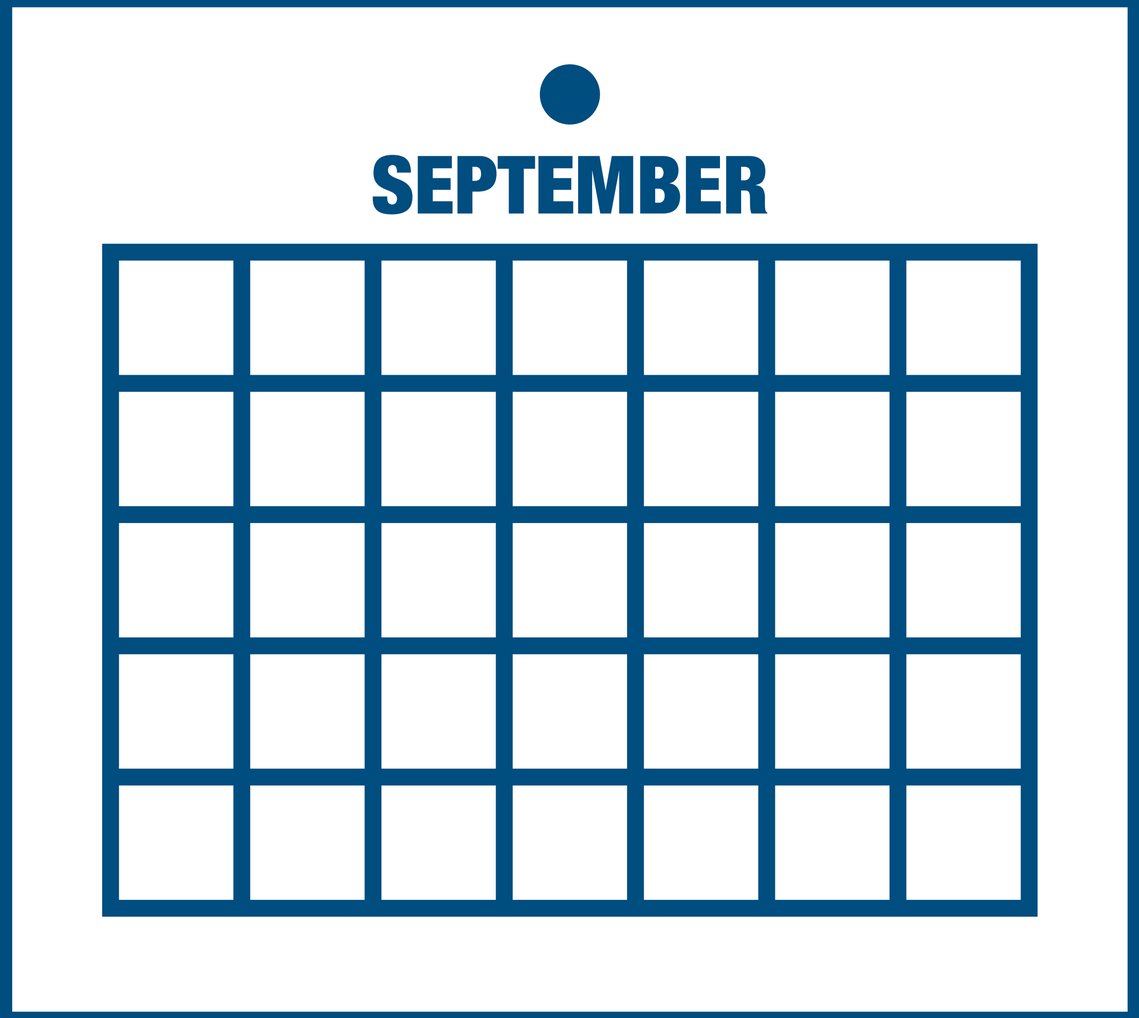
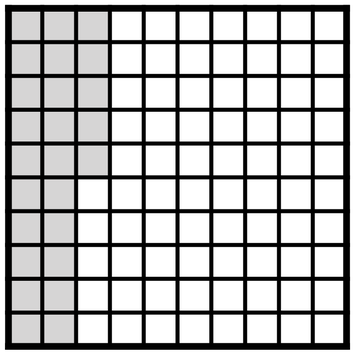
Starting the Math Year off Right: Building a Community in Which All Learners Belong

Summer Institute 2022



Chris Hunter
K-12 Numeracy Helping Teacher
email: **hunter_c@surreyschools.ca**
Twitter: **@ChrisHunter36**
blog: **chrishunter.ca**

Which **One *Doesn't*** **Belong**?

	65 %
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What are
your **goals**?

ROOTS

Starting off *right*

Starting off *wrong*

LOCAL

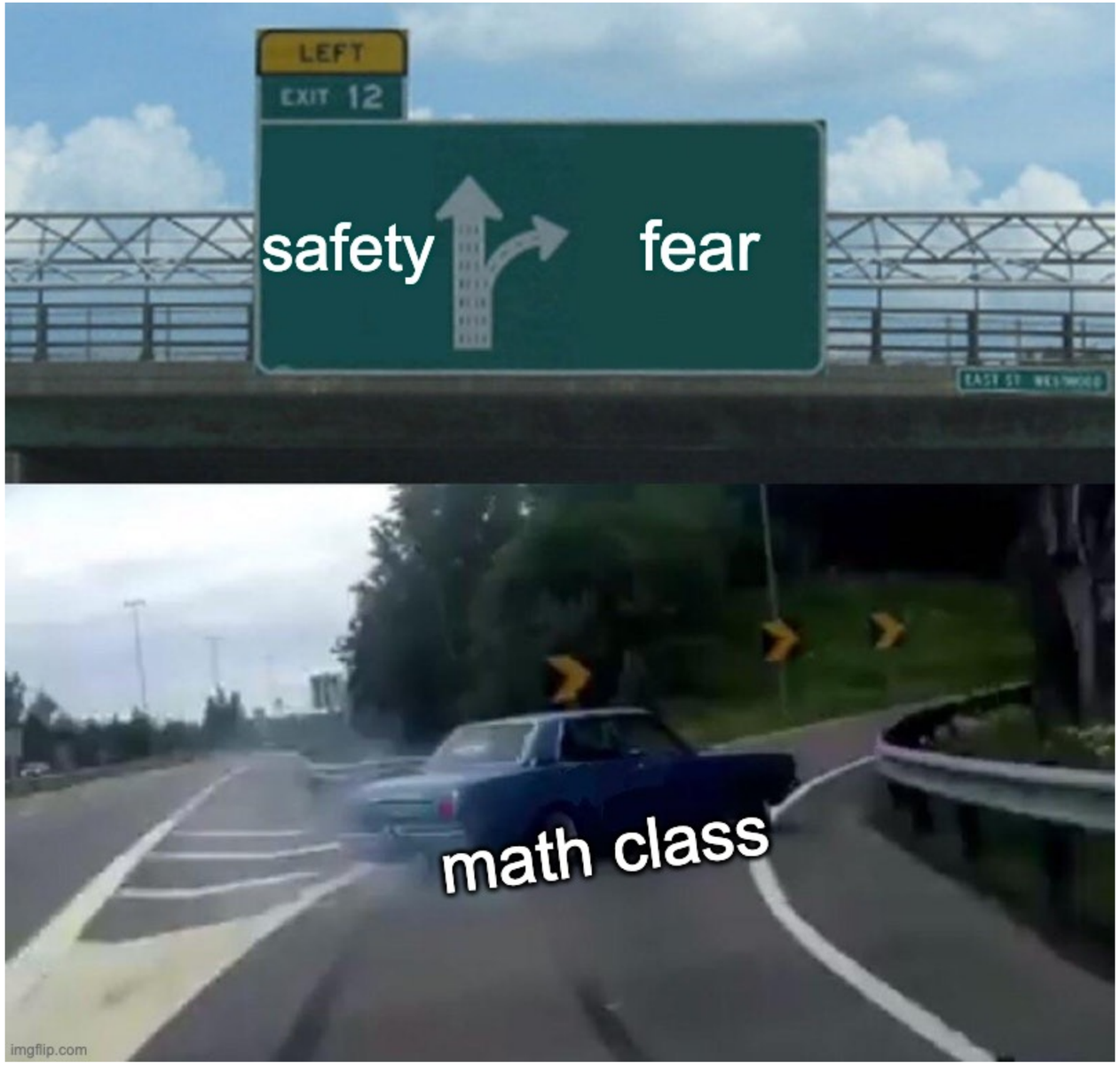
Fourth-Grade Teacher Polishing Up Speech On This Not Being Third Grade Anymore

LOCAL

Fourth-Grade Teacher Polishing Up Speech On This Not Being Third Grade Anymore

8/18/14 1:55PM

PALMYRA, PA—Saying it was important for her students to understand their increased expectations at the start of the new school year, Pine Street Elementary school teacher Veronica Potter reportedly spent Sunday evening putting the finishing touches on a speech that will inform her incoming class they are not in third grade anymore. “Many of you are 10 years old now, and I expect you to act like it,” said Potter, rehearsing the speech that will emphasize how the students’ responsibilities will extend not just to academic performance, but to behavior and classroom participation as well. “There’s going to be homework every night and we’re going to do several science units outdoors, which will require a lot of focus. You may have gotten away with excuses or outbursts last year, but this is fourth grade now. Okay?” Sources confirmed that Potter, worried about overwhelming her students too much on the first day, later revised her speech to put more emphasis on the spring field trip to Gettysburg.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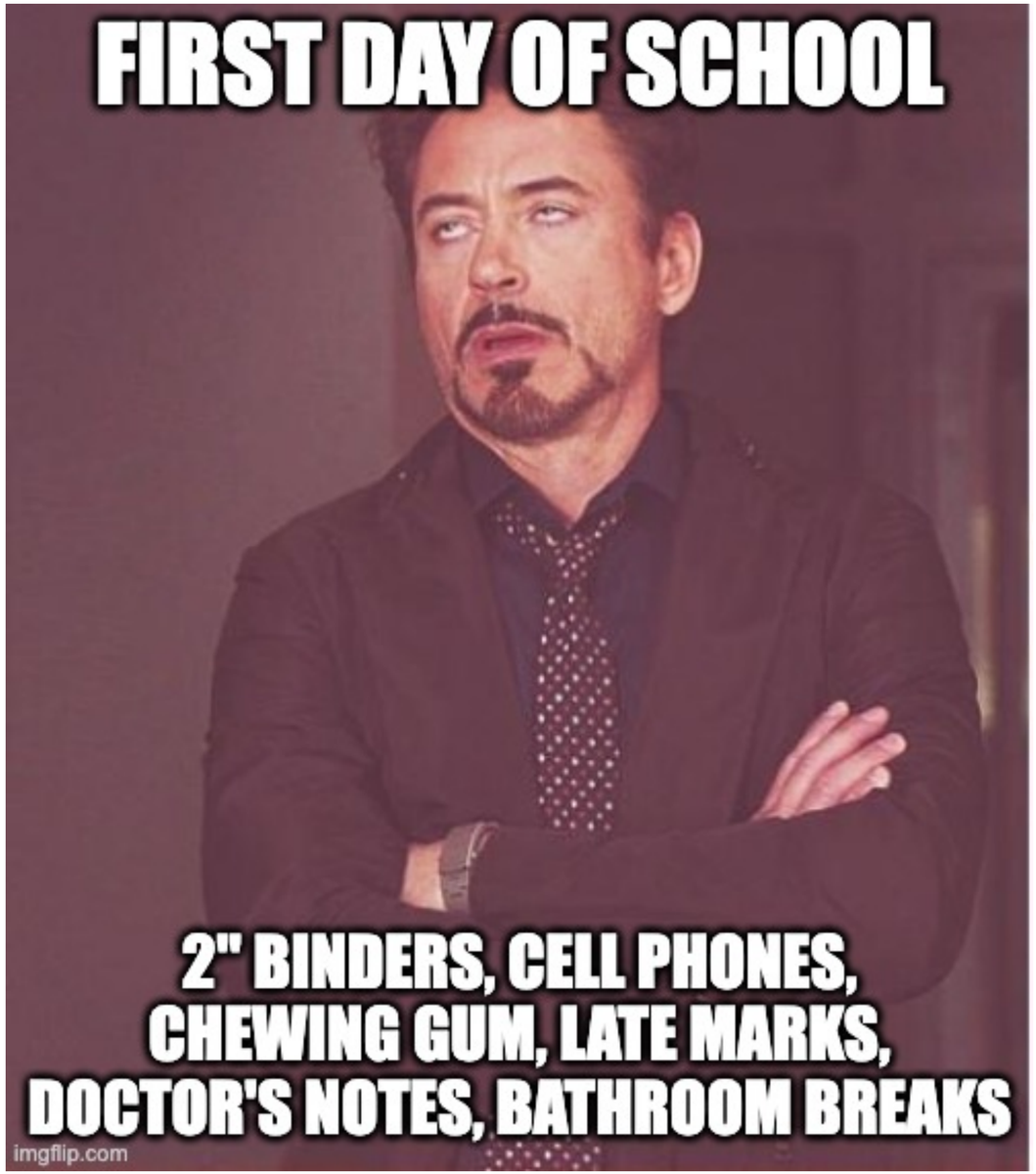
FIRST DAY OF SCHOOL
2" BINDERS, CELL PHONES,
CHEWING GUM, LATE MARKS,
DOCTOR'S NOTES, BATHROOM BREAKS
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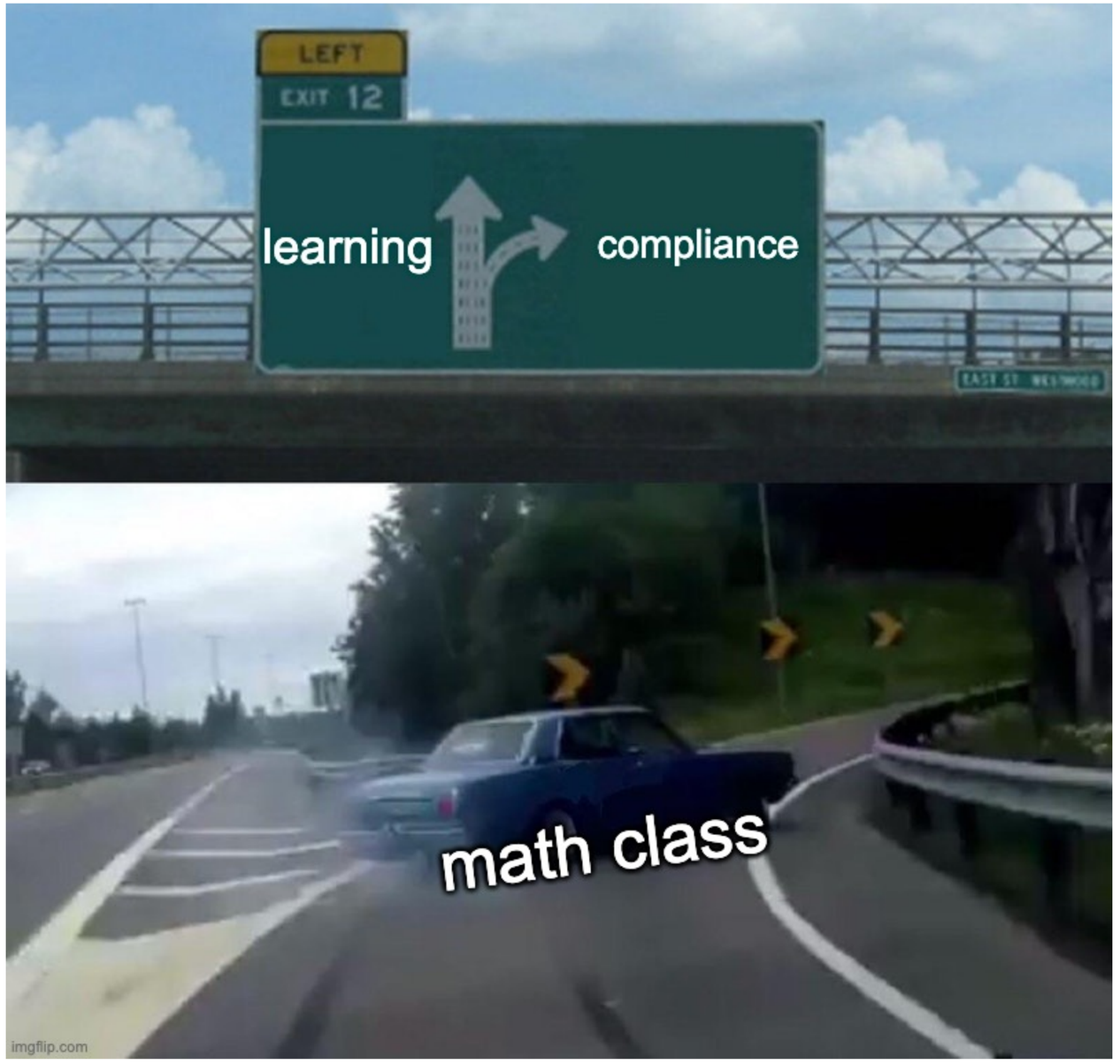
$n = 40$


LEFT
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math class
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Not this **but that**

talk about
the course outline
for 77 minutes
OR
draw
25
imgflip.com
UNO

Geometry 2020-2021 | Room #314

Teacher: Geoff Krall | Email: gmkrall@gmail.com | (555)-867-5309 | Pronouns: he/him/his | Class Website: www.emergentmath.com
Tutoring Hours: MWF Lunch or by Appointment before/after school | Room #314

Welcome to Geometry. Welcome to Math. Like the study of mathematics, my class is a welcoming inclusive space. We will explore your ideas and identity through the lens of Geometry. I'm excited that you are going to learn with me over the course of the next school year. - Mr. Krall

Geometry is a branch of mathematics involving space, shape, size, and position of things. Here are a few Geometers (those who practice Geometry).

Emmy Noether (1882-1935) Fixed Einstein's Theory of Relativity with *Noether's Theorem*	Vivienne Malone-Mayes (1932-1995) First African-American professor at Baylor University	Maryam Mirzakhani (1977-2017) Beautiful mathematical work; exceptional communicator

I highlighted these three Geometers because they bring a bunch of different mathematical skills to the table:

Outspoken	Courageous	Curious
Creative	Collaborative	Persistent

Some of my mathematical skills are the following:

Willingness to be wrong	Thoughtful	Humorous

What are some of *your* skills?

In order to bring out these skills, we need to ensure that our math classroom is a safe, inclusive space that allows us to think deeply. In order to do that, I'd like to offer a few *norms* or "ways of being." I also invite you to develop additional *norms* with me.

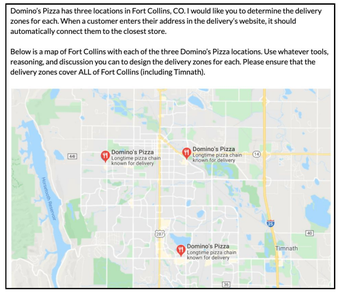
Be curious and express curiosity	Encourage one colleague every day	Work on the same problem at the same time

We will reflect on these *norms* often. I'll do my best to live up to them.

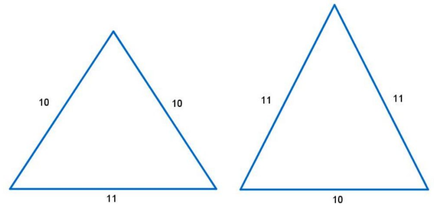
And now, some triangle dot paper. Feel free to doodle.

The Structure of our Course: Portfolio Problems. Our courses will be structured around ten problems of significant complexity and value. Here are three problems we are going to solve this year. There are eight additional problems posted around the room (for a total of ten "anchor problems." We'll learn strategies to solve them and you'll keep a record of your solution methods in a mathematical work portfolio.

Portfolio Problem #1: Pizza Delivery Problem (September)

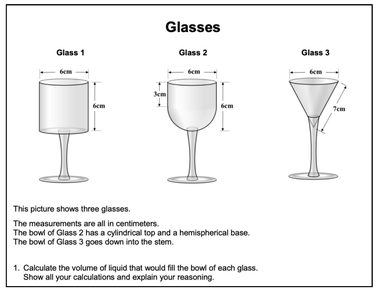


Portfolio Problem #2: Equilateral-er Triangles (October)



Which of these two triangles is the "more equilateral" triangle?

Portfolio Problem #3: Glasses (November)



Portfolio Problem #4: Elmo's Microwave Travel (December)

- How many rotations will Elmo make?
- How far does Elmo travel?

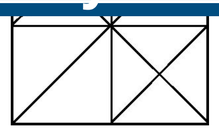
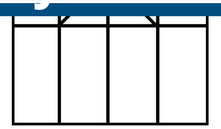
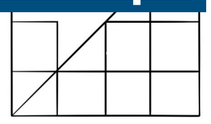
Grades. A few words about grades:

- Grades are not an accurate representation of what you know, what you can do, and who you are. Nevertheless, I understand how important they can be to your future. I will approach your grade with humility.
- Any grade you receive is eligible for full credit on redos.
- Any grade you receive is up for negotiation. Come see me and we'll figure it out.
- The assignments that count the most will be graded using a *rubric.*

How will I calculate your grade? Because I have to input a numerical grade in the gradebook at the end of every grading period, here's my breakdown:

- Mathematical Work Portfolio: 40%
- Daily Assignments: 40%
- Tests and Quizzes: 20%

And now for a bit more fun. Shade one section and see if you can figure out what fraction of the whole shape it is.

https://emergentmath.com/2020/07/14/your-math-syllabus-boot-camp/

belonging

part of something greater

the feeling of being an accepted member of a group.

need
desire

respected
included
supported

math class
“math people”

“… another key part of **belonging** is being given **the opportunity to add value**.”

Petters, A. O. (2018). Belonging. *Notices of the AMS, 65*(2), 120.

- Community
- Curriculum

- Interpersonal
- Instructional

Matthews, J. (2021, October 15). Belonging-centered instruction: An observational approach toward establishing inclusive mathematics classrooms. https://doi.org/10.31219/osf.io/n7bv2

https://www.saravanderwerf.com/week-1-day-1-name-tents-with-feedback/

Inigo Montoya

Minneapolis South High School	**First Week Feedback Form**	Advanced Algebra

Name:

<u>Use this form to communicate with me.</u> Write a comment OR question OR make a suggestion about this class. (Ideally a couple of sentences). Each day I will respond to whatever you write. Thank you for your time. Leave this name tent on your table each day.

<u>POSSIBLE QUESTIONS TO RESPOND TO:</u> How do you feel about math? What would you like me to know about you outside of school? What hopes do you have for this class (Advanced Algebra) for 2016-17? What do you like about math or this class? What are you fearful of? What activities (sports/arts/jobs…) are you involved in after school? Draw a picture/sketch of how you are feeling. Draw a picture/sketch of something that represents you.

Monday, August 29	Tuesday, August 30	Wednesday, August 31	Thursday, September 1	Friday, September 2
Comments: **(student)**	Comments:	Comments:	Ask me a question:	Comments:
Response: **(teacher)**	Response:	Response:	Response:	Response:

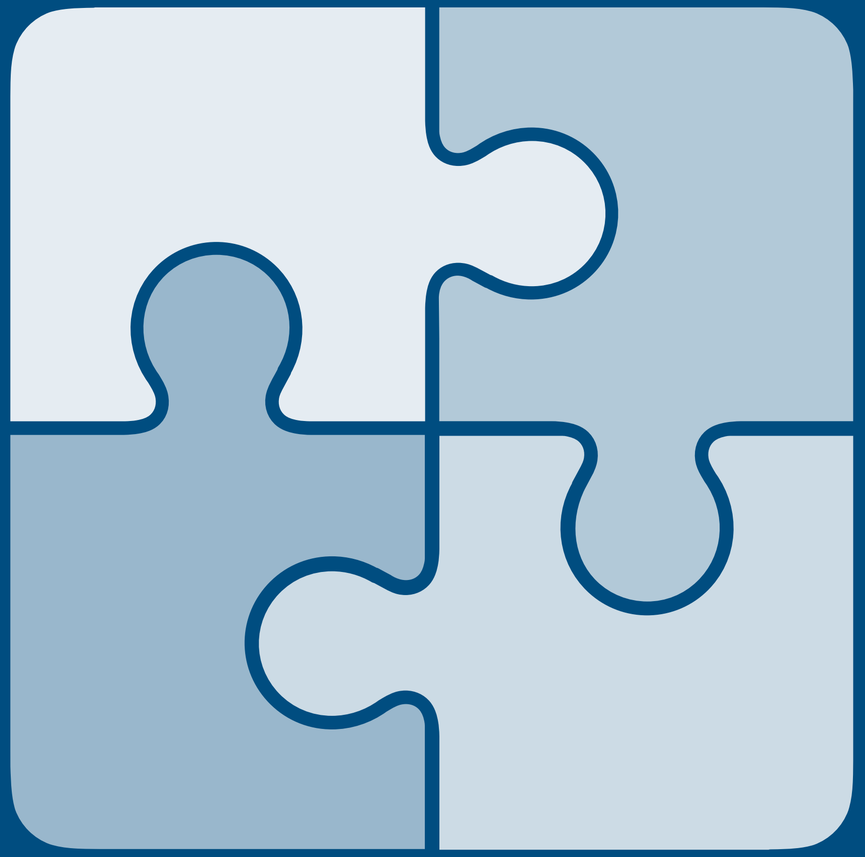
“… interpersonal supports for belonging are necessary but insufficient for creating inclusive mathematical environments; teachers must also create opportunities for **mathematical belonging** through their **instructional techniques** and **pedagogical choices**.”

Matthews, J. (2021, October 15). Belonging-centered instruction: An observational approach toward establishing inclusive mathematics classrooms. https://doi.org/10.31219/osf.io/n7bv2

The **instructional domain** of **Belonging-Centered Instruction**

Safety to Be Wrong

Mathematics to Know Myself & My World



De-centering Teacher Authority

High Standards & Rigorous Support

Matthews, J. (2021, October 15). Belonging-centered instruction: An observational approach toward establishing inclusive mathematics classrooms. https://doi.org/10.31219/osf.io/n7bv2

getting to know each other
getting to the curriculum
START OF THE SCHOOL YEAR
JAKE-CLARK.TUMBLR
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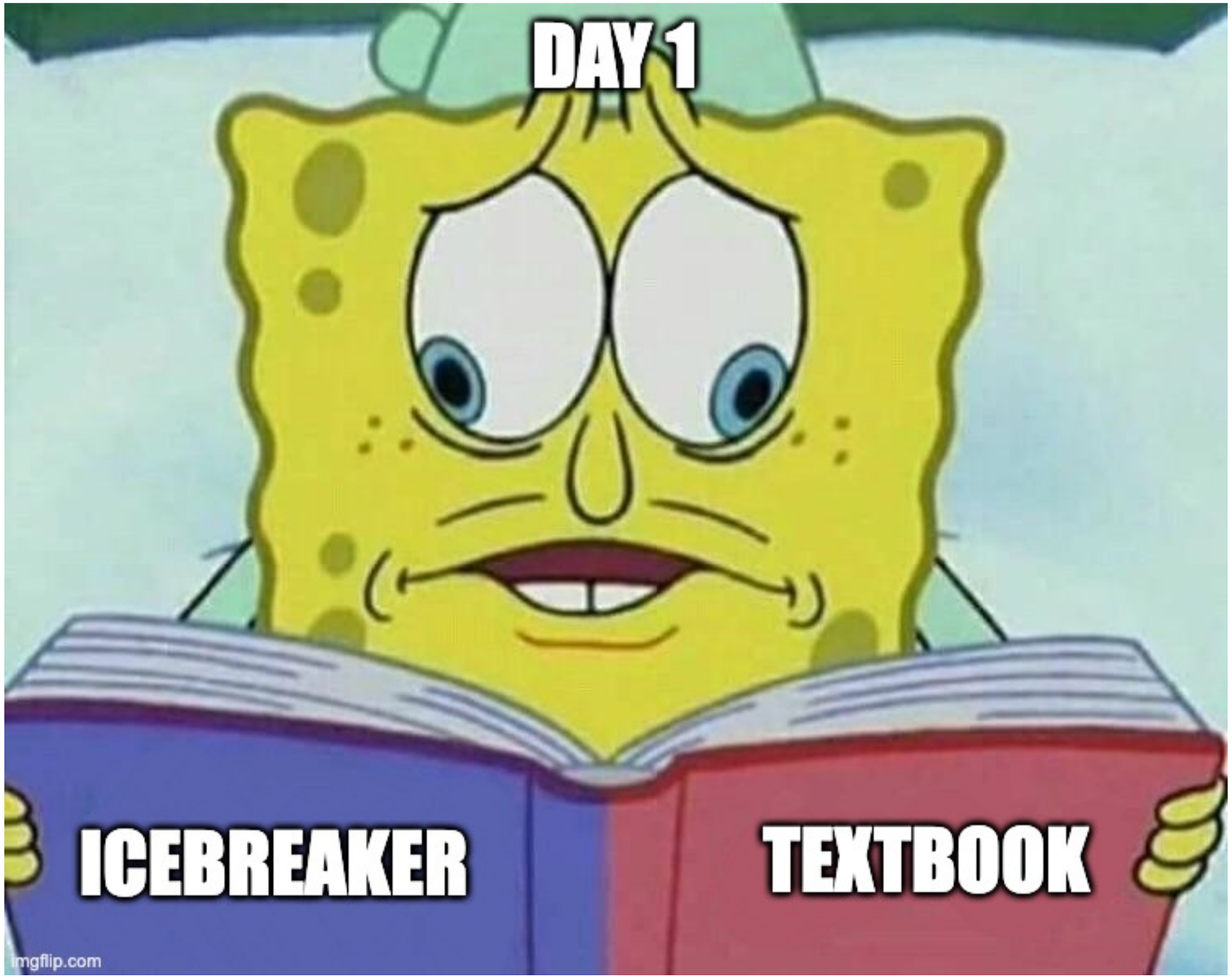
DAY 1
ICEBREAKER
TEXTBOOK
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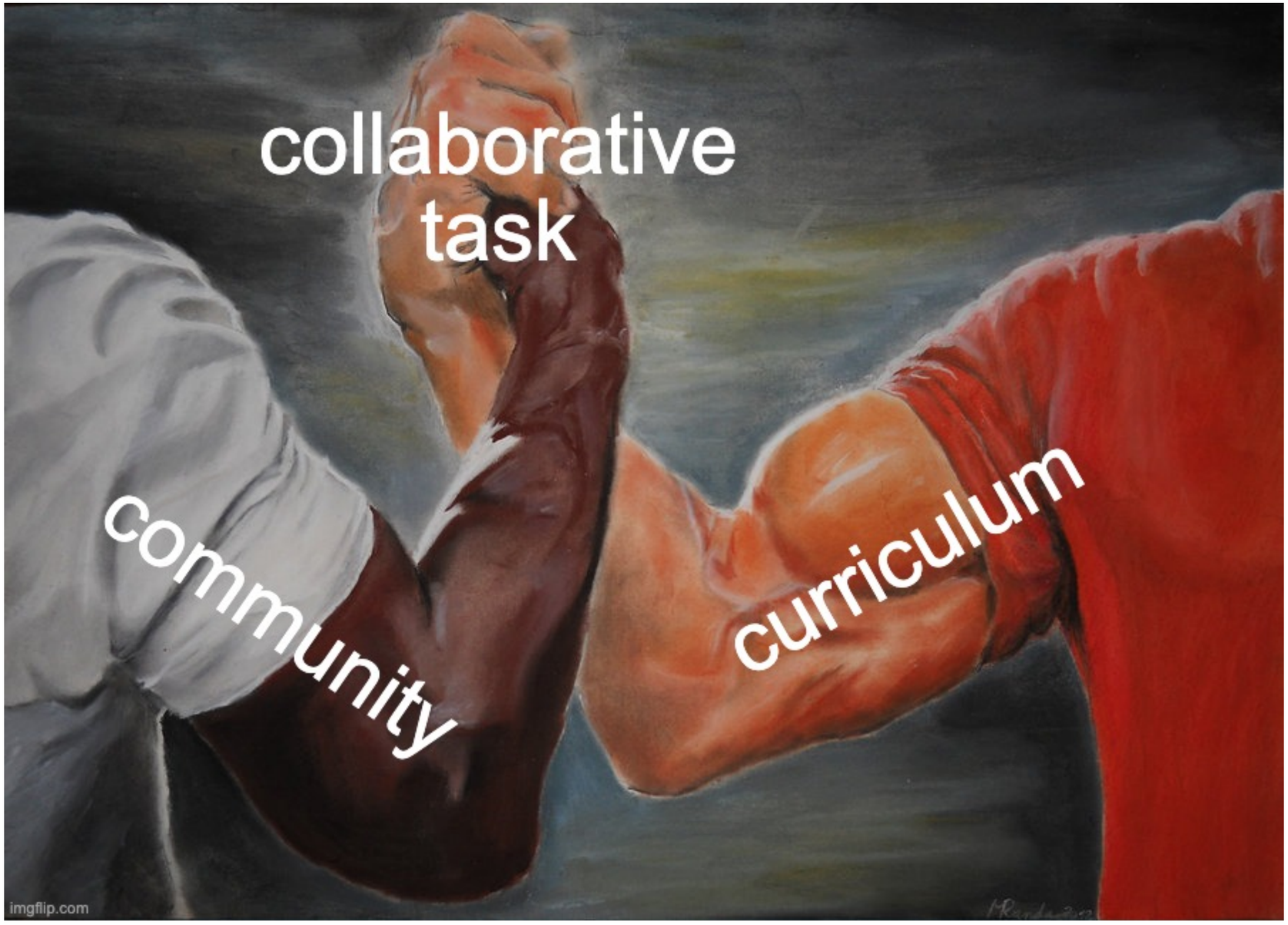
collaborative
task
community
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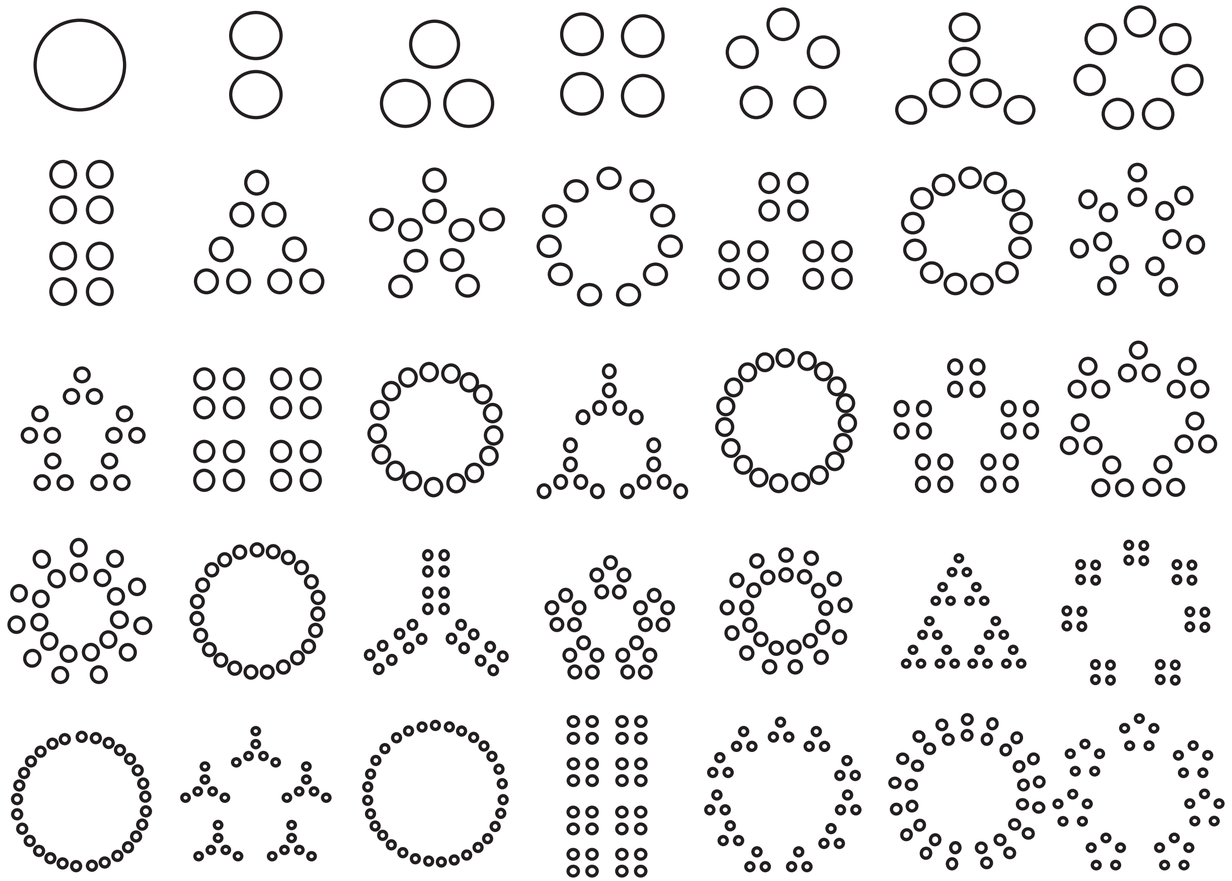
What do *you* **see**?

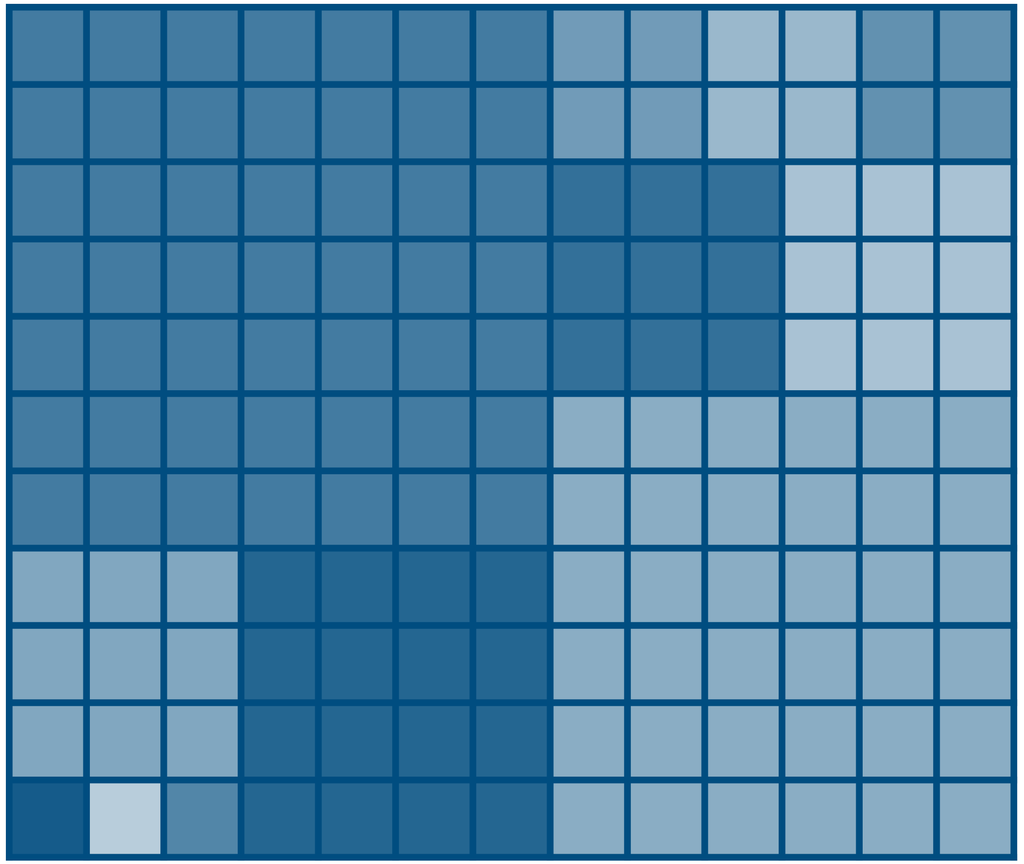


https://www.youcubed.org/week-inspirational-math/

What is the **fewest** number of squares you can build inside of your 11×13 rectangle?

How do you know? Convince me!

What about in a 12×15 rectangle?



What is the size of the rectangle you can find using 9 squares?

Can you find more than one?

https://www.youcubed.org/week-inspirational-math/

“Imagine this problem is a room, and all students need to enter it through a doorway. If we want all our students to be able to succeed, we can ***lower the threshold*** in the doorway and the floor in the room so students have fewer barriers to get inside and get started.

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

We also want to make sure the students in the room are not constrained, banging their heads, unable to stretch. We want to ***raise the ceiling*** so there are fewer limits on students' thinking. We want to create problems that will flow right into deeper investigations for students who are ready."

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

Everyone can get **started**.

Piggott, J. (2018). Rich tasks and contexts. *NRICH*. https://nrich.maths.org/5662

Everyone can get **stuck**.

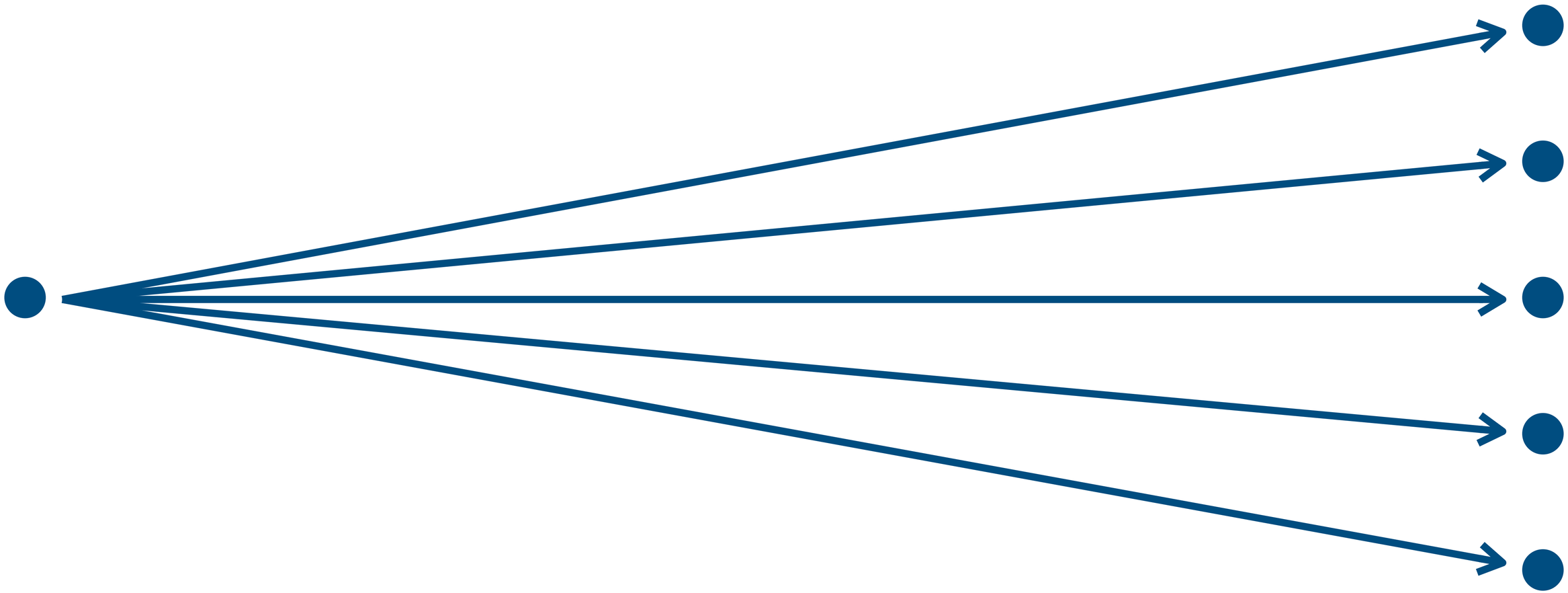
Piggott, J. (2018). Rich tasks and contexts. *NRICH*. https://nrich.maths.org/5662

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

beginning

closed end

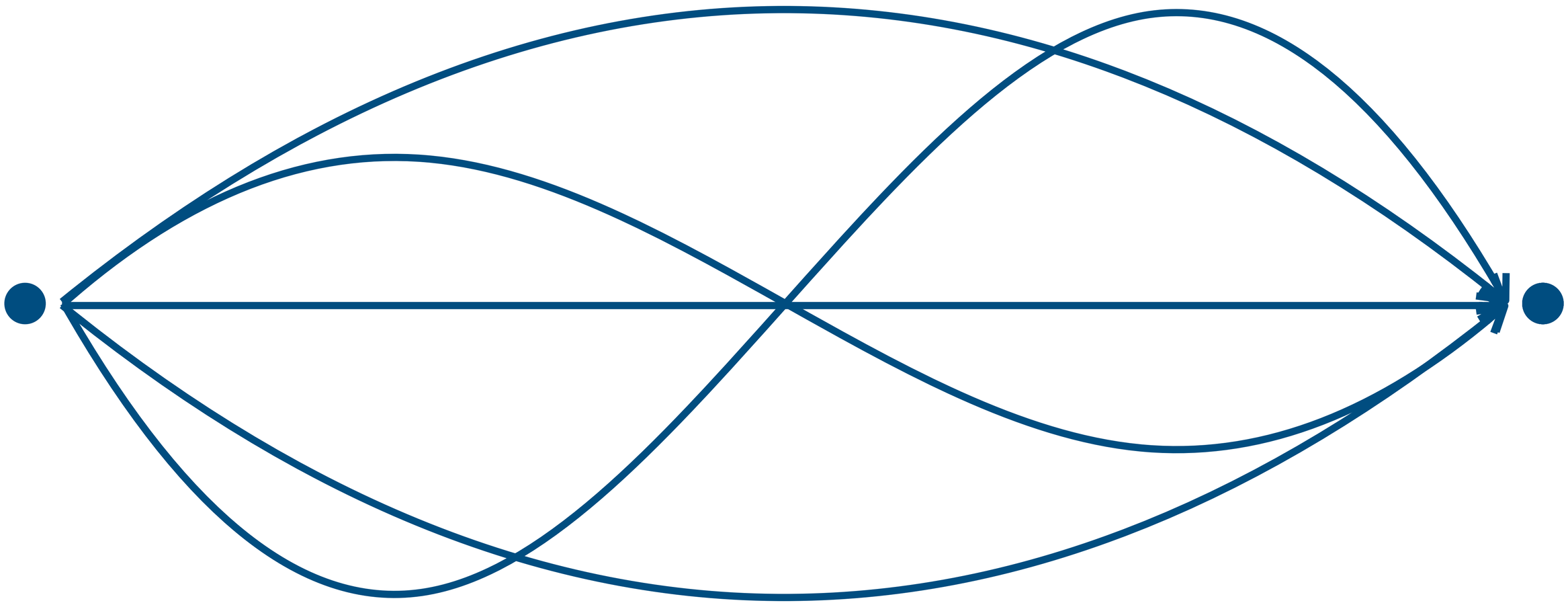
Meyer, D. (2014). Video games and making math more like things students like. [Video]



beginning

open end

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

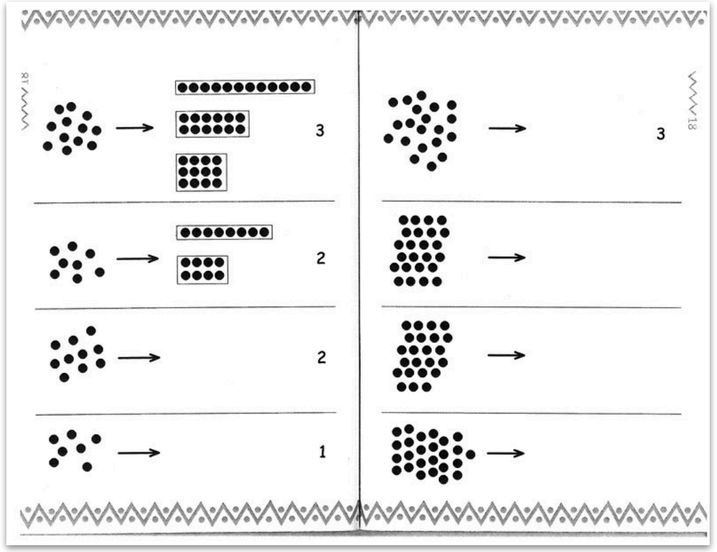


beginning **open** middle **closed** end

“… another key part of **belonging** is being given **the opportunity to add value**.”

Petters, A. O. (2018). Belonging. *Notices of the AMS, 65*(2), 120.

“**Not a single word is written.** These puzzles are universal: they transcend the barriers of language and culture, literally, and are thereby accessible to all people on the globe. Moreover, the puzzles themselves speak the universal truth of mathematics.”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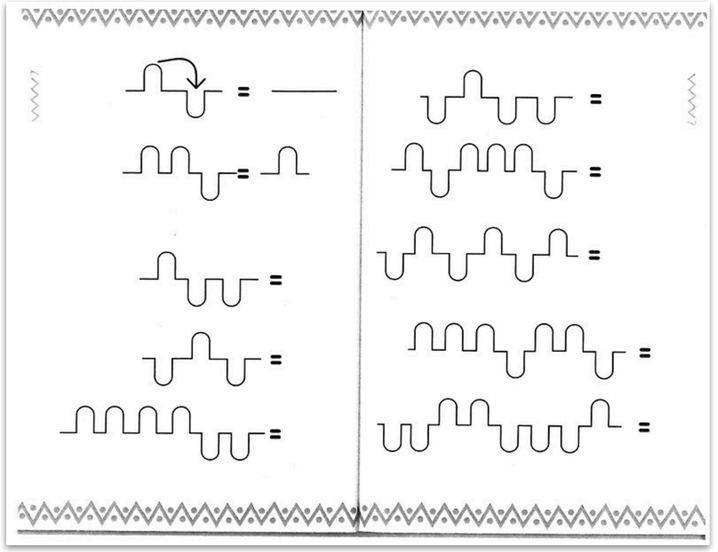
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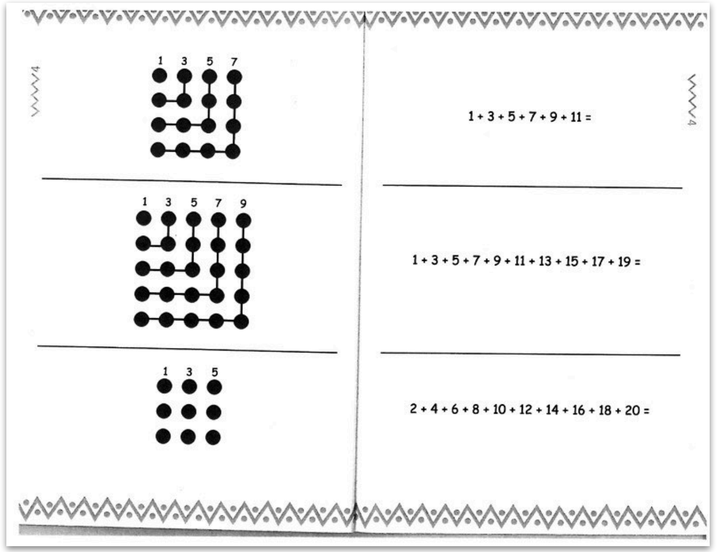
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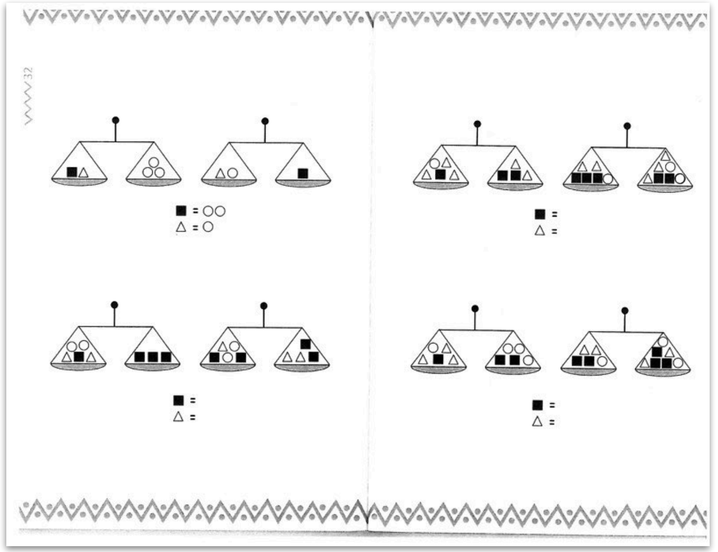
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“**Rich tasks** (or good problems) **encourage** collaboration and discussion”

Piggott, J. (2018). Rich tasks and contexts. *NRICH*. https://nrich.maths.org/5662

“And sometimes the bulk of the challenge is **figuring out what is being asked**.”

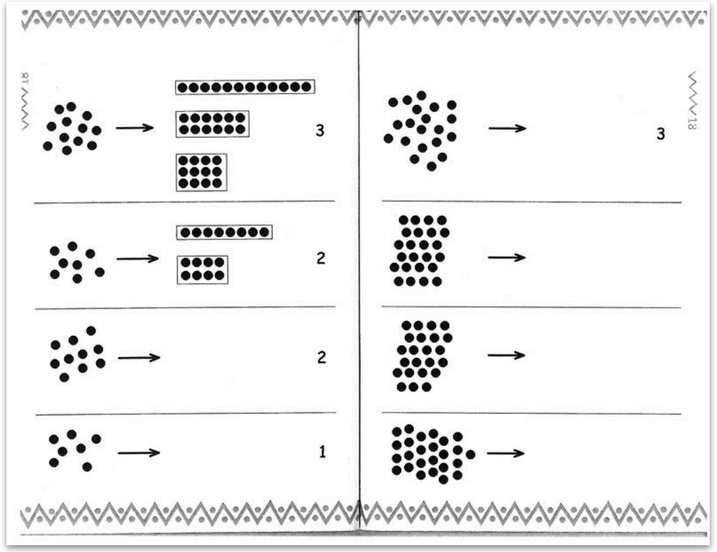
non-curricular

highly engaging thinking tasks used without concern for curriculum.

Liljedahl, P. (2021). *Building thinking classrooms in mathematics, grades K-12: 14 teaching practices for enhancing learning*. Corwin.

“… these results show that to get students thinking *about* curriculum tasks, they need to first be **primed** to do so using **non-curricular tasks**. Nothing in my research has shown a way to avoid this. **You have to go slow to go fast.**”

Liljedahl, P. (2021). *Building thinking classrooms in mathematics, grades K-12: 14 teaching practices for enhancing learning*. Corwin.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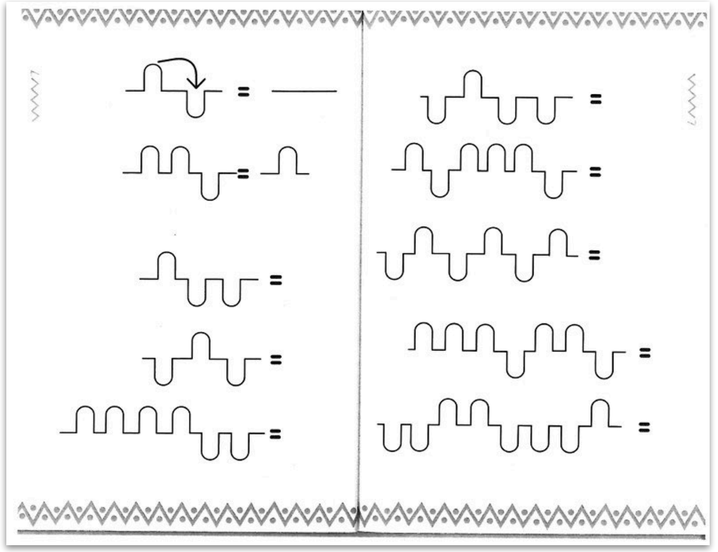
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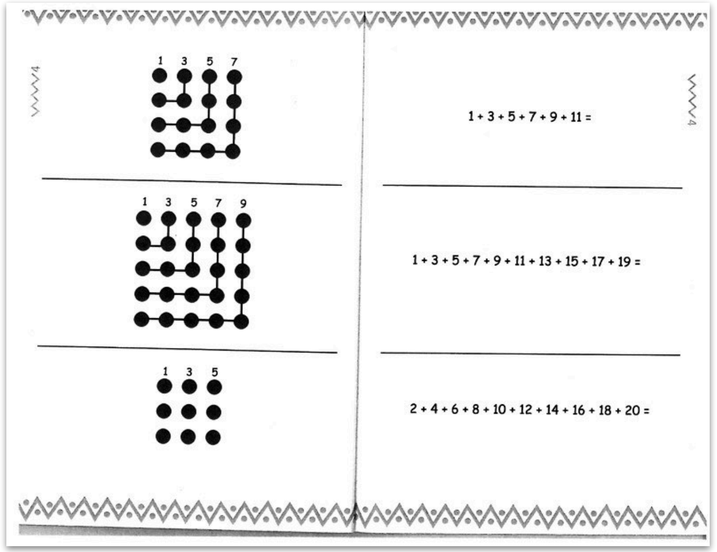
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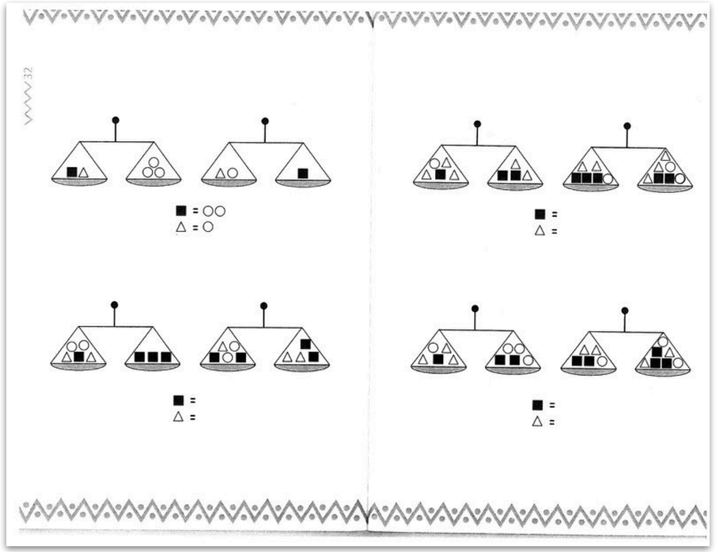
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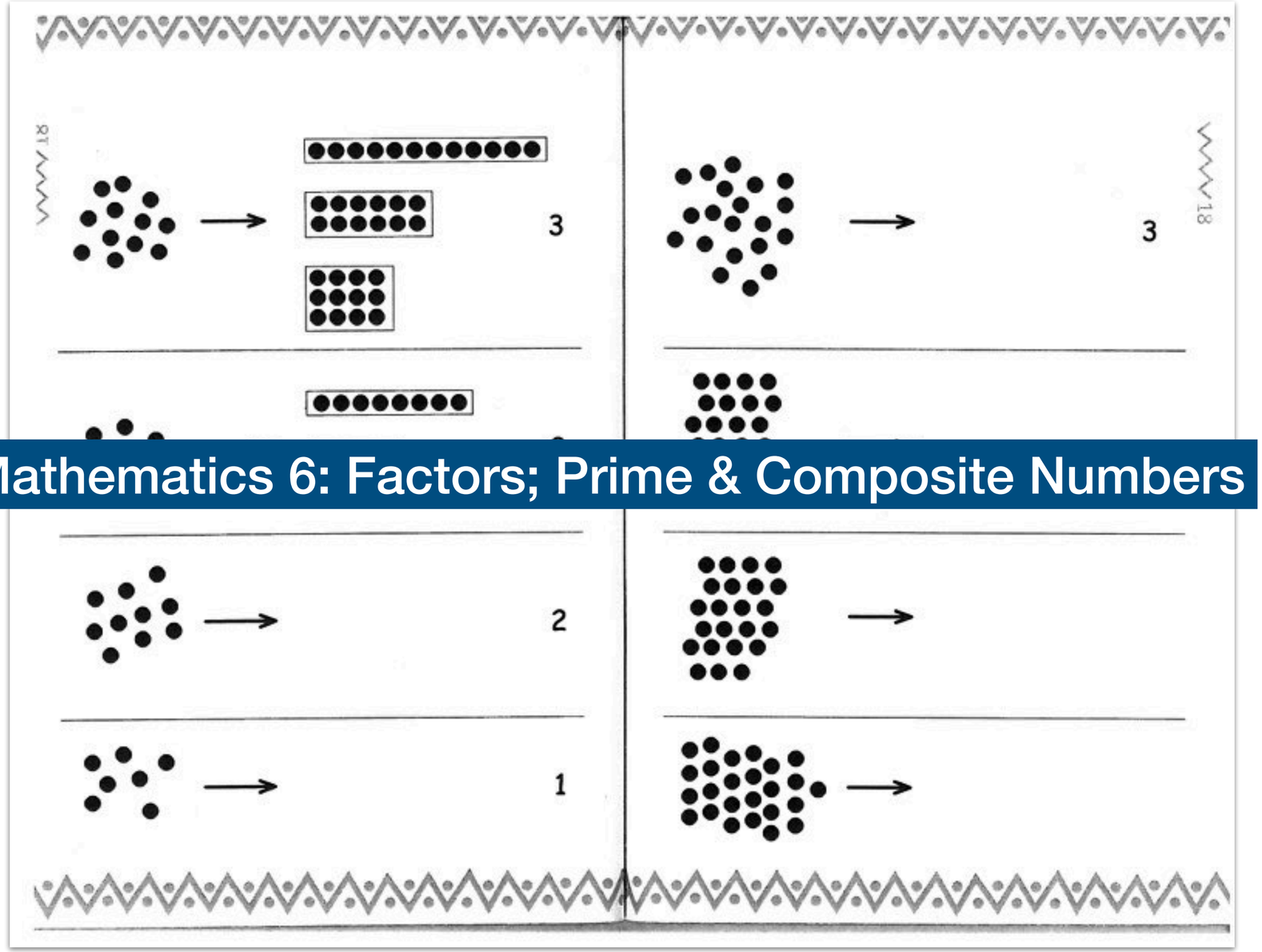
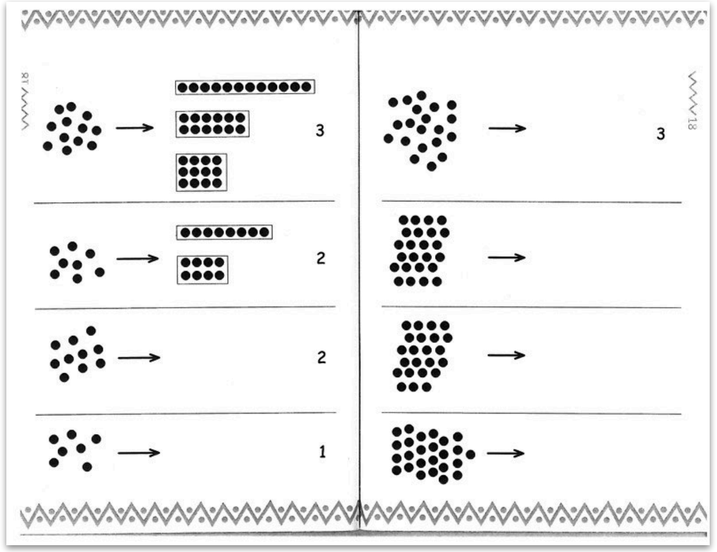


Mathematics 6: Factors; Prime & Composite Numbers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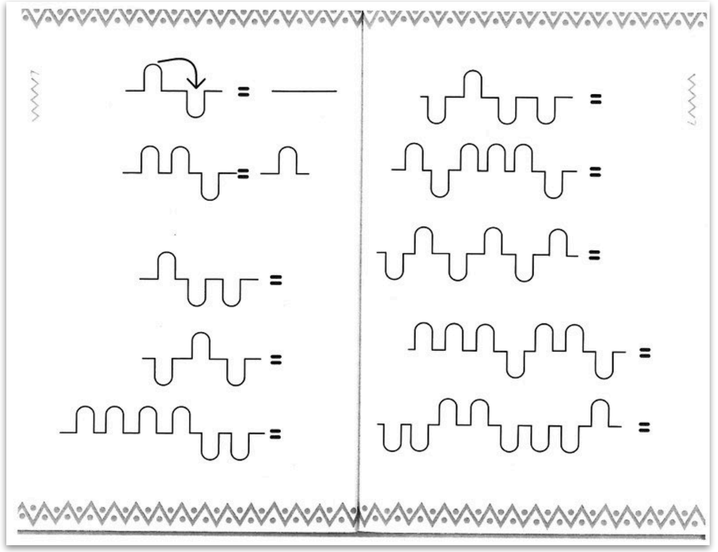
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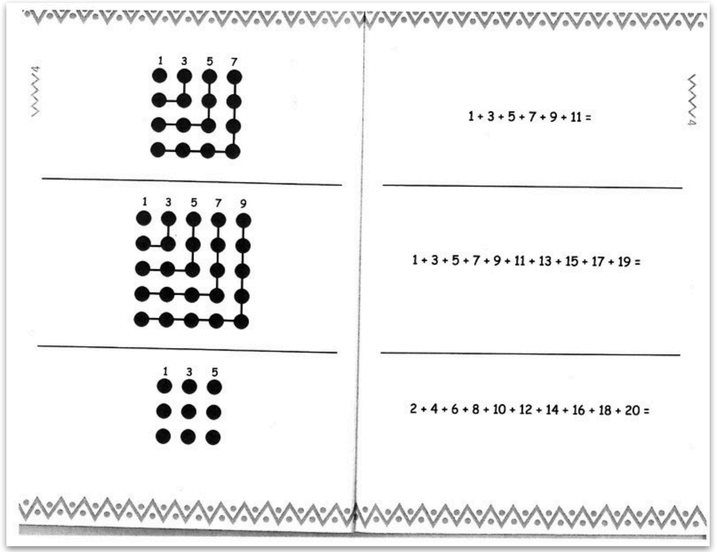
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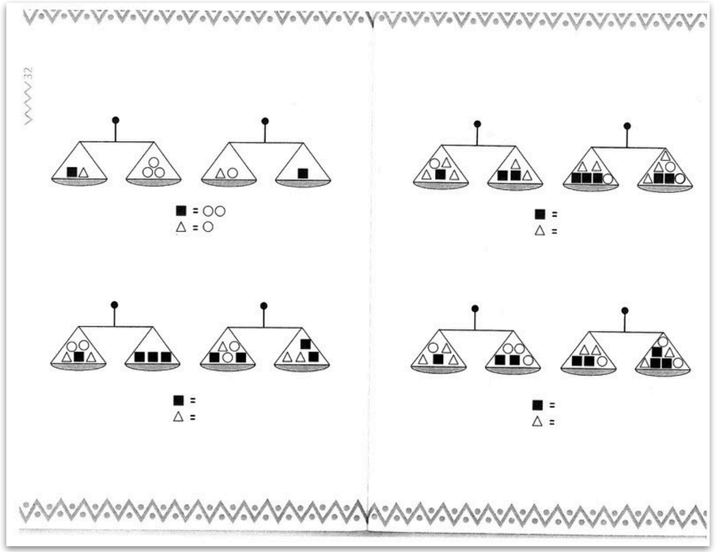
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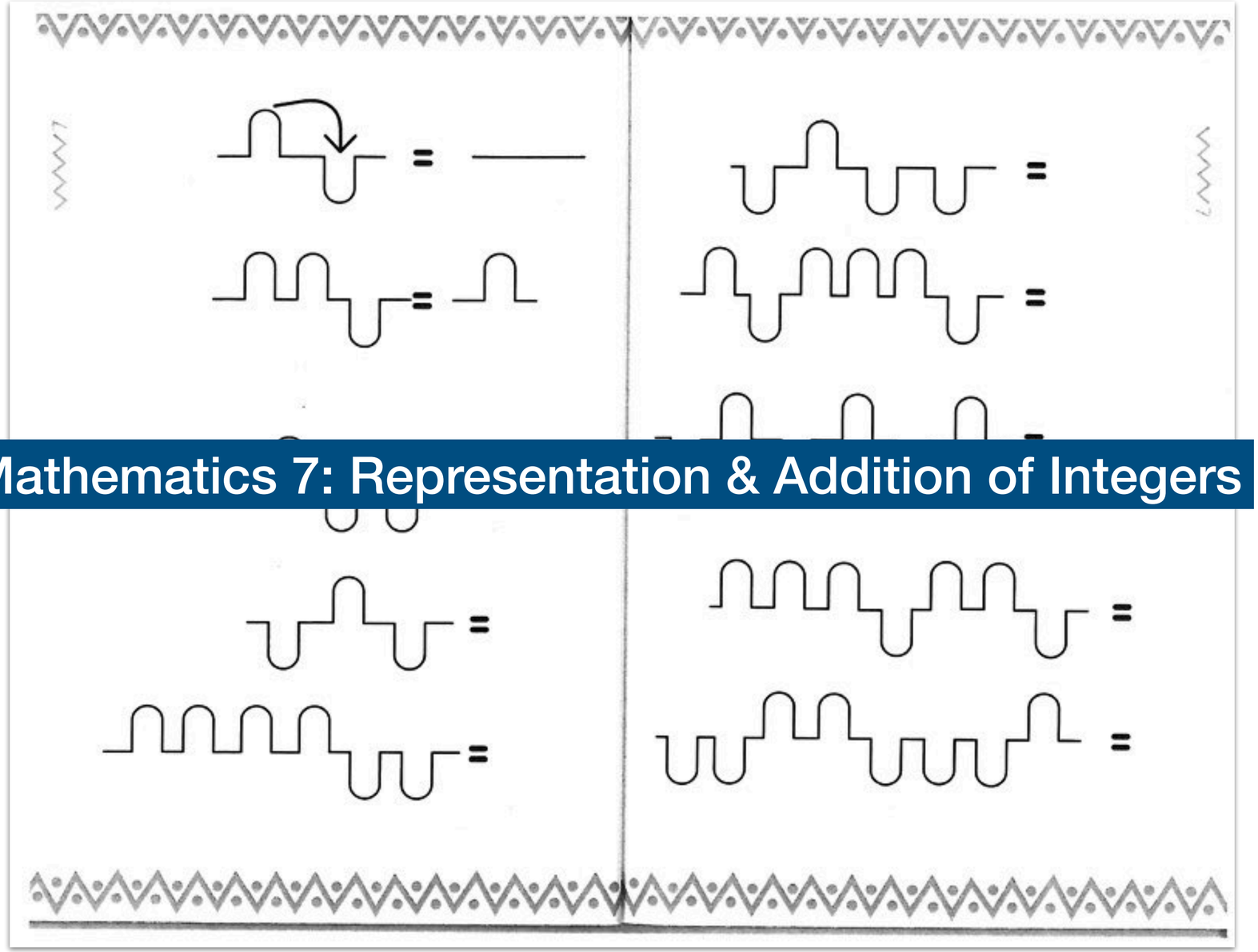
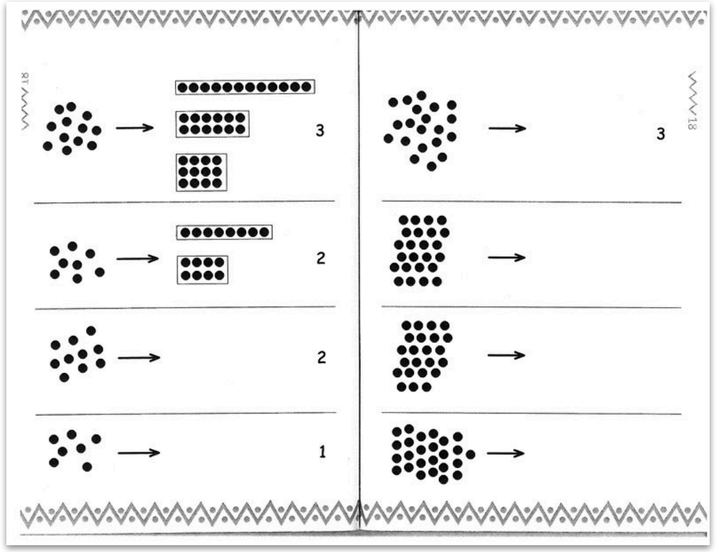


Mathematics 7: Representation & Addition of Integers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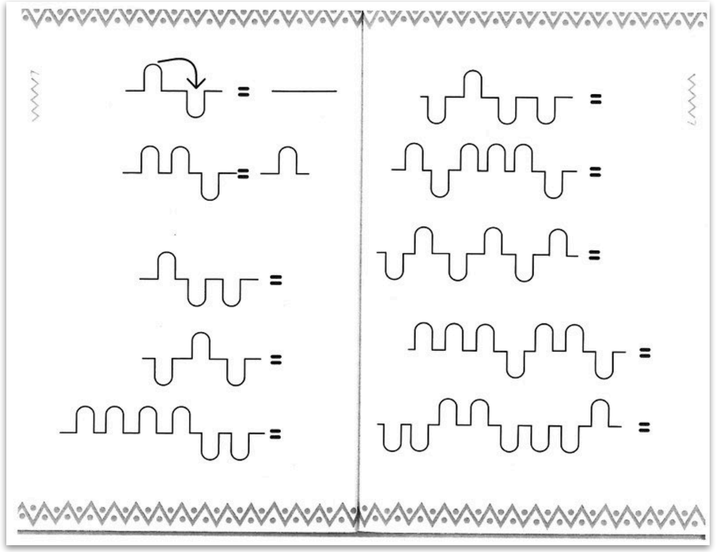
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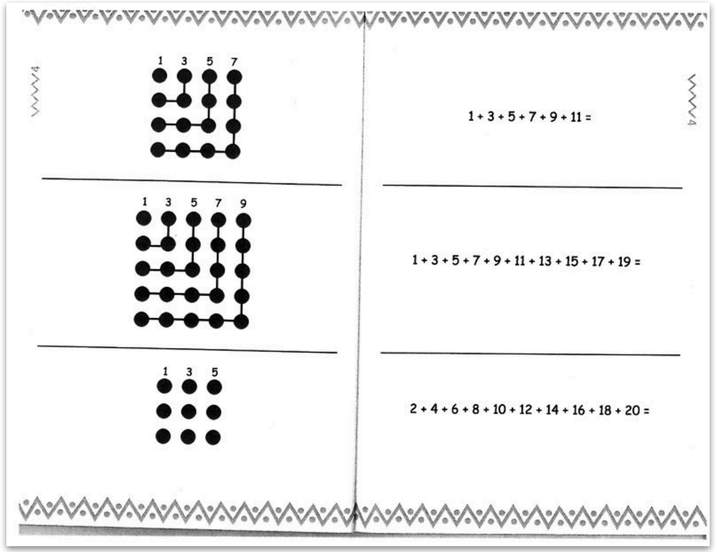
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1 3 5 7
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2 + 4 + 6 + 8 + 10 + 12 + 14 + 16 + 18 + 20 =
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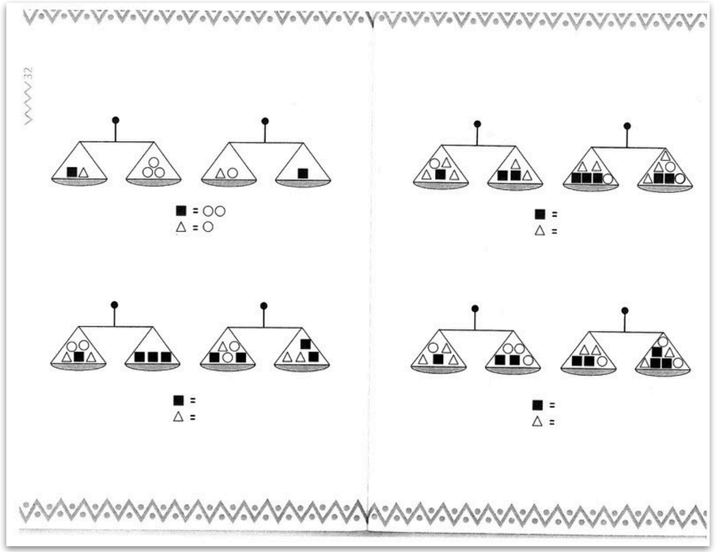
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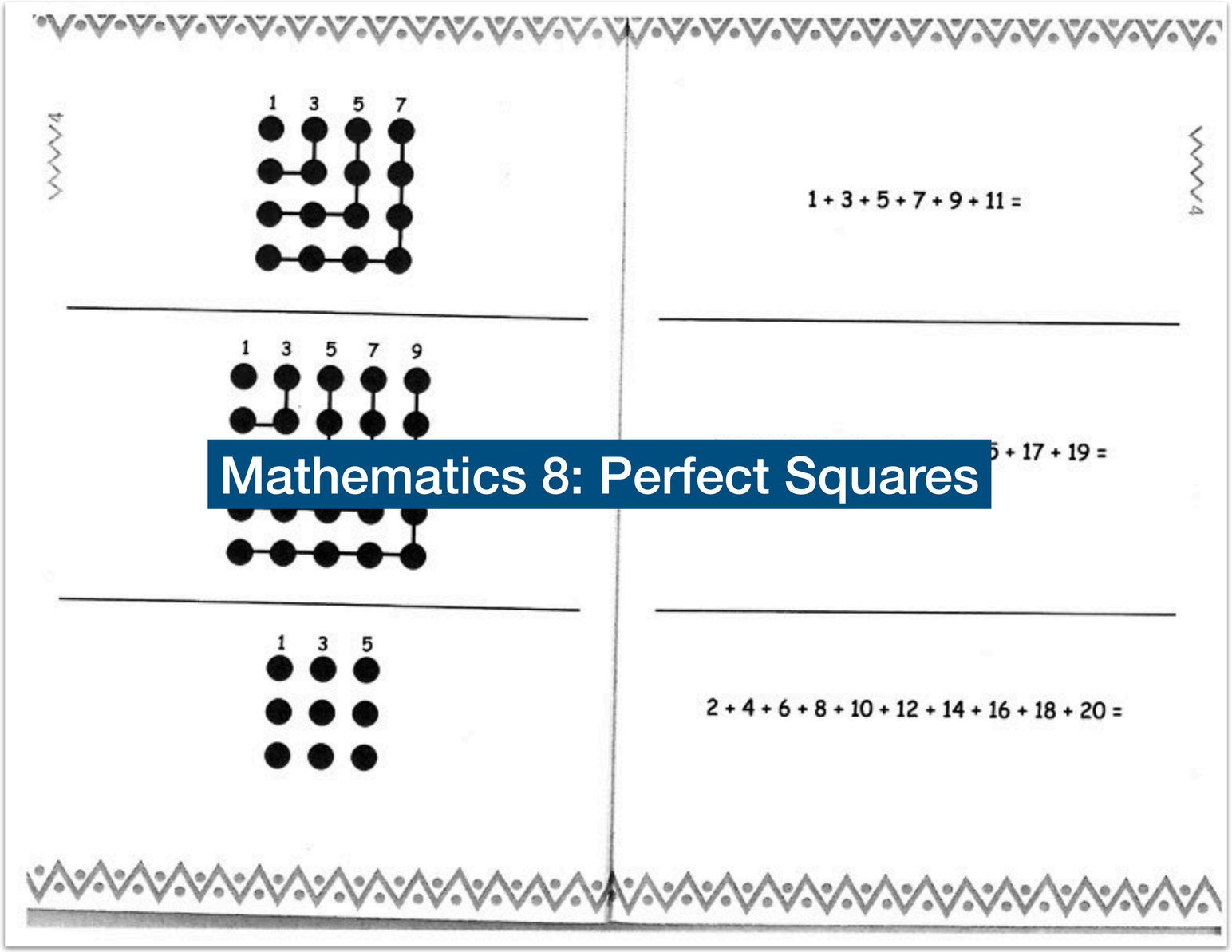
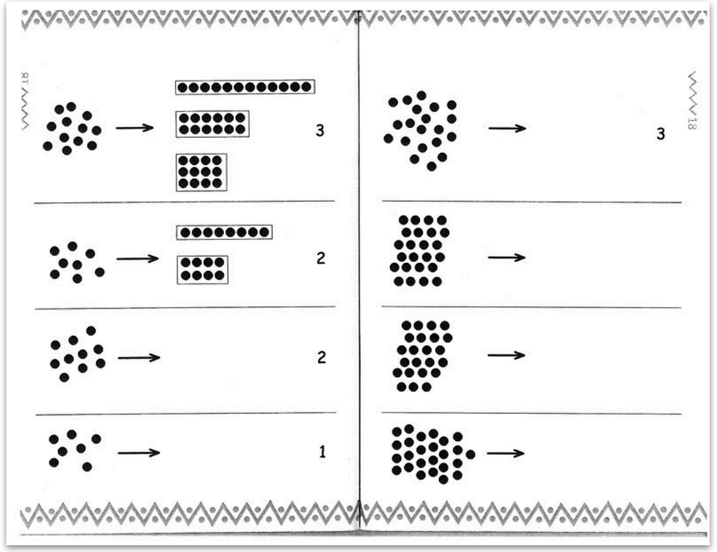


Mathematics 8: Perfect Squares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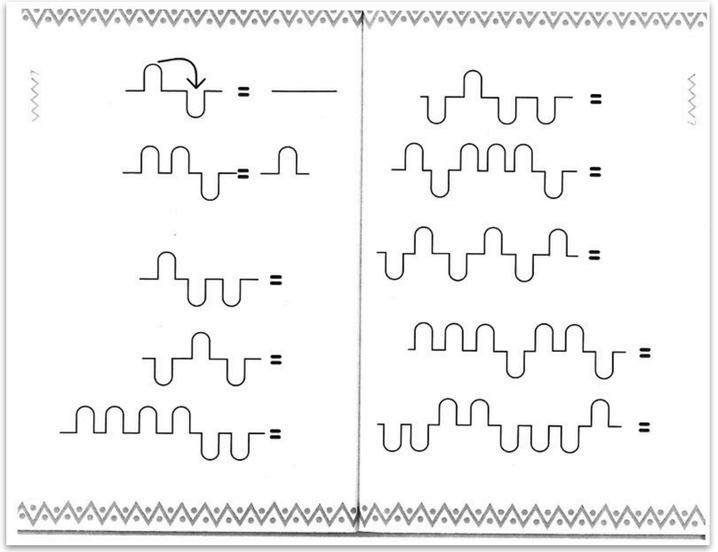
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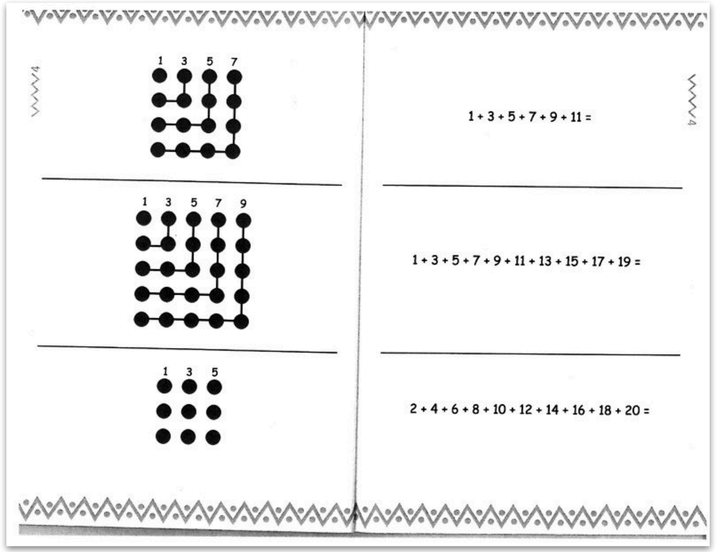
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1 + 3 + 5 + 7 + 9 + 11 =
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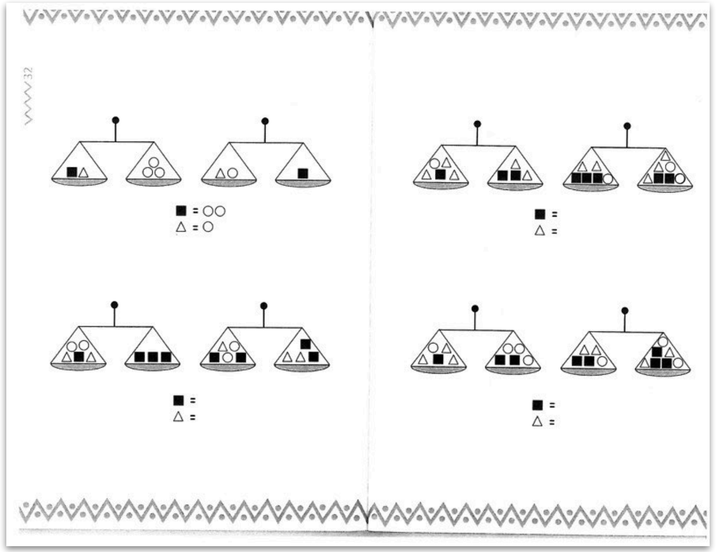
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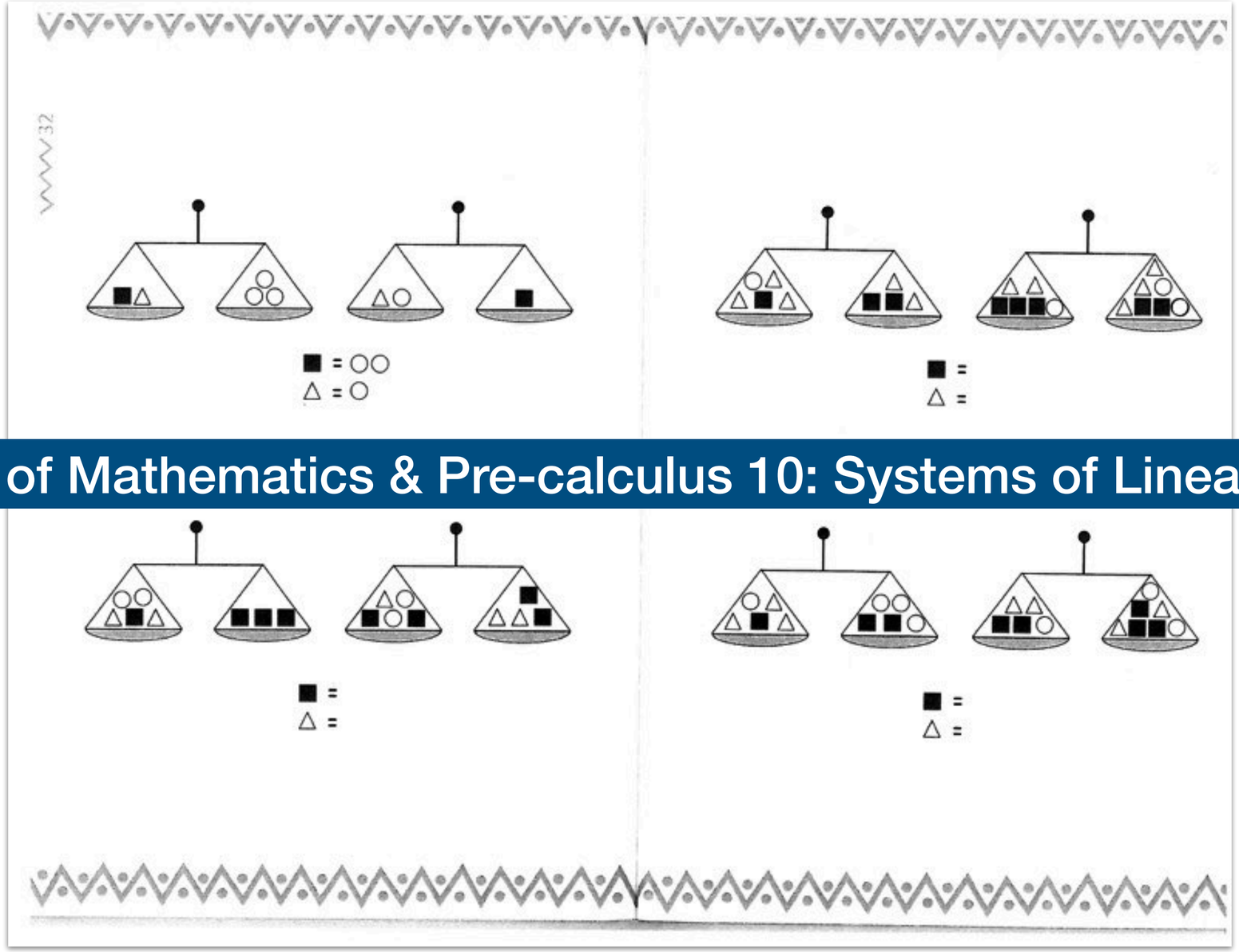
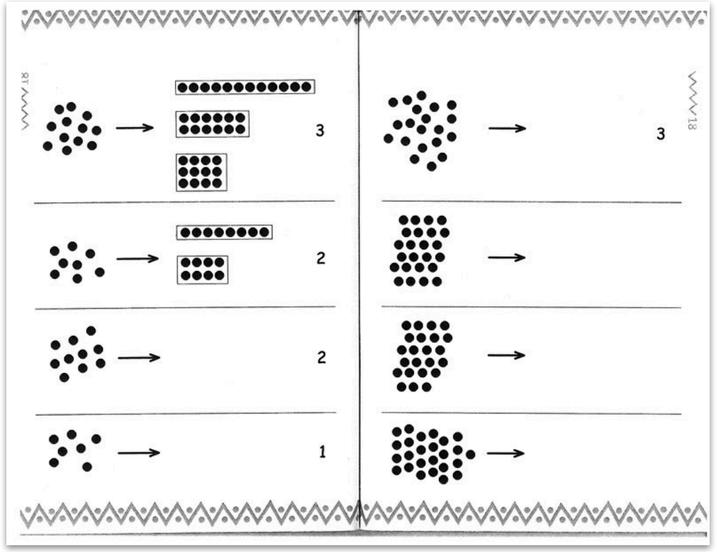


Foundations of Mathematics & Pre-calculus 10: Systems of Linear Equations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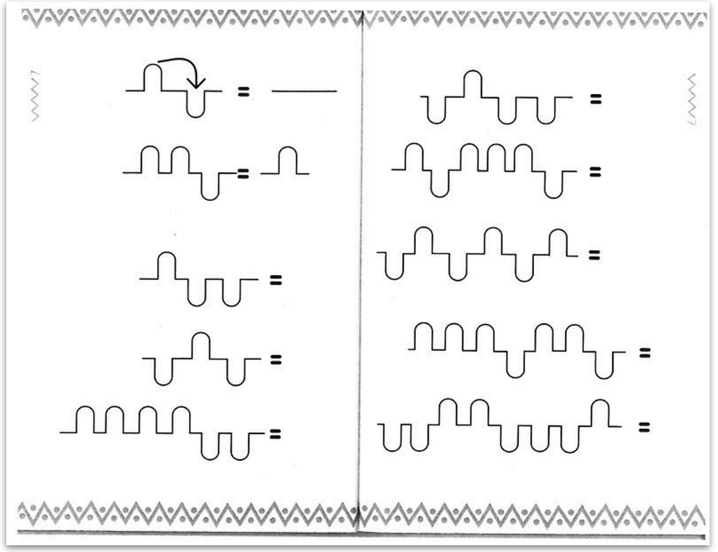
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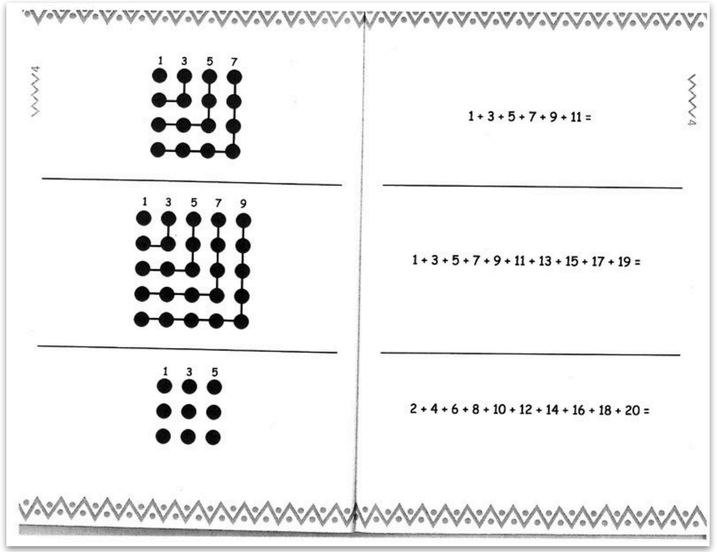
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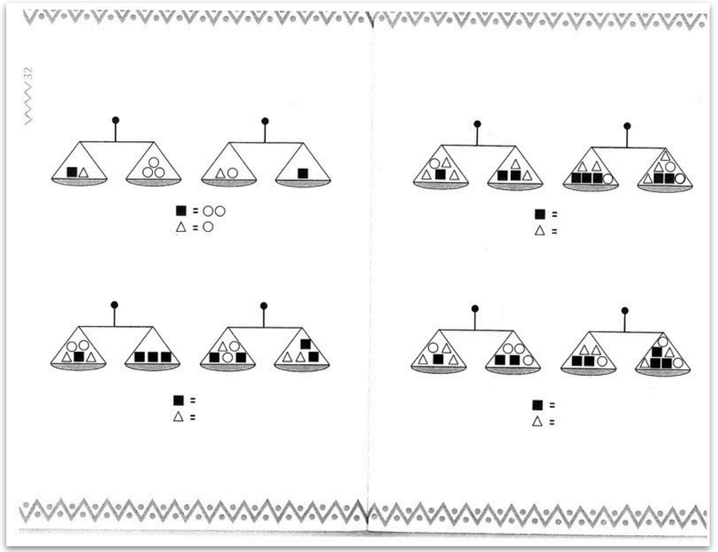
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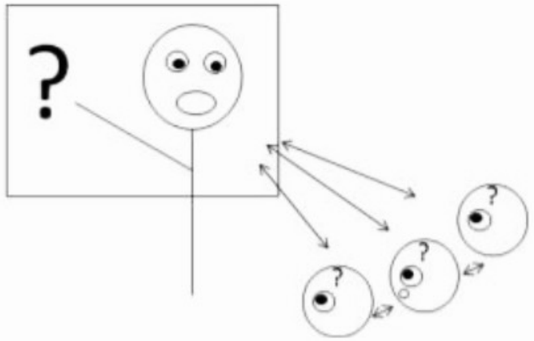
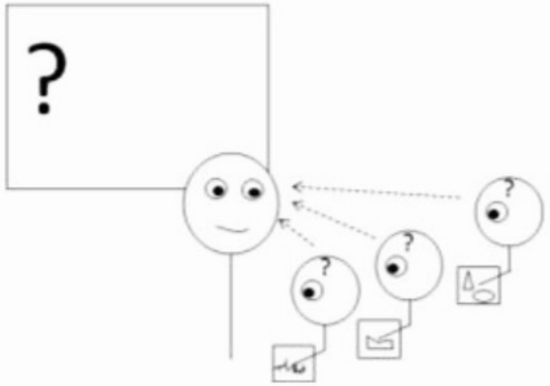
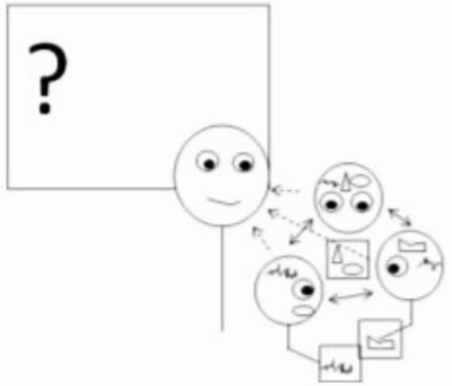


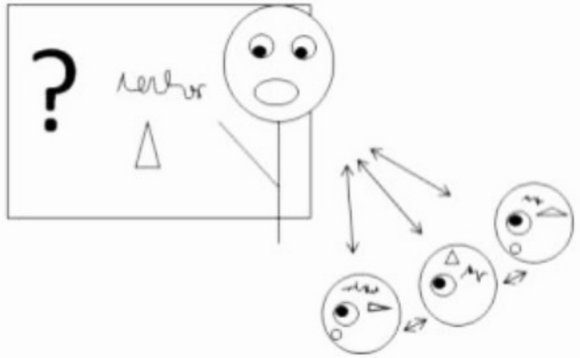
1. Teacher ensures students understand the question



2. Students work individually; teacher listens and asks questions to understand students' thinking and move students' thinking forward



3. Students work in groups; teacher listens and asks questions to understand students' thinking and move students' thinking forward



4. Teacher helps students synthesize their learning

Ray-Riek, M. (2019, July 29). Explicit classroom norms to teach kids how to learn from problem solving. *Illustrative Mathematics*. https://illustrativemathematics.blog/2019/07/29/explicit-classroom-norms-to-teach-kids-how-to-learn-from-solving-problems/

Be willing to share your thinking, right or wrong

Be willing to listen to and learn from others' ideas, right or wrong

Be curious about the work of other students, even if you have already solved the problem one way

Actively work to make sense of what other people are saying, even if you are confused

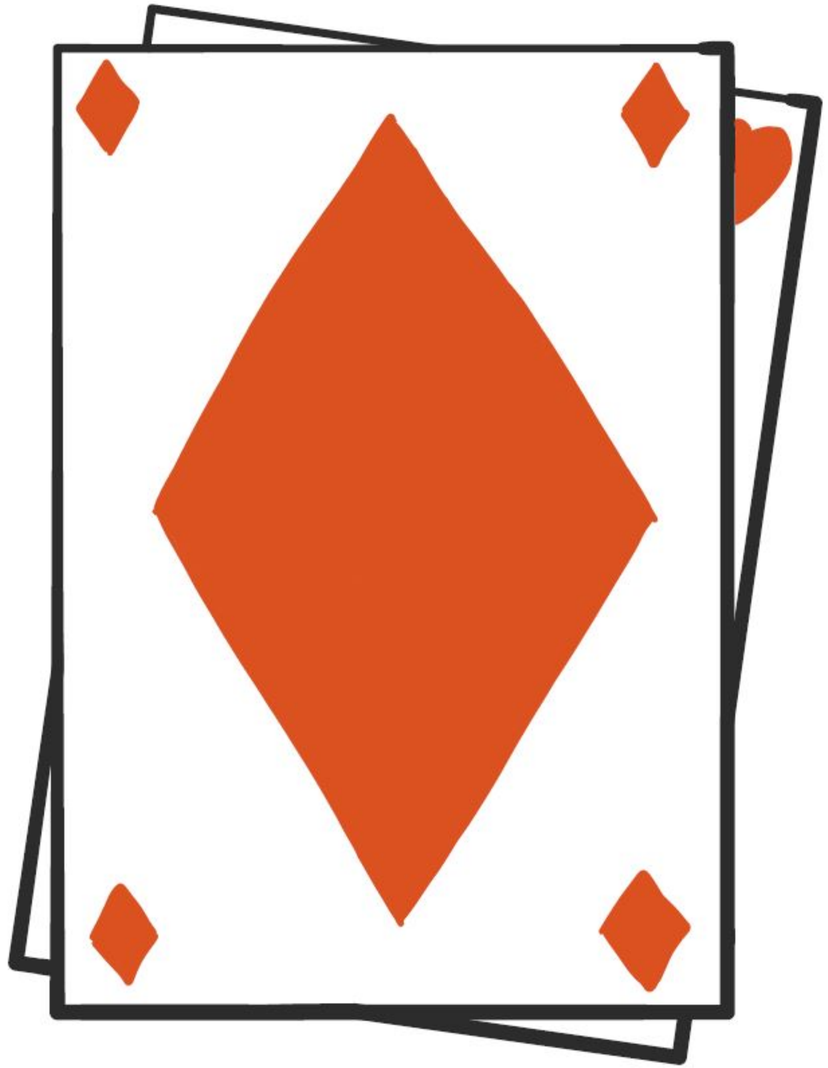
Be willing to try someone else's method and work until you feel confident in your reasoning to solve similar problems in the future

Listen for structure, patterns, representations, and methods, not just answers and steps

“… interpersonal supports for belonging are necessary but insufficient for creating inclusive mathematical environments; teachers must also create opportunities for **mathematical belonging** through their **instructional techniques** and **pedagogical choices**.”

Matthews, J. (2021, October 15). Belonging-centered instruction: An observational approach toward establishing inclusive mathematics classrooms. https://doi.org/10.31219/osf.io/n7bv2

visibly
random
groupings



“Although many students rail against the groups they find themselves in on Day 1, at the three-week point this resistance is usually completely gone, and they are **open to working with anyone** they are placed with.”

Liljedahl, P. (2021). *Building thinking classrooms in mathematics, grades K-12: 14 teaching practices for enhancing learning*. Corwin.

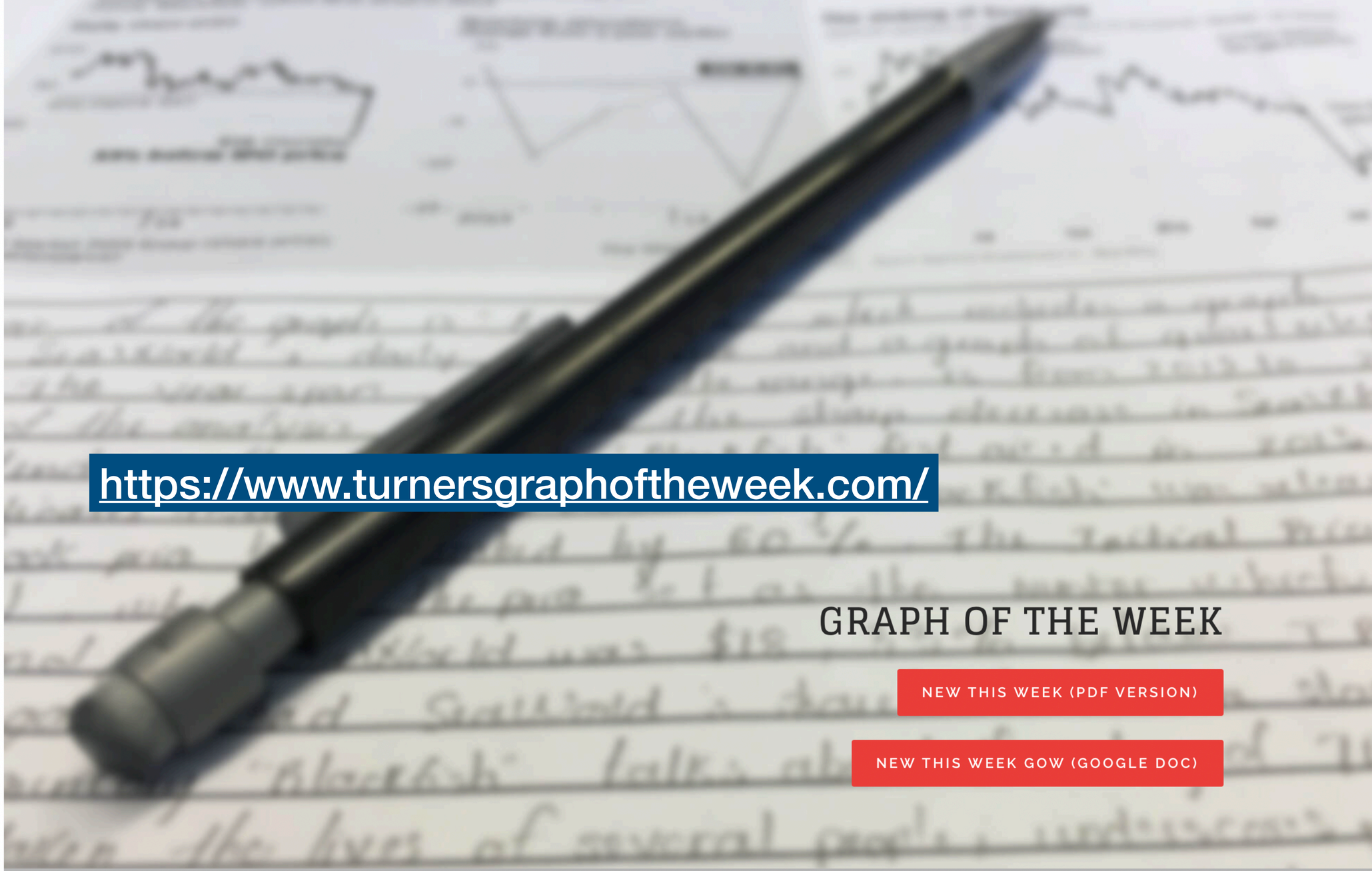
“When teachers allow students to self-select, what we see is a often a reflection of the social structures easily observable in the hallways. Students choose their friends, their affinity groups, or their social groups. These social structures can create barriers to collaboration in the classroom.

Liljedahl, P. (2021). *Building thinking classrooms in mathematics, grades K-12: 14 teaching practices for enhancing learning*. Corwin.

With visibly random grouping, these **barriers** begin to **fall away**. When students worked with new random partners every hour, they began to **cross social boundaries** and **form an awareness about each other** in ways that were not happening before.”

Liljedahl, P. (2021). *Building thinking classrooms in mathematics, grades K-12: 14 teaching practices for enhancing learning*. Corwin.

TURNER'S GRAPH OF THE WEEK



https://www.turnersgraphoftheweek.com/

GRAPH OF THE WEEK

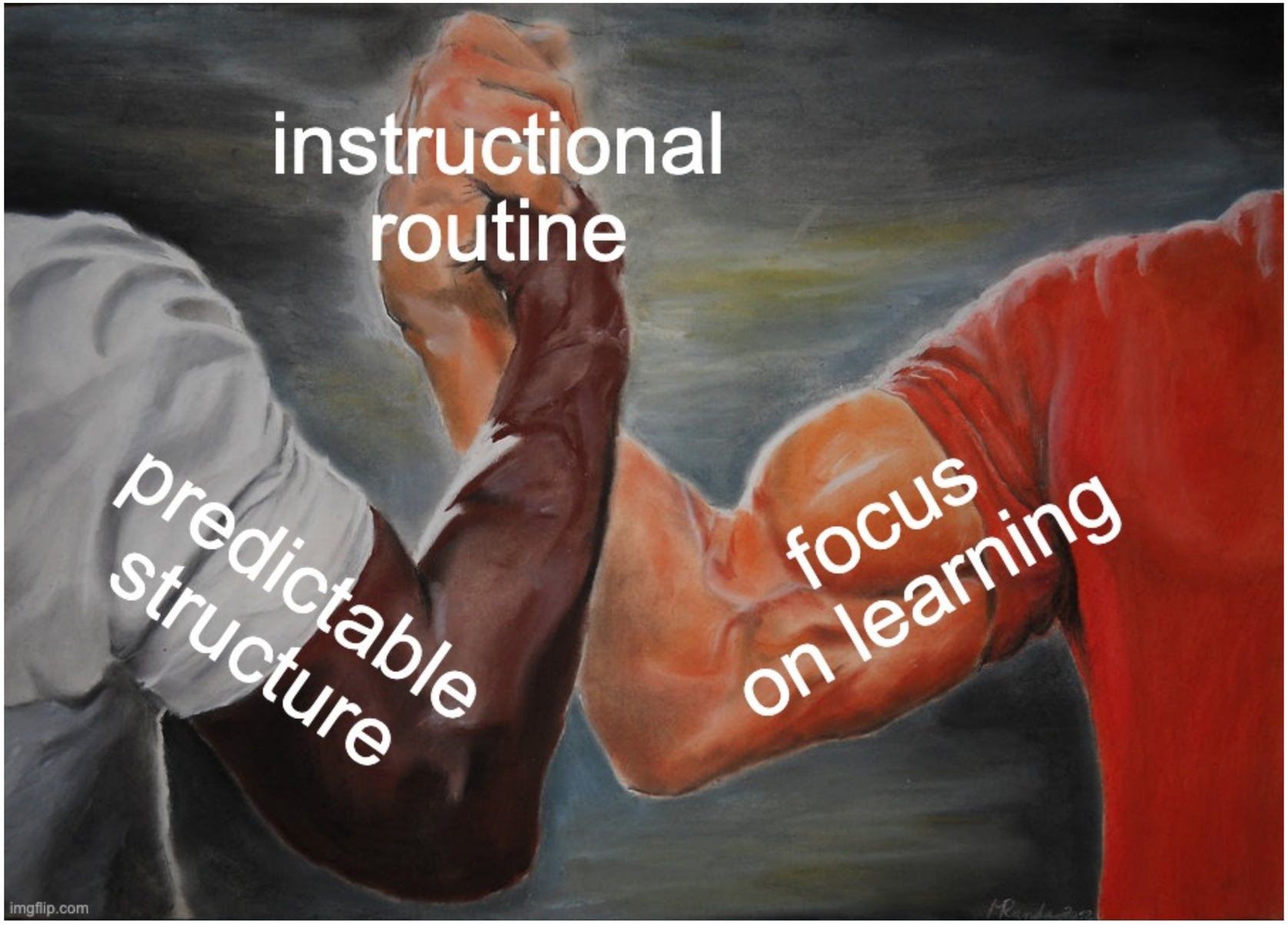
NEW THIS WEEK (PDF VERSION)

NEW THIS WEEK GOW (GOOGLE DOC)

No GOW this week

Have a wonderful summer break!

How will my students benefit from this weekly assignment?

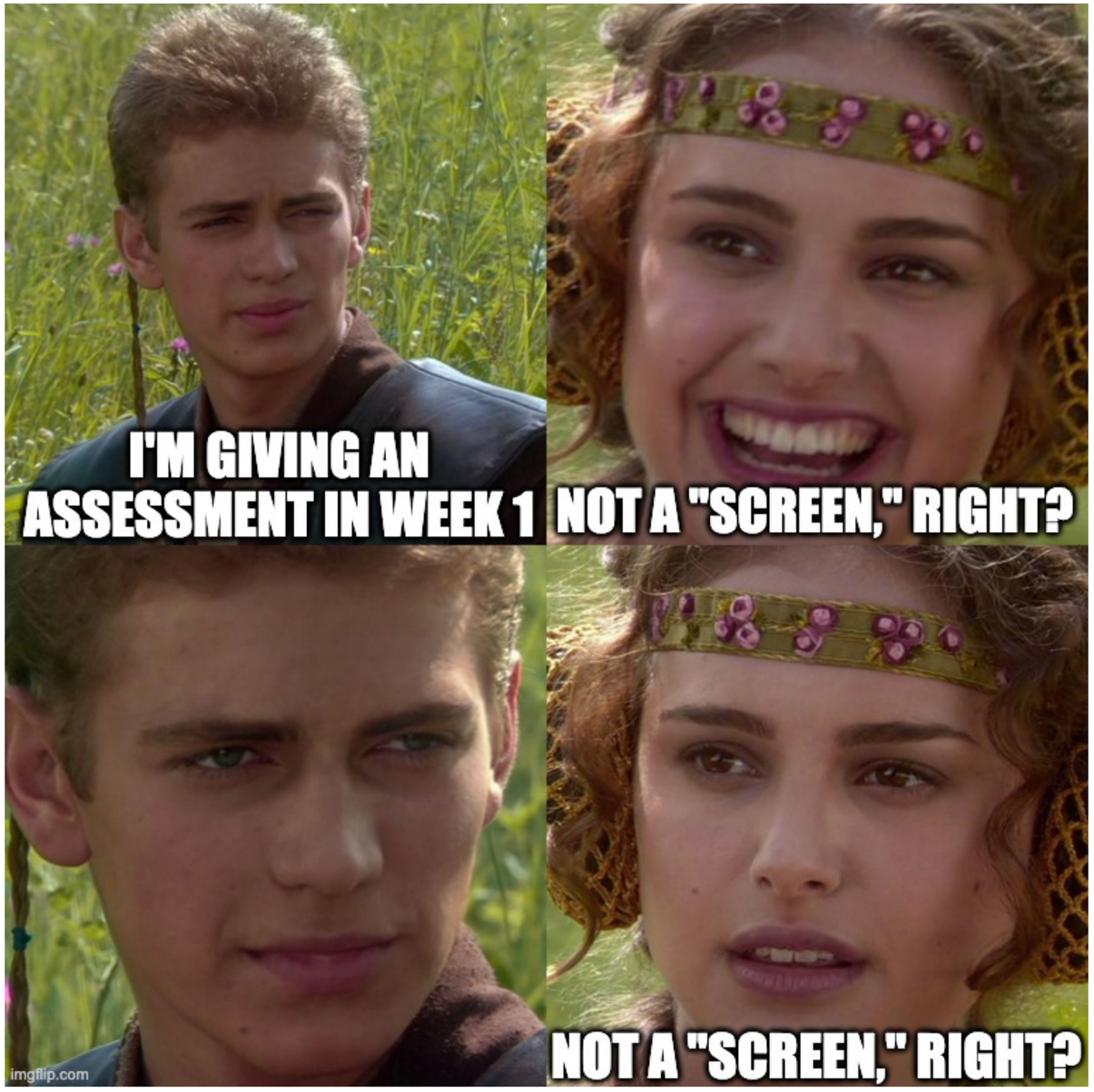

instructional routine
predictable structure
focus on learning
imgflip.com

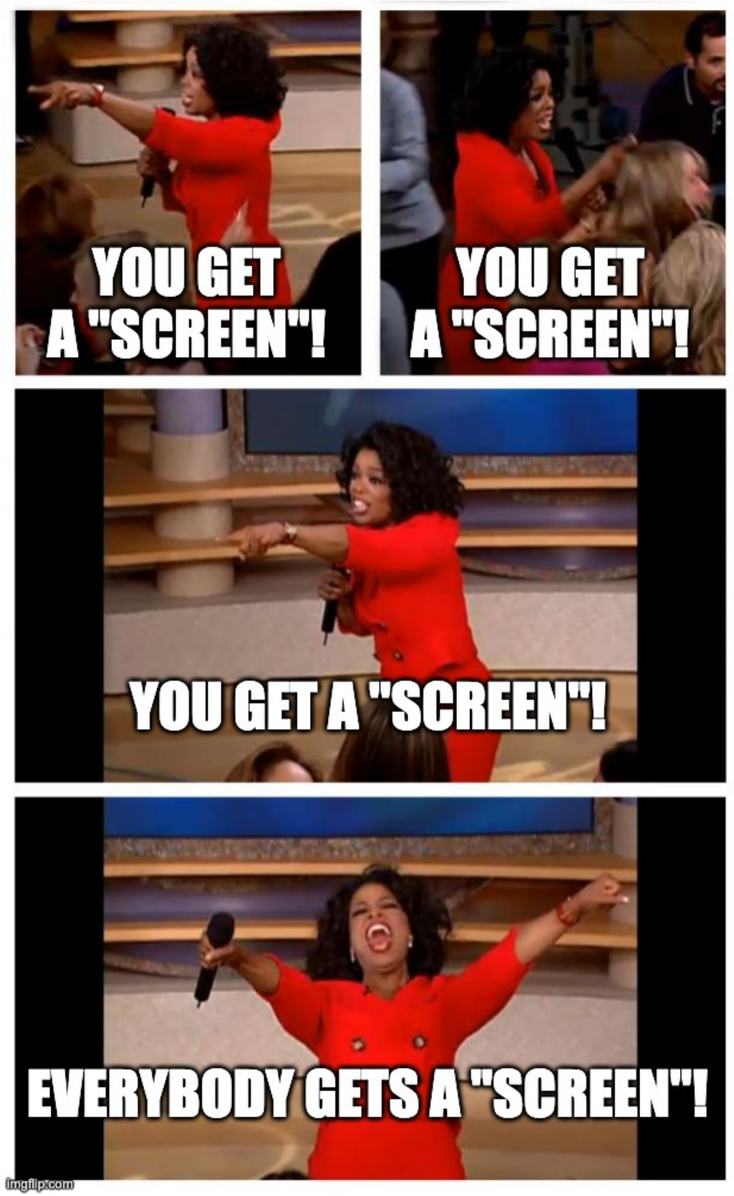
“The **predictable** structure lets **students** pay less attention to [‘What is it that I’m supposed to be doing?,’ ‘What question will I be asked next?,’ or ‘How will things work today in the lesson?’] and **more attention to the way in which they and their classmates are thinking about a particular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

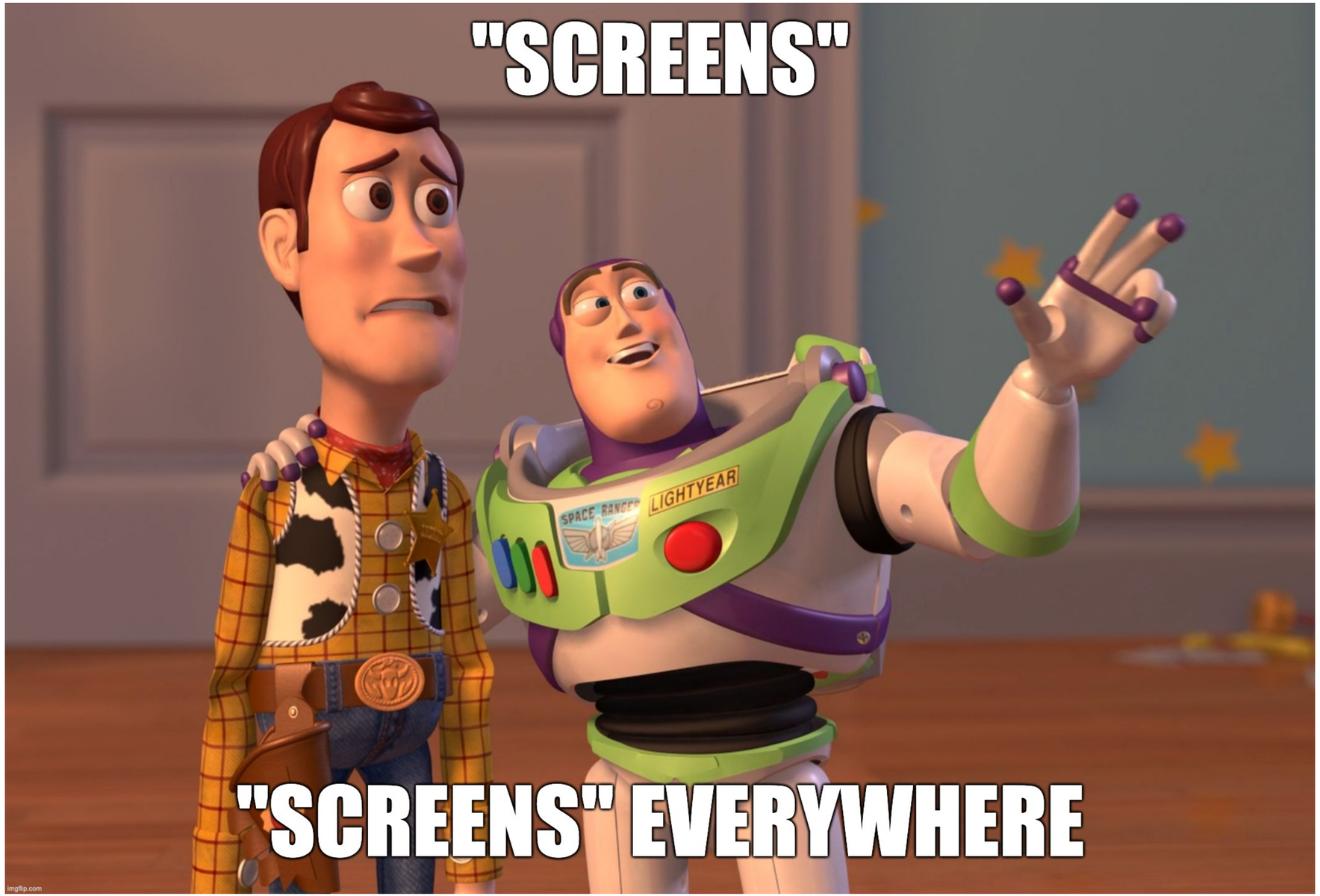
Kelemanik, G., Lucenta, A., & Creighton, S.J. (2016). *Routines for reasoning: Fostering the mathematical practices in all students*. Heinemann.

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.

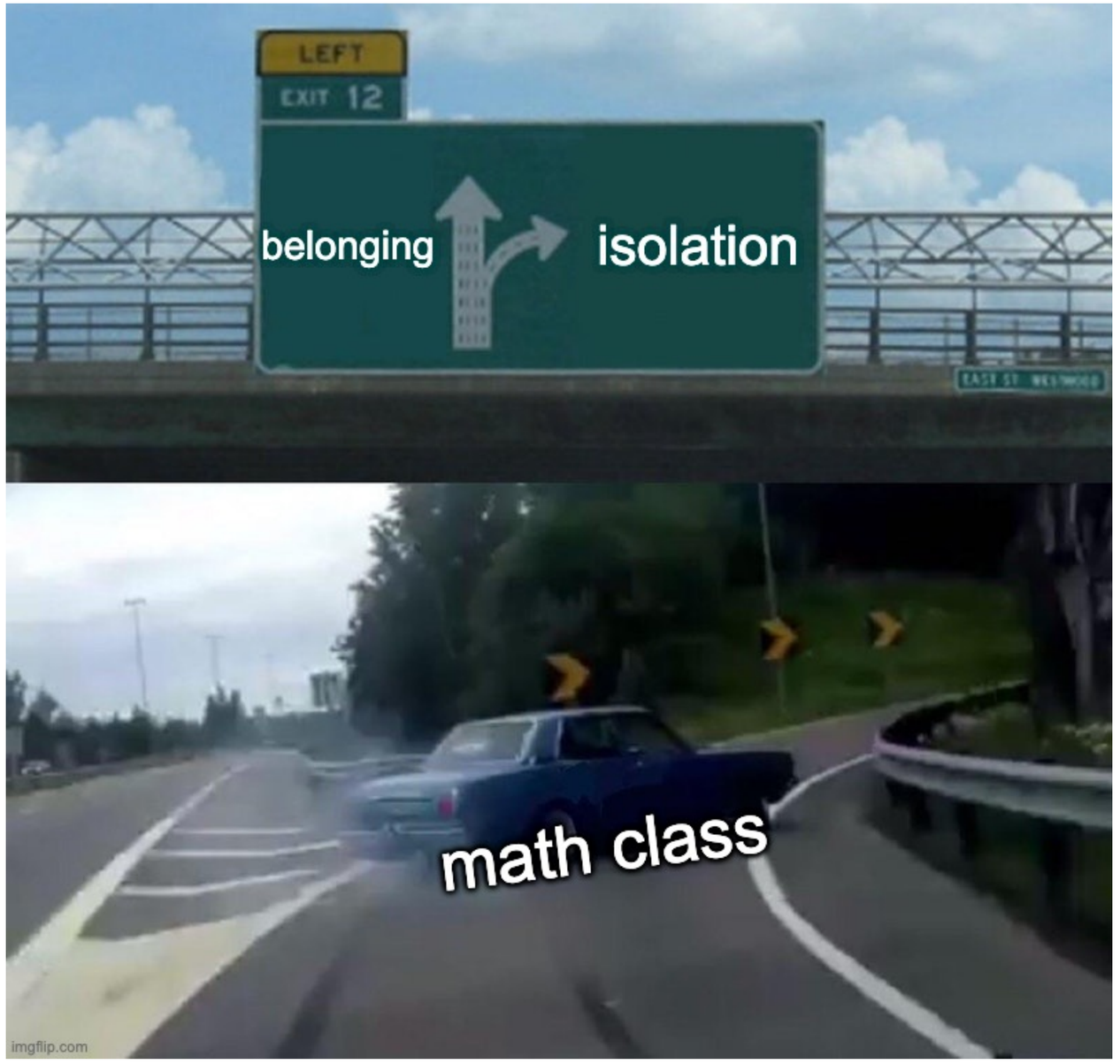

I'M GIVING AN ASSESSMENT IN WEEK 1
NOT A "SCREEN," RIGHT?
NOT A "SCREEN," RIGHT?
imgflip.com

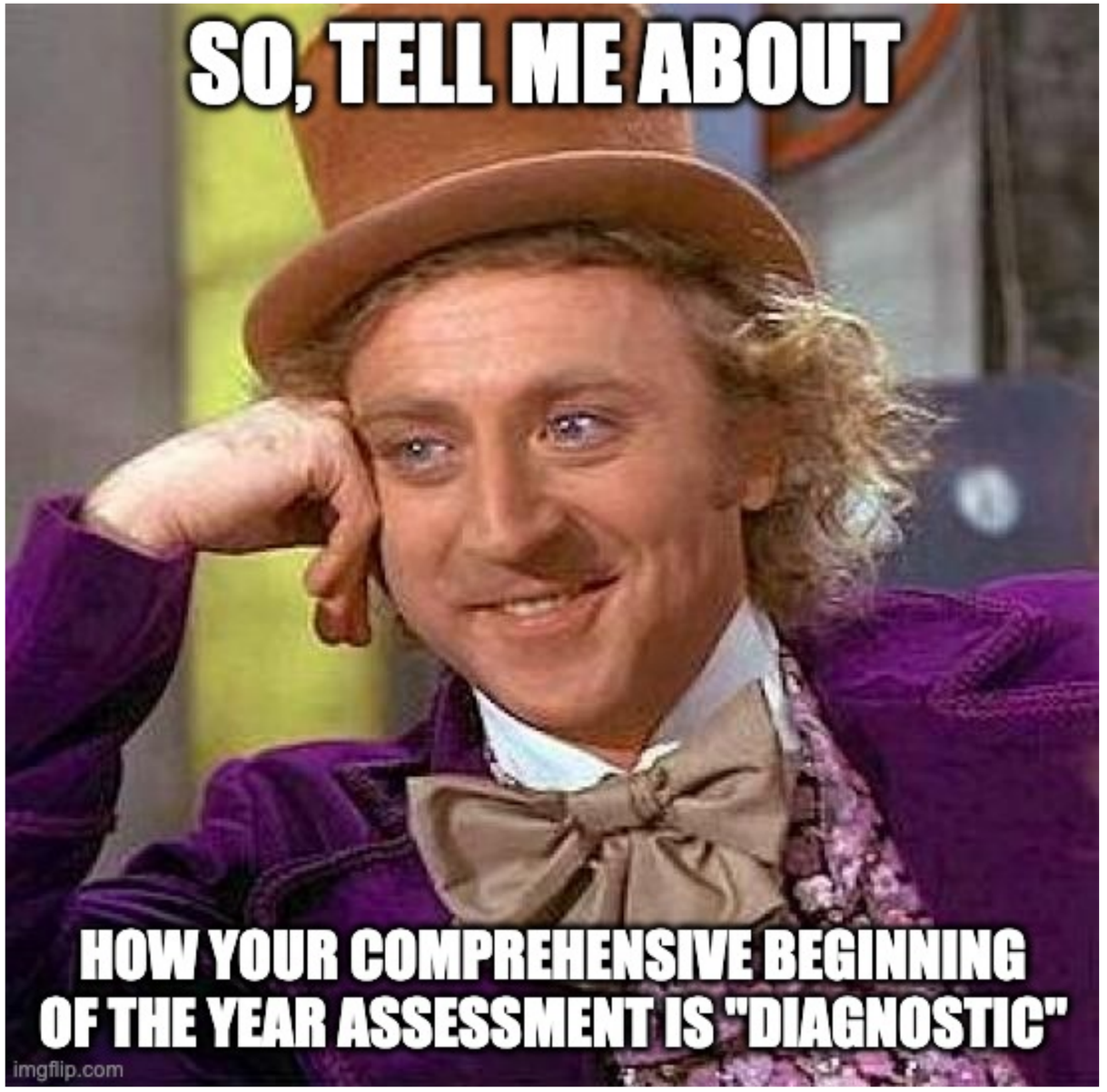

YOU GET A "SCREEN"!
YOU GET A "SCREEN"!
YOU GET A "SCREEN"!
EVERYBODY GETS A "SCREEN"!
imgflip.com


"SCREENS"
SPACE RANGER
LIGHTYEAR
"SCREENS" EVERYWHERE
imgflip.com

belonging

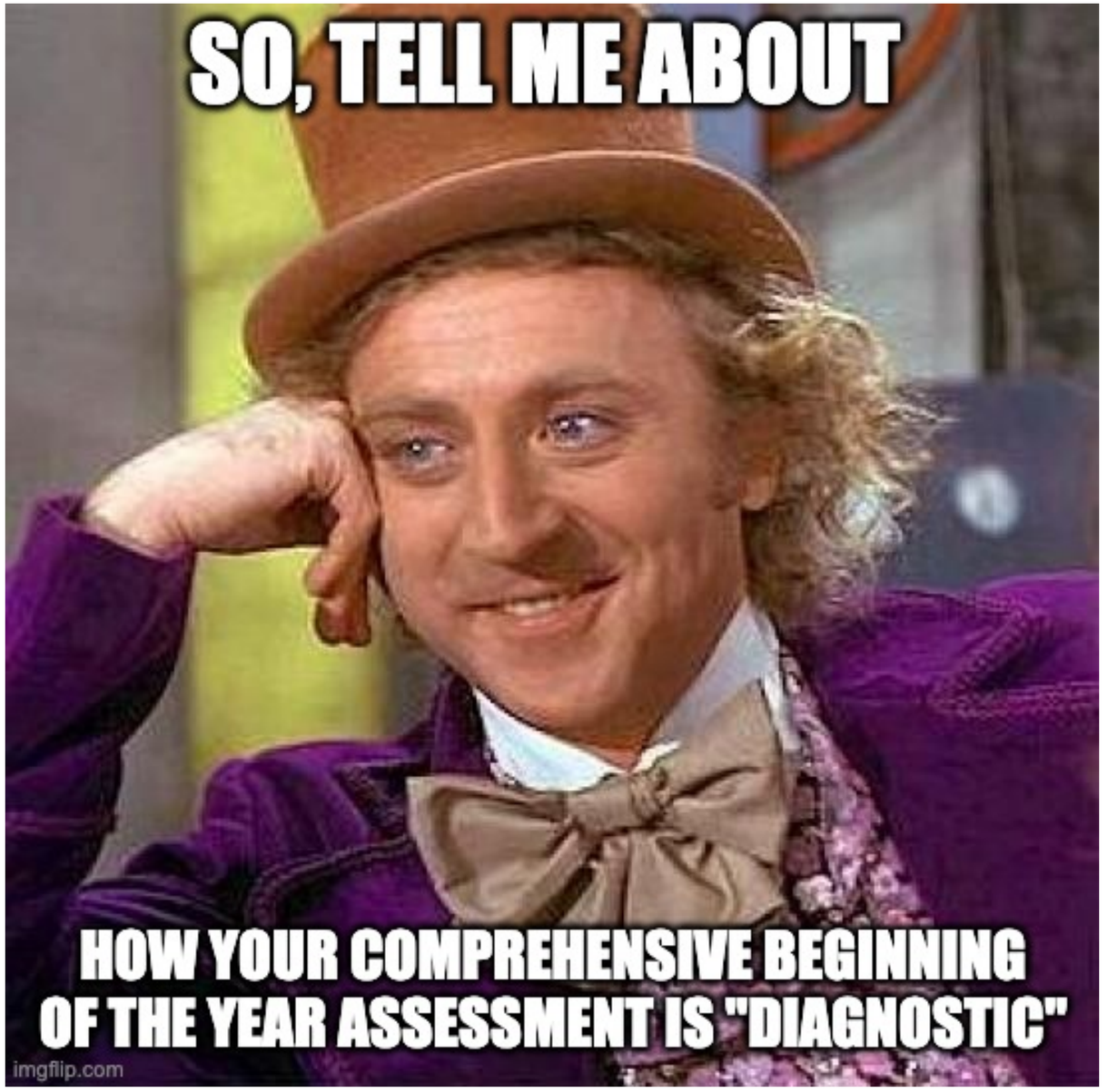
the feeling of being an accepted member of a group.


LEFT
EXIT 12
belonging
isolation
math class
imgflip.com


SO, TELL ME ABOUT
HOW YOUR COMPREHENSIVE BEGINNING OF THE YEAR ASSESSMENT IS "DIAGNOSTIC"
imgflip.com

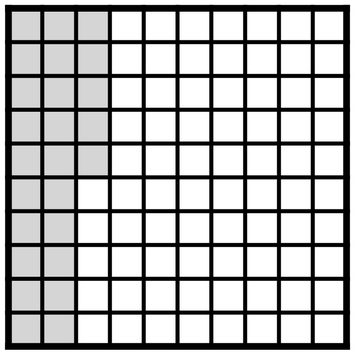
“An assessment **functions formatively** to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers **to make decisions about the next steps in instruction** that are likely to be better than the decisions that they would have made in the absence of that evidence.”

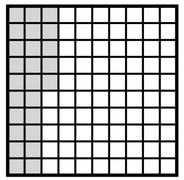
Wiliam, D. (2011). *Embedded formative assessment*. Solution Tree.


SO, TELL ME ABOUT
HOW YOUR COMPREHENSIVE BEGINNING OF THE YEAR ASSESSMENT IS "DIAGNOSTIC"
imgflip.com

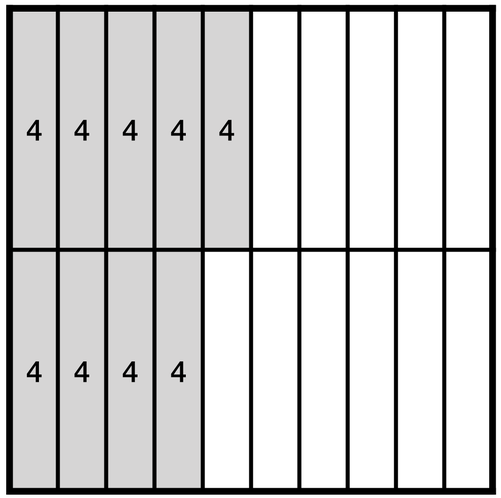
beginning
of the year
assessment of
content knowledge
from prior grades
ongoing
pre-assessments
of readiness
for upcoming
grade-level concepts
AIR
imgflip.com

Which **One *Doesn't*** **Belong**?

	65 %
0.83	$\frac{8}{10}$

Model	Fraction	Decimal	Percent
			
	$\frac{8}{10}$		
		0.83	
			65 %

10% of 80 is 8.
40% of 80 is 32.
5% of 80 is 4.
45% of 80 is 36.



What is 45% of 80?

$$\frac{45}{100} = \frac{9}{20}$$

$$\frac{9}{20} = \frac{x}{80}$$

$$0.45 \times 80 = 36$$

What is 25% of 80?

“Well, well, well.
How the
turn
tables.”

–Michael Scott

hidden curriculum

a set of unintended lessons included in any learning experience.

the norms, values, and beliefs conveyed in the classroom.

FASTER IS SMARTER
imgflip.com

You Retweeted

Dave Martin
@d_martin05

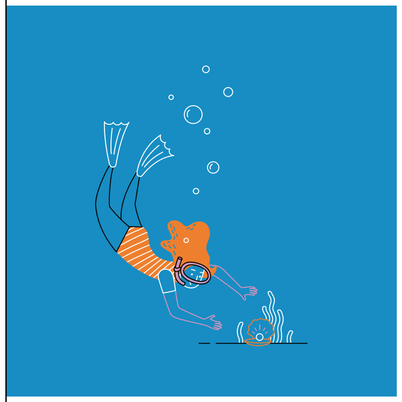
Please @Kahoot allow people to remove the speed component to scoring.

We need to stop teaching students that the fastest person is the smartest.

#edchat #mathchat

1:14 PM · Aug 16, 2022 · Twitter for iPhone

Depth Is More Important Than Speed!



Many mathematicians work slowly because they think deeply rather than quickly. Award-winning mathematician Laurent Schwartz talked about feeling stupid when he was in school because he was a slow thinker. When you work on maths go for depth over speed!

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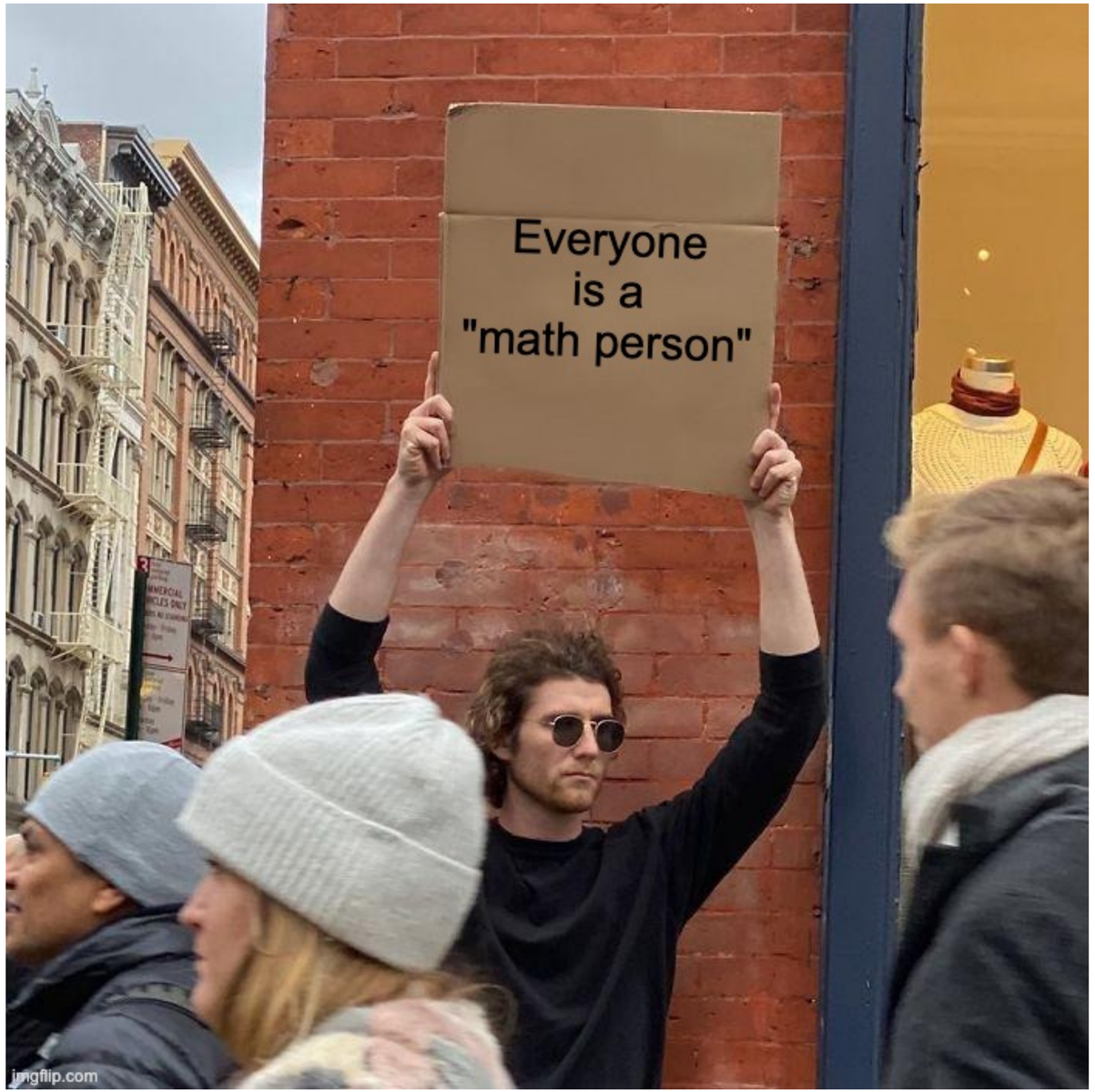
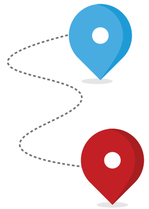


Everyone Can Learn Maths To High Levels!

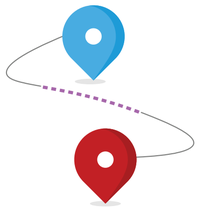
There is no such thing as a maths person! This is how we grow maths brains. When we learn, one of three things happen:

(1) We grow a new brain pathway:



(2) A brain pathway becomes stronger:

(3) Different brain pathways connect:



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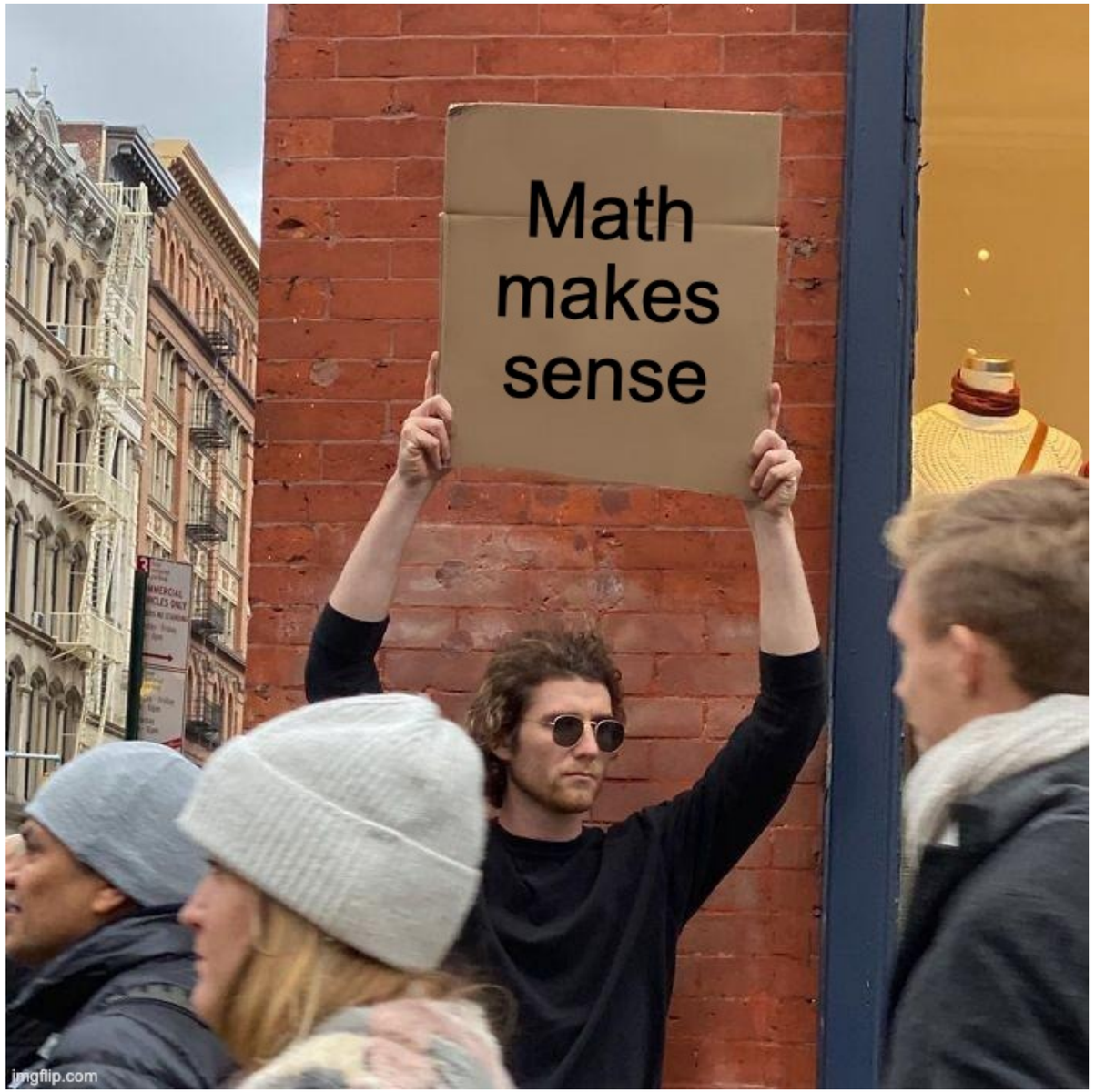
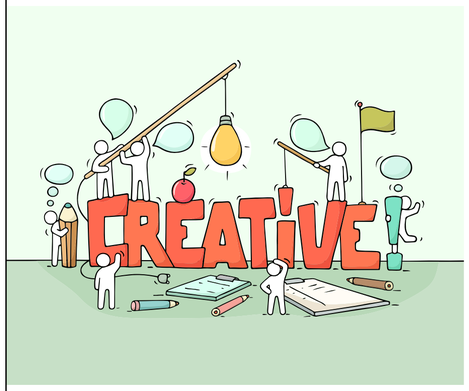


Maths Is About Creativity And Making Sense!



Maths is a sense-making subject, you yourself can know if an answer is right by reasoning about it.

If you finish a question think of a different way to solve it or pose another question!

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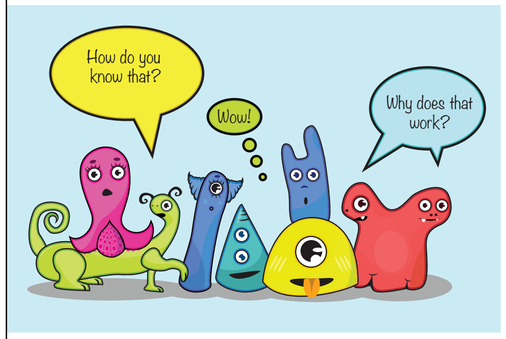
Questions and Discussion Deepen Your Mathematical Understanding!



Studies show that doing maths with others helps you. Get together with your friends to do maths and discuss it, it will really help you!

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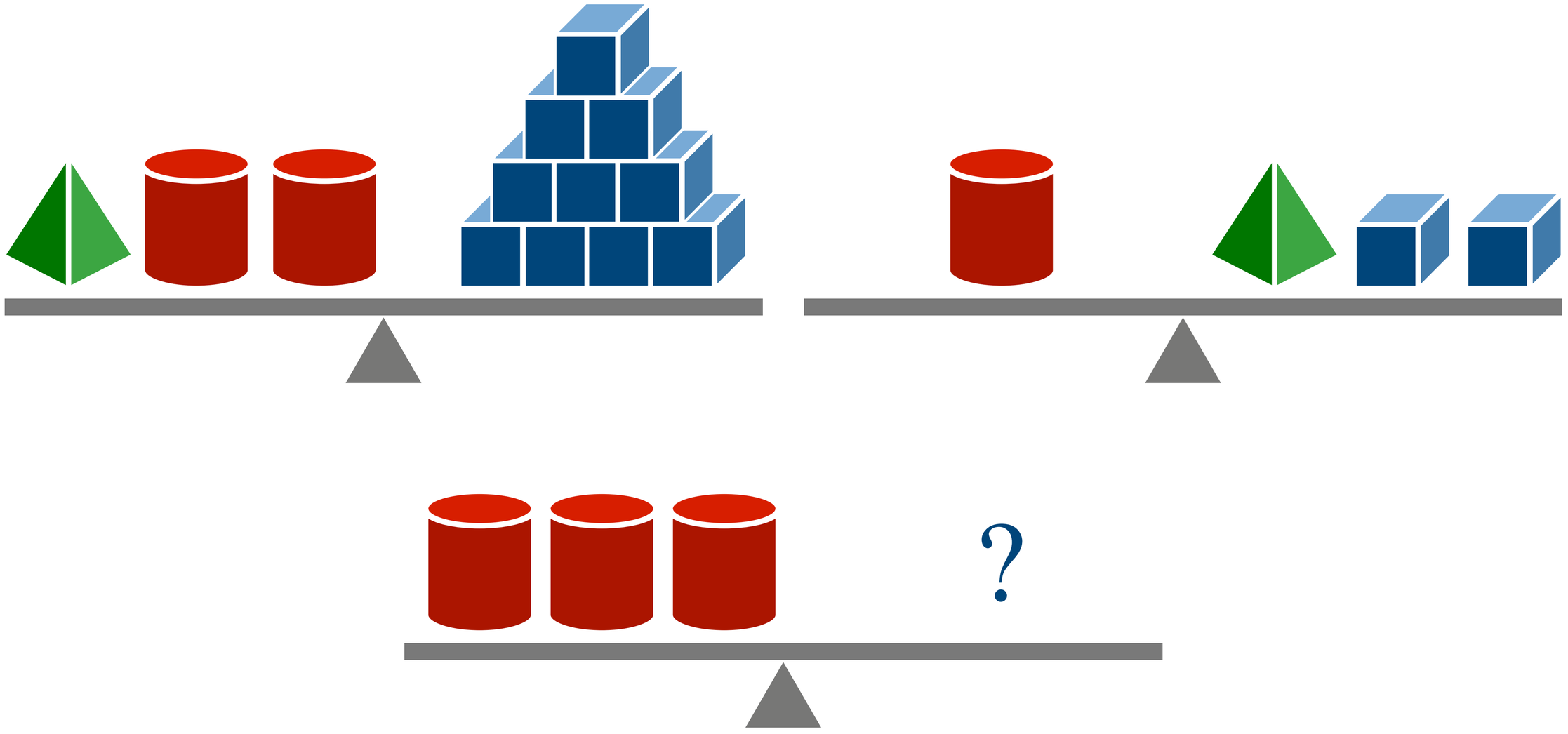

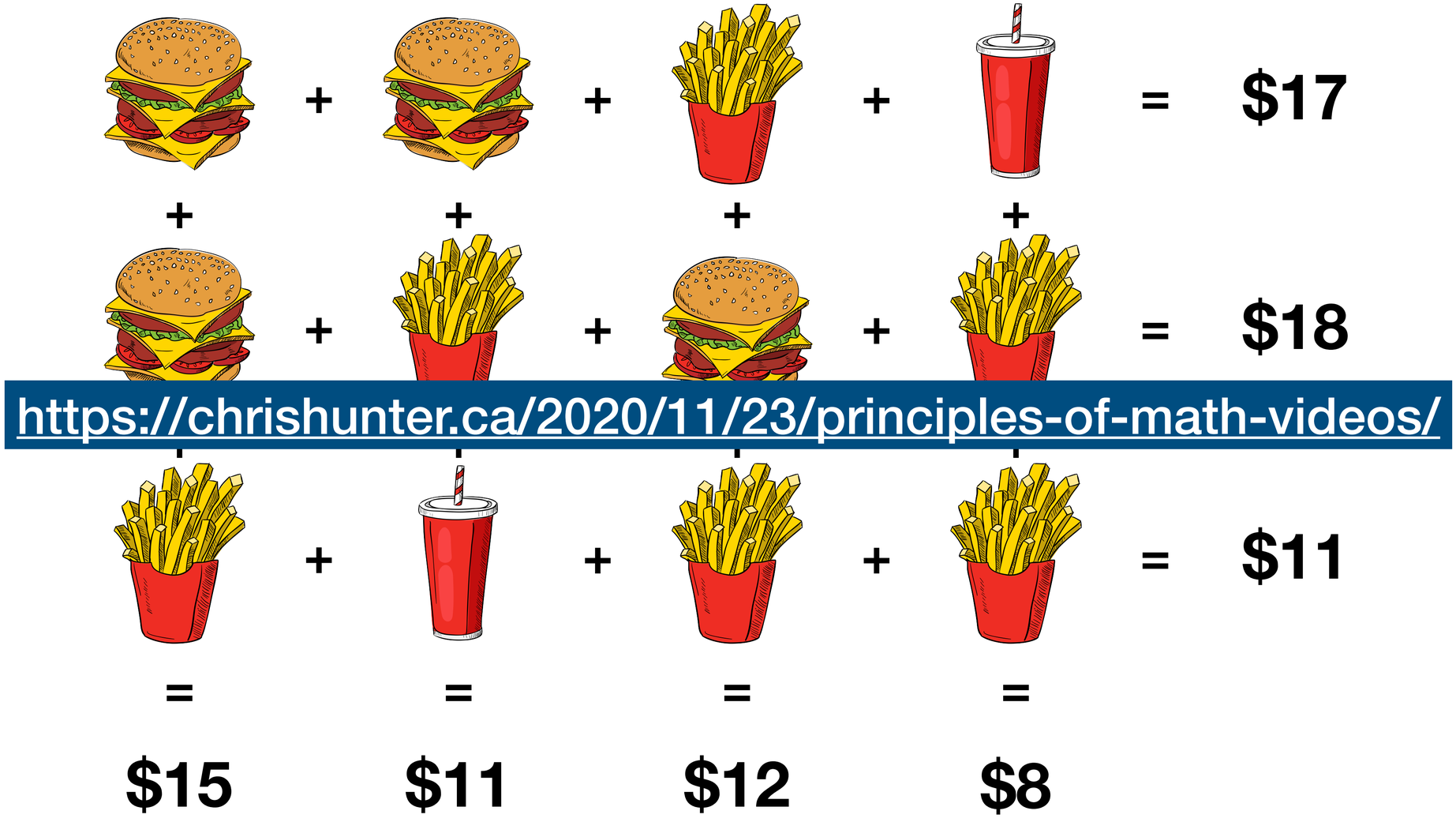

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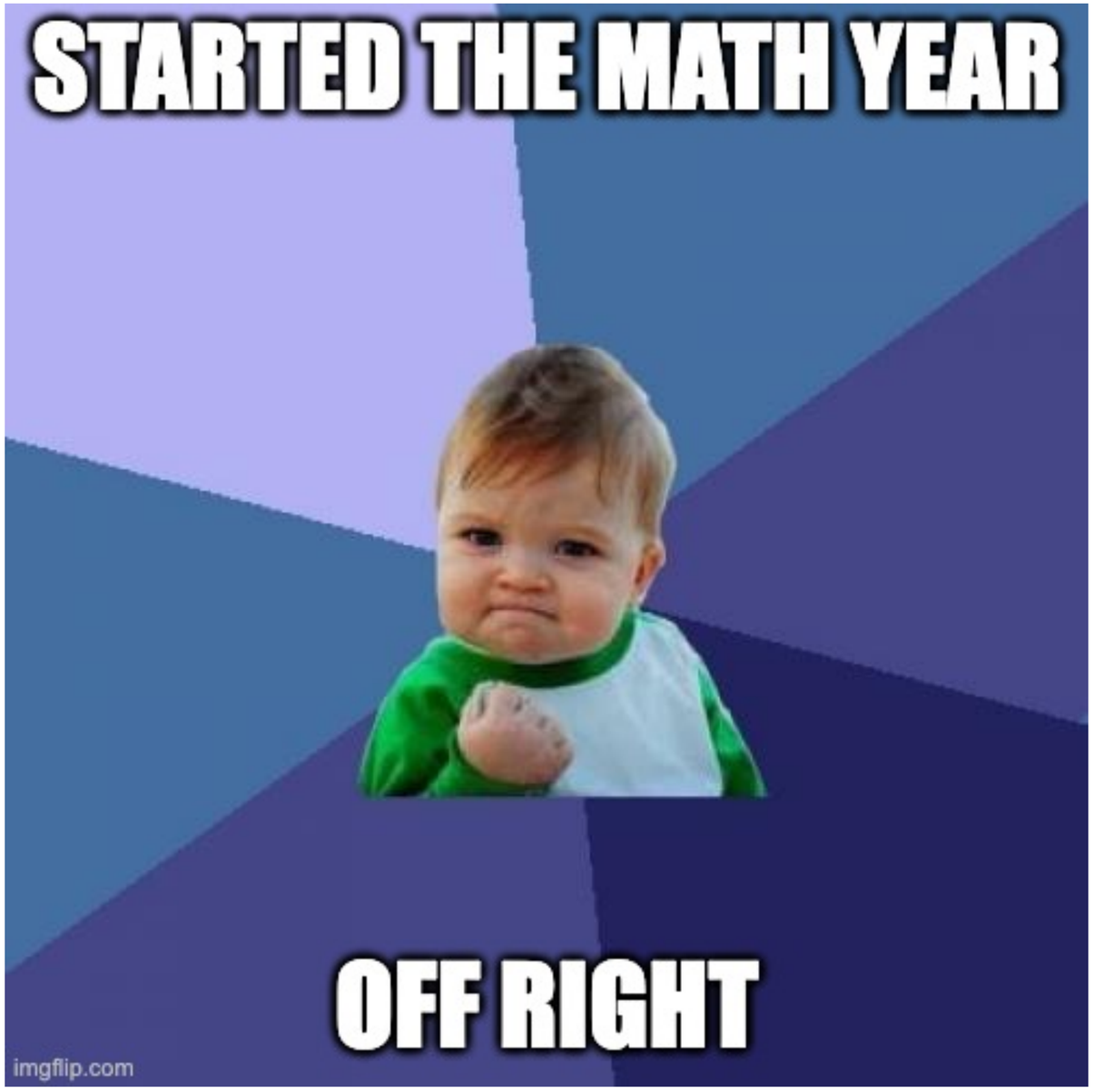
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