Getting to Multiplicative Thinking:

Our LPS Journey

Supporting Students with Learning Difficulties in Math

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https://goo.gl/2dVFQf

Soft Landing

https://goo.gl/2dVFQf

Clotheslinemath

https://goo.gl/2dVFQf

Clothesline Math - Determine 13% of $145.

Goals

1) Introduction to some flexible 15 minute activities that address student needs/gaps in numeracy
2) Describe our journey in the development of a numeracy program within the resource classroom at a medium sized secondary school
3) Discuss feedback for program revision

Our Program and Journey

Typical Student Profile:

- Reading skills on average **between grade 3 to 6**

- Learning disability can affect other areas as well, such as writing, mathematics, social skills
- Often **attention** and **concentration difficulties**
- Possible low motivation, poor self-esteem, discouragement - often related to not being successful at school
- Grades 9-12

Description of program goals

Responding to Student Need

Functional Literacy Skills

- Improved reading fluency and comprehension
- Writing skills

Numeracy Skills

- Closing the gaps

How is literacy and numeracy instruction different for high school students with exceptionalities?

From LDs in Mathematics: Evidence-Based Interventions, Strategies, and Resources

By Hanna A. Kubas and James B. Hale on LD@School:

Students with LDs are typically poor strategic learners and problem solvers, and often manifest strategy deficits that hinder performance, particularly on tasks that require higher level processing (Montague, 2008). So there is a strong relationship between fluid reasoning, executive functioning, and quantitative reasoning (Hale et al., 2008). Students with LDs often benefit from explicit instruction in selecting, applying, monitoring, and evaluating the use of appropriate strategies to solve word problems

Time Block in A9

20 minutes - Reading - Everyone

10 minutes - Reading Fluency - Everyone

10 minutes - Number Talk - Everyone

Time Remaining

- Journal Writing
- Math Bins
- Individual Needs

Numeracy Starting Point

- Resources
- Visits
- Prime Diagnostics - Number at first, then operation
- Number Talks
- Number Path Placemat and Cards
- Learner Profiles
- Instructional “Bins”
- Staff Training - Conceptual Development Training

Resources

- Jo Boaler - Mathematical Mindsets
- Number Talks
- Prime Math Assessment
- Ministry Materials - Fractions
- Number Path Cards and Placemats
- Money Cards, Fraction Cards, Place Value Cards

School Visits

1) Modelled number talk
2) Fractions lessons
3) Co-teaching
4) Prime assessments - a need for diagnostics?
5) Small group PD using release time

Needs in Conceptual Development

1) Number Path Cards and Placemat
2) Staff Training
3) More resources
4) The push for math PD at the board/ministry level - RMS

Staff Training

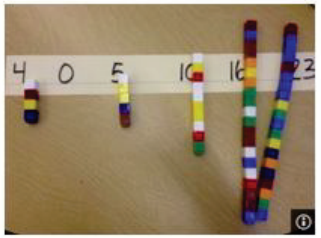
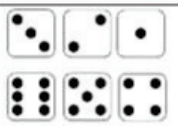
Our focus in this training session was on understanding the

Conceptual Development Continuum (Lawson and Richardson)

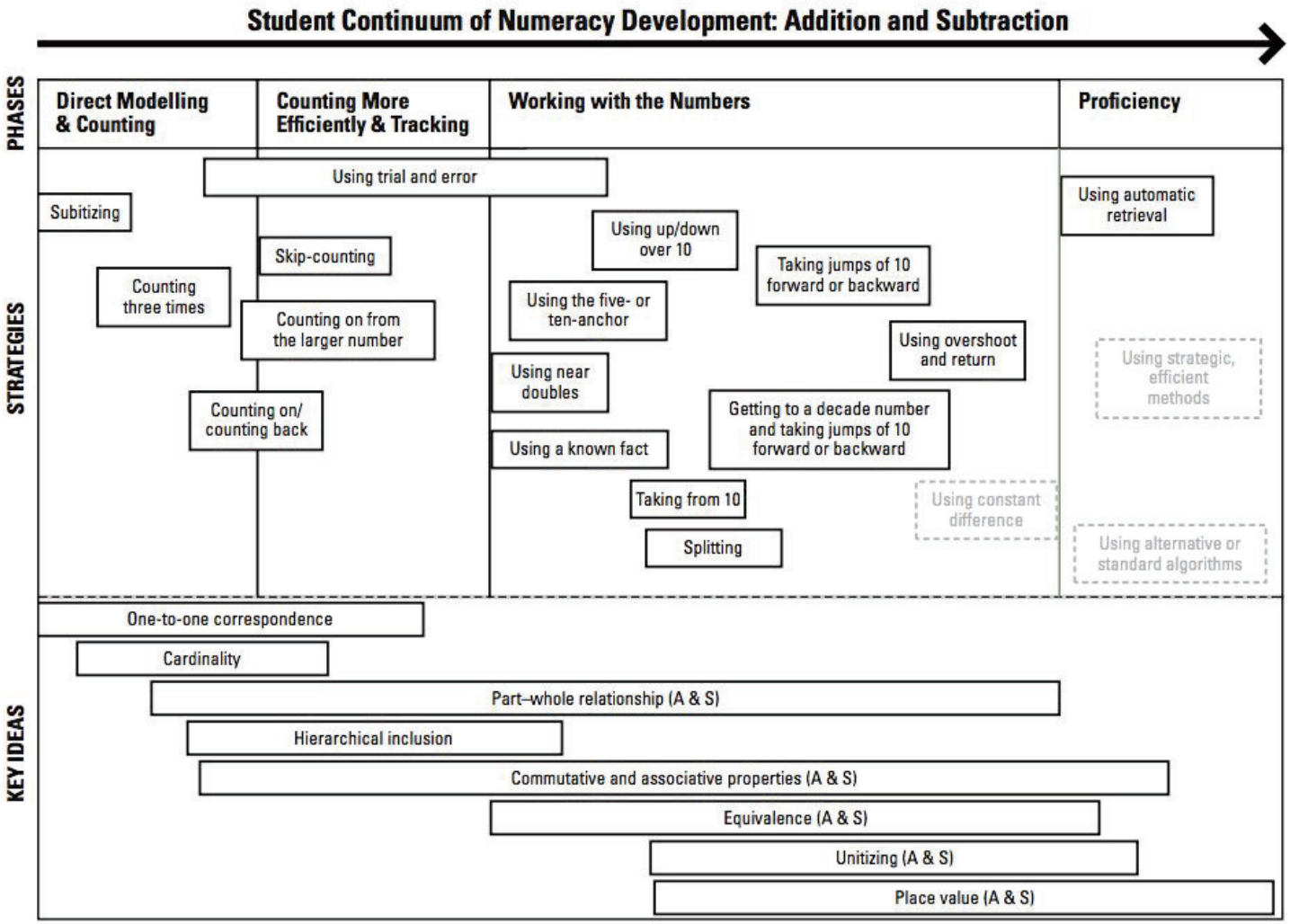
and where our students stood on them

Key Number and Quantity Concepts

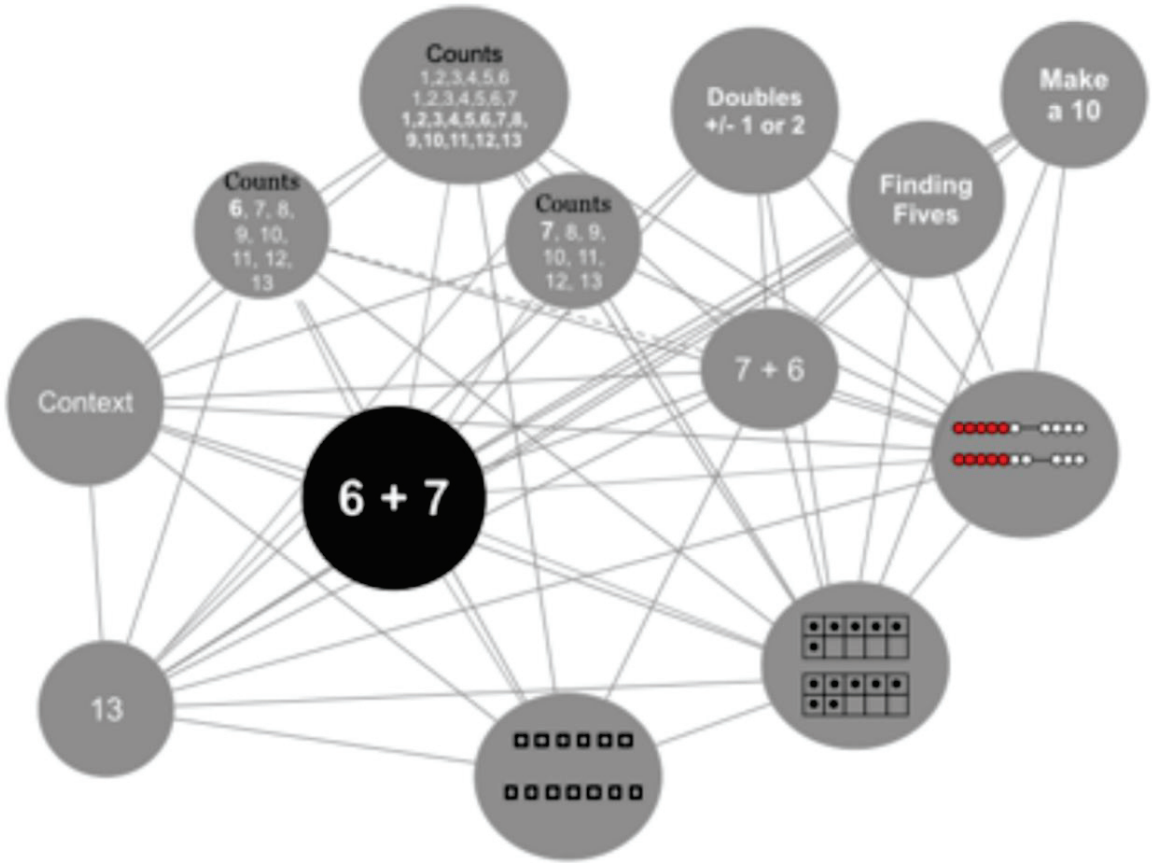
Early Number Quantity and Counting Concepts

Concept	Definition	Representation
Conservation of Number	The idea that quantity stays the same even when the items are spread out or close together. The only way that the count can change is when objects are added to, or removed from the set.	
Cardinality	An understanding that the last number of the count of a set of objects represents the number of objects.	
Subitizing	The ability to recognize small quantities of objects at a glance, without having to count all the objects.	

Number Sense Continuums: Addition



Note: the commutative and associative properties apply only to addition and not subtraction.


Counts
1,2,3,4,5,6
1,2,3,4,5,6,7
1,2,3,4,5,6,7,8,
9,10,11,12,13
Doubles
+/- 1 or 2
Make
a 10
Counts
6, 7, 8,
9, 10,
11, 12,
13
Counts
7, 8, 9,
10, 11,
12, 13
Finding
Fives
Context
7 + 6
6 + 7
13

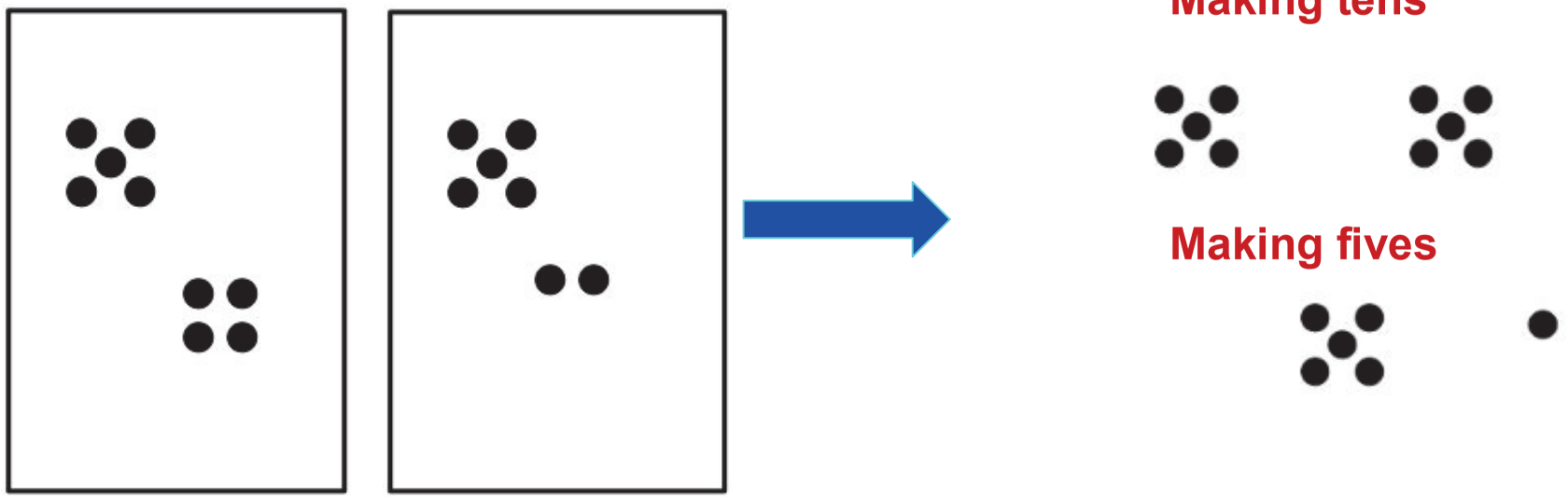
Fluency

Children who have fluency with numbers seem to have these relationships:

- **Spatial Relationships:** subitizing, spatializing numbers to decompose
- **Benchmarks of 5 and 10:** [five and ten frames, rekenreks] ***solve problem***
- **Parts/Wholes:** understanding that numbers can be broken into parts
- **Derived Facts -** using facts they know to derive facts they don't know

Number Path Cards

7 students are in the class and 9 more will be coming, how many chairs will we need in the classroom?



Money Cards

Flip Card

Which is more?

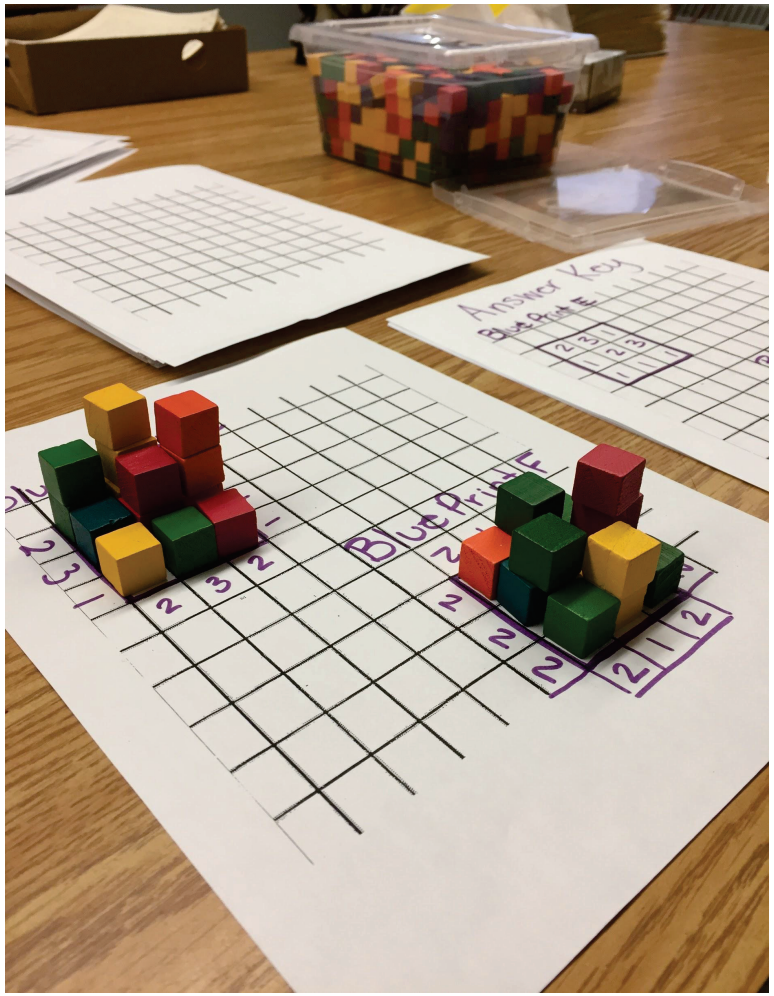
$0.55

?

City Scape

How many buildings can you see?

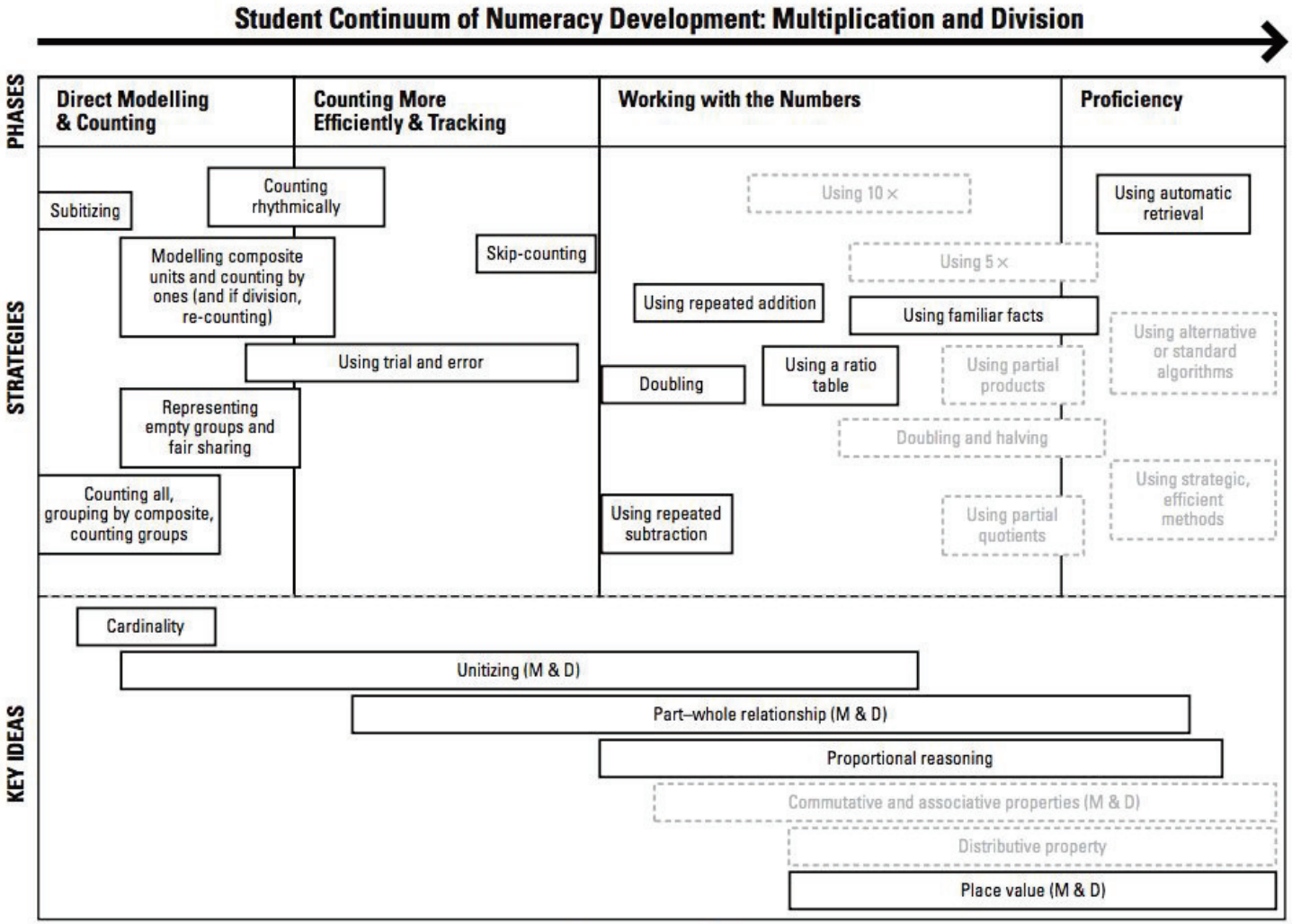
Develop the cityscape as a 3 x 3 or 4 x 4.



Number Talk

1025 + 1349

Number Sense Continuums: Multiplication



Note: the commutative and associative properties apply only to multiplication and not division.

Progression of Multiplication

32x16

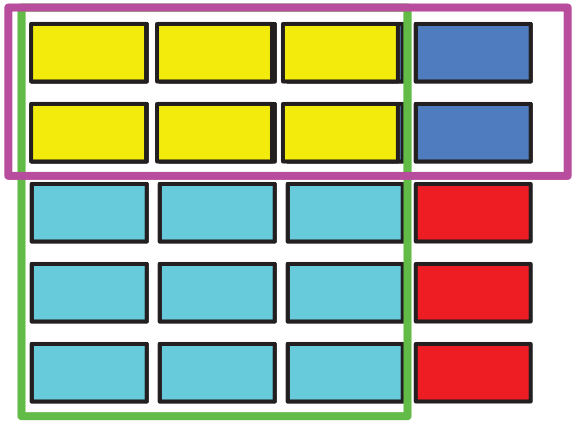
Fraction Multiplication

Array for multiplication

$$\frac{3}{4} \times \frac{2}{5}$$

Fraction Multiplication

$$\frac{3}{4} \times \frac{2}{5}$$



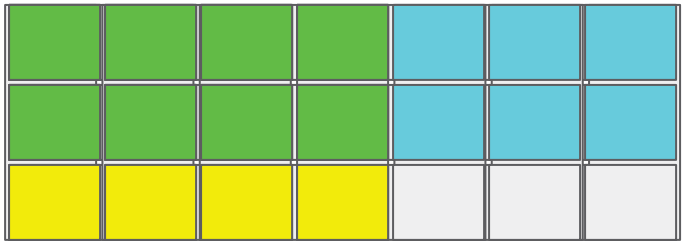
$$\frac{6}{20}$$

Fraction Multiplication - you try!

Array for multiplication

$$\frac{2}{3} \times \frac{4}{7}$$

Mark 4/7



Mark ⅔

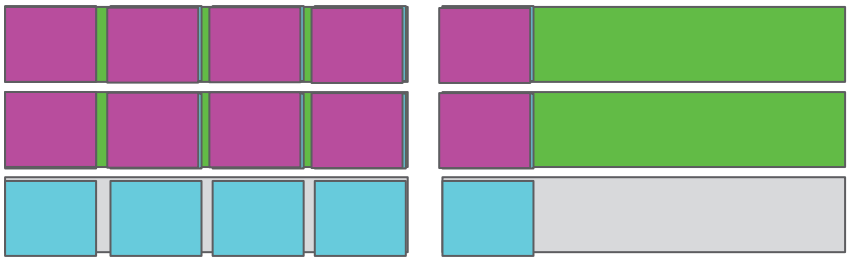
What is the overlap?

$$\frac{8}{21}$$

Fraction Multiplication

Array for multiplication

$$\frac{2}{3} \times \frac{5}{4}$$



How many pieces are in one whole? 12 pieces

What is the overlap? $\frac{10}{12}$

Learner Profiles and Record Sheets

1) Record sheet for Self Advocacy and Parent Communication
2) Design Process for a Learner Profile
3) Individual Tracking Sheets for Numeracy and Literacy

Student Name:

Beginning of Semester		End of Semester	
GSRT DRA WTW	Prime Math	GRST DRA WTW	Prime Math

Summative #1 – Learner Portfolio	
Summative #2 – Reading Comprehension	
Summative #3 – Math Mindset - Strategies	
Summative #4 – Book Talk	
Summative #5 – PEE Paragraph/Revision	
Culminating Interview (30%)	
Final Grade	

Unit #1 –Learner Portfolio

FORMATIVES/CLASSWORK

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

☐ SUMMATIVE

Math/Numeracy Tracking:

Reading Strategies:

Books Read:

Unit #2 – Reading Comprehension

FORMATIVES/CLASSWORK

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

☐ SUMMATIVE

Math/Numeracy Tracking:

Reading Strategies:

Books Read:

Unit #3 – Math Mindset and Strategies

FORMATIVES/CLASSWORK

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

☐ SUMMATIVE

Math/Numeracy Tracking:

Reading Strategies:

Books Read:

Learner Profiles - Who are they for?

- Who are they for?
- GLE Summative
- Exit Interview

Instructional “Bins”

1) Reviewing Learner Profiles and addressing needs of a student and needs of a class.
2) Strategies as “Bins” (Concrete -> Diagram -> Symbol)
3) What we noticed about the students in our resource classes…
    - Most were in phase 2 or 3
    - Struggle with place value, vocabulary, and the jump to multiplicative thinking

Our “Bins”

Include:

- Flex 15 activities on Spatial Reasoning, Patterns, Algebra, Number Sense, Operations, planned Number Talks using whole and fractional values, Fraction Talks.
- Games of strategy and numeracy:
  - No Thanks, Kinoddle, Coggy, War (and adapted war games with number path cards)

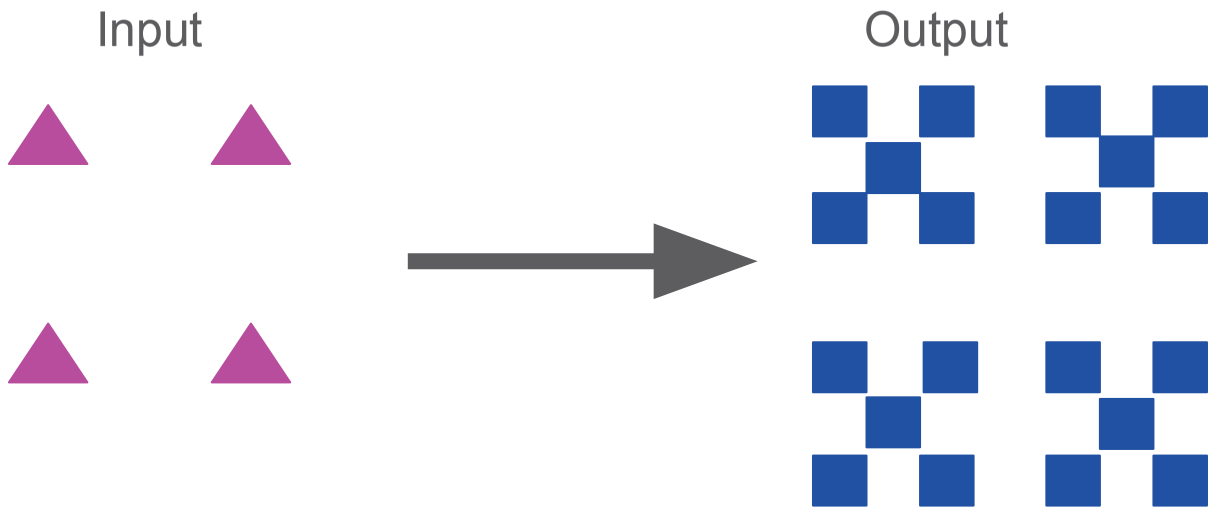
Picture here

#Flex15

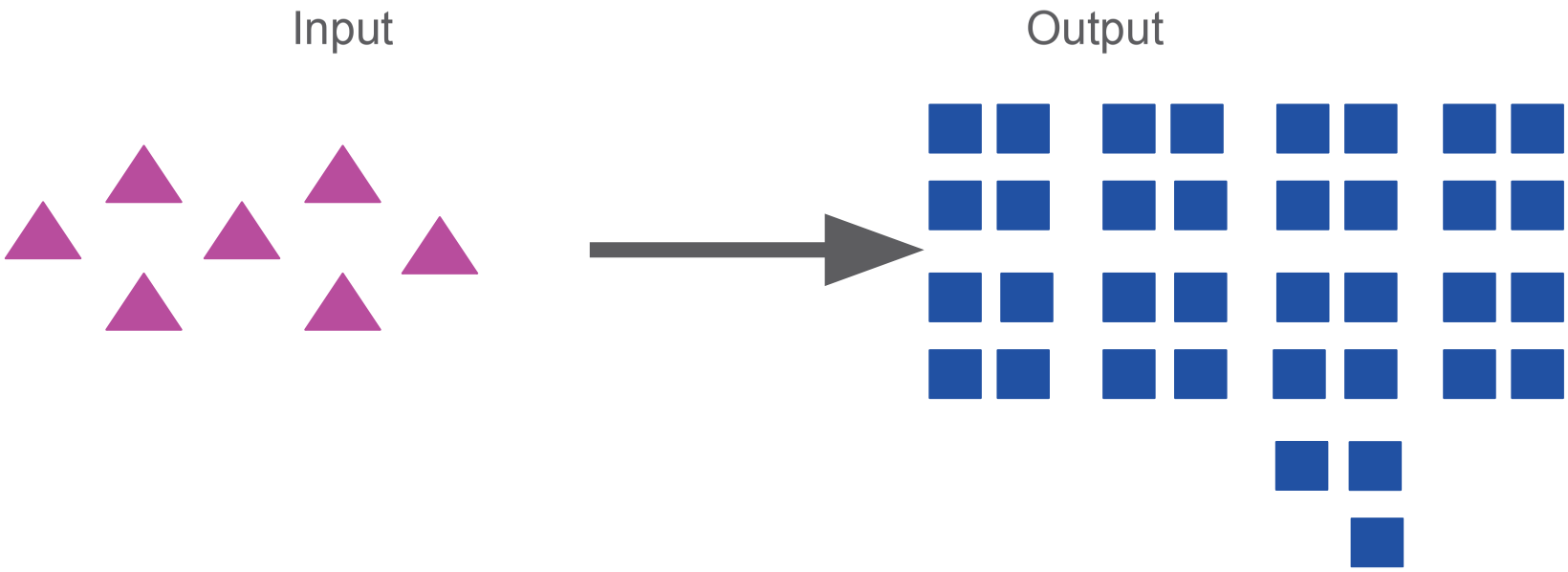
What's My Rule?

Input	Change Rule	Output
7	x 3	21
2		6
4		12
3		9

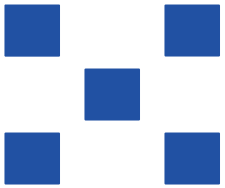
Flex 15 - Guess my rule?



Flex 15 - Guess my rule?



Flex 15 - Guess my rule?

Input			Output
	x 5	=	

Input x 5 = Output

Flex 15 - Guess my rule?

Input

$4

Output

$1

Flex 15 - Guess my rule?

Input

Output

$2

$0.50

Flex 15 - Guess my rule?

Input		Output
	x (¼) =	

Input x (¼) = **Output**

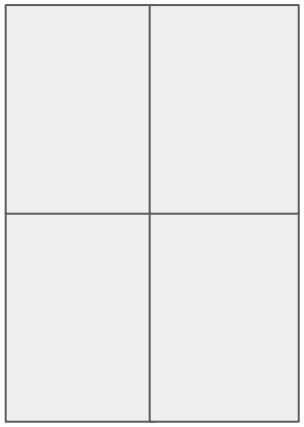
What's My Rule?

Input	Change Rule	Output
3		15
5	x 4 + 3	23
7		31
2		11

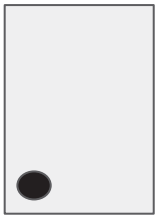
Questions?

Spatial Task - Paper Folding

Predict what this folding looks like when it is unfolded.



Full page

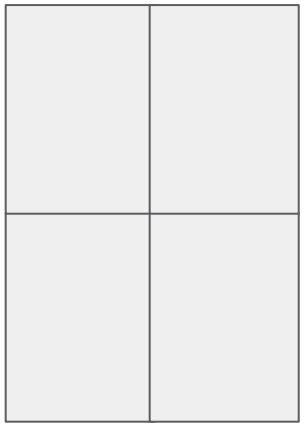


One folded section with hole punch

PREDICT!

Spatial Task - Paper Folding

Predict what this folding looks like when it is unfolded.



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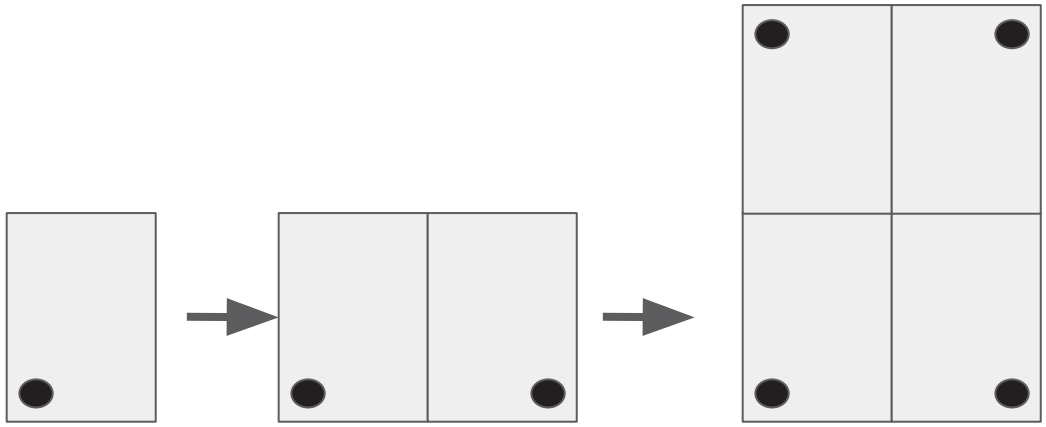

One folded section with hole punch