personal and Social - Personal and social competency is the set of abilities that relate to students' identity in the world, both as individuals and as members of their community and society. Personal and social competency encompasses the abilities students need to thrive as individuals, to understand and care about themselves and others, and to find and achieve their purposes in the world.

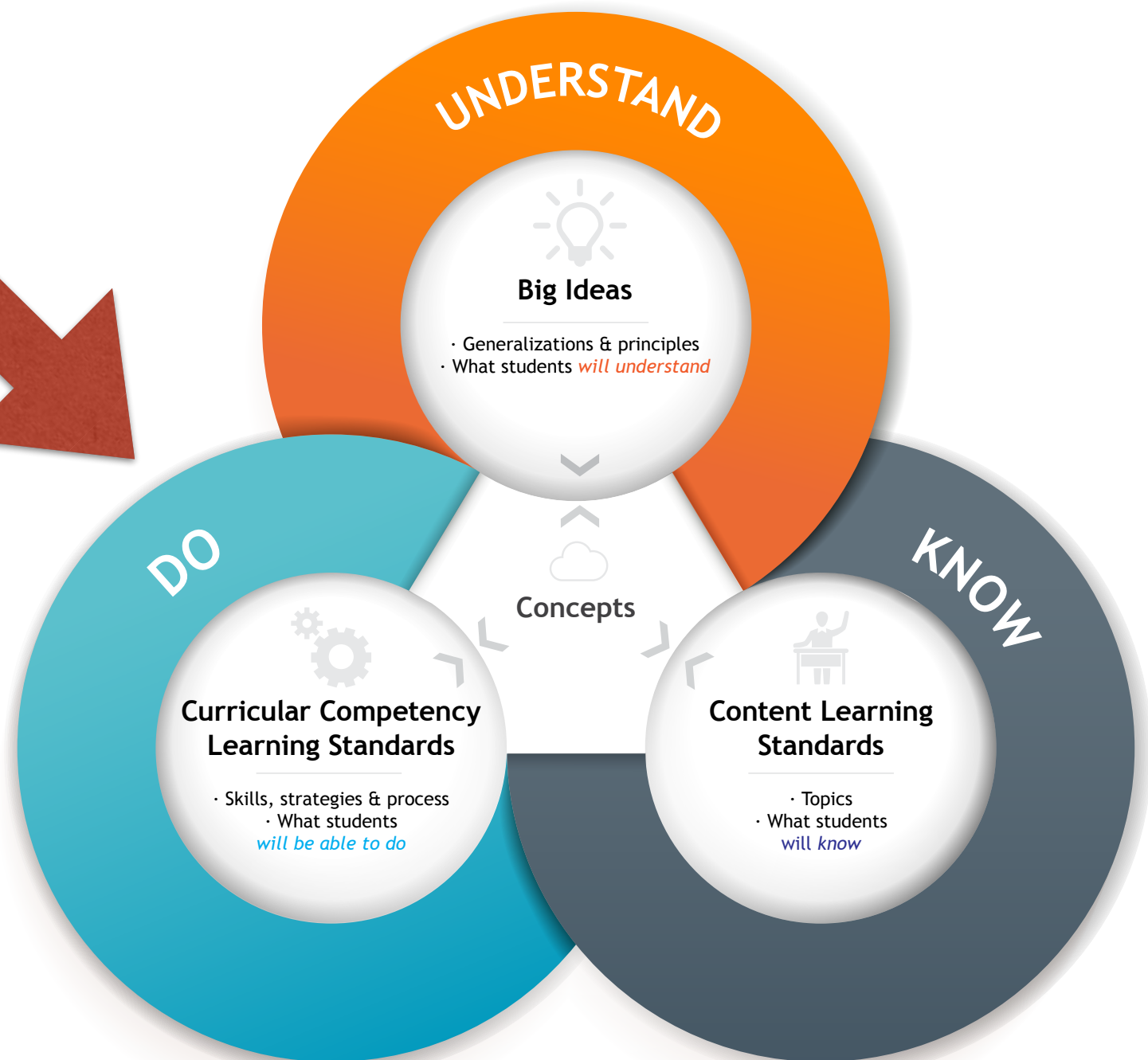
No longer focussed solely on CONTENT



We are now placing emphasis on the DOING of Mathematics!

Curricular Competencies

(Do) The skills, strategies, and processes that students develop over time.



Competencies should be used every day!

- Core competencies are evident in every area of learning; however, they manifest themselves uniquely in each discipline.
- Competencies come into play when students are engaged in “doing” in any area of learning.
- This includes activities where students use thinking, collaboration, and communication to solve problems, address issues, or make decisions.

What are the Mathematical curricular competencies?

Thinking

Reasoning and analyzing

- Estimate reasonably
- Develop mental math strategies and abilities to make sense of quantities
- Use reasoning and logic to explore and make connections

Understanding and solving

- Use multiple strategies to engage in problem solving (e.g., visual, oral, role-play, experimental, written, symbolic)
- Develop, construct, and apply mathematical understanding through role-play, inquiry, and problem solving
- Engage in problem-solving experiences that are connected to place, story, and cultural practices relevant to the local community

Communicating and representing

- Communicate in many ways (concretely, pictorially, symbolically, and by using spoken or written language to express, describe, explain, and apply mathematical ideas)
- Describe, create, and interpret relationships through concrete, pictorial, and symbolic representations
- Use technology appropriately to explore mathematics, solve problems, record, communicate, and represent thinking

Understanding

Communicating

Connect and Reflect

Connecting and reflecting

- Visualize and describe mathematical concepts
- Connect mathematical concepts to each other and make mathematical connections to the real world (e.g., in daily activities, local and traditional practices, the environment, popular media and news events, cross-curricular integration)
- Share and reflect upon mathematical thinking
- Draw upon local First Peoples knowledge and/or expertise of local Elders to make connections to mathematical topics and concepts

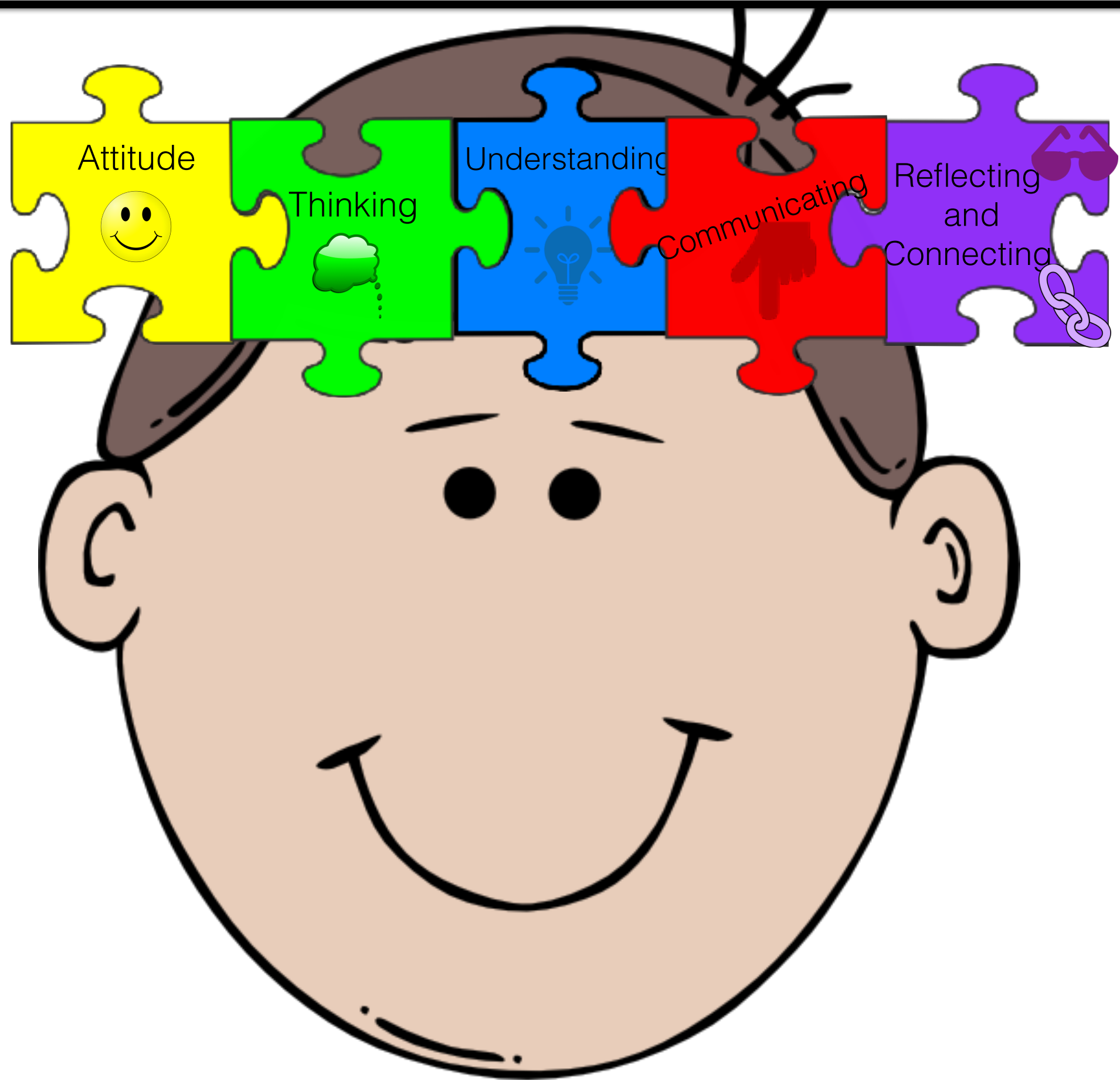
Not to be forgotten

Attitude



Personal and Social - Personal and social competency is the set of abilities that relate to students' identity in the world, both as individuals and as members of their community and society. Personal and social competency encompasses the abilities students need to thrive as individuals, to understand and care about themselves and others, and to find and achieve their purposes in the world.

Powers of a Mathematician or Habits of Mind



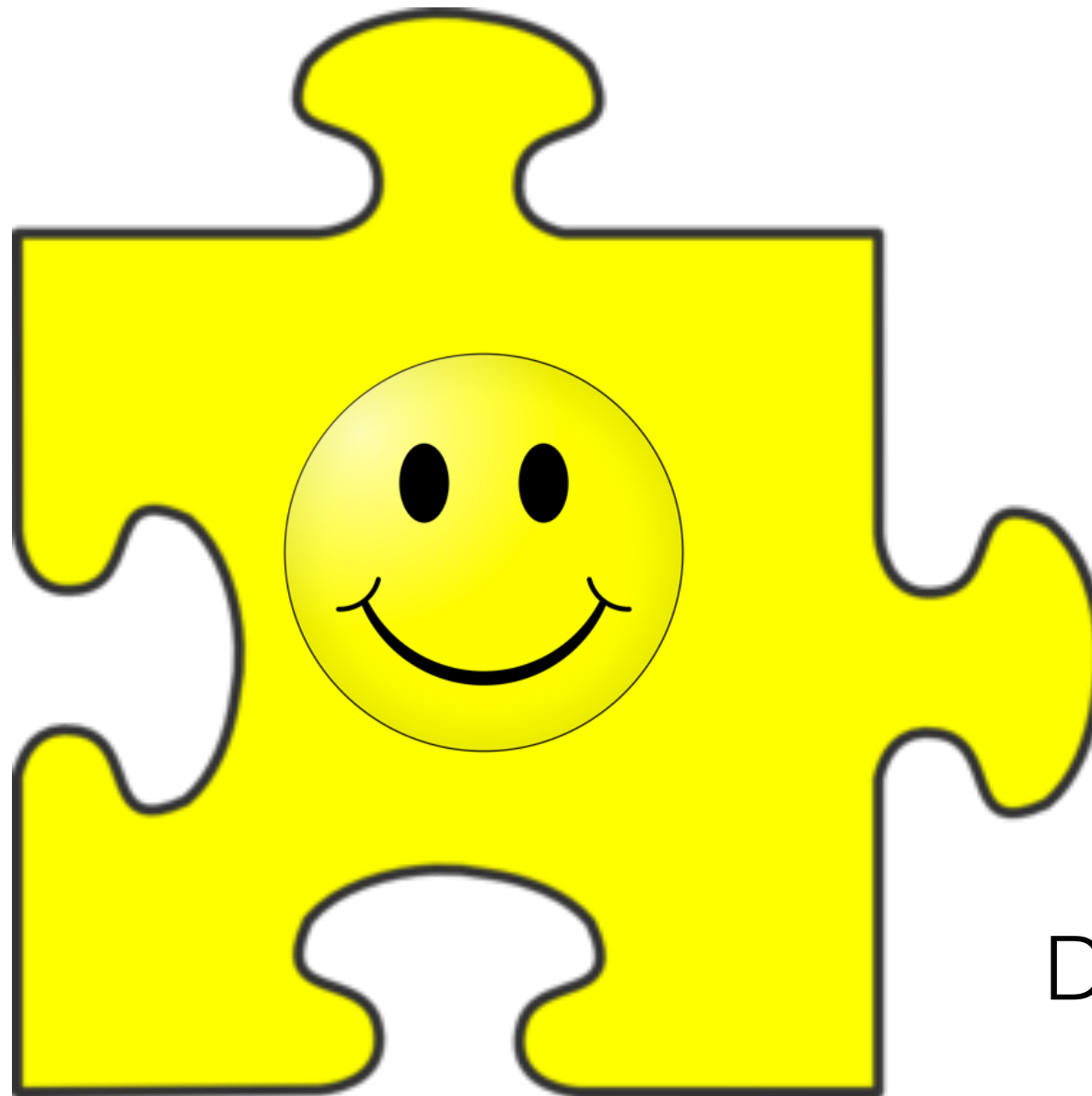
Attitude

We want students who:

Like and enjoy
Math

Engage

Take risks



Give their
best effort

Keep going

Don't give up

Build a Safe Community



Lessons that provided an entry point for all and allow each student to work to their potential

Learning Intentions for:

ALL

SOME

FEW

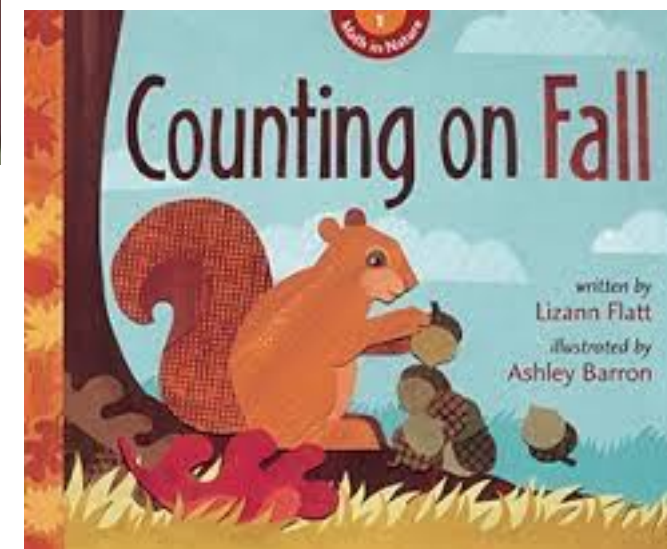
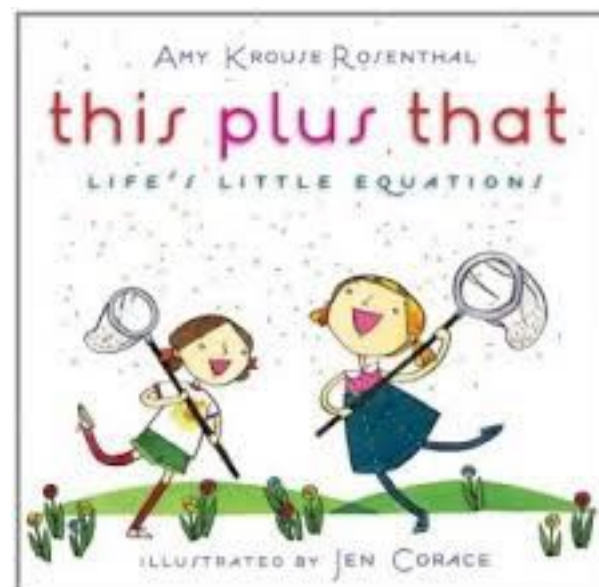
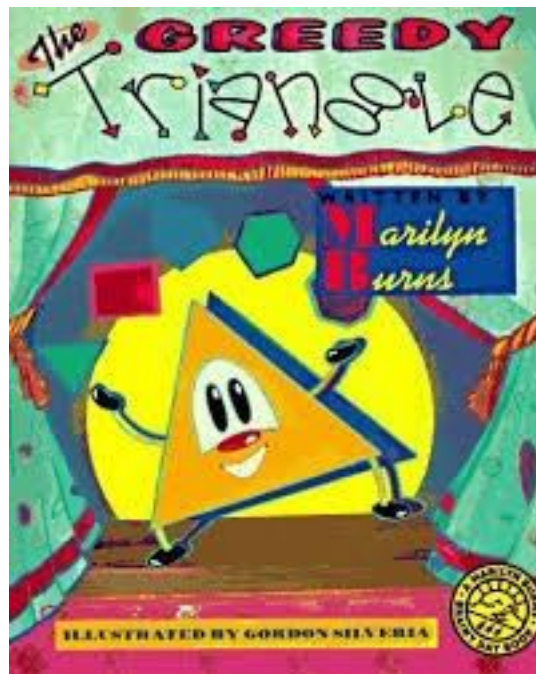
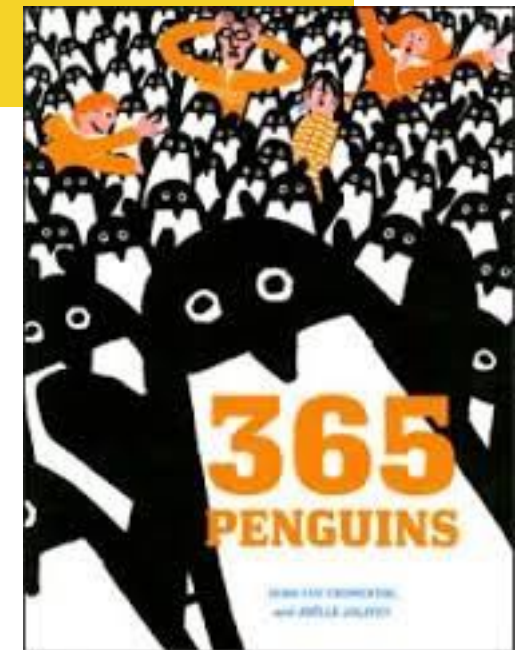
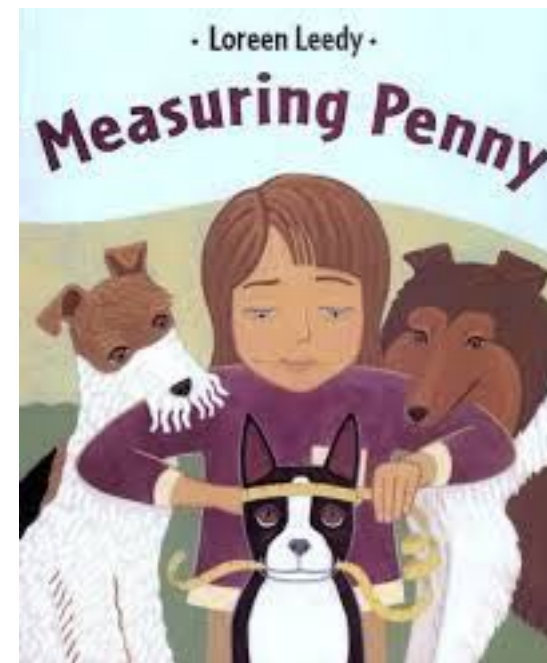
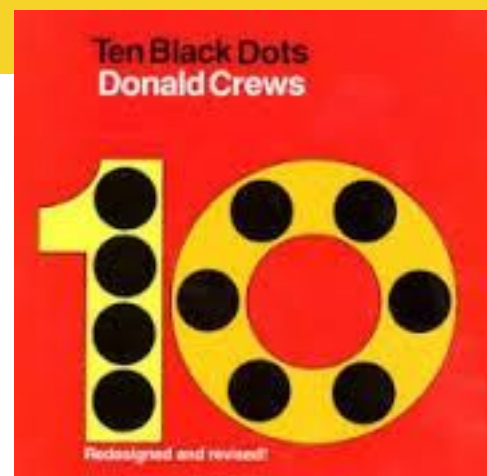
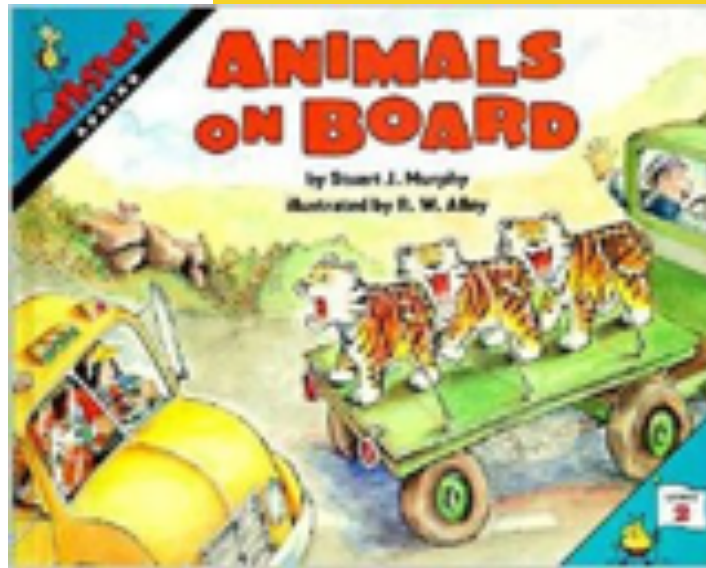


Students need to see mistakes
as learning opportunities!



Mathematicians revise their answers
as they get more information!

Engaging Literature

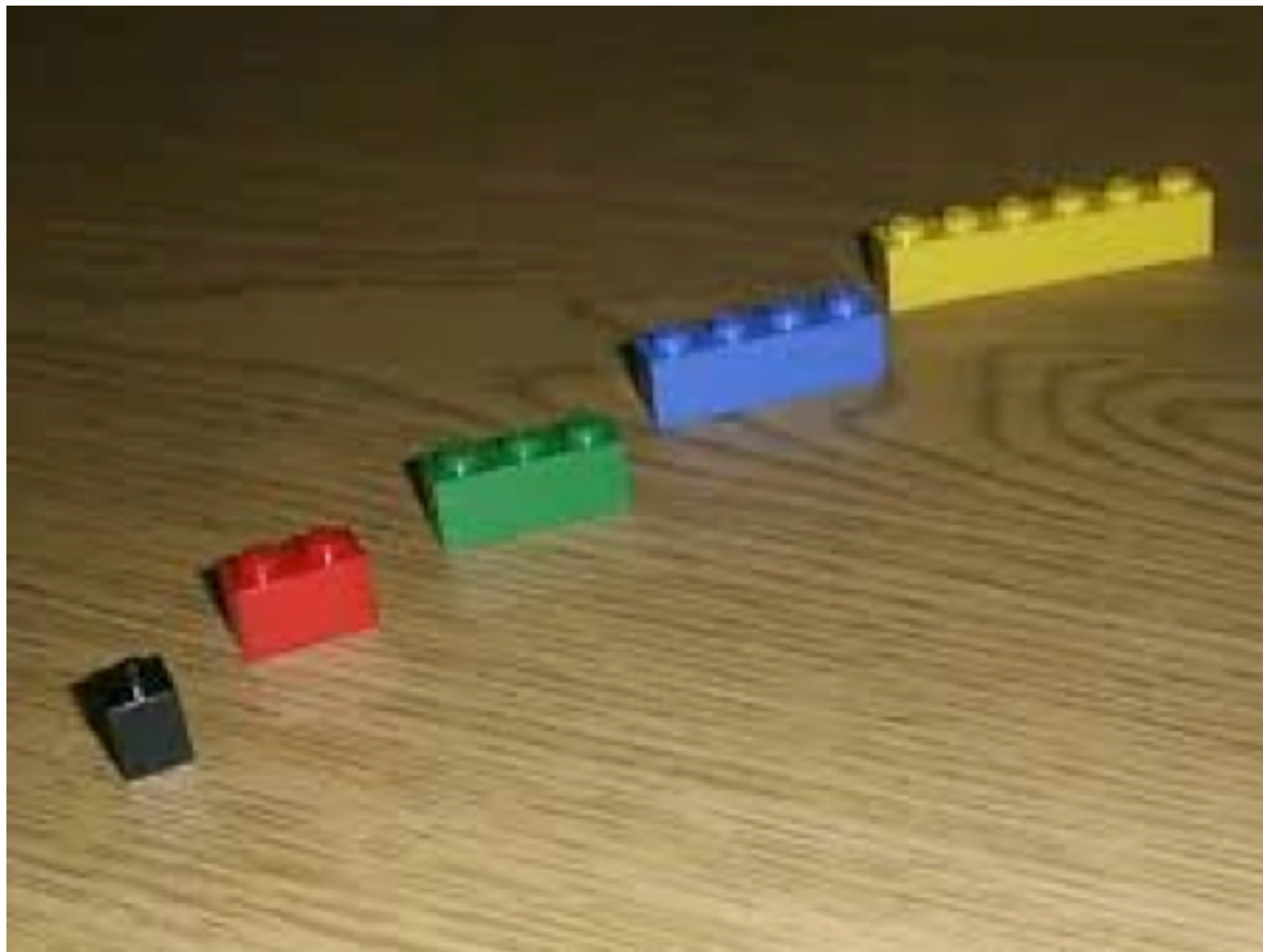


Engaging Materials



Connected to Students Interests





Problem: Using Lego pieces how many different ways can you make 6? Try to record your designs using pictures, numbers, and words.

Extension: Increase the number you ask the students to represent (e.g., 12, 24, 36)

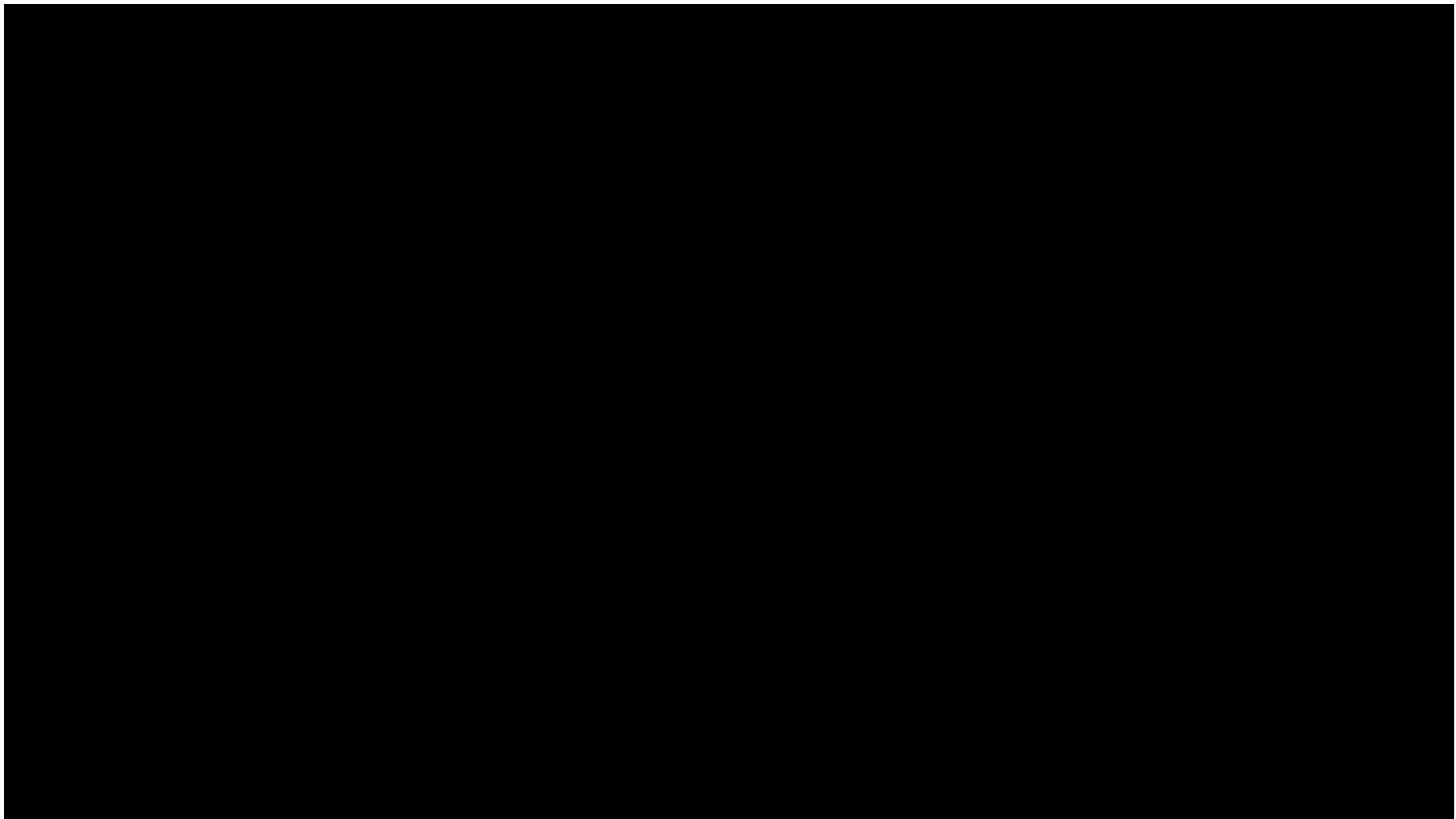
Real World Connections



Sharon "I picture fractions when I think of sharing cookies". (Gr. 3)



Ruby "I picture fractions when I see cars". (Gr. 4)



ATTITUDE



I

Enjoy doing Math

I give my best effort

Keep going and don't give up

Wonder and ask questions

Thinking

We want students who can:

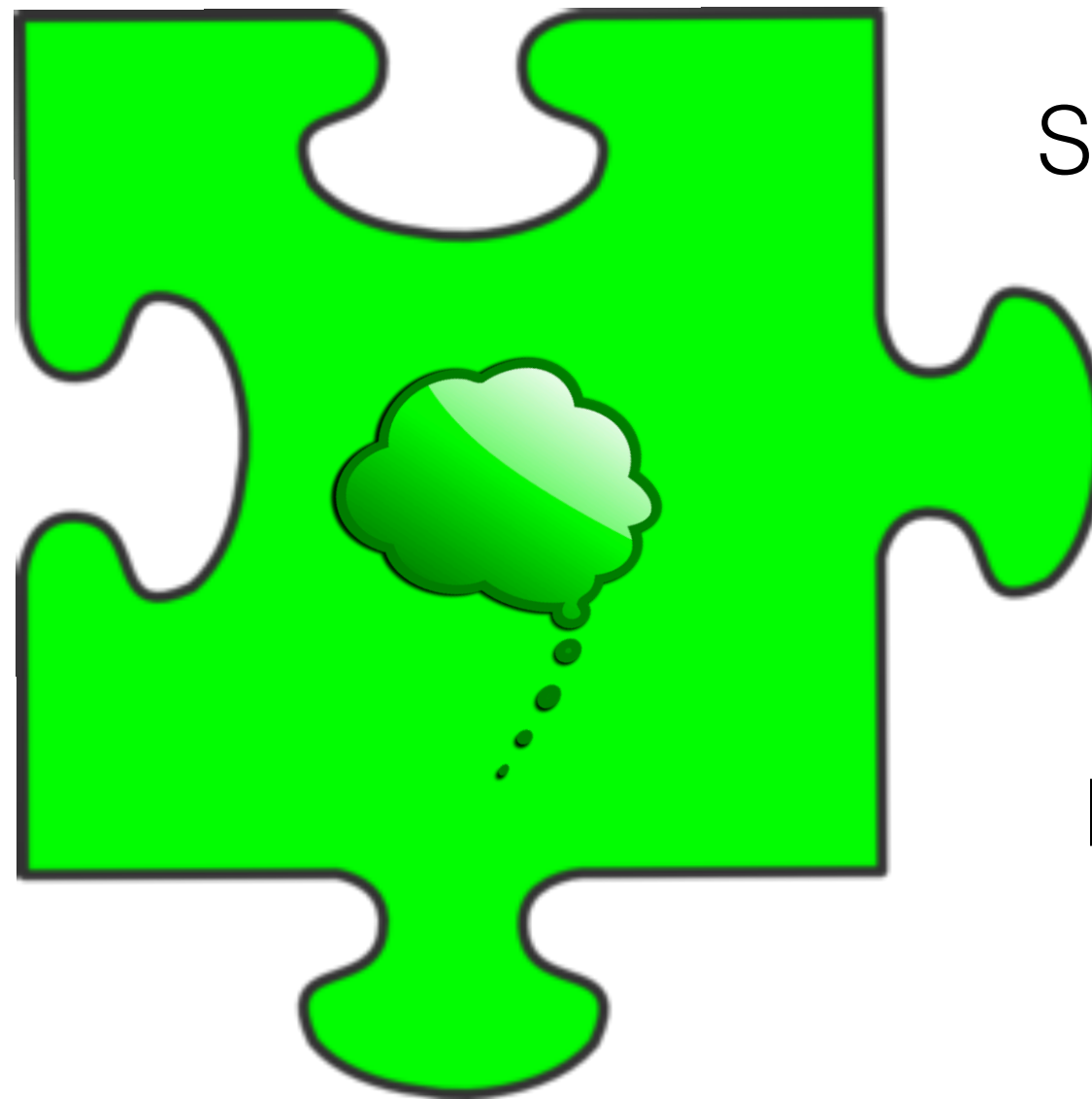
Make sense of a
question

See the question in
their mind
(Visualize)

Estimate/
Guess

Look for patterns

Ask themselves what they know



Build THINKING time in the the lesson



Who remembers a question we did that is similar to this?

Think - Pair - Share

Hold up one finger if you have one strategy
you think you could use... hold up two

Close your eyes and picture the question.
What do you see in your mind?

Show with your fingers... no call outs.
Don't rob your friends of thinking time!

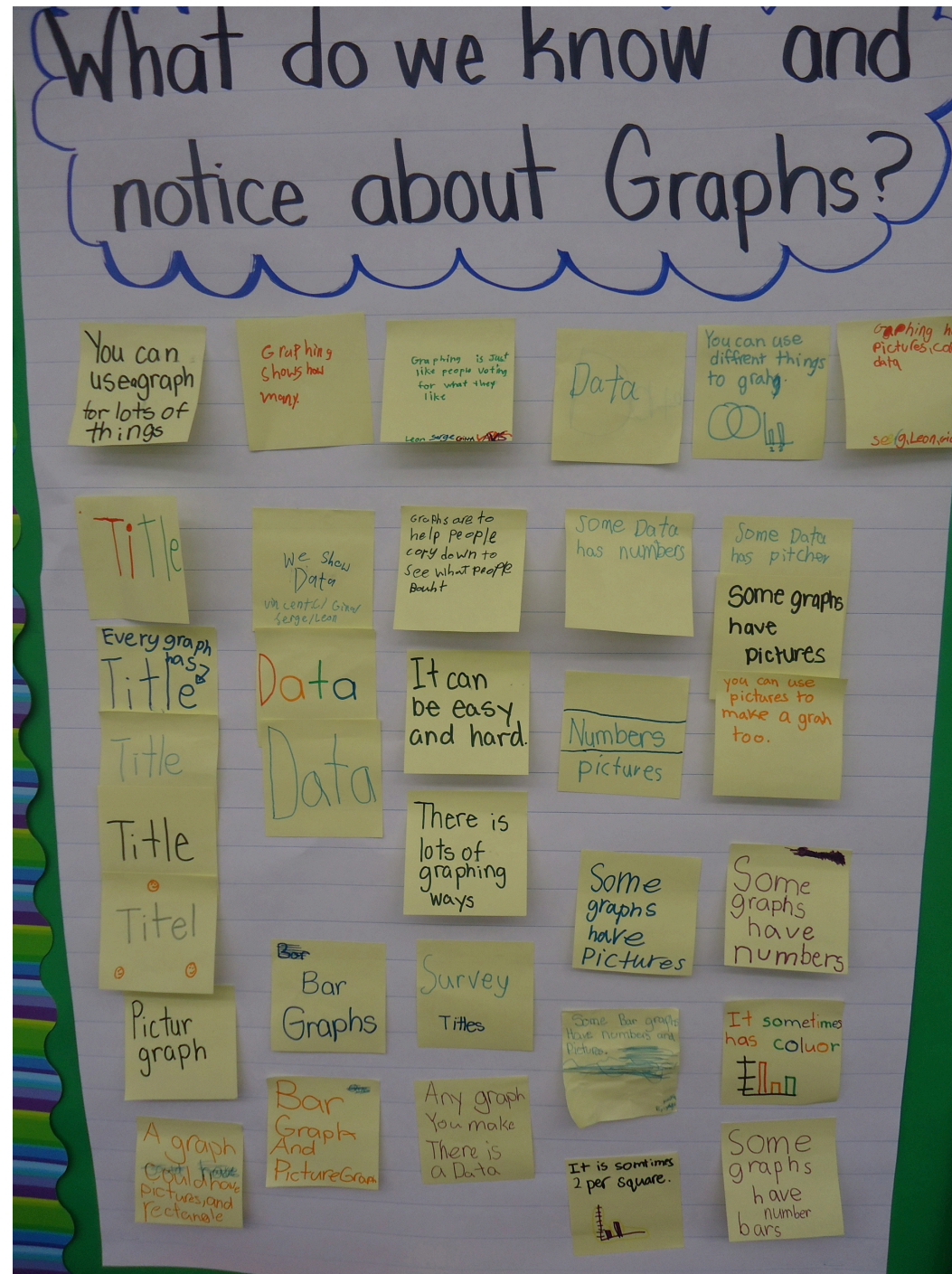
Back to Back: Face to Face



Take time by yourself to think about the problem. What does it remind you of? What strategy do you think you could try?



Now turn and talk to your partner and explain what you are thinking.



Access prior knowledge through quick writes!

NUMBERLESS Problems

- Pose the problem with the numbers removed
- Ask the students to explain the context “What is happening?”
- Then ask “What do you notice?”
- And “What do you wonder?”

**Julie had some chocolate bars.
Her brother Steve had fewer chocolate bars than Julie.**

What math do you see in this problem?

What do we know already?

Do you have any estimates?

Julie had 8 chocolate bars.
Her brother Steve had fewer chocolate bars than Julie.

Hmm, does this change what we know?

So what does this tell us?

How might we figure out how many chocolate bars Steve has?

Julie had 8 chocolate bars.

Her brother Steve had 2 fewer chocolate bars than Julie.

Hmm, does this change what we know?

So what does this tell us?

How might we figure out how many chocolate bars Steve has?

THINKING



I CAN

Make sense of the question

See the question in my mind

Estimate an answer

Ask myself what I know

Revise my answers

Understanding

We want students who can:

Engage in Math

Use
strategies
they know

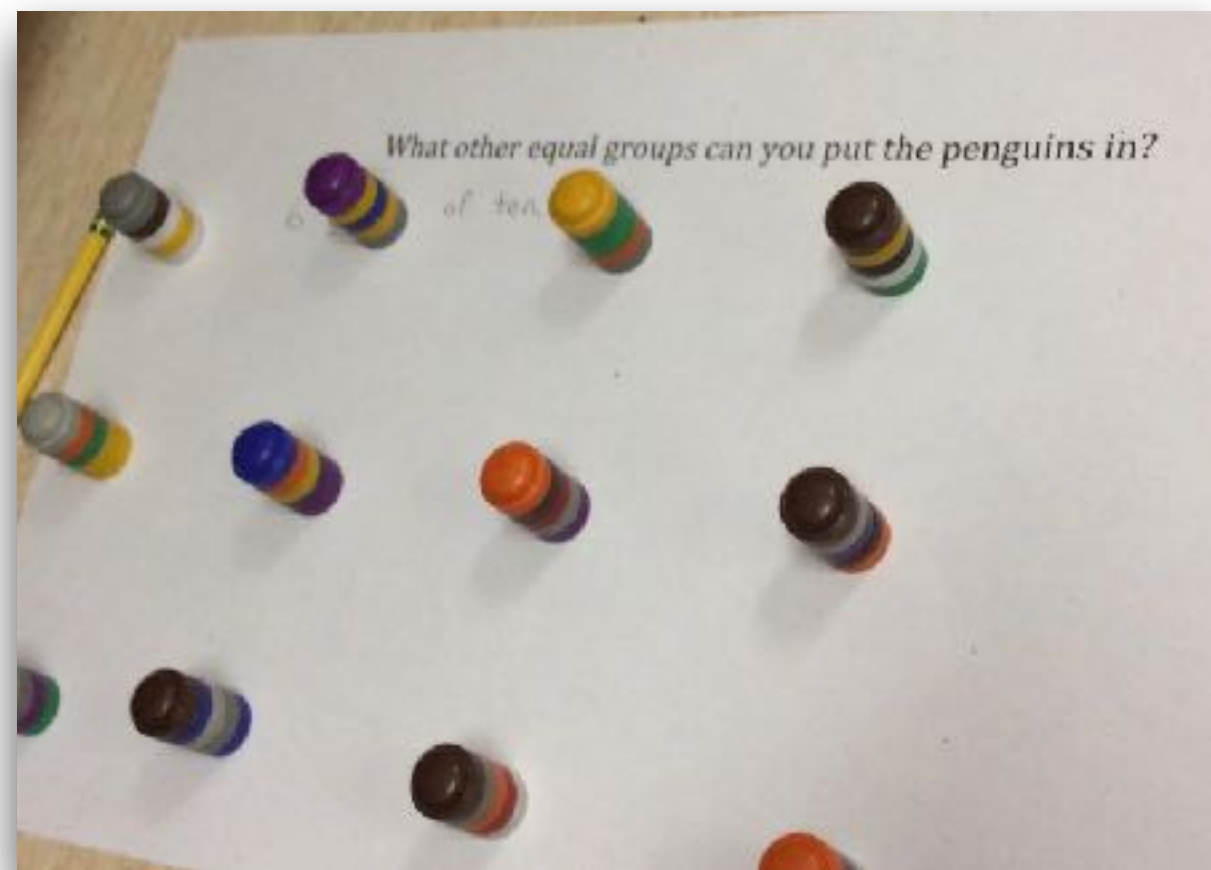
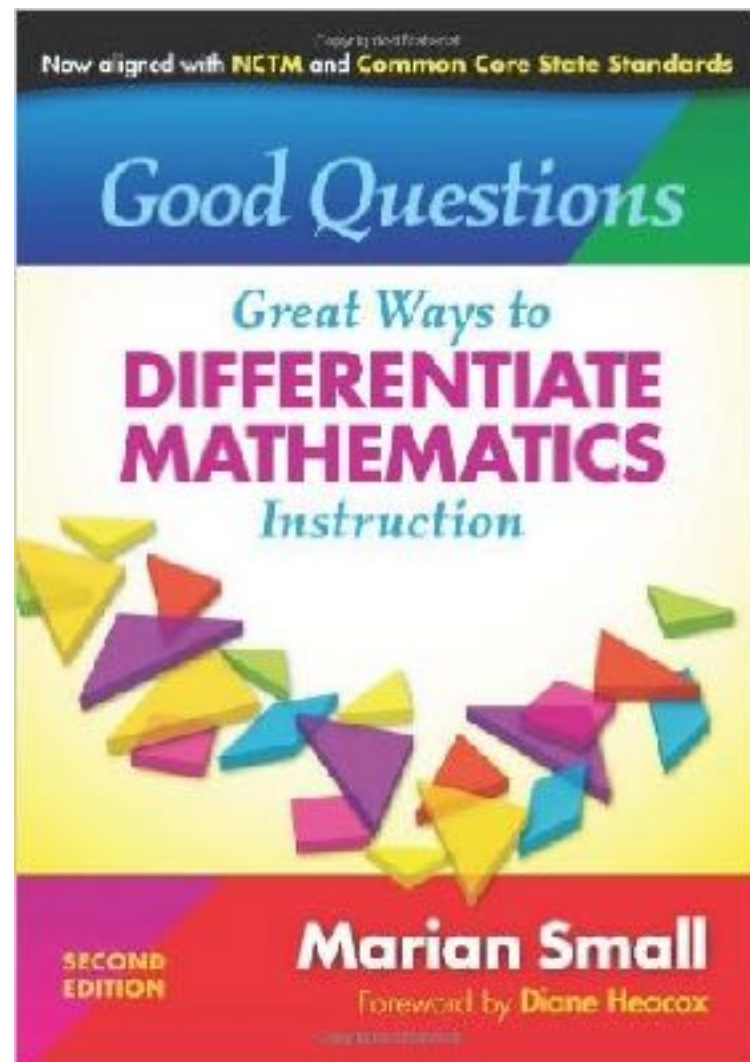


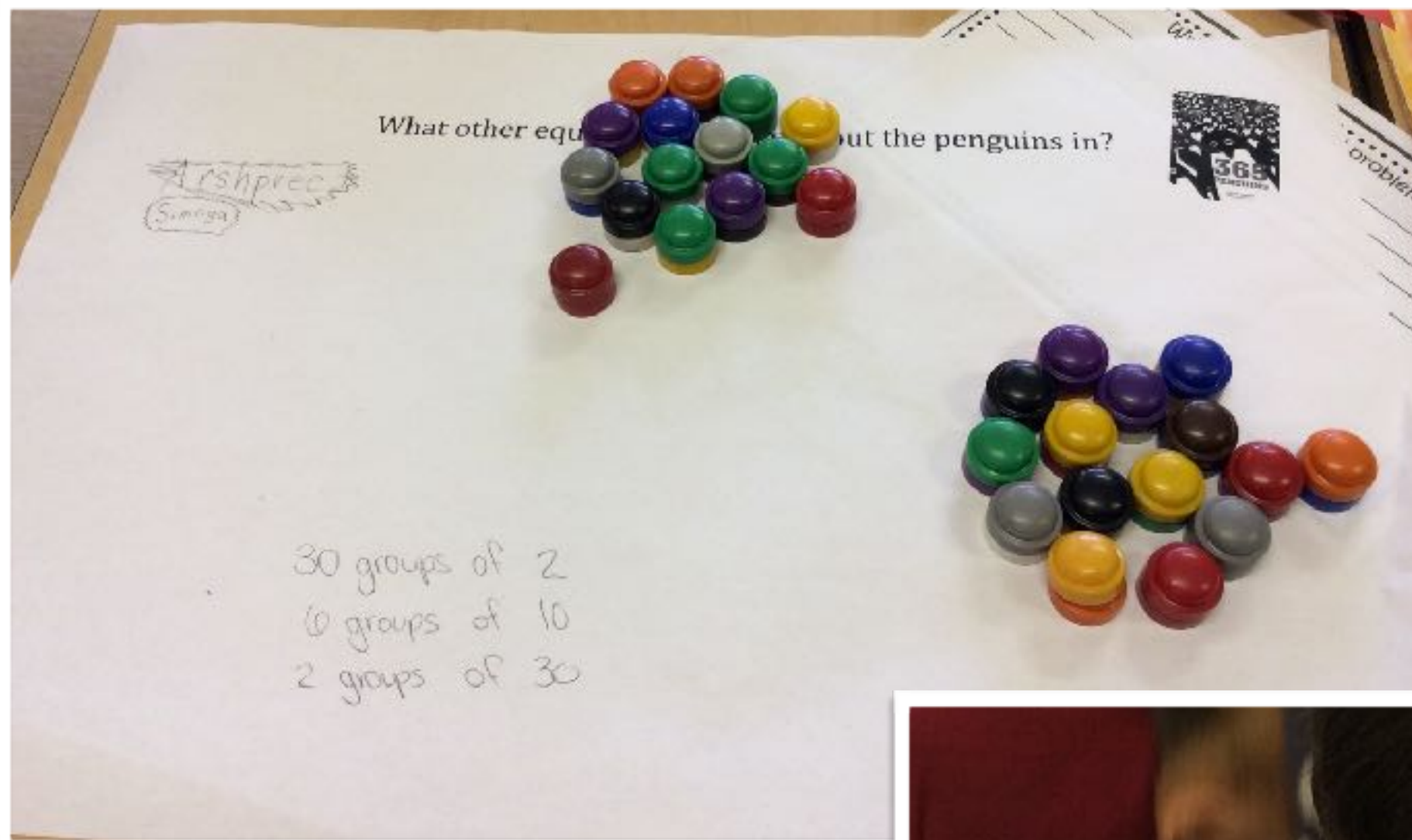
Make a plan

Solve the question

Apply more than one strategy

Provide open-ended questions with multiple pathways or answers to build students repertoire!





Make students thinking visible





I made 12 by counting by ones. - Madison



I made
12 by
counting
by twos.
- Aaron

I made the
number 12
with sticks. I
also know
that 10 plus
2 more
makes 12. -
Felix

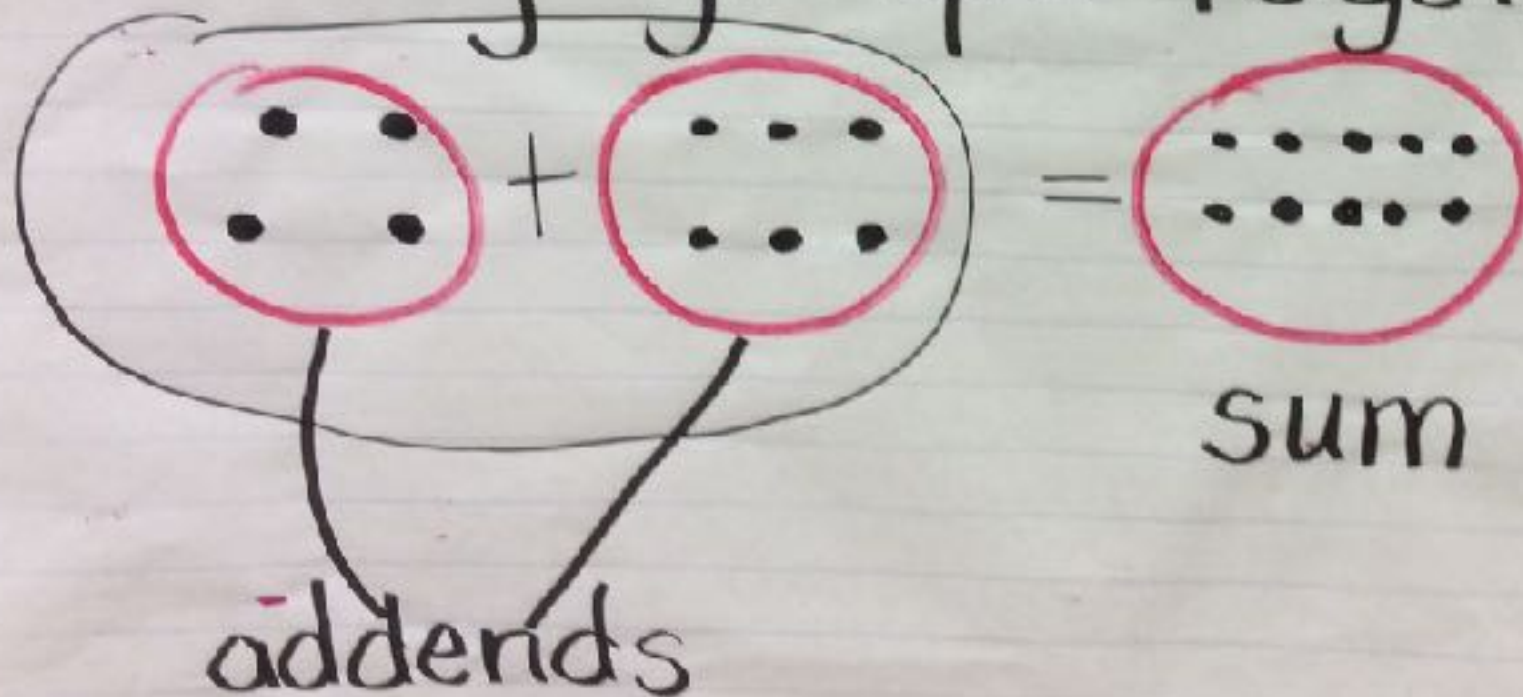


I know that $4 + 4 + 4 = 12$. - Sara

Build an anchor chart

Adding : 1 more (+1)
: Doubles (5+5)

• Joining groups together



UNDERSTANDING



I CAN

Engage with the problem

Make a plan

Use multiple strategies

Solve the question

Communicating

We want students who can:

Show my thinking

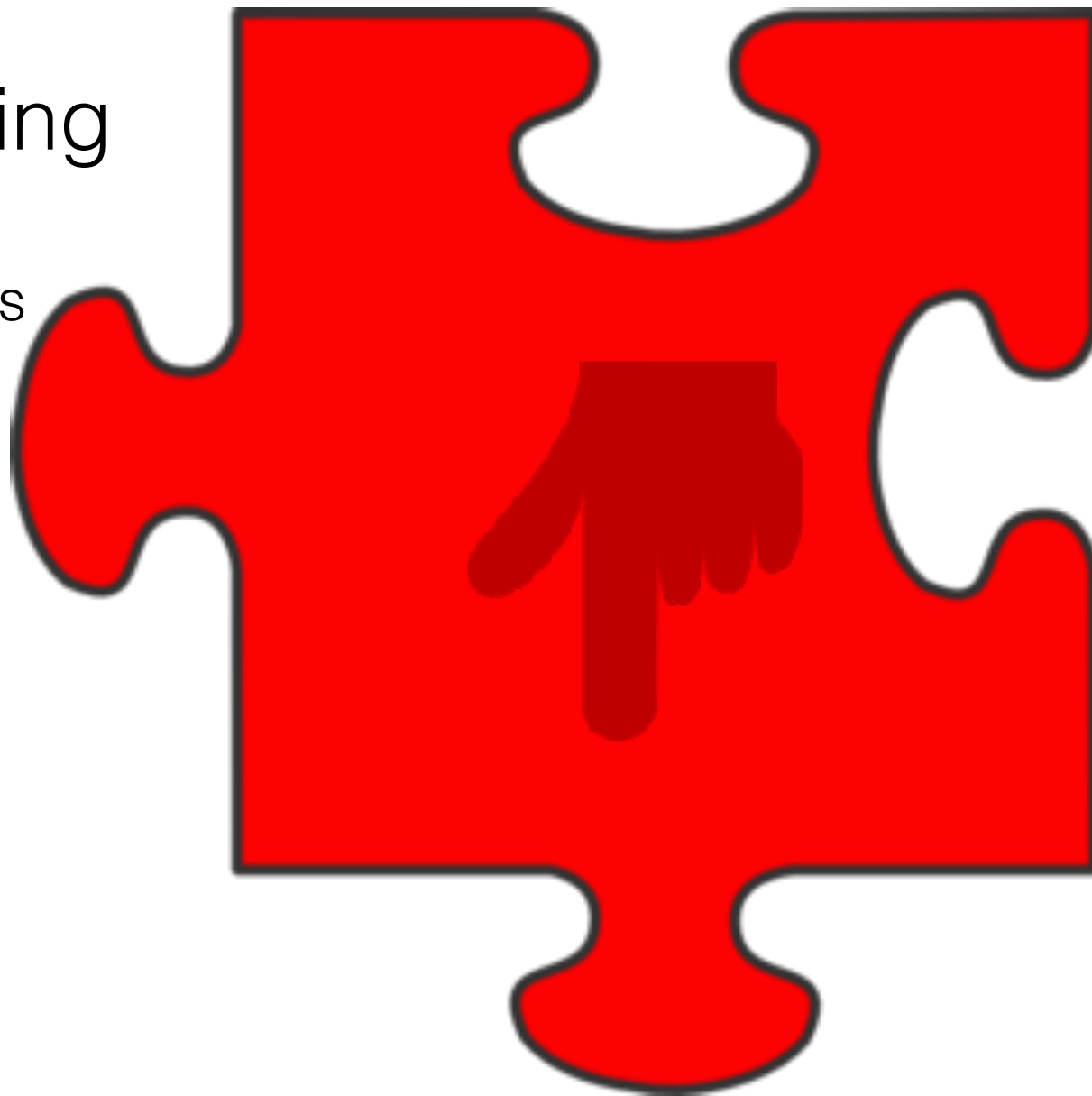
- Build a model
- Use manipulatives
- Draw a picture
- Act it out
- Use my Words
- Record using numbers and symbols

Share ideas
with others

Listen and learn from others' ideas

Explain my
strategies

Use Math
language



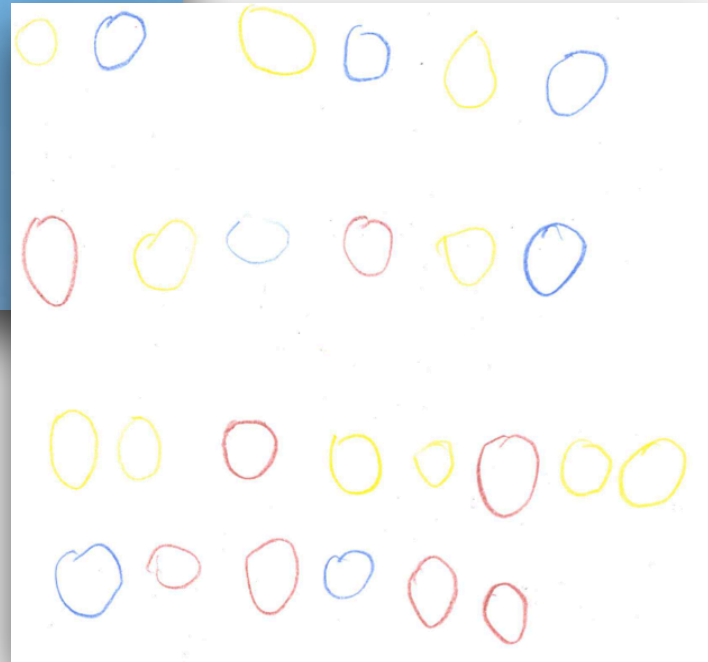
Opportunities for Collaboration



Many ways for students to show what they know...



Concretely

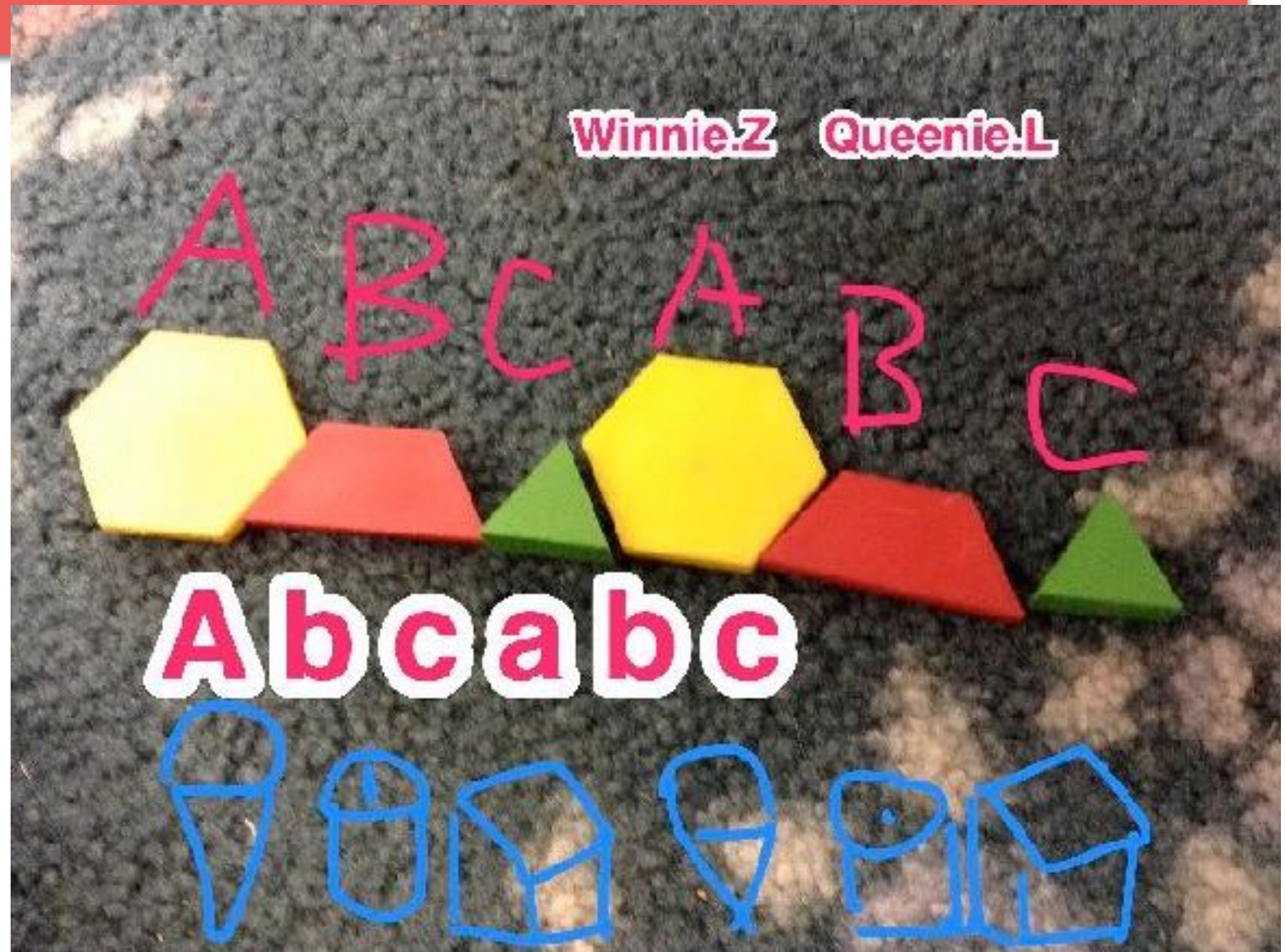


Representation (Pictorial)

RRRRYBRRRRYB RRRYB
YYBRBYBRRBYBRRBYB
RRBYBRRBYBRRBYB
YYBRBYBRRBYBRRBYB
YYYYYBRRRRRYYYYYBRRRRR

Symbolically

Use the technology available
when it makes sense





Hundred Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Ask effective questions!

How did you solve the problem? What did you do?

What strategy did you use? How did your strategy work?

What steps were involved?

What would happen if....?

How else might you have solved it?

How is _____ like or different from _____?

Convince me!

What does this make me think of?

What other math can you connect this with?



COMMUNICATING



I CAN

Show my thinking

- Build a model
- Use manipulatives
- Draw a picture
- Act it out
- Use my words
- Record using numbers and symbols

Explain my strategies

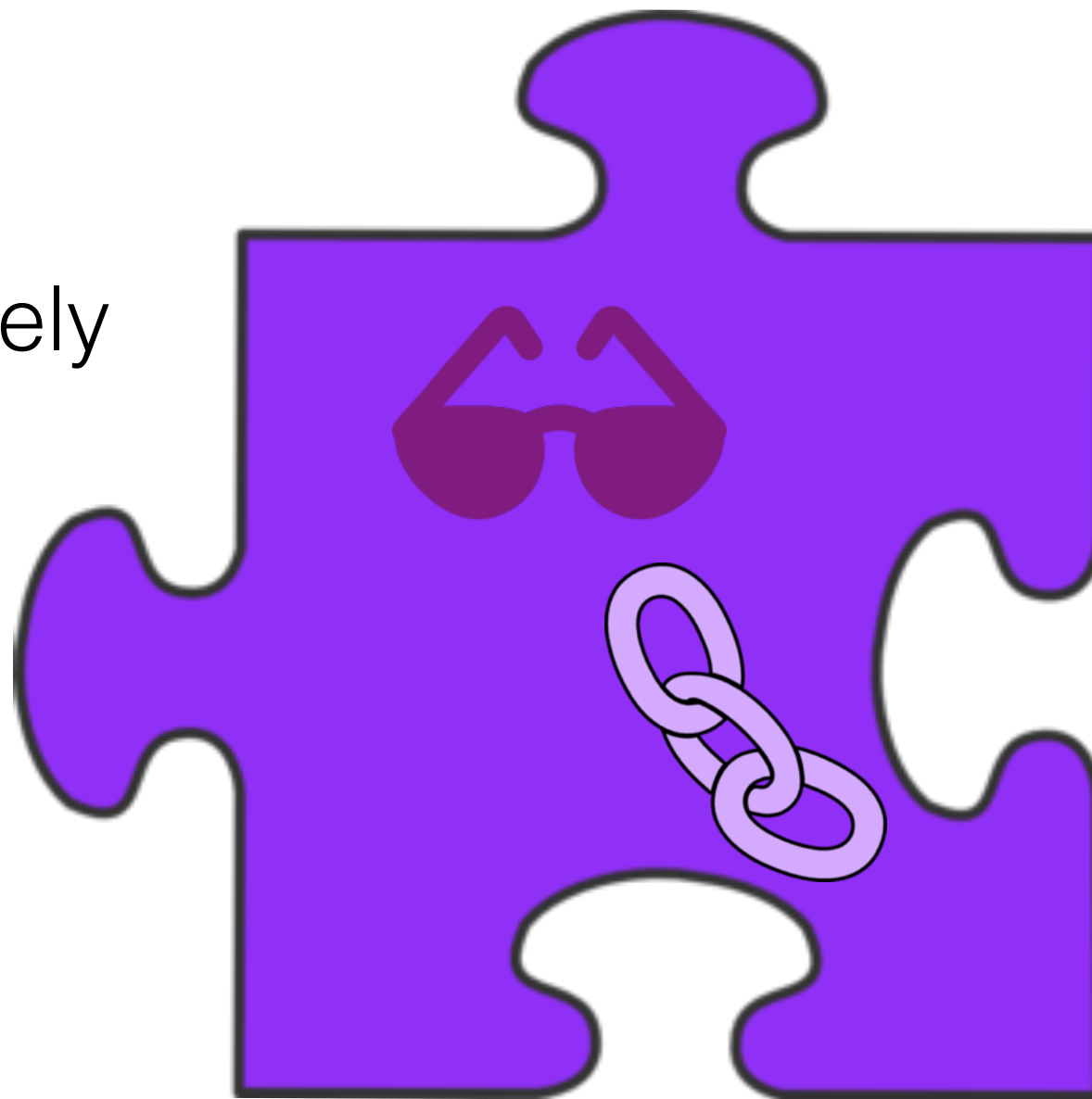
Share ideas with others

Reflecting and Connecting

We want students who can:

Think
metacognitively

Compare
Strategies



Listen and learn
from others' ideas

Make connections among Math concepts
and to the real world!

Structure of a lesson

- Clear learning intentions
- Thought provocation
 - Story book
 - Picture
 - Manipulatives
- Assign the Learning Task
- Exploration/Conferencing/Assessing
- Reflection / Sharing





TOLAY

I CAN OVER THE NUMBER
THAT IS ONE MORE.



Tristian

I can tell my partner the number and I can guess how many are hiding.

Rimi



**I can roll the dice and count
the dots. I can cover the
number on the heart.**



REFLECTING and CONNECTING



I CAN

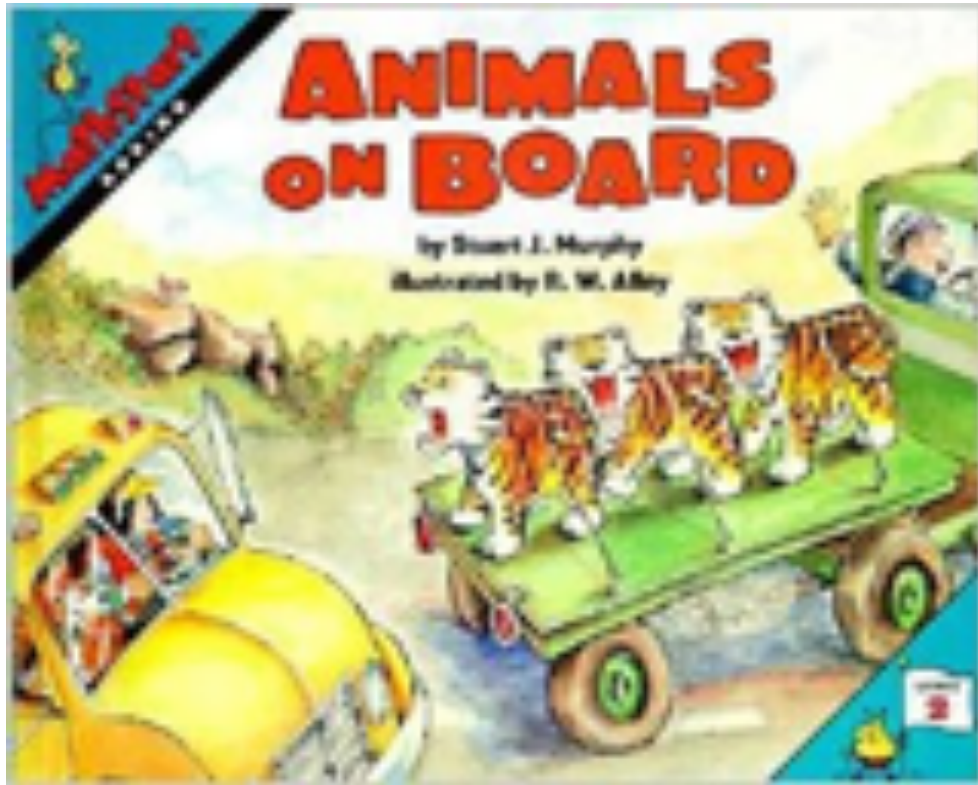
Think about what I did

Listen and learn from other's
ideas

Compare strategies

Make connections

Let's try an example together!



Engaging Literature

Engaging Materials



Framing Learning Intentions:



It is important for our students to understand what they are expected to learn in kid friendly language!

What content does the book address?

How will we engage our students as Mathematicians - in the “doing” of Mathematics?

BIG IDEAS

Numbers represent quantities that can be decomposed into smaller parts.

One-to-one correspondence and a sense of 5 and 10 are essential for **fluency** with numbers.

Repeating elements in **patterns** can be identified.

Objects have **attributes** that can be described, measured, and compared.

Familiar events can be described as likely or unlikely and compared.

Learning Standards

Curricular Competencies	Content
<p><i>Students are expected to do the following:</i></p> <p>Reasoning and analyzing</p> <ul style="list-style-type: none"> Use reasoning to explore and make connections Estimate reasonably Develop mental math strategies and abilities to make sense of quantities Use technology to explore mathematics Model mathematics in contextualized experiences <p>Understanding and solving</p> <ul style="list-style-type: none"> Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving Visualize to explore mathematical concepts Develop and use multiple strategies to engage in problem solving Engage in problem-solving experiences that are connected to place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures <p>Communicating and representing</p> <ul style="list-style-type: none"> Communicate mathematical thinking in many ways Use mathematical vocabulary and language to contribute to mathematical discussions Explain and justify mathematical ideas and decisions Represent mathematical ideas in concrete, pictorial, and symbolic forms 	<p><i>Students are expected to know the following:</i></p> <ul style="list-style-type: none"> number concepts to 10 ways to make 5 decomposition of numbers to 10 repeating patterns with two or three elements change in quantity to 10, using concrete materials equality as a balance and inequality as an imbalance direct comparative measurement (e.g., linear, mass, capacity) single attributes of 2D shapes and 3D objects concrete or pictorial graphs as a visual tool likelihood of familiar life events financial literacy — attributes of coins, and financial role-play
<p>Connecting and reflecting</p> <ul style="list-style-type: none"> Reflect on mathematical thinking Connect mathematical concepts to each other and to other areas and personal interests Incorporate First Peoples worldviews and perspectives to make connections to mathematical concepts 	

Learning Intentions for:

ALL

I can use stuffed animals to tell an addition story.

SOME

I can draw a picture of an addition story.

FEW

I can record an addition story using numbers and symbols.

Close your eyes and picture the question.
What do you see in your mind?



Opportunities for Collaboration

Many ways for students to show what they know...

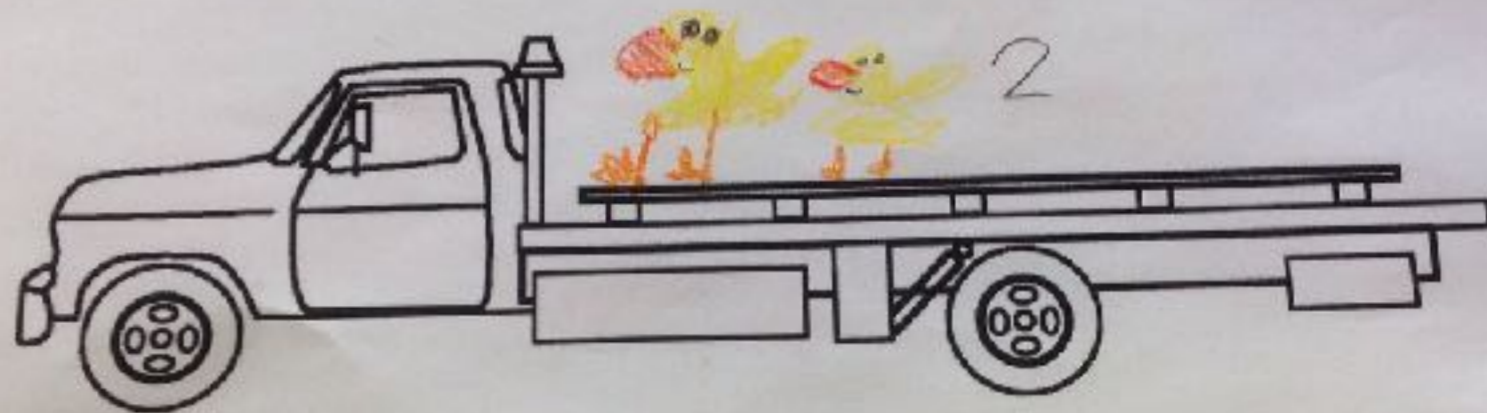


Concretely

Ravleen♥
Animals on Board

$$2 + 4 = 6$$

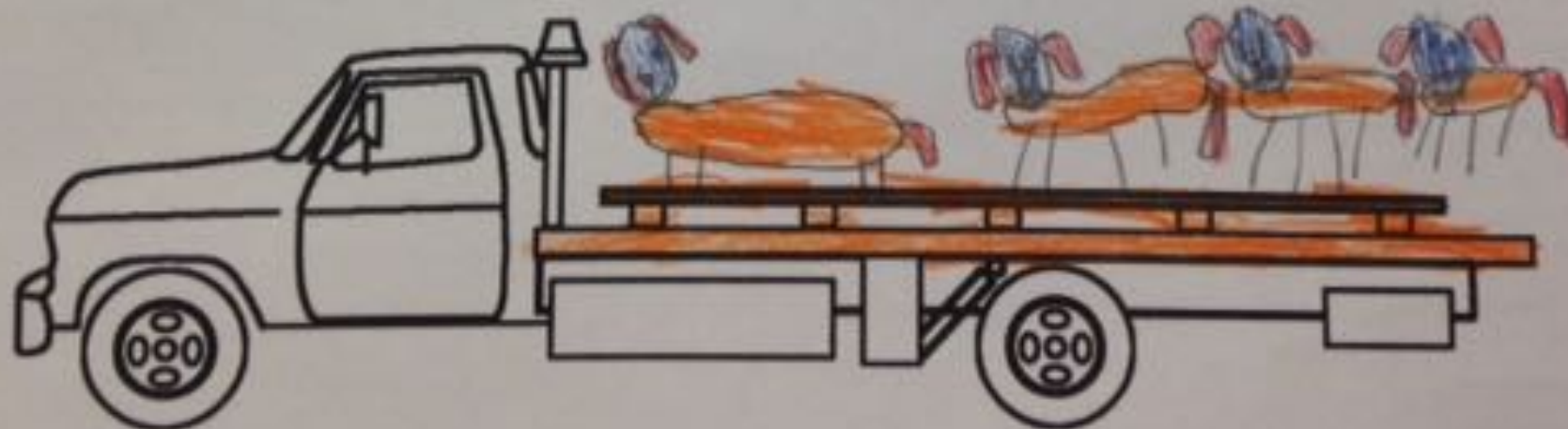
Teacher Scribed



Pictorially (Representation)

Animals on Board

LOGAN
 $1 + 4 = 5$

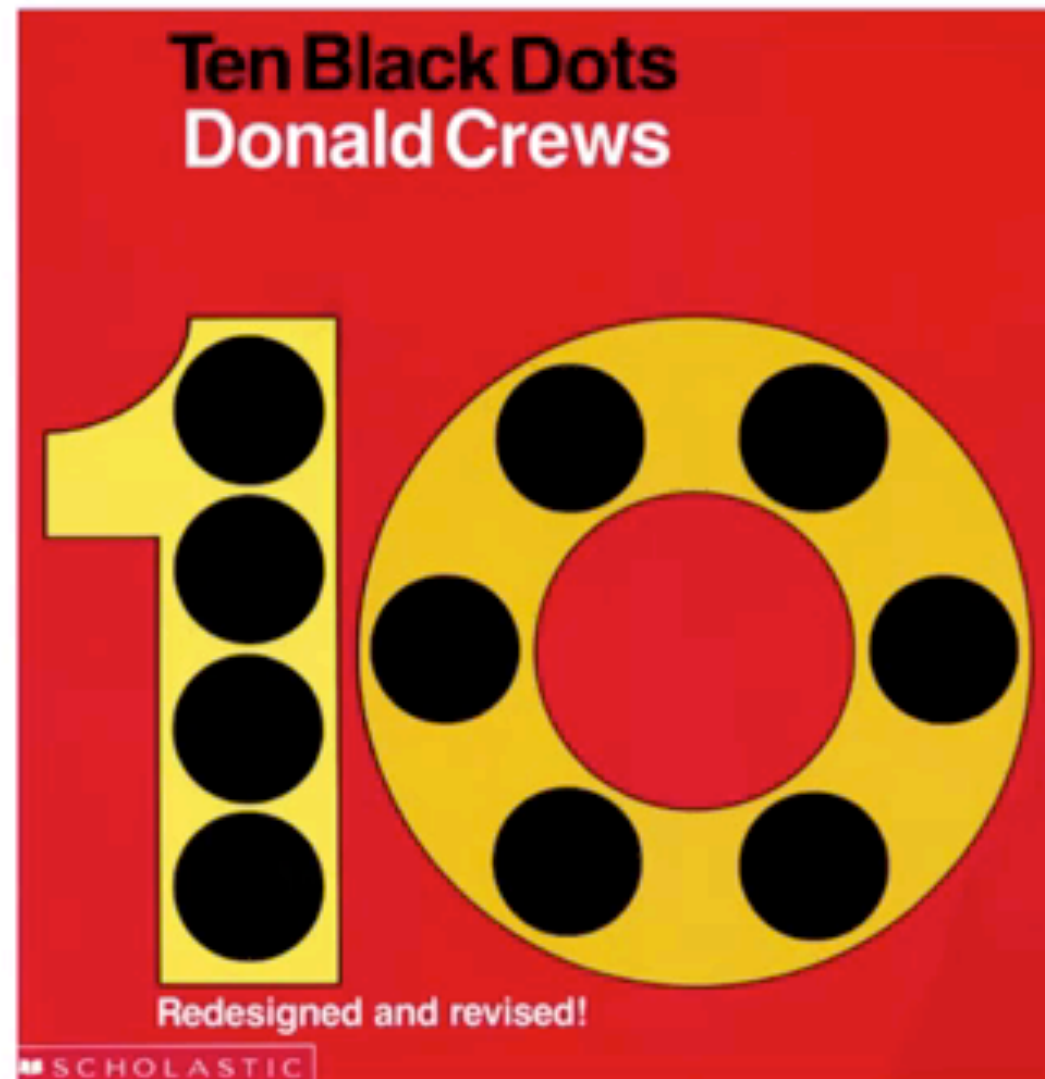
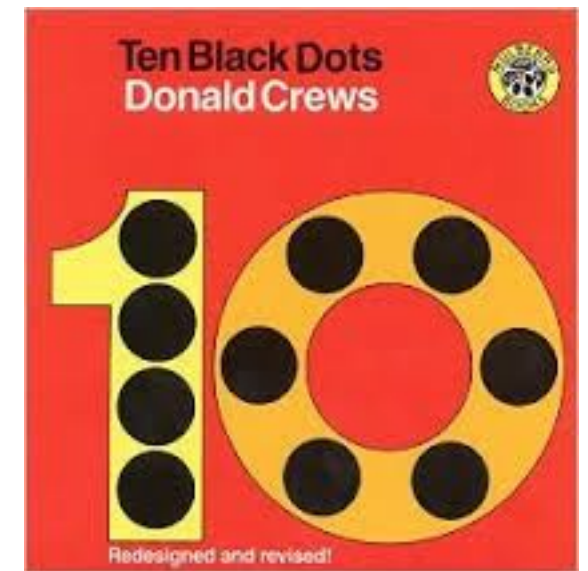


Symbolically

Guiding Questions:

- Can the child decompose a number?
- Was the child able to orally tell an addition story?
- Could the child identify and write the number of animals on each truck?
- When adding did the children find the total by counting each of the animals or were they able to recognize (subitize) one group and add on?
- Were the children able to connect the story with a number sentence? Did they recognize that the scenario called for an addition symbol?

And one more!



Framing Learning Intentions:



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<p>Connecting and reflecting</p> <ul style="list-style-type: none"> Reflect on mathematical thinking Connect mathematical concepts to each other and to other areas and personal interests Incorporate First Peoples worldviews and perspectives to make connections to mathematical concepts 	

Learning Intentions for:

ALL

I can make a picture using dot stickers and I can count and tell how many I used.

SOME

I can create a picture using dot stickers and I can count and record the number of stickers I used.

FEW

I can make two different pictures to show the same number. OR I can use groups of dots to make a picture.

I e n e



3 dots can make

ROWN



9 dots can make

ICE CREAM

Guiding Questions:

- Was the child able to represent a quantity in a picture?
- Did they have one-to-one correspondence when counting their dot stickers?
- Do they have cardinality?
- Could they identify and write the corresponding numeral?

Let's try some examples at
our table groups!



BCAMT



NEW TEACHERS MATH CONFERENCE

Keynote: Selina Millar

**Learning is Doing
the Math!**



Registration Includes:

- BCAMT membership
- Practical sessions for all grade spans. K-2, 3-5, 6-8, and 9-12
- Lesson and assessment ideas and activities
- Prepping for your interview with Surrey's HR District Principal, Kevin Fadum
- Lunch

Saturday, November 21st, 2015
Queen Elizabeth Secondary
8 a.m. - 2 p.m.

Registration Fees:

Before Nov. 19th

Pre-Service Teachers	\$40
Teachers/TOC	\$65

Onsite

Pre-Service Teachers	\$50
Teachers/TOC	\$75

Register online: https://register.bcamt.ca/newteachers_math_conference

Recommended Resources:

