Instructional Routines for Teaching & Learning Mathematics

Summer Institute 2025

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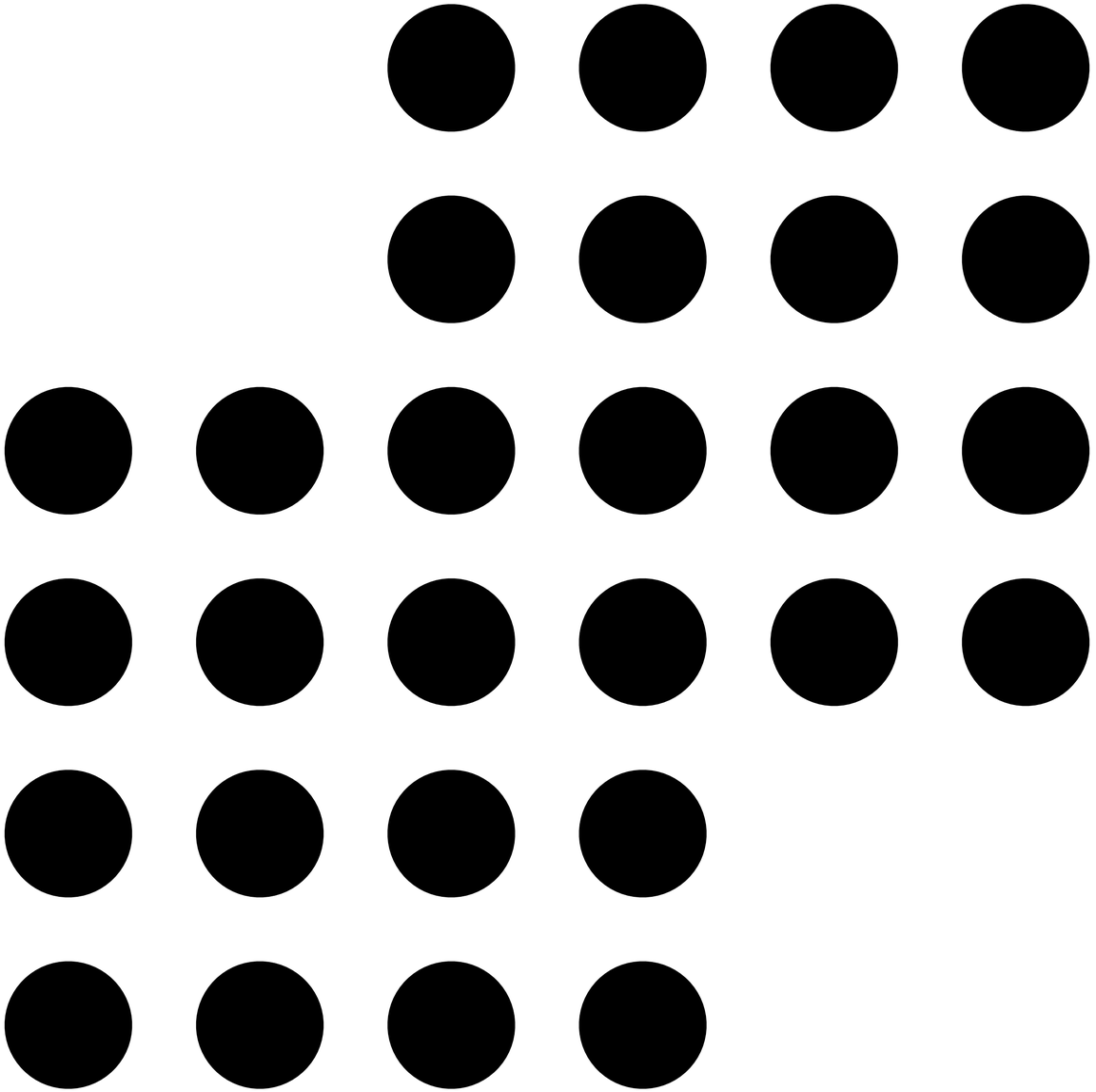
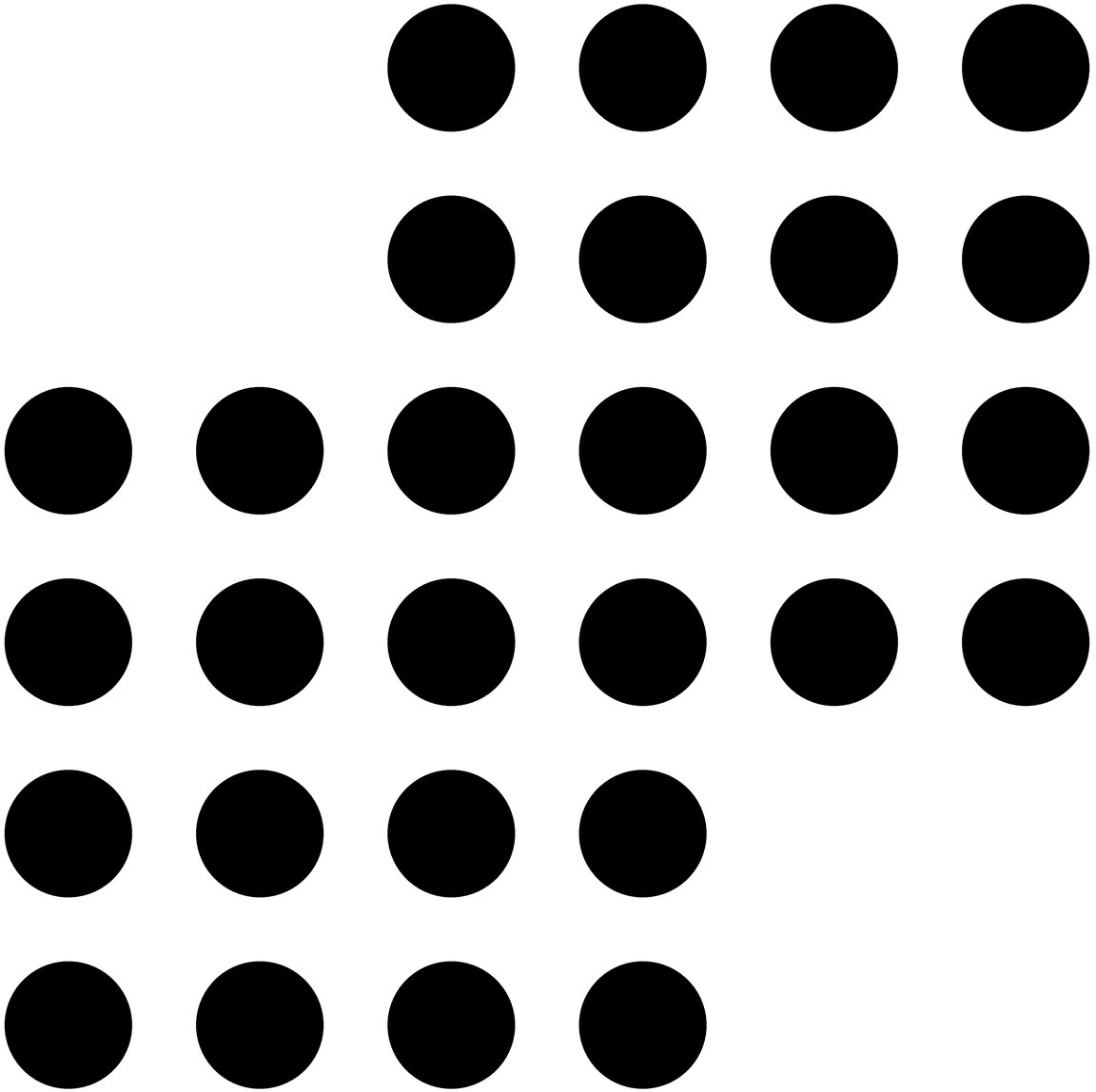
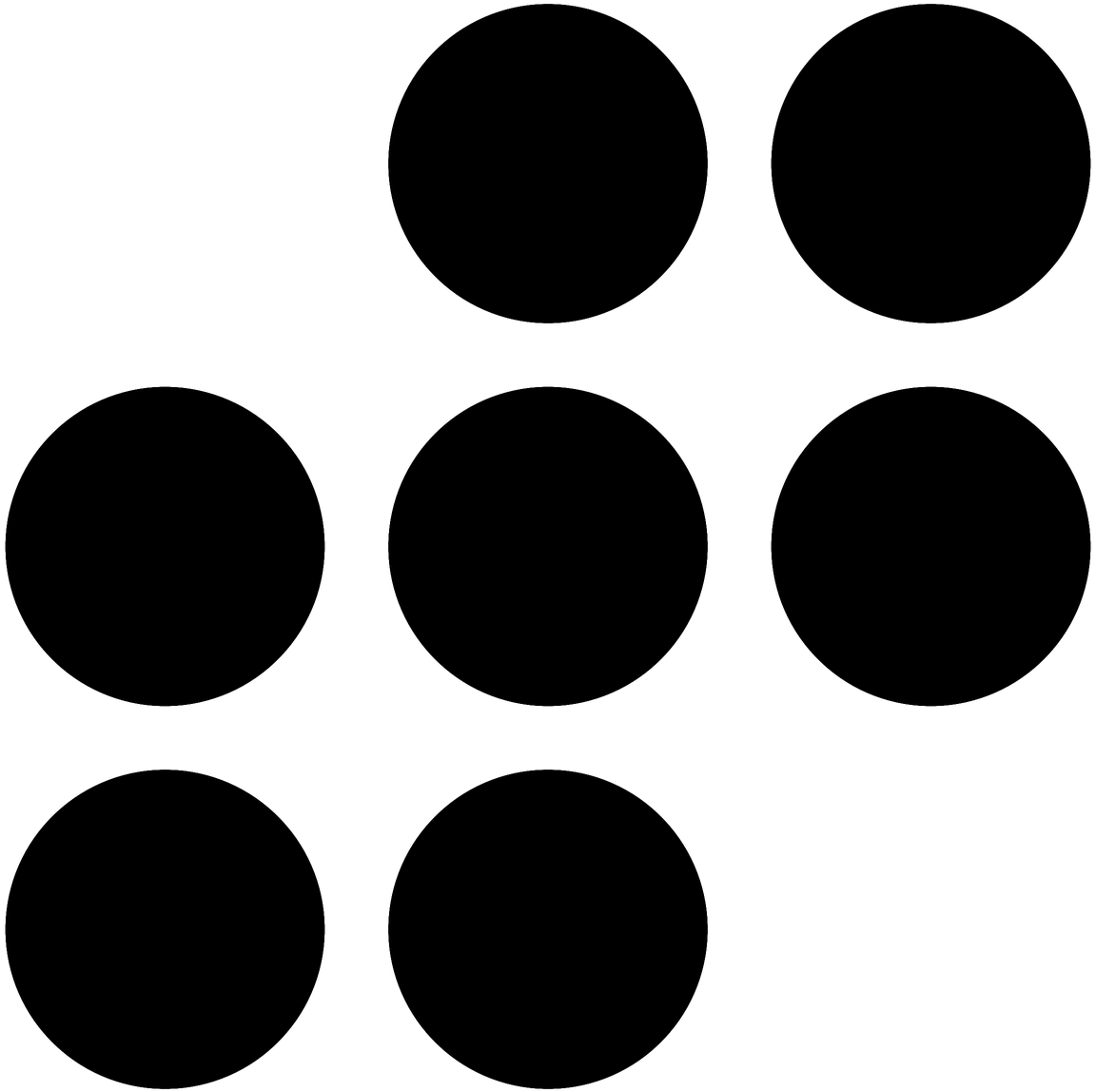
*How many do you **see**?*

*How do **you** see them?*







“The **predictable** structure lets **students** pay less attention to [‘What is it that I’m supposed to be doing?,’ ‘What question will I be asked next?,’ or ‘How will things work today in the lesson?”] and **more attention to the way in which they and their classmates are thinking about a particular math task**.

Kelemanik, G., Lucenta, A., & Creighton, S.J. (2016). *Routines for reasoning: Fostering the mathematical practices in all students*. Heinemann.

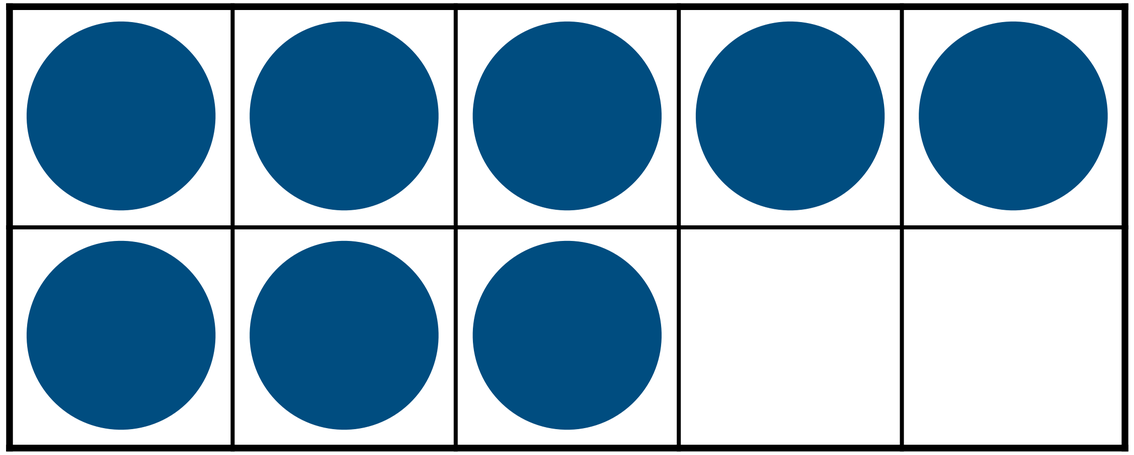
For you as the **teacher**, the routines keep the flow of the mathematics instruction deliberately **predictable** so that, as you gain familiarity with them, you can **better attend to** the most unpredictable elements of your mathematics instruction: **how your students are making sense of the mathematics**."

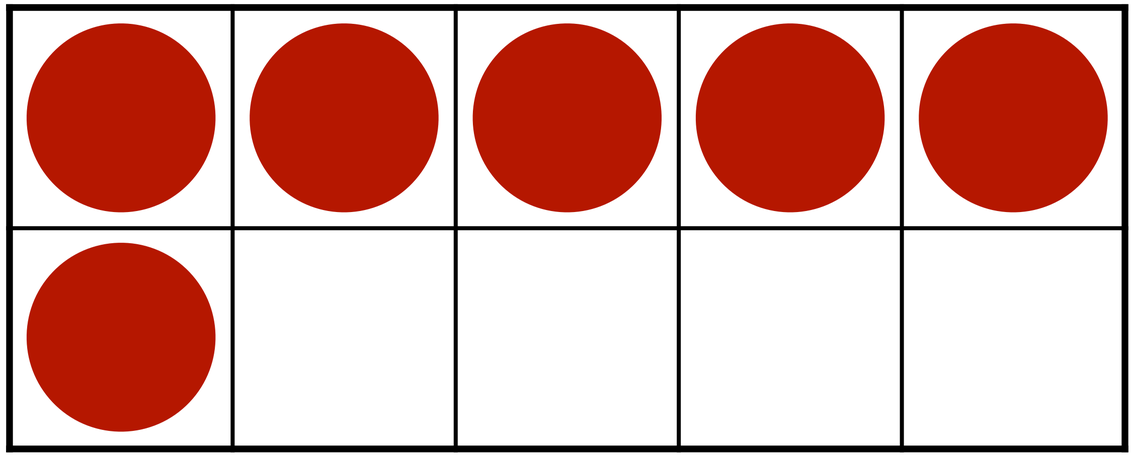
Kelemanik, G., Lucenta, A., & Creighton, S.J. (2016). *Routines for reasoning: Fostering the mathematical practices in all students*. Heinemann.

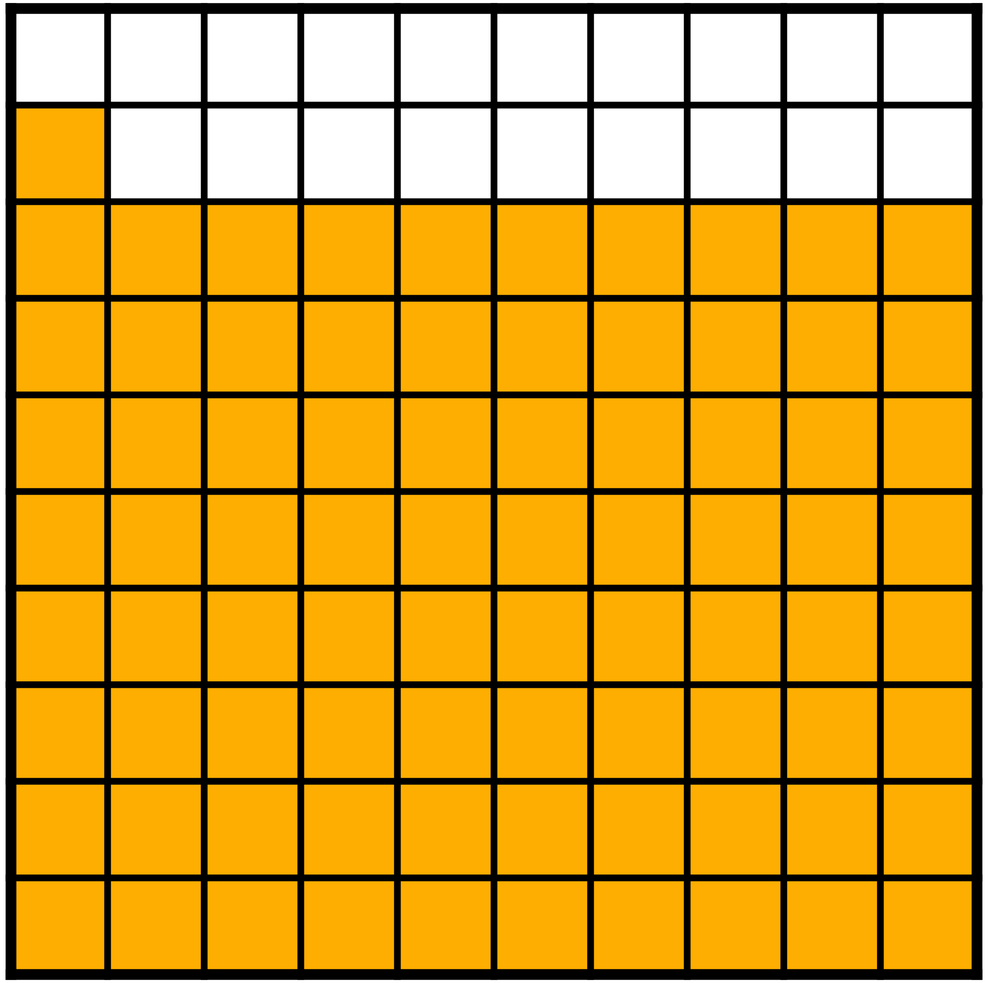
Quick Images

“No matter what grade you teach, even high school, so-called ‘dot cards’ (which may or may not have dots) are a great way to start your students on the path to mathematical reasoning. We say this because, from experience, we have realized that with dot cards, students only need to describe what they **see**—and **people have many different ways of seeing!**”

Humphreys, C. & Parker, R. (2015). *Making number talks matter: Developing mathemtical practices and deepening understanding*. Stenhouse.







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“Not only is **‘What counts as one?’** an important question, its answer changes based on your perspective, and so it offers opportunities for play. Children like to play; they need to play. Children find numbers wonderful, delightful, interesting and fun. **Numbers constitute a playground for children’s minds!**”

Danielson, C. (2018). *How many? A teacher’s guide*. Stenhouse

NUMBER TALK IMAGES

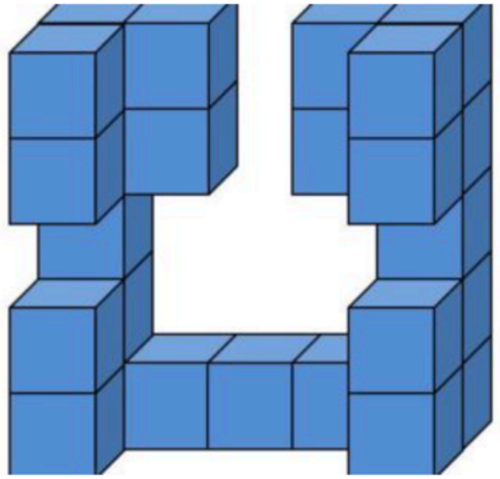
En vedette / Featured...

Custom Number Talk Images

Créer vos propres images! Voici une ressource de Berkeley Everett. Offert en format PowerPoint ou Google Slides, vous n'avez qu'à modifier les diapositives afin de produire des images sur mesure.
You can create your own Number Talk Images thanks to Berkeley Everett! Using his shared PowerPoint or Google Slides templates, you simply edit/re-arrange images of kumquats, blueberries, nuts and toaster pastries.

December 29, 2017

Cube Conversations



Categories

- 3-Container Estimation Routine (1)
- Animated Posts (64)
- Course (1)
- Cube Conversations (3)
- Dot Patterns (4)
- Downloadables (29)
- e-book (1)
- Esti-Mysteries (11)
- Estimation (13)
- Estimation Clipboard (1)
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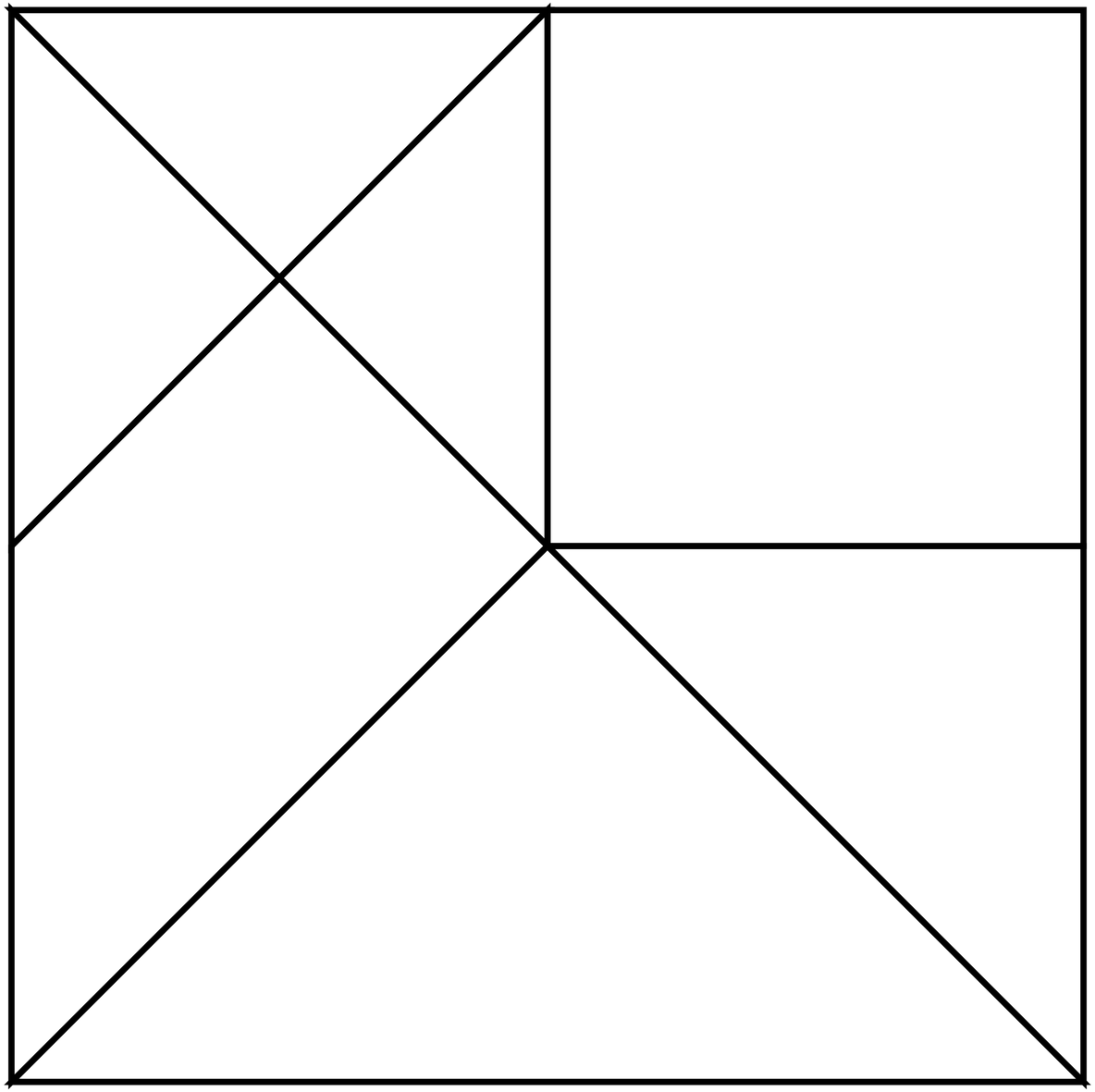
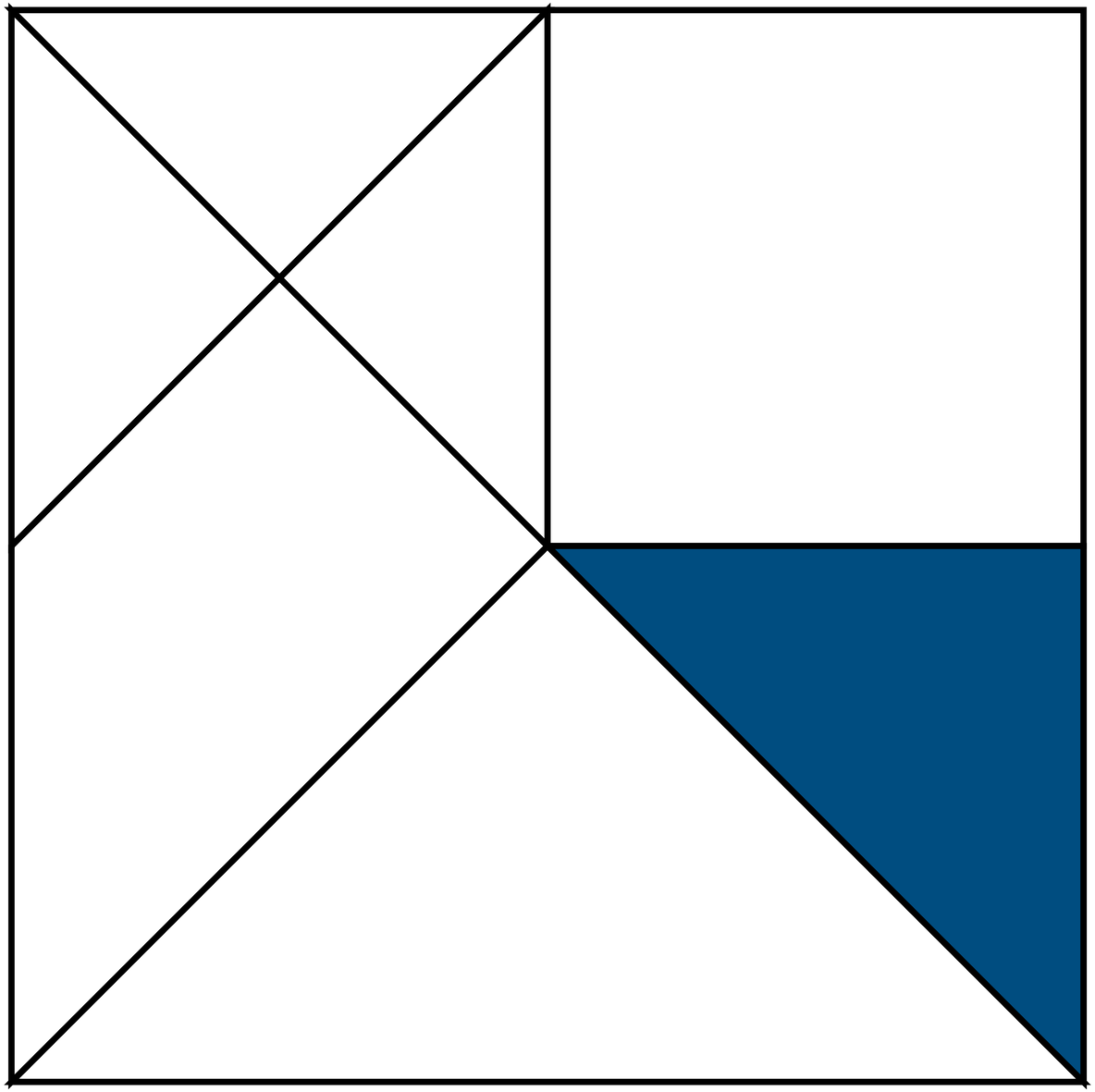
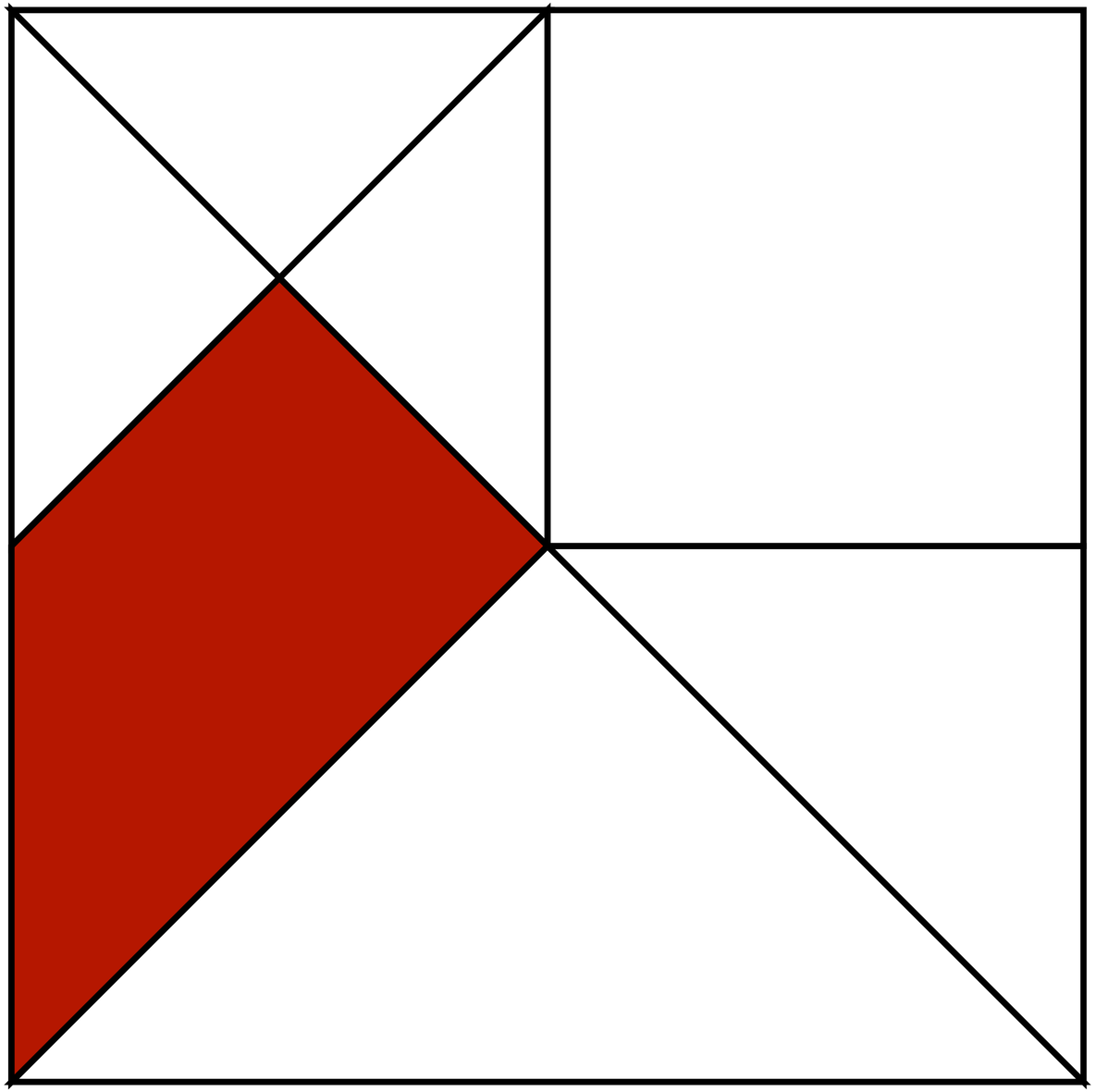
- Instructional Strategies (66)
- Leap Day (1)
- Leaping Numbers (2)
- Math (68)
- Multiplication (2)
- Multiplication Course (2)
- Number Sense (10)

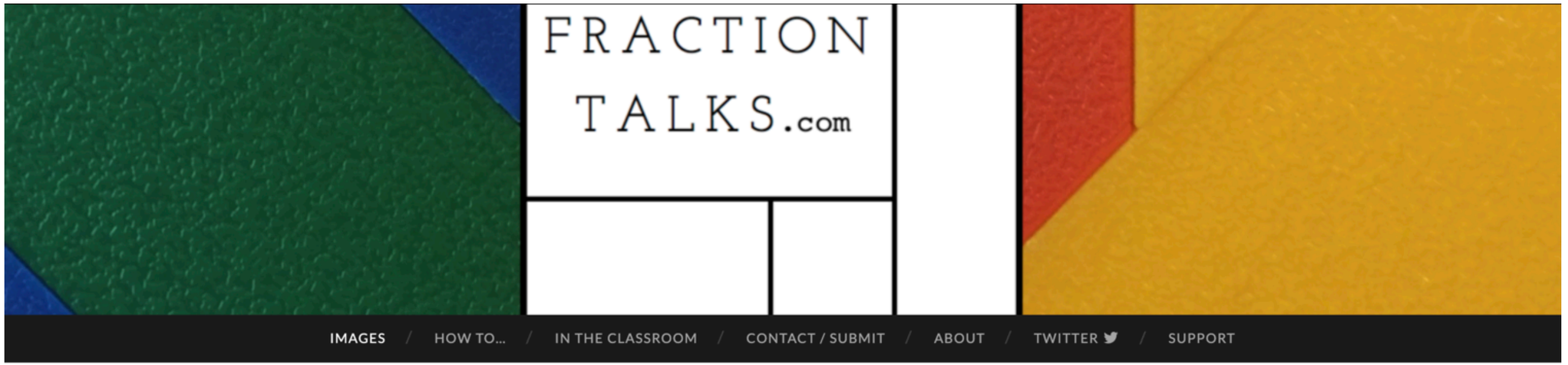
Fraction Talks

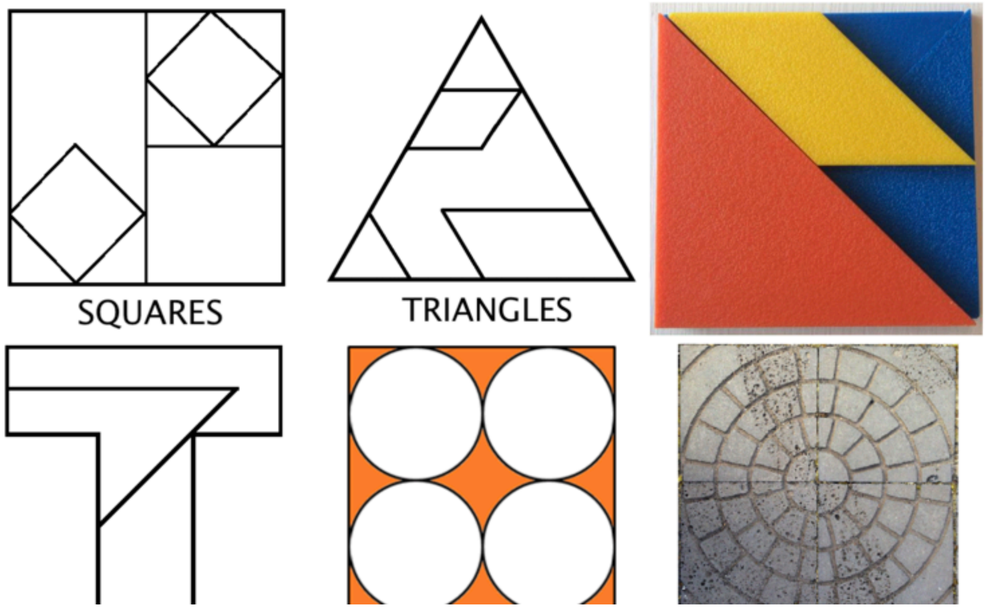


*What **fraction** is shaded?*






FRACTION
TALKS.com
IMAGES / HOW TO... / IN THE CLASSROOM / CONTACT / SUBMIT / ABOUT / TWITTER / SUPPORT


SQUARES
TRIANGLES

Can you shade a section with twice the area?

Can you shade exactly one-quarter of the shape?

Can you find all other sections that are the same size as ____?

Can you find all sections that represent ____?

If the shaded section is worth ____, how big is each other section?

What possible fractions can be shaded?

Which section has the easiest area to find?

What needs to be added to make the shaded section equal to ____?

If the area of the shaded section is ____, what is the area of the whole shape?

Shade ____ as many ways as possible.

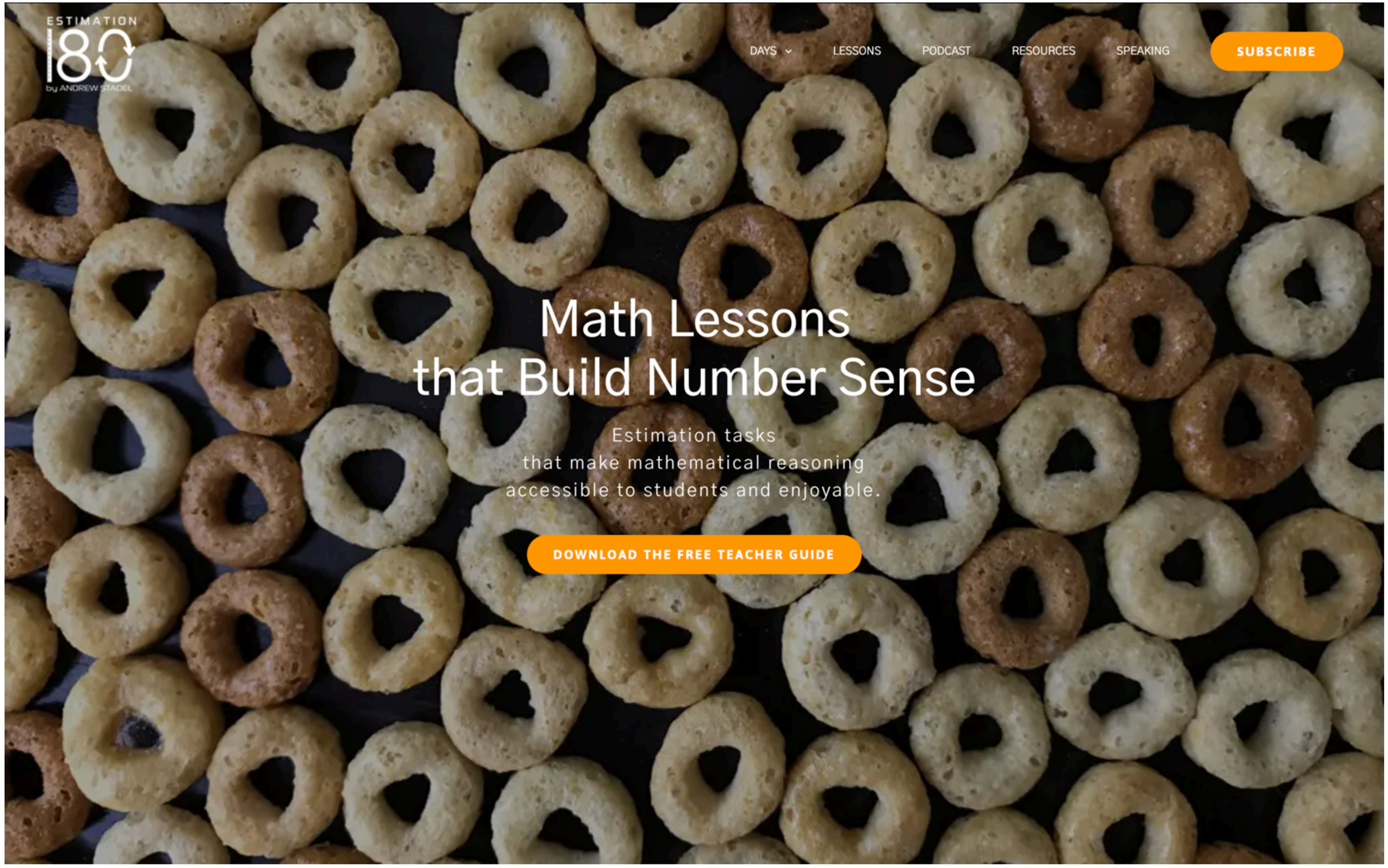
Estimation 180


ESTIMATION180.com

ESTIMATION 180 by ANDREW STADEL


Cheeseballs: 0
ESTIMATION180.COM


ESTIMATION180.com


ESTIMATION 180
by ANDREW STADEL
DAYS
LESSONS
PODCAST
RESOURCES
SPEAKING
SUBSCRIBE
Math Lessons
that Build Number Sense
Estimation tasks
that make mathematical reasoning
accessible to students and enjoyable.
DOWNLOAD THE FREE TEACHER GUIDE

“For each challenge, students are asked to give an estimate they know is too low and another that is too high. These bounding estimates are so important. **We’re working toward the idea of a reasonable range of estimates, which is one of the most common ways we estimate in daily lives.**”

Zager, T. (2017). *Becoming the math teacher you wish you’d had: Ideas and strategies from vibrant classrooms*. Stenhouse.

“Also, students who are worried about estimating ‘right’ often feel much less nervous when asked for an answer they know is wrong because it’s too low or too high. **The bounding estimates are a great way to help tentative and struggling students enter a meaningful math discussion.**”

Zager, T. (2017). *Becoming the math teacher you wish you’d had: Ideas and strategies from vibrant classrooms*. Stenhouse.

“Whether you use it daily or choose specific lessons to complement your curriculum, the most important thing you can do is focus on students’ *reasoning* and *arguments*. Students need to learn that estimating involves strategy and is not the same as guessing. Class discussions around strategies, including reflecting on our estimates and refining our strategies, are powerful opportunities for students to build number sense and mathematical intuition in a variety of contexts.”

Zager, T. (2017). *Becoming the math teacher you wish you’d had: Ideas and strategies from vibrant classrooms*. Stenhouse.

Counting Collections

Today, you and your partner are going to count a collection, figure out how many you have in your collection, and show me a picture of how you counted.

“In Counting Collections, students have the opportunity to figure out how to count with a partner or partners; they get to navigate mathematics, their explanations, and others’ ideas as they figure out how to work together.”

Franke, M.L., Kazemi, E., & Turrou, A.C. (2018). *Choral counting & counting collections: Transforming the PreK-5 math classroom*. Stenhouse.

Ca-Lishea served at the Houston Food Bank by putting together food boxes that go to senior citizens. Each box contains 26 meals. The boxes are loaded onto a pallet that holds 45 boxes. How many meals are there on the pallet?

71

“When you’re a grown-up, nobody says ‘Please multiply these numbers.’ You have to know **when** to do it. That’s all that actually matters when you’re a big person.”

Marian Small OAME2024

Choral Counting

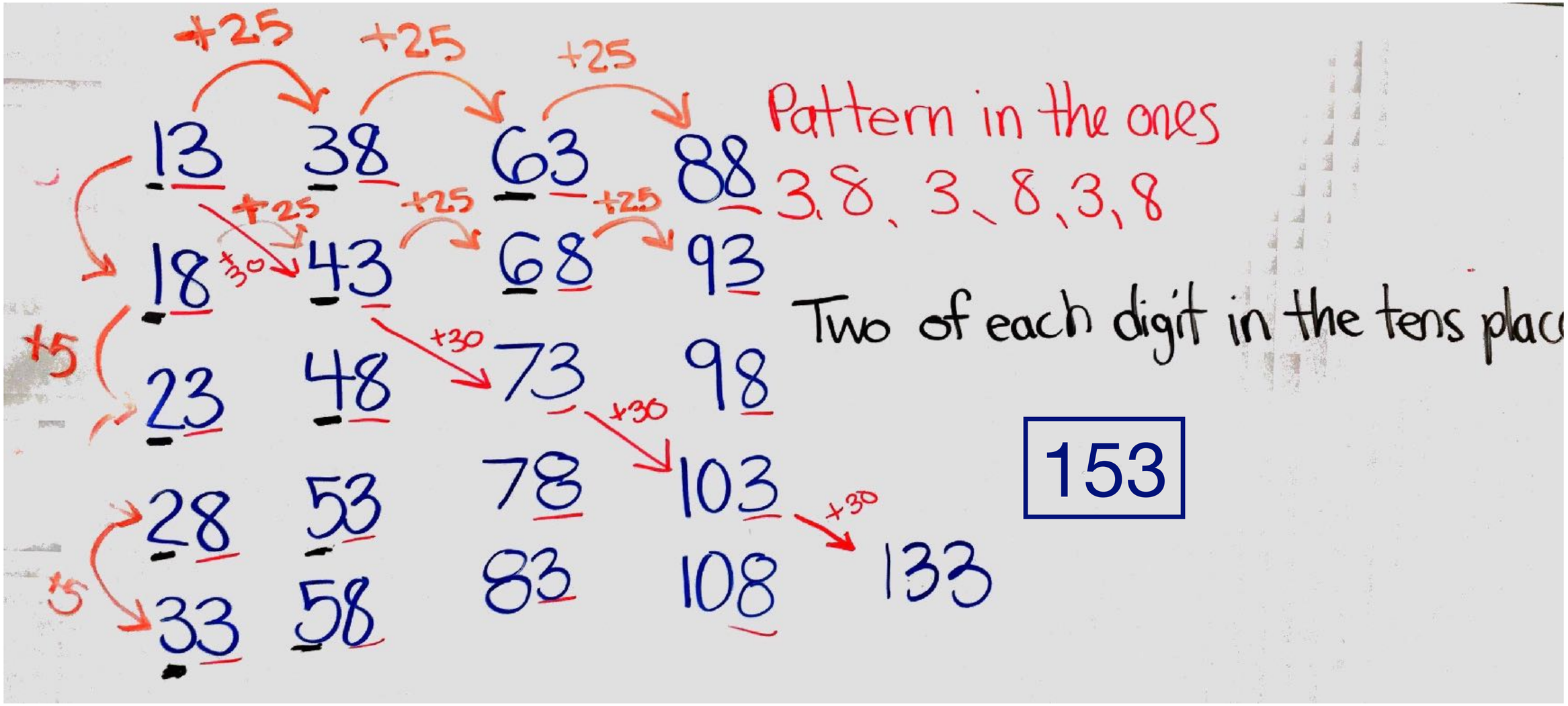
Counting [Forward] by [5s] Starting at [13]

13	38	63	88
18	43	68	93
23	48	73	98
28	53	78	103
33	58	83	108

*What **patterns** do you see?*

Counting [Forward] by [5s] Starting at [13]

13	38	63	88
18	43	68	93
23	48	73	98
28	53	78	103
33	58	83	108


+25
+25
+25
13
38
63
88
Pattern in the ones
3, 8, 3, 8, 3, 8
+25
+25
+25
+30
18
43
68
93
Two of each digit in the tens plac
+5
+30
23
48
73
98
+30
153
28
53
78
103
+30
+5
133
33
58
83
108

“In Choral Counting, students support one another often in the whole-group setting to count, to see relationships and patterns, to build on someone else’s idea, and to ask different kinds of questions of the mathematics.”

Franke, M.L., Kazemi, E., & Turrou, A.C. (2018). *Choral counting & counting collections: Transforming the PreK-5 math classroom*. Stenhouse.

Number Talks

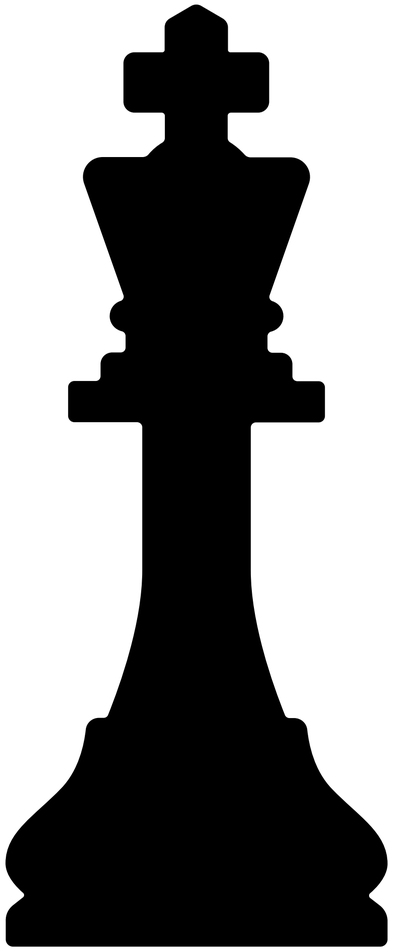
“Simply defined, number talks are five- to fifteen-minute classroom conversations around **purposely crafted computation** problems that are solved mentally.”

Parrish, S. D. (2011). Number talks build numerical reasoning. *Teaching Children Mathematics*, *18*(3), 198–206. https://doi.org/10.5951/teacchilmath.18.3.0198

$$56 - 29$$

Subtraction Strategies

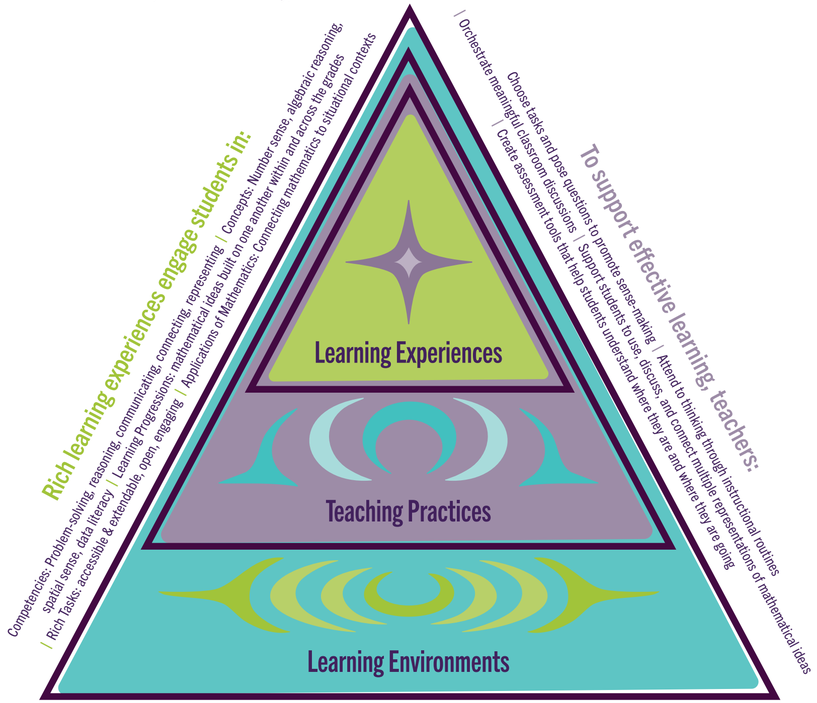
1. Round the subtrahend to a multiple of ten and adjust
2. Decompose the subtrahend
3. Add instead
4. Same difference
5. Break apart by place



Numeracy Framework K–12

Surrey Schools
LEADERSHIP IN LEARNING

The nested nature of the triangles in this diagram communicates that the three elements of Surrey Schools' Numeracy Framework—rich learning experiences, effective teaching practices, and inclusive learning environments—are interwoven. Each element supports, and is supported by, the others.



An inclusive learning environment is one in which learners demonstrate:

Acceptance, respect, and support for each other | Willingness to work together | Reliance on and responsibility for others' learning | A view of themselves as mathematicians | Confidence and persistence in problem-solving | Appreciation for diverse voices, cultures, and lived experiences

Shaping Rich Learning Experiences

- Aim to develop students' abilities to engage in mathematical competencies as well as their understanding of mathematical content
- Encourage students to see math as a coherent connected whole
- Draw on the knowledge, experience, and background of students
- Allow all students to participate in and benefit from carefully chosen problems, tasks, and activities

Implementing Effective Teaching Practices

- Engage students in sense-making through the active doing of mathematics
- Provide opportunities for collaboration, communication, and reflection
- Develop procedural fluency through conceptual understanding
- Promote a positive disposition in mathematics
- Gather and analyze evidence to determine next steps in student learning

Building Inclusive Learning Environments

- Create classroom communities in which all learners belong
- Recognize that learning is closely tied to students' identities
- Inspire students to see mathematics as joyful, playful, creative and collaborative
- Make explicit connections to Indigenous ways of knowing and being

We are deeply grateful to artist Elinor Atkins from the qʷɑ:nʌ'ən (Kwantlen) and Nɬeʔkepmx (Shakan) First Nations for her artistic vision and expression of geometric Coast Salish designs. With trigons, circles, ovals, and crescents, Coast Salish design elements shape the Morning Star and the all-seeing Coast Salish Eyes of this land. In their harmony, we are reminded of the beauty of connection and the wisdom of place.

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Rich learning experiences engage students in:

Competencies: Problem-solving, reasoning, communicating, connecting, representing | Concepts: Number sense, algebraic reasoning, spatial sense, data literacy | Learning Progressions: mathematical ideas built on one another within and across the grades | Rich Tasks: accessible & extendable, open, engaging | Applications of Mathematics: Connecting mathematics to situational contexts

To support effective learning, teachers:

Choose tasks and pose questions to promote sense-making | Attend to thinking through instructional routines | Orchestrate meaningful classroom discussions | Support students to use, discuss, and connect multiple representations of mathematical ideas | Create assessment tools that help students understand where they are and where they are going

Learning Experiences

Teaching Practices

Learning Environments

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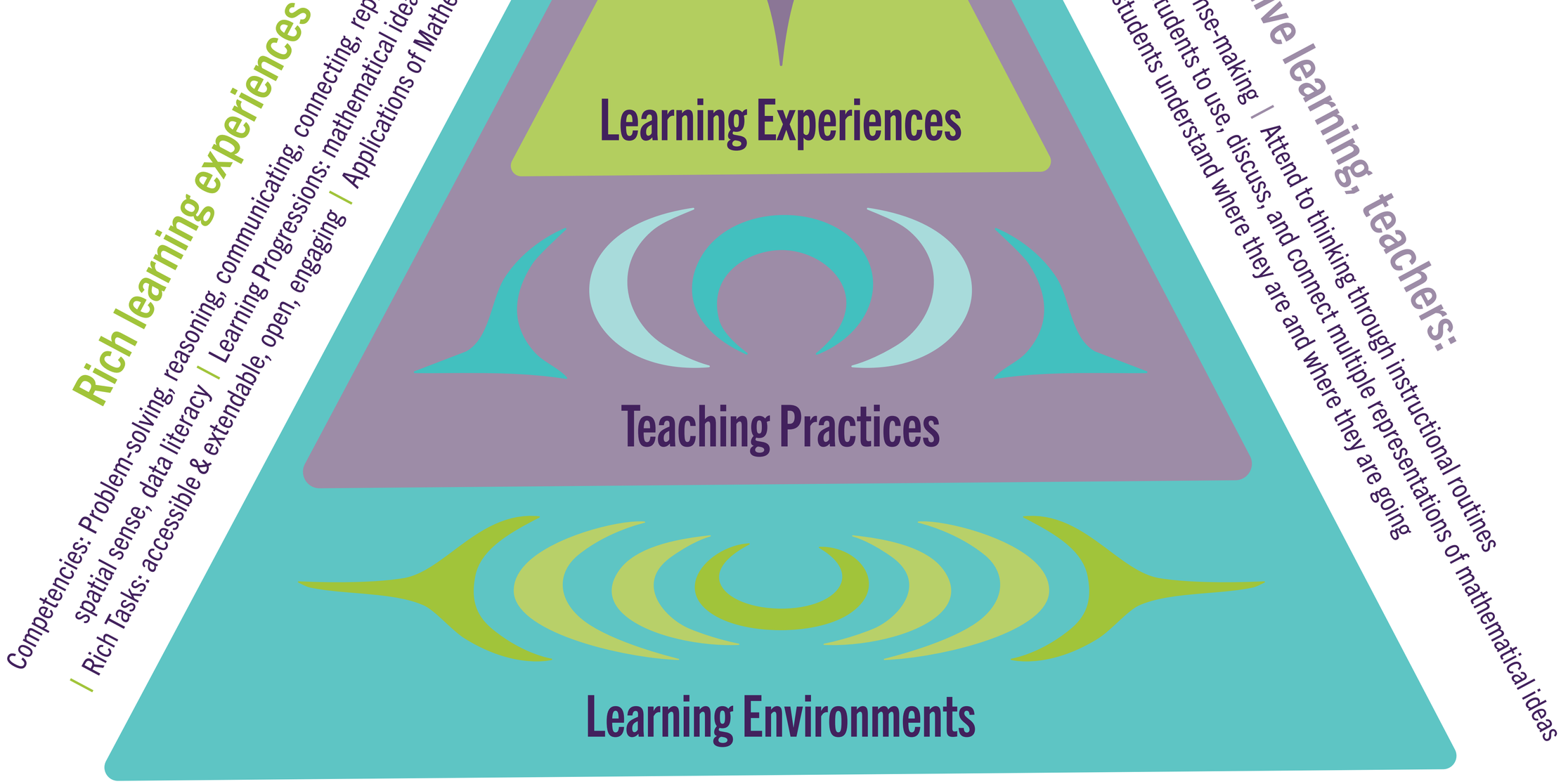

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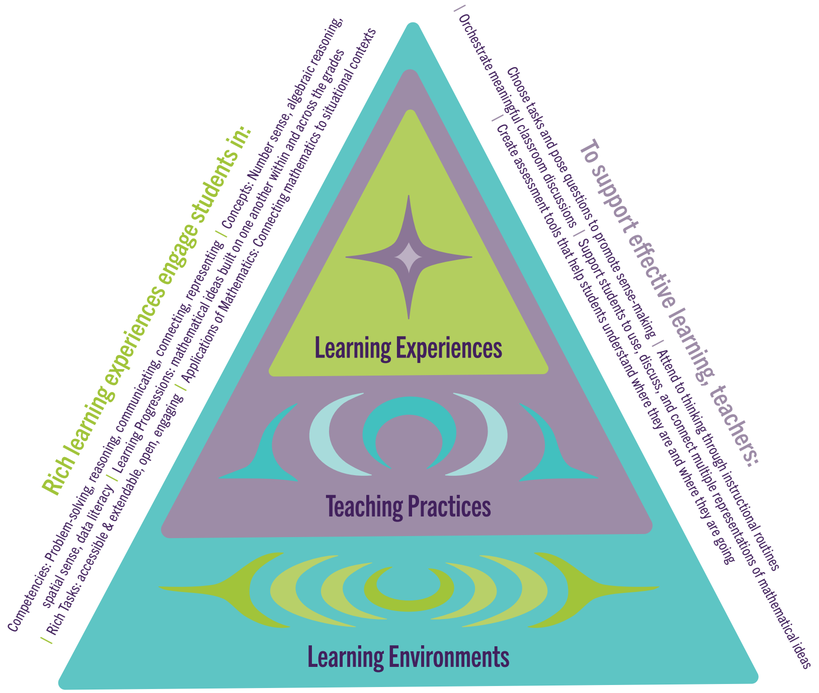

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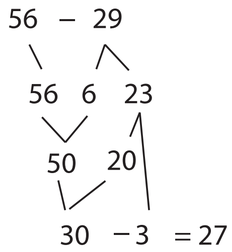
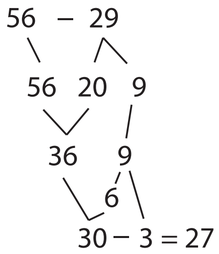
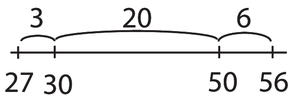
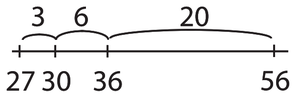
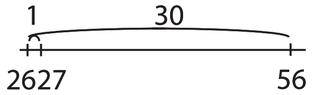
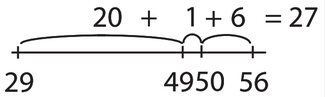
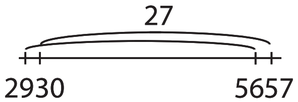
PACE
Sound Check

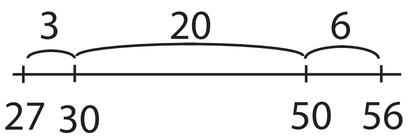
Strategies: How You Mess with the Numbers

Models: How You Show Your Thinking

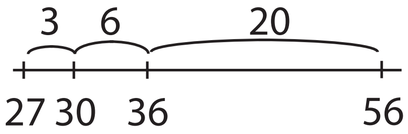
Models - How You Show Your Thinking	Strategies - How You Mess with the Numbers				
	Remove to a Friendly Number	Remove a Friendly Number	Remove a Friendly Number - Over	Find the Distance (Difference)	Constant Difference (Equivalent Difference)
Splitting					
Equations	56 – 29 = 56 – 6 – 23 = 50 – 23 = 50 – 20 – 3 = 30 – 3 = 27	56 – 29 = 56 – 20 – 9 = 36 – 9 = 36 – 6 – 3 = 30 – 3 = 27	56 – 29 56 – 30 = 26 26 + 1 = 27 56 – 29 = 56 – (30 – 1) = (56 – 30) + 1 = 26 + 1 = 27	29 + 1 = 30 30 + 20 = 50 50 + 6 = 56 1 + 20 + 6 = 27	56 – 29 +1 +1 57 – 30 = 27 56 + 1 = 57 – 29 + 1 = –30 27
Open Number Line					

1. Round the subtrahend to a multiple of ten and adjust

56 – 29
= 56 – 6 – 23
= 50 – 23
= 50 – 20 – 3
= 30 – 3
= 27

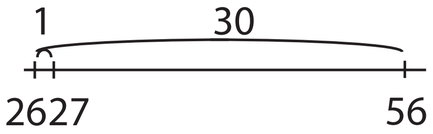


56 – 29
= 56 – 20 – 9
= 36 – 9
= 36 – 6 – 3
= 30 – 3
= 27

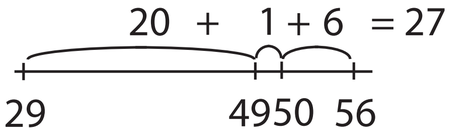


56 – 29
56 – 30 = 26
26 + 1 = 27

56 – 29
= 56 – (30 – 1)
= (56 – 30) + 1
= 26 + 1
= 27

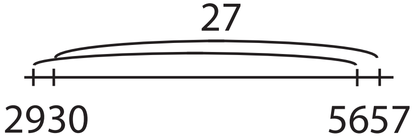


29 + 1 = 30
30 + 20 = 50
50 + 6 = 56
1 + 20 + 6 = 27



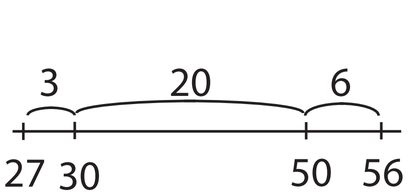
56 – 29
+1 +1
57 – 30 = 27

56 + 1 = 57
– 29 + 1 = –30
27

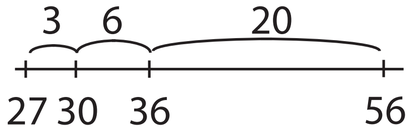


2. Decompose the subtrahend

$56 - 29$
$= 56 - 6 - 23$
$= 50 - 23$
$= 50 - 20 - 3$
$= 30 - 3$
$= 27$

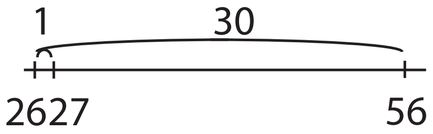


$56 - 29$
$= 56 - 20 - 9$
$= 36 - 9$
$= 36 - 6 - 3$
$= 30 - 3$
$= 27$

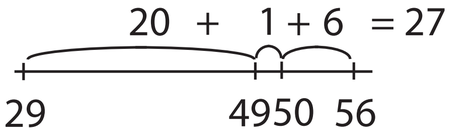


$56 - 29$
$56 - 30 = 26$
$26 + 1 = 27$

$56 - 29$
$= 56 - (30 - 1)$
$= (56 - 30) + 1$
$= 26 + 1$
$= 27$

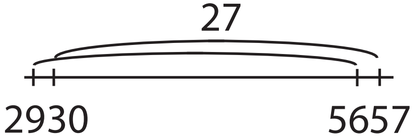


$29 + 1 = 30$
$30 + 20 = 50$
$50 + 6 = 56$
$1 + 20 + 6 = 27$



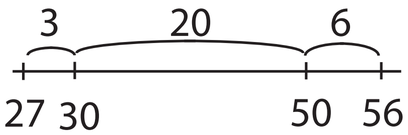
$56 - 29$
$+1 \quad +1$
$57 - 30 = 27$

$56 + 1 = 57$
$-29 + 1 = -30$
27

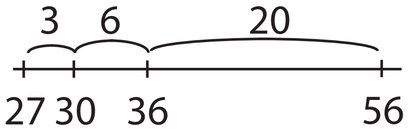


3. Add instead

56 – 29
= 56 – 6 – 23
= 50 – 23
= 50 – 20 – 3
= 30 – 3
= 27

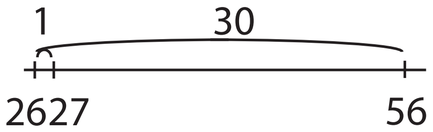


56 – 29
= 56 – 20 – 9
= 36 – 9
= 36 – 6 – 3
= 30 – 3
= 27

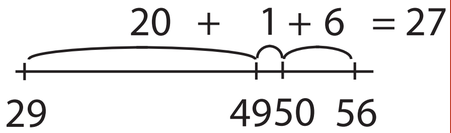


56 – 29
56 – 30 = 26
26 + 1 = 27

56 – 29
= 56 – (30 – 1)
= (56 – 30) + 1
= 26 + 1
= 27

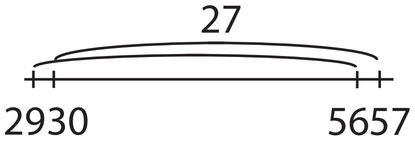


29 + 1 = 30
30 + 20 = 50
50 + 6 = 56
1 + 20 + 6 = 27



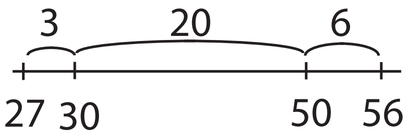
56 – 29
+ 1 + 1
57 – 30 = 27

56 + 1 = 57
– 29 + 1 = –30
27

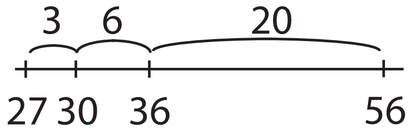


4. Same difference

$56 - 29$
$= 56 - 6 - 23$
$= 50 - 23$
$= 50 - 20 - 3$
$= 30 - 3$
$= 27$

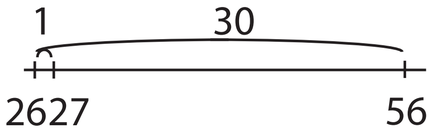


$56 - 29$
$= 56 - 20 - 9$
$= 36 - 9$
$= 36 - 6 - 3$
$= 30 - 3$
$= 27$

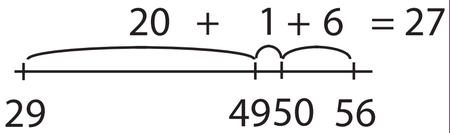


$56 - 29$
$56 - 30 = 26$
$26 + 1 = 27$

$56 - 29$
$= 56 - (30 - 1)$
$= (56 - 30) + 1$
$= 26 + 1$
$= 27$

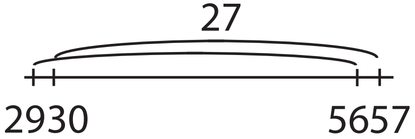


$29 + 1 = 30$
$30 + 20 = 50$
$50 + 6 = 56$
$1 + 20 + 6 = 27$



$56 - 29$
$+1 \quad +1$
$57 - 30 = 27$

$56 + 1 = 57$
$-29 + 1 = -30$
27



Number Strings

“Simply defined, number talks are five- to fifteen-minute classroom conversations around **purposely crafted computation** problems that are solved mentally.”

Parrish, S. D. (2011). Number talks build numerical reasoning. *Teaching Children Mathematics*, *18*(3), 198–206. https://doi.org/10.5951/teacchilmath.18.3.0198

$$56 - 29$$

23 – 10

23 – 9

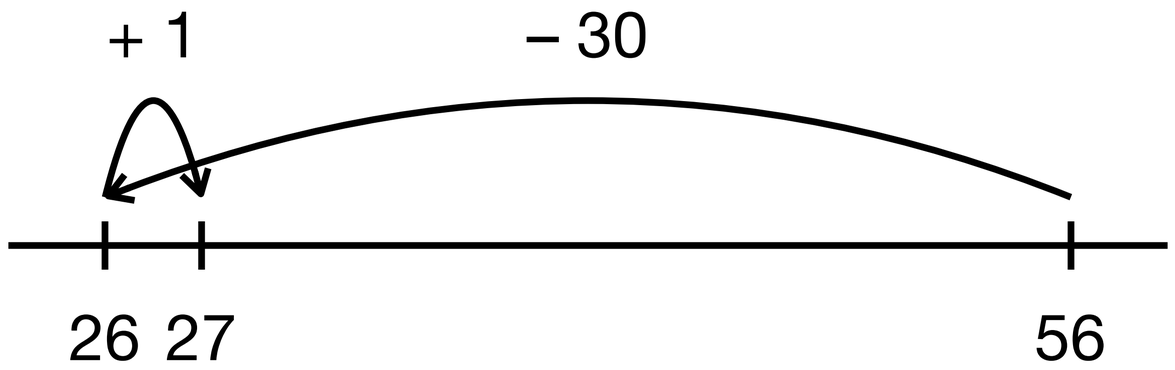
42 – 20

42 – 19

74 – 40

74 – 39

56 – 29


+ 1
– 30
26
27
56

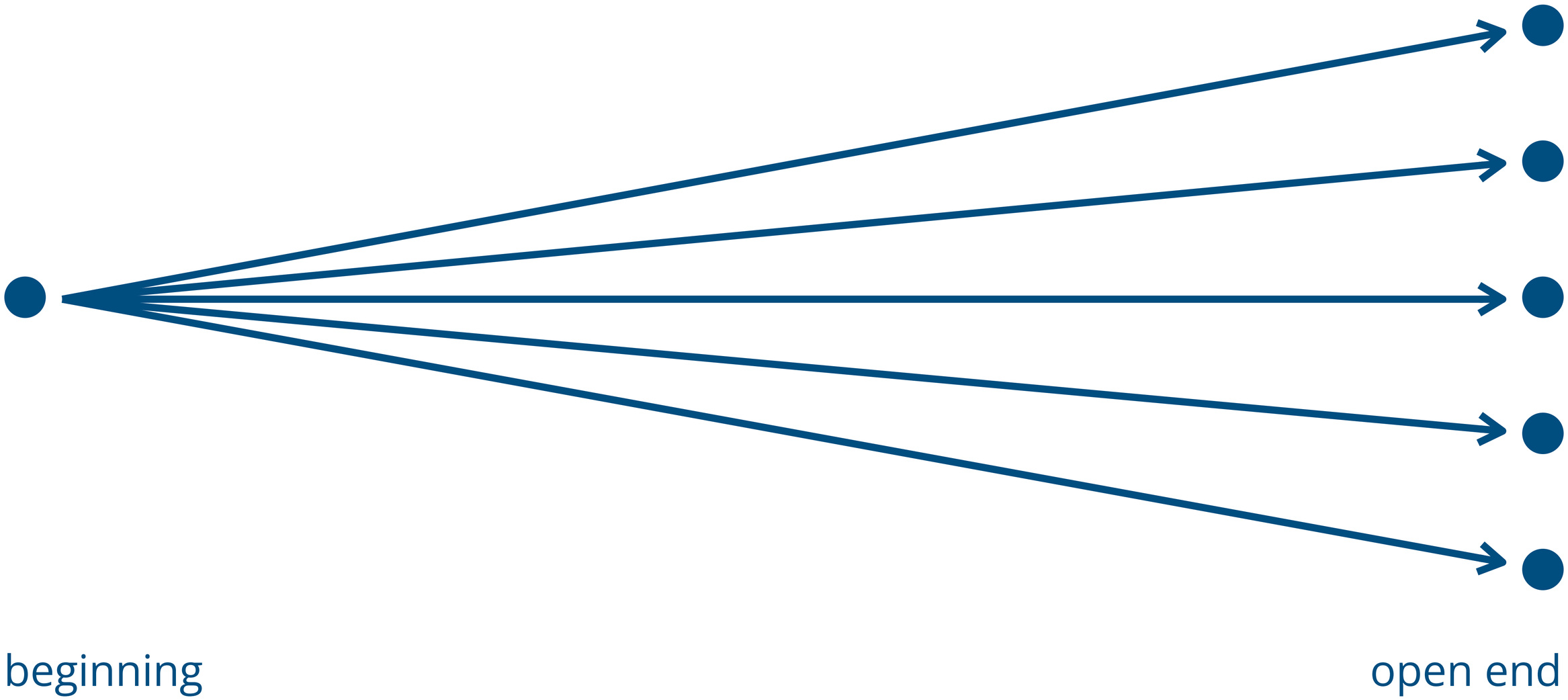
Open Middle

Meyer, D. (2014). Video games and making math more like things students like. [Video]

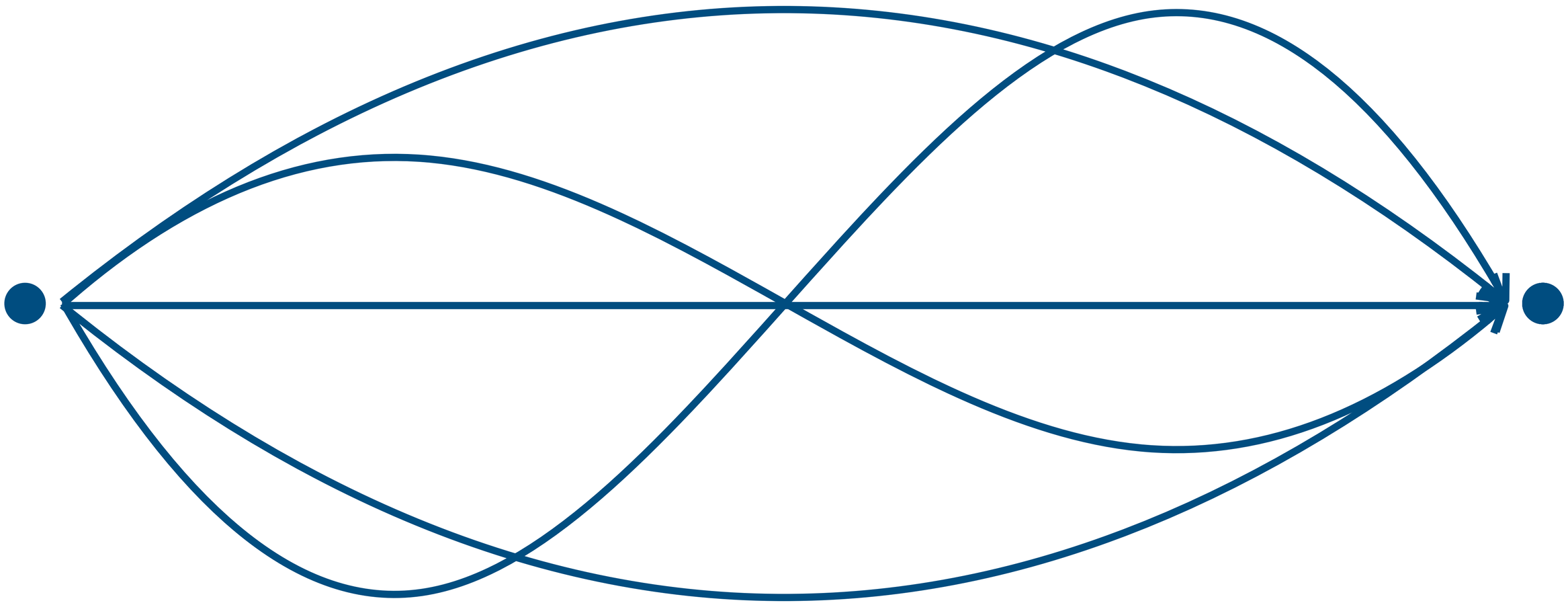
beginning

closed end

Meyer, D. (2014). Video games and making math more like things students like. [Video]



Meyer, D. (2014). Video games and making math more like things students like. [Video]

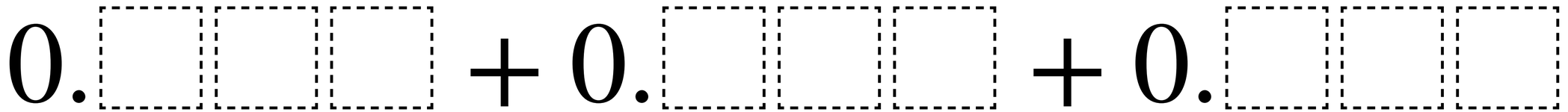


beginning

open middle

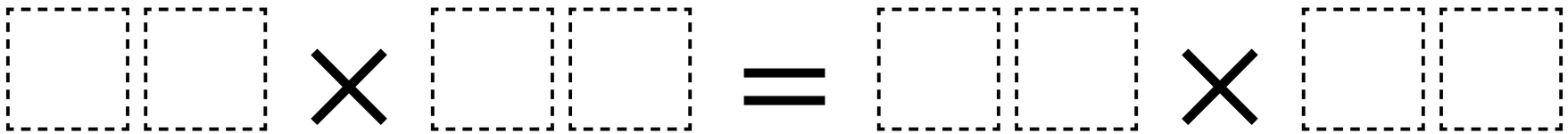
closed end


Oops, I forgot…
each digit can be used **at most once**!
1
2
3
4
5
6
7
8
9



1 2 3 4 5 6 7 8 9

0 1 2 3 4



5 6 7 8 9

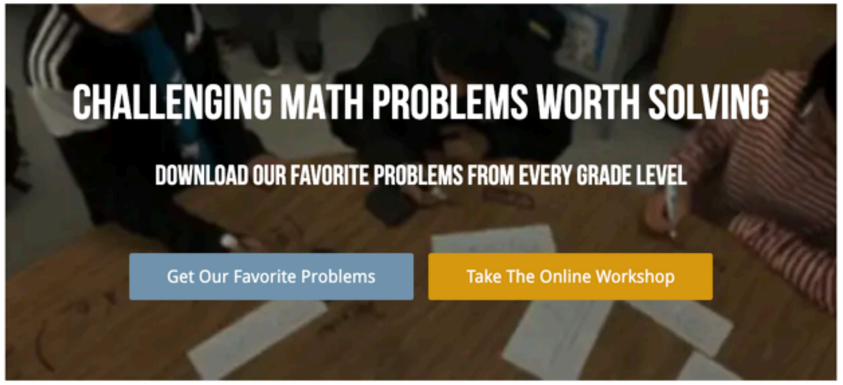
“I came to understand that when I asked students superficial questions, I got superficial information back about what they knew.”

Kapliinsky, R. (2020). *Open middle math: Problems that unlock student thinking*. Stenhouse.

OPEN MIDDLE

Take The Online Workshop

Home | Kinder | 1st Gr | 2nd Gr | 3rd Gr | 4th Gr | 5th Gr | 6th Gr | 7th Gr | 8th Gr | High School | About | Submit | English



MAKE A WARM-UP IN 30 SECONDS

READ OUR ARTICLE ABOUT EMBEDDING OPEN MIDDLE PROBLEMS

READ THE ARTICLE | WATCH THE VIDEO

Search

OPEN MIDDLE STICKERS

- Get an Open Middle sticker

OPEN MIDDLE WORKSHEET

- English (student version)
- English (document camera version)
- English (Google Doc version)
- French (student version)
- French (document camera version)
- French (Google Doc version)
- Spanish (student version)
- Spanish (document camera version)
- Spanish (Google Doc version)

NUMBER TILES

- Printable PDF with the digits 0 to 9
- Printable PDF with the integers -9 to 9

OPEN MIDDLE SLIDES

- Google Slides Version

Wanted Number

Wanted Number

It is a 2-digit number.
It is an odd number.
It is less than 40.
The number contains one prime digit.
It is a number with no repeating digits.
An even number is in the 10s place.
It is a prime number.
Its digits add up to 11.
It is a number between 25 and 30.

Krpan, C.M. (2013). *Math expressions: Developing student thinking and problem solving through communication.* Pearson.

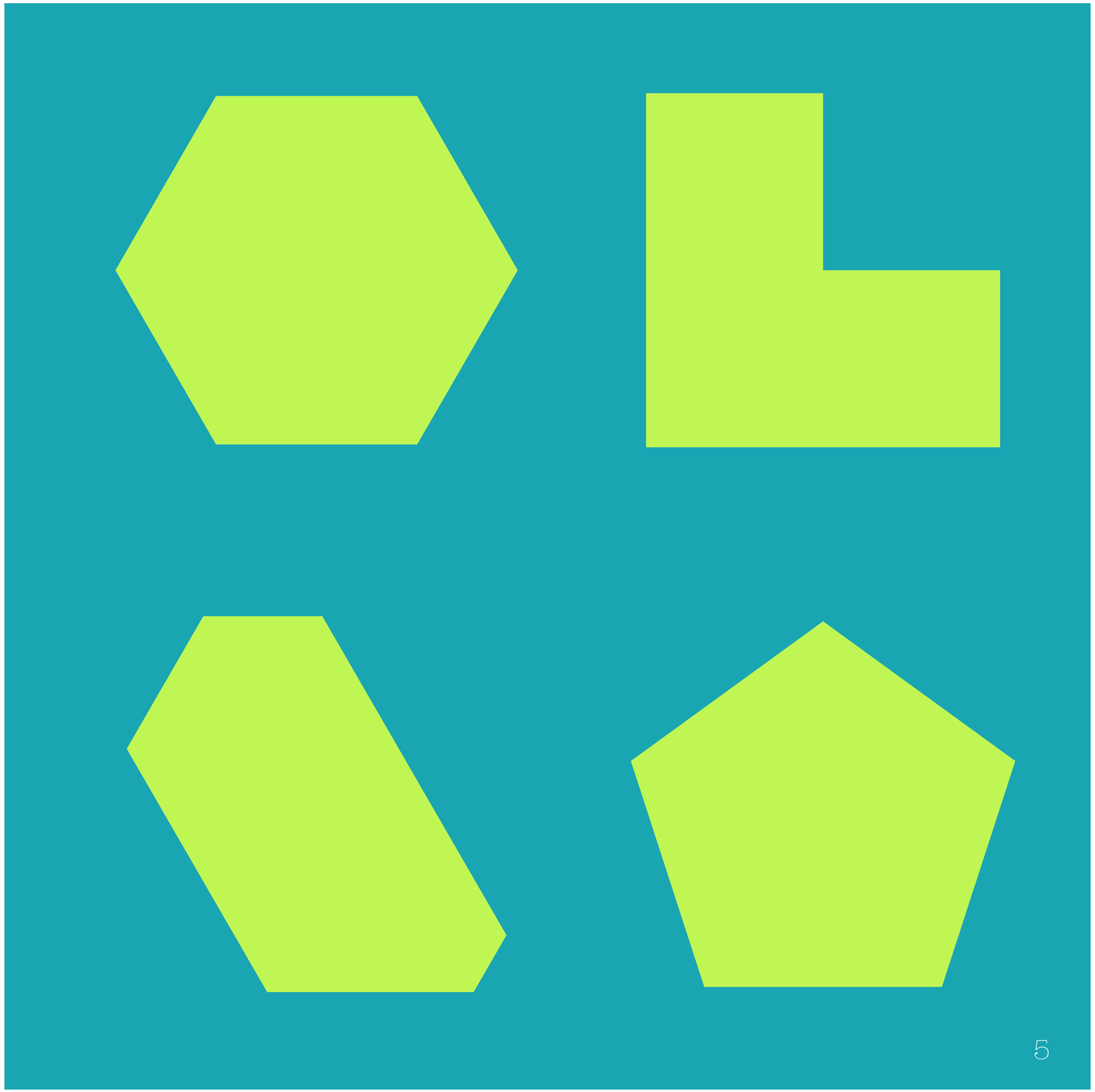
Which One Doesn’t Belong?

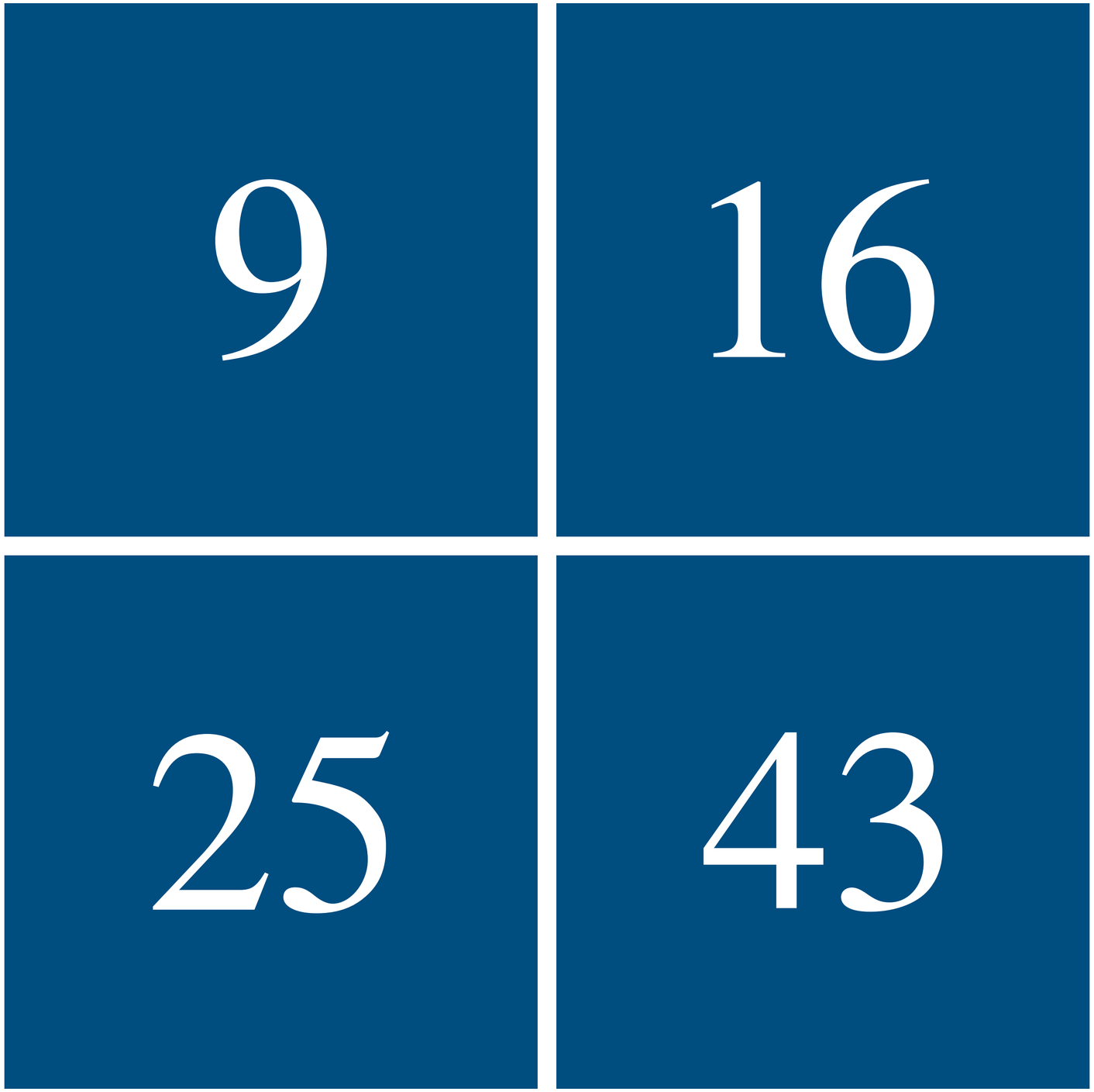
____ does not belong because…

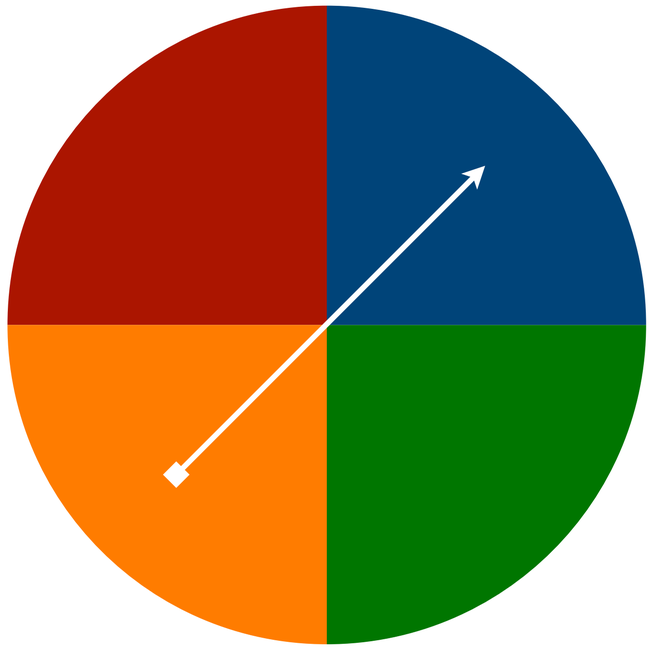
What makes ____ different from the others is…

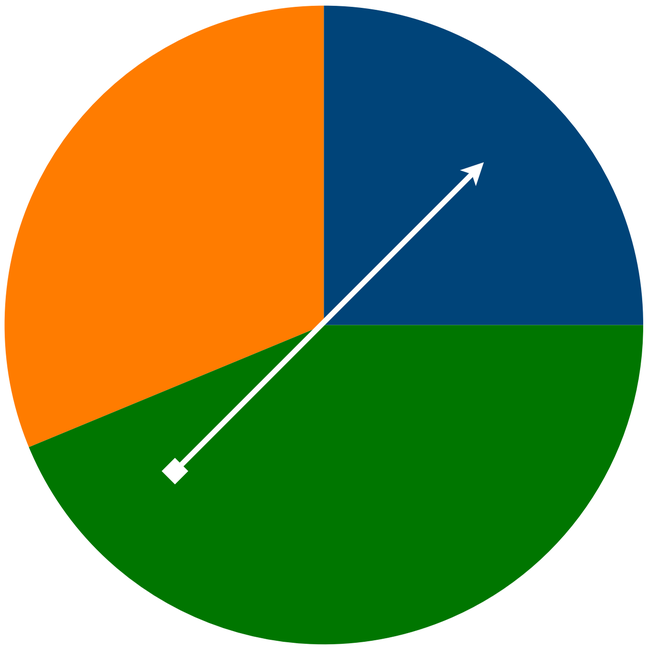
Only ____ has ____

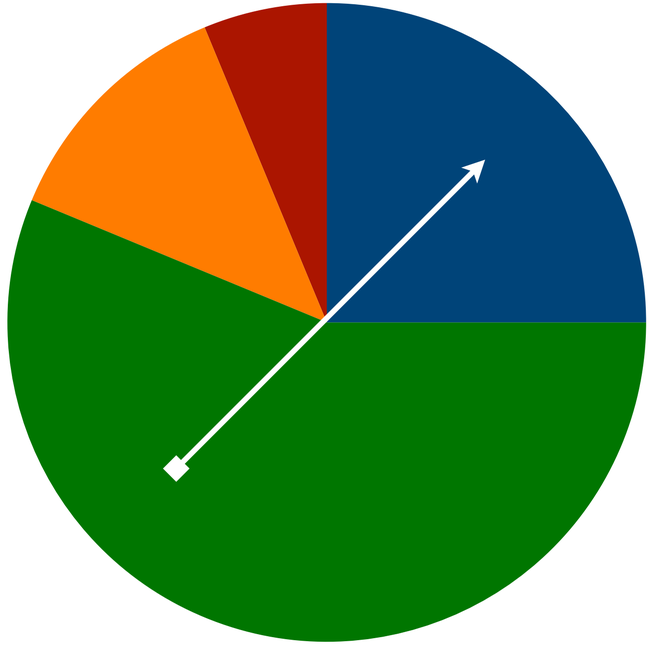
All ____ have ____ except ____

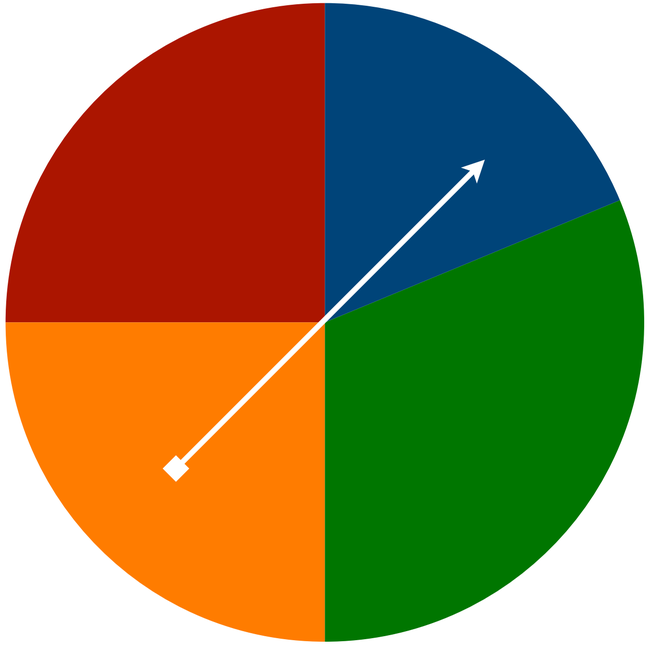



9
16
25
43









5, 8, 11, 14, ...

4, 7, 10, 13, ...

5, 9, 13, 17, ...

“All choices are correct, which shifts the focus to **justification**. *Which One Doesn’t Belong?* isn’t about guessing the right answer; it’s about expressing mathematical relationships precisely in order to **communicate** with others.”

Danielson, C. (2016). *Which one doesn’t belong? A teacher’s guide*. Stenhouse.

“When children look for **sameness and difference**; when they work hard to put their ideas into words; when they evaluate whether somebody else’s justification makes sense; when they wonder *What if […]?*—in all these cases, **children engage in real mathematical thinking**.”

Danielson, C. (2016). *Which one doesn’t belong? A teacher’s guide*. Stenhouse.

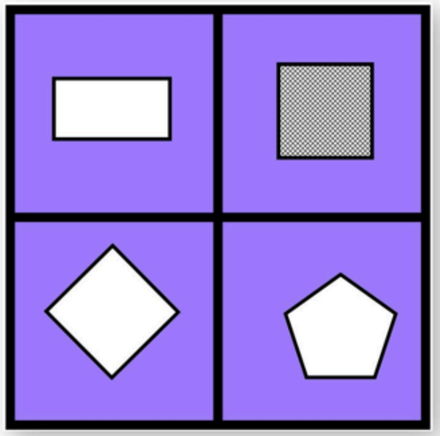
“The use of sentence frames was critical to support students who are feeling anxious about what to say, as well as students who have difficulty getting started. They also support students who have challenges with social cues. […] **A sentence frame can give permission to get started, and help students know that they are on the right track.**”

Lambert, R. (2024). *Rethinking disability and mathematics: A UDL math classroom guide for grades K-8.* Corwin.

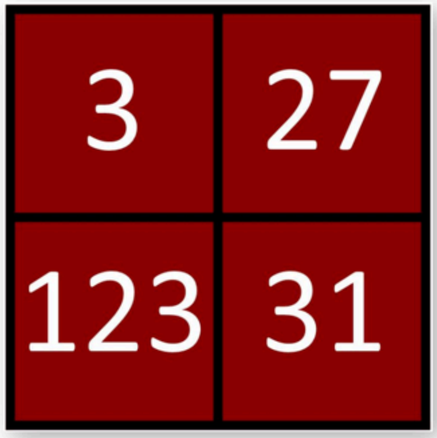
WODB

shapes numbers graphs expressions photos incomplete sets misc about

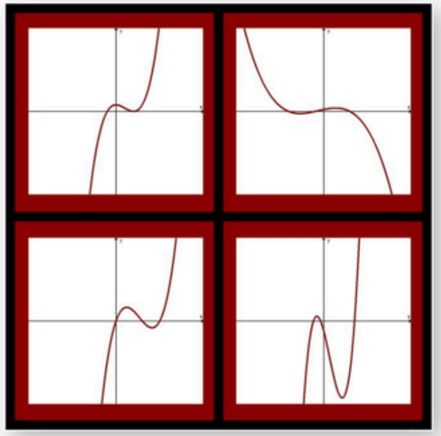
Which One Doesn't Belong?



shapes



numbers

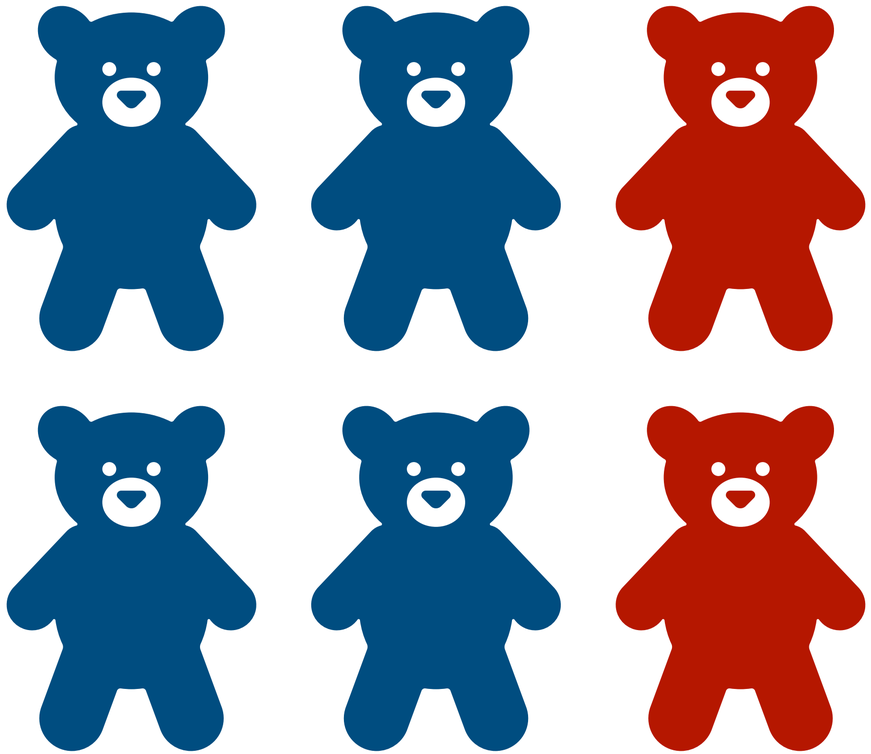


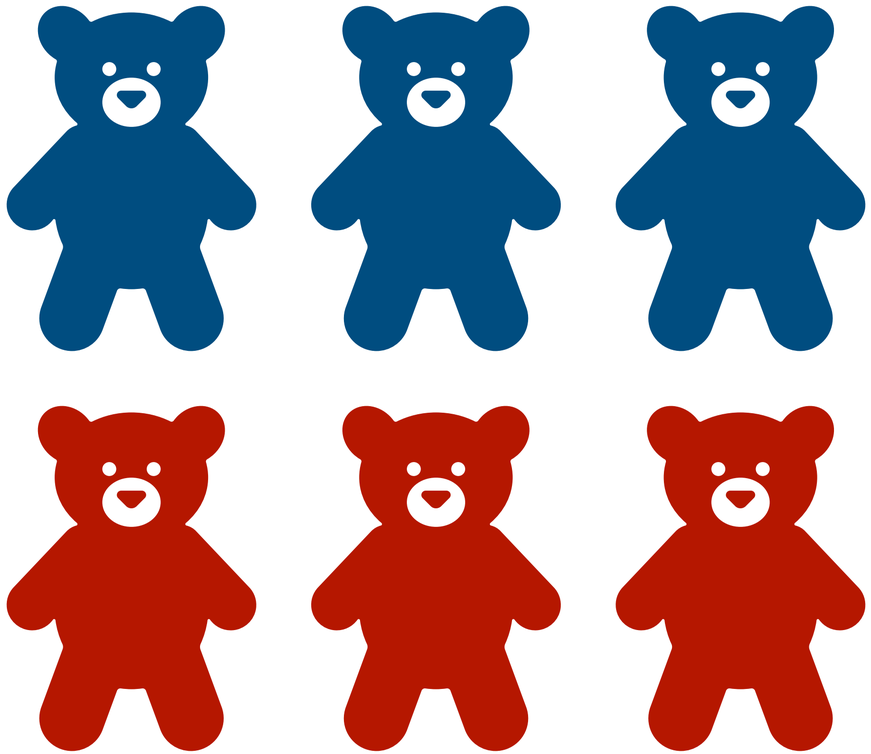
graphs

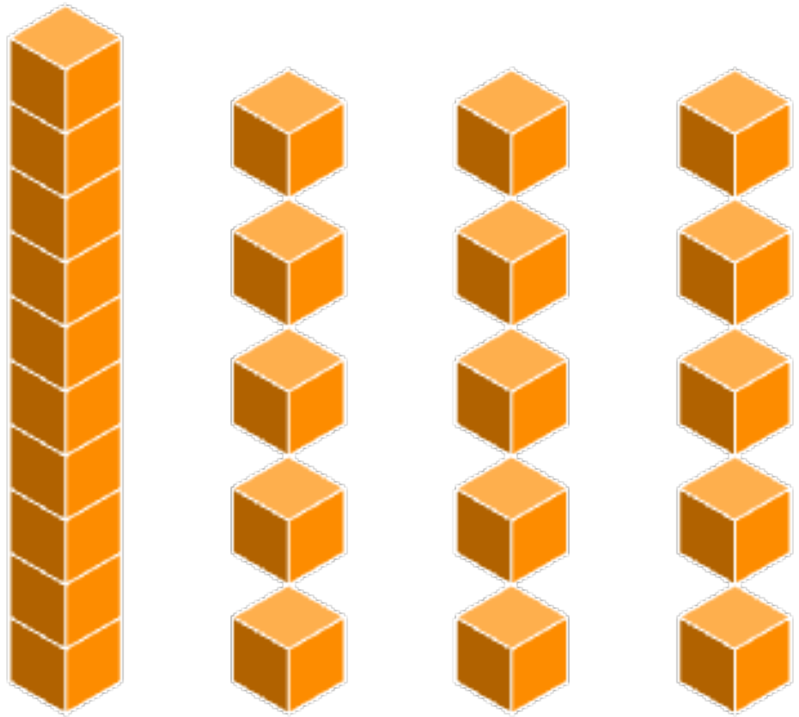
Same and Different

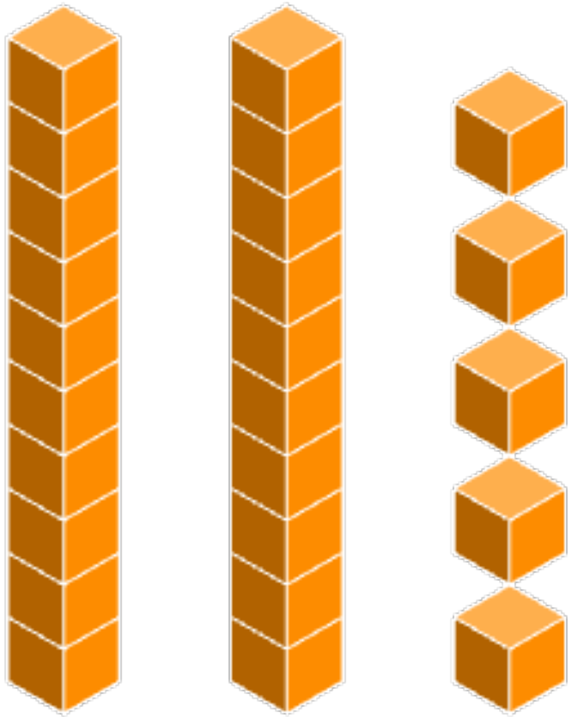
What is the ***same****?*

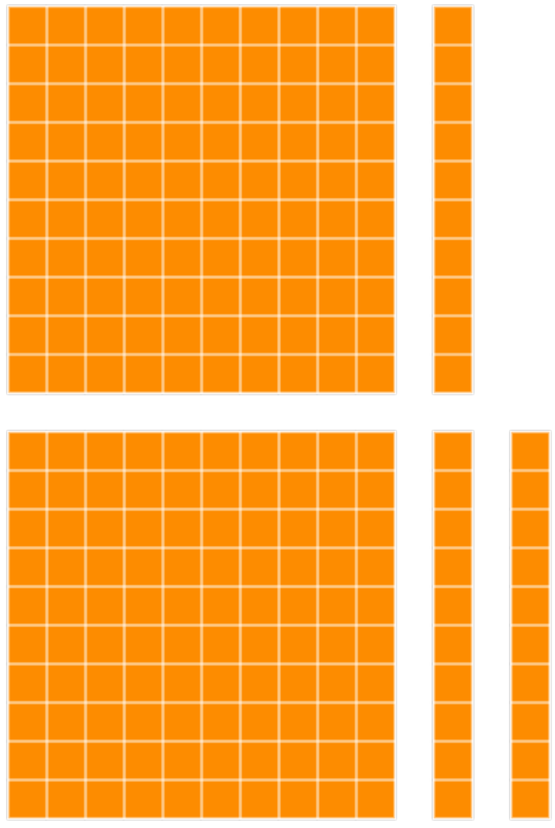
What's ***different****?*

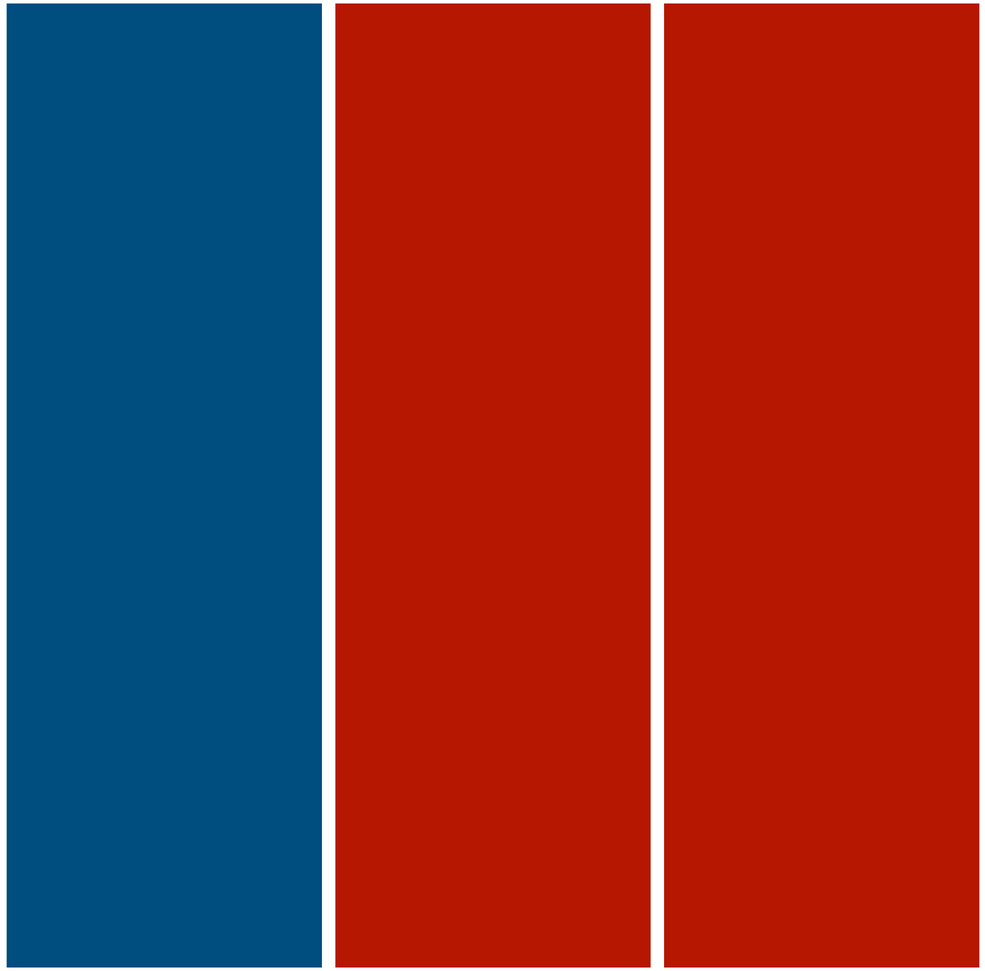


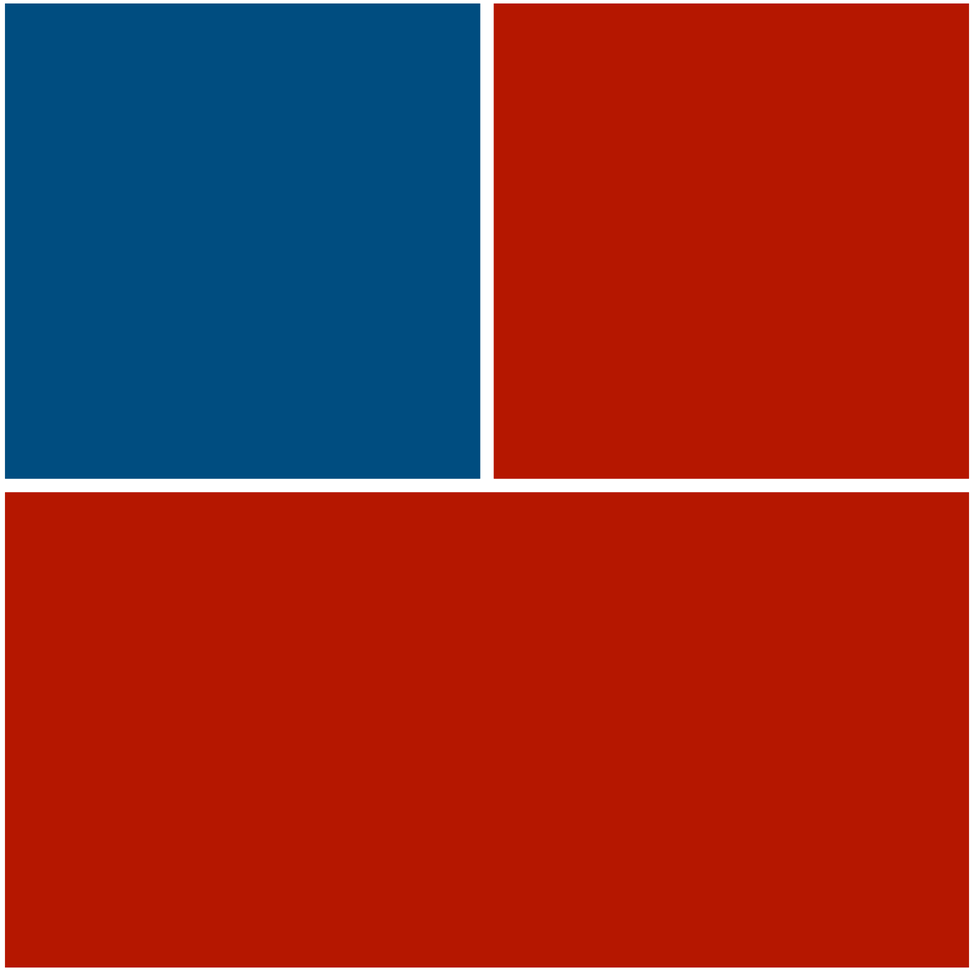












20

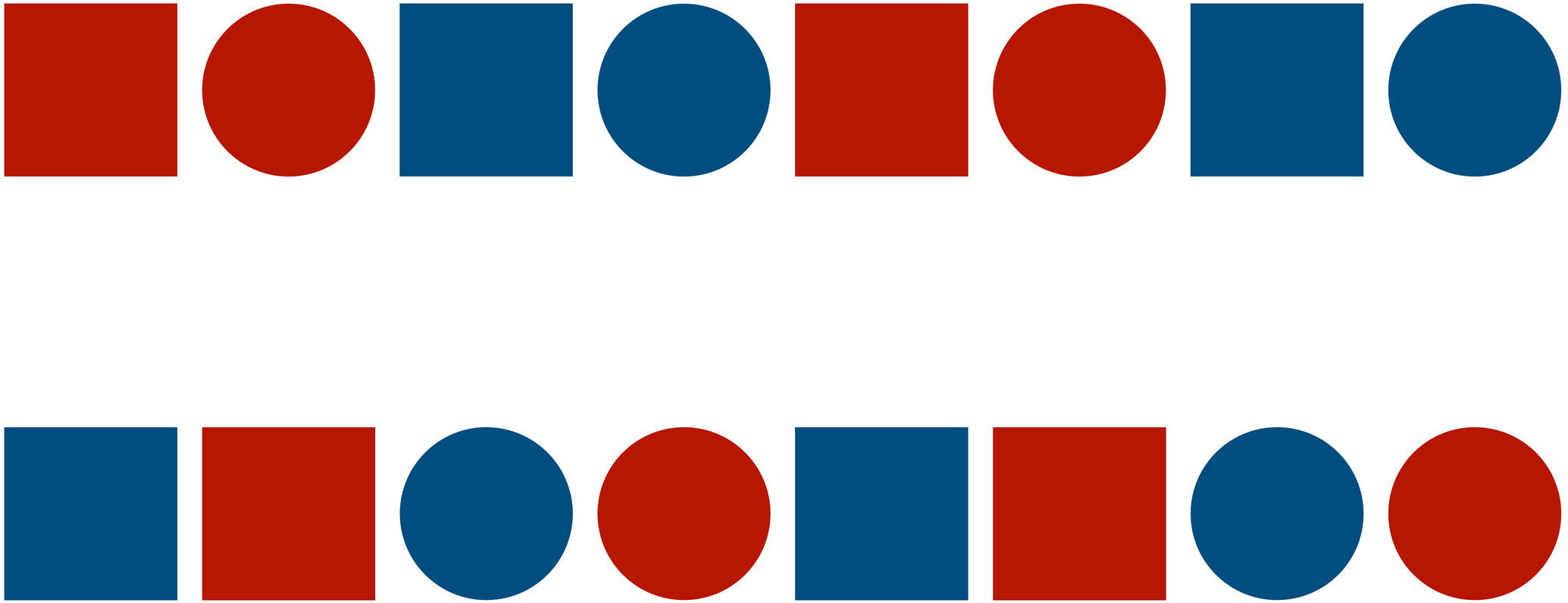
35

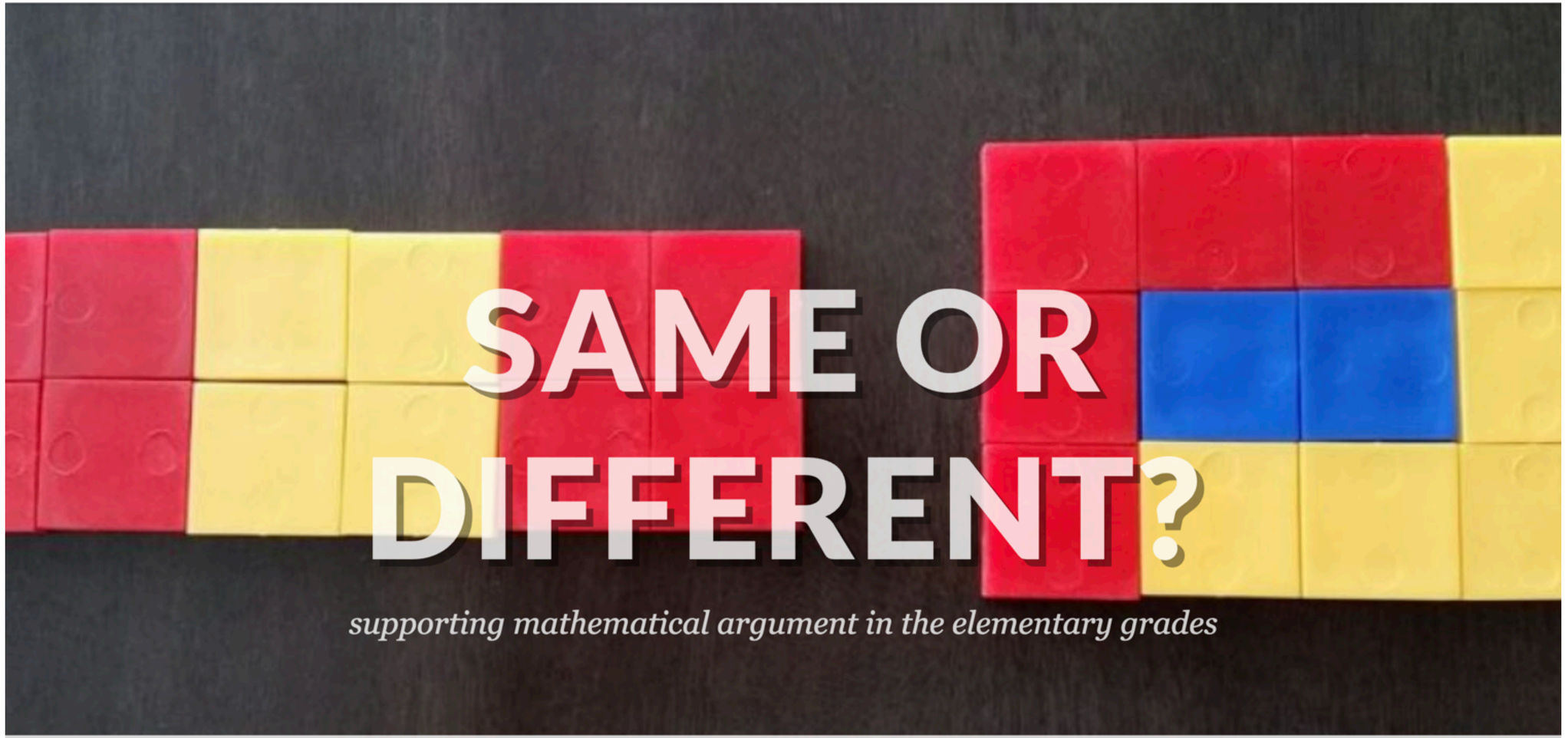
200

350

0.2

0.35



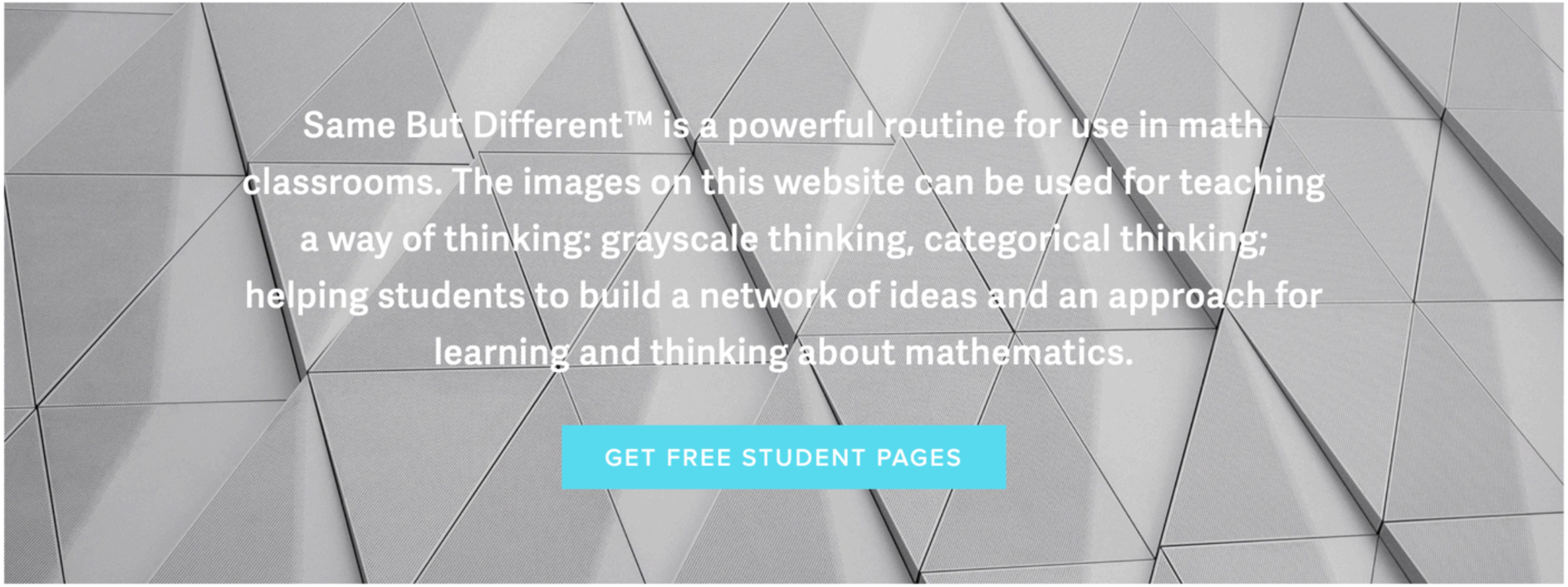


WELCOME!

SAME BUT DIFFERENT™ MATH from Looney Math

Developing Grayscale Thinking

ABOUT EARLY NUMERACY ADDITION/SUBTRACTION MULTIPLICATION/DIVISION MEASUREMENT PLACE VALUE FRACTIONS, RATIOS, ETC GEOMETRY ALGEBRA HIGH SCHOOL T-SHIRTS

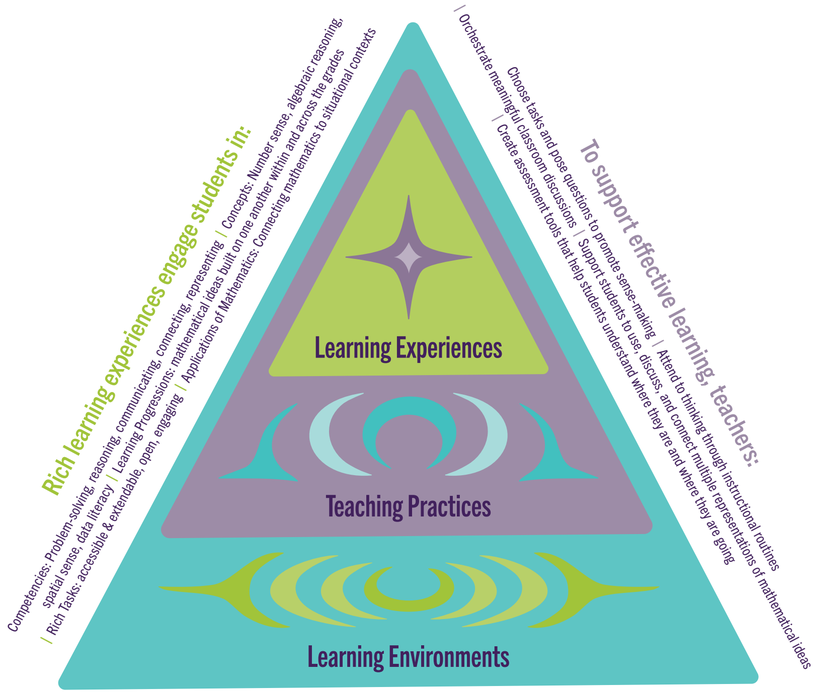


LEARN MORE

Numeracy Framework K–12

Surrey Schools
LEADERSHIP IN LEARNING

The nested nature of the triangles in this diagram communicates that the three elements of Surrey Schools' Numeracy Framework—rich learning experiences, effective teaching practices, and inclusive learning environments—are interwoven. Each element supports, and is supported by, the others.



An inclusive learning environment is one in which learners demonstrate:

Acceptance, respect, and support for each other | Willingness to work together | Reliance on and responsibility for others' learning | A view of themselves as mathematicians | Confidence and persistence in problem-solving | Appreciation for diverse voices, cultures, and lived experiences

Shaping Rich Learning Experiences

- Aim to develop students' abilities to engage in mathematical competencies as well as their understanding of mathematical content
- Encourage students to see math as a coherent connected whole
- Draw on the knowledge, experience, and background of students
- Allow all students to participate in and benefit from carefully chosen problems, tasks, and activities

Implementing Effective Teaching Practices

- Engage students in sense-making through the active doing of mathematics
- Provide opportunities for collaboration, communication, and reflection
- Develop procedural fluency through conceptual understanding
- Promote a positive disposition in mathematics
- Gather and analyze evidence to determine next steps in student learning

Building Inclusive Learning Environments

- Create classroom communities in which all learners belong
- Recognize that learning is closely tied to students' identities
- Inspire students to see mathematics as joyful, playful, creative and collaborative
- Make explicit connections to Indigenous ways of knowing and being

We are deeply grateful to artist Elinor Atkins from the qʷɑ:nʌ'ən (Kwantlen) and Nɬeʔkepmx (Shakan) First Nations for her artistic vision and expression of geometric Coast Salish designs. With trigons, circles, ovals, and crescents, Coast Salish design elements shape the Morning Star and the all-seeing Coast Salish Eyes of this land. In their harmony, we are reminded of the beauty of connection and the wisdom of place.

BCAMT Fall Conference

Math Wide Open: Rethinking What Counts

New Westminster Secondary
& Online

October 24, 2025

bcamt.ca/fall2025

Chris Hunter

K-12 Numeracy Helping Teacher

Surrey Schools

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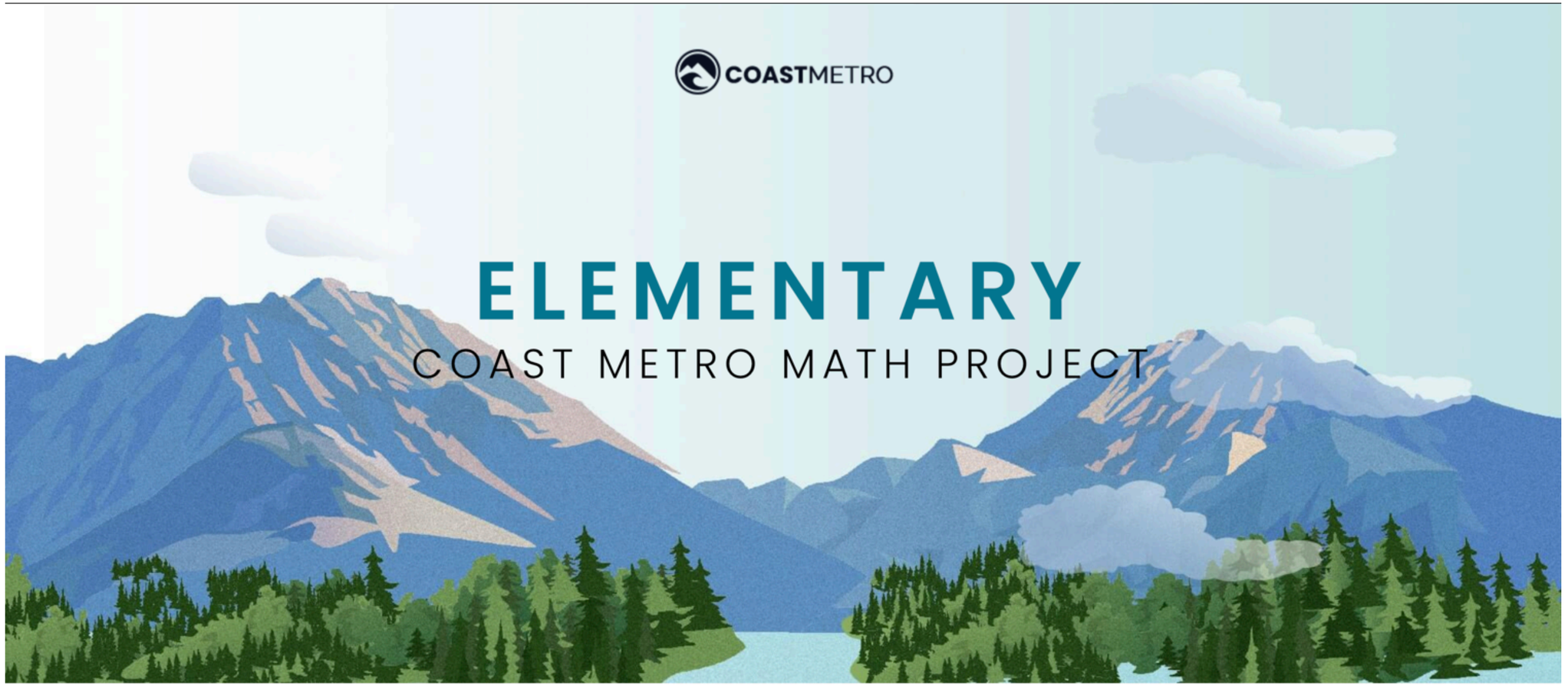

INTRODUCTION

After a successful spring 2022 professional learning series with Dr. Marian Small, the Coast Metro Consortium invited educators from the Lower Mainland Math Contacts (LMMC) group to develop an elementary math framework to support teachers in the Coast Metro region in the teaching and assessment of elementary mathematics. A team of teachers