Developing Computational Fluency in Grades 4 - 7

April 17th, 2018
REC 206
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Learning Intentions

- I understand what it means to have Computational Fluency.

- I have an emerging understanding of Math Running Records and how they can be used to assist me in providing specific, responsive instruction.

- I am aware of various resources that I can use to support the development of my students' computational fluency.

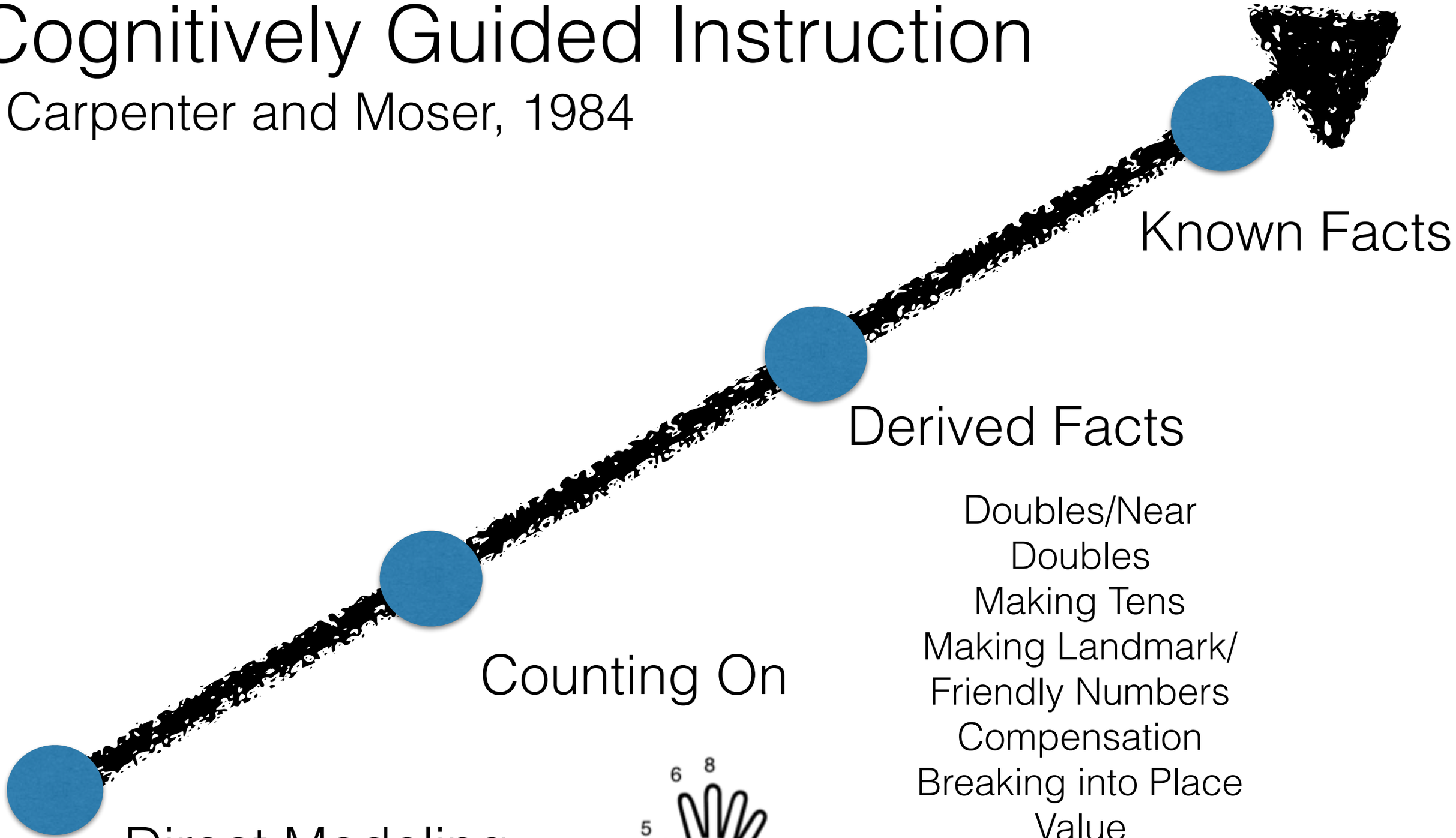
How would you describe a student with computational fluency?

Computational Fluency

refers to having efficient and ***accurate*** methods for computing. Students exhibit computational fluency when they demonstrate ***flexibility*** in the computational methods they chose, ***understand*** and can explain these methods, and produce accurate answers ***efficiently***. The computational methods that a student uses should be based on mathematical ideas that the student understands well, including the structure of the base-ten number system, properties of multiplication and division, and number relationships.

- NCTM (2000), p. 152

Addition
Cognitively Guided Instruction
- Carpenter and Moser, 1984



Known Facts

Derived Facts

Doubles/Near Doubles
Making Tens
Making Landmark/ Friendly Numbers
Compensation
Breaking into Place Value
Adding up in Chunks

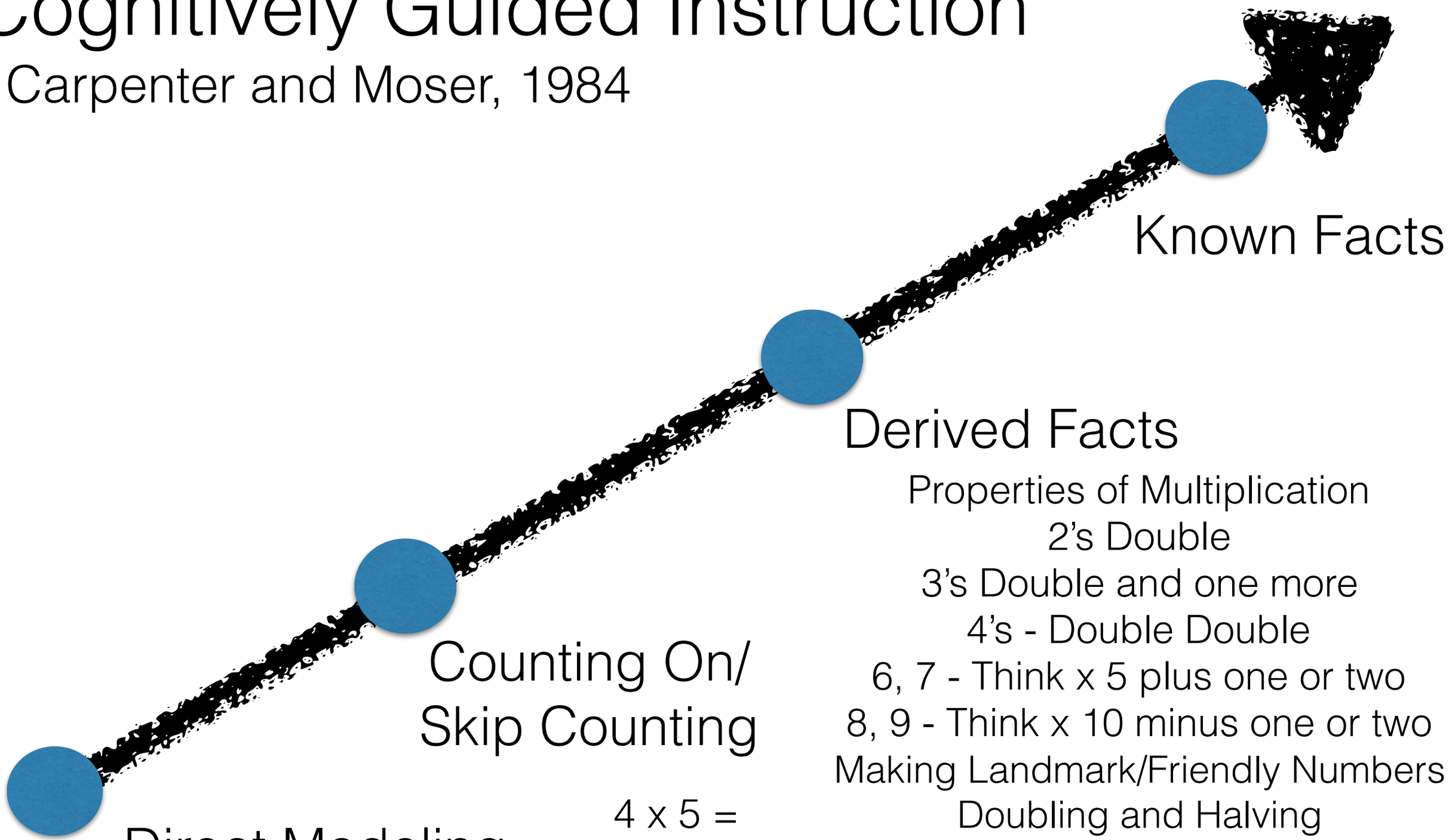
Counting On

4 + 3 =

Direct Modeling

Counts all

Multiplication
Cognitively Guided Instruction
- Carpenter and Moser, 1984



Three scenarios…

Jordan is a memorizer. She has worked with flashcards to master the facts. She comes across 9 x 6 and can't remember it, so she skips it.

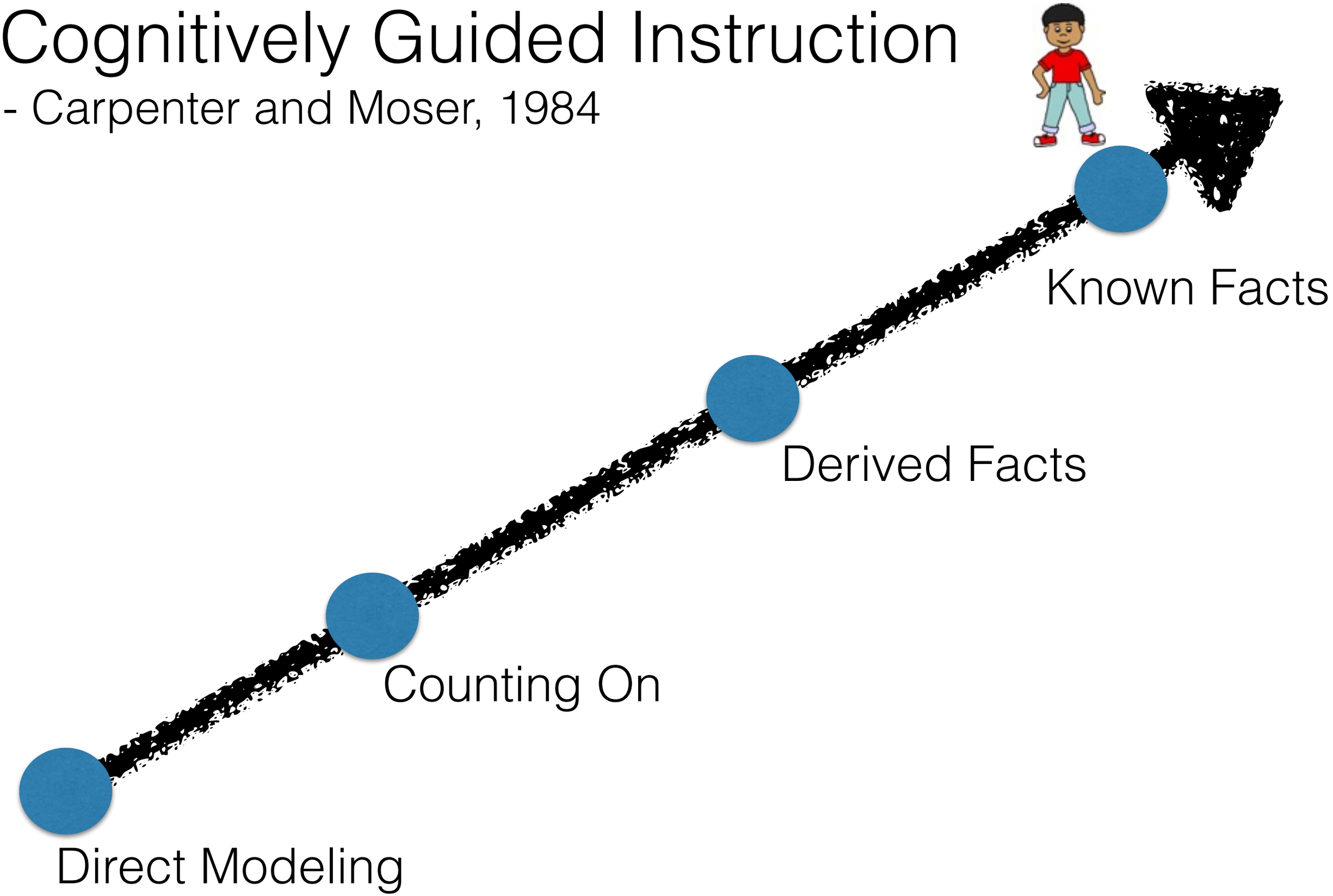
Michael is also a memorizer. He has comes across 9 x 6 and also can't remember it. He decides to try and count to get the answer. It takes awhile but he eventually gets the answer but he does not feel confident so he takes the time to count again.

Charlotte is a strategic thinker. She has some known facts but has learned to be flexible with numbers and uses their relationships to help her reason when she gets stuck. When she can't recall 9 x 6, she thinks about what she knows. She reasons that 10 is one more than 9. She multiples 10 x 6 to get 60 and takes away the extra 6 she added to get 54. She produces this answer in 3 seconds and she is confident she is correct.

Adapted from foreword, Math Running Records, 2016

Cognitively Guided Instruction

- Carpenter and Moser, 1984



Cognitively Guided Instruction

- Carpenter and Moser, 1984

Direct Modeling
Level One

Counting On
Level Two

Derived Facts
Level Three

Known Facts
Level Four

16 x15 =

Students who have simply memorized will struggle to compute this question in their heads.

Whereas, a student with *Number Sense* is able to draw upon strategies, such as doubling and halving, and can think 8 x 30 and know within seconds the answer is 240.

In our BC Context…

BRITISH COLUMBIA
Ministry of Education

Area of Learning: MATHEMATICS — **Grade 3**

BIG IDEAS

Fractions are a type of **number** that can represent quantities.	Development of computational fluency in addition, subtraction, multiplication, and division of whole numbers requires flexible decomposing and composing.	Regular increases and decreases in **patterns** can be identified and used to make generalizations.	Standard units are used to describe, measure, and compare **attributes** of objects' shapes.	The likelihood of possible **outcomes** can be examined, compared, and interpreted.

Learning Standards

Curricular Competencies	Content
Students are expected to do the following: **Reasoning and analyzing** • 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 **Understanding and solving** • 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 **Communicating and representing** • **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**	*Students are expected to know the following:* • **number concepts to 1000** • **fraction concepts** • **addition and subtraction** to 1000 • addition and subtraction facts to 20 (emerging **computational fluency**) • **multiplication and division** concepts • increasing and decreasing **patterns** • **pattern rules** using words and numbers, based on concrete experiences • one-step addition and subtraction **equations** with an unknown number • measurement, using **standard units** (linear, mass, and capacity) • **time** concepts • construction of **3D shapes** • **one-to-one correspondence** with bar graphs, pictographs, charts, and tables • likelihood of **simulated events**, using comparative language • **financial literacy** — fluency with coins and bills to 100 dollars, and earning and payment

BIG IDEAS

Numbers describe quantities that can be represented by equivalent fractions.	Computational **fluency** and flexibility with numbers extend to operations with larger (multi-digit) numbers.	Identified regularities in number **patterns** can be expressed in tables.	Closed shapes have **area and perimeter** that can be described, measured, and compared.	**Data** represented in graphs can be used to show many-to-one correspondence.

Learning Standards

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What does this mean?

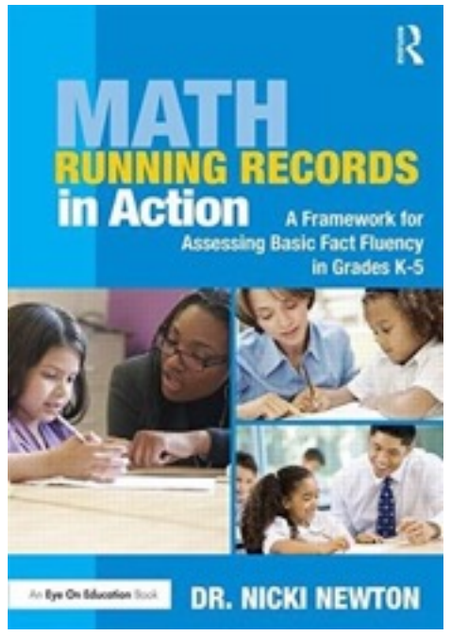
My students don't know know their facts!

Math Running Records

Where are our students?
What do they know?
What should be our next steps
to move them toward computational fluency?

Math Running Records

- speed and accuracy
- flexibility and efficiency (give a deep look at the *thinking process)*
- disposition towards mathematics



We can be more productive, confident, and intentional in our teaching decisions when we have dependable, reliable, valid systems for collecting, organizing, analyzing, and interpreting students' mathematical skills and behaviours.
- Newton, p.g. 4

Three Parts

1. **<u>Part One</u>** - Assessing for ***Automaticity***
   Students are given a set of benchmark problems to see and hear if students have automaticity with the basic facts.

2. **<u>Part Two</u>** - ***Flexibility and Efficiency***
   Students look at specific problems and share the strategies they used. Students' thinking is made visible and teachers can see whether students are using lower level strategies such as counting or more advance strategies such as relating the facts they know to solve facts they don't know (also referred to as derived facts).

3. **<u>Part Three</u>** - ***Mathematical Disposition***
   Students are asked how they think about themselves as mathematicians, what they do well and what they need to work on.

Benchmark Problems for Addition

- Adding 0 to a number
- Adding 1 to a number
- Adding within 10
- Adding numbers that make 10
- Adding doubles facts
- Adding doubles plus 1 facts
- Adding doubles plus 2 facts
- Adding10 to a number
- Adding 7, 8, or 9 to a number
- Adding within 20 (larger numbers)

ADDITION RUNNING RECORD	
Student Page	
0 + 1	5 + 6
2 + 1	7 + 5
3 + 2	4 + 8
2 + 6	7 + 8
4 + 6	8 + 9
7 + 7	10 + 4

Benchmark Problems for Multiplication

- Multiplying by 0
- Multiplying by 1
- Multiplying by 5
- Multiplying by 10
- Multiplying by 2
- Multiplying by 4
- Multiplying by 8
- Multiplying by 3
- Multiplying by 6
- Multiplying by 9
- Multiplying by 7

MULTIPLICATION RUNNING RECORD	
Student Page	
0 x 4	4 x 8
1 x 2	6 x 7
5 x 3	4 x 4
10 x 7	7 x 8
2 x 6	8 x 5
3 x 9	9 x 6

Part One:

MULTIPLICATION RUNNING RECORD	
Student Page	
0 x 4	4 x 8
1 x 2	6 x 7
5 x 3	4 x 4
10 x 7	7 x 8
2 x 6	8 x 5
3 x 9	9 x 6

Part 1: Multiplication Running Record Recording Sheet Strategy Levels and Accuracy			
0 x 4	a ca sc asc fco/skf coh pth dk	M0	0 1 2 3 4
1 x 2	a ca sc asc fco/skf coh pth dk	M1	0 1 2 3 4
5 x 3	a ca sc asc fco/skf coh pth dk	M5	0 1 2 3 4
10 x 7	a ca sc asc fco/skf coh pth dk	M10	0 1 2 3 4
2 x 6	a ca sc asc fco/skf coh pth dk	M2	0 1 2 3 4
3 x 9	a ca sc asc fco/skf coh pth dk	M3	0 1 2 3 4
4 x 8	a ca sc asc fco/skf coh pth dk	M4	0 1 2 3 4
6 x 7	a ca sc asc fco/skf coh pth dk	M6	0 1 2 3 4
4 x 4	a ca sc asc fco/skf coh pth dk	MD	0 1 2 3 4
7 x 8	a ca sc asc fco/skf coh pth dk	MHN/M7	0 1 2 3 4
8 x 5	a ca sc asc fco/skf coh pth dk	MHN/M8	0 1 2 3 4
9 x 6	a ca sc asc fco/skf coh pth dk	MHN/M9	0 1 2 3 4
Codes: a- automatic sc- self corrected asc- attempted self-correction ca – counted all on fingers skf – skip counted on fingers coh- counted on in head pth – prolonged thinking time dk – didn't know		Codes: M0 – multiplying by 0 M1 – multiplying by 1 M10 – multiplying by 10 M5 – multiplying by 5 M2– multiplying by 2 M3 – multiplying by 3 M4 - multiplying by 4 M6 – multiplying by 6 M7– multiplying by 6 M8– multiplying by 6 M9– multiplying by 6 MD – multiplying doubles MHN- multiplying higher numbers	Codes: 0 – doesn't know 1 – counting strategies by ones or skip counting using fingers or drawings 2 - mental math/solving in head (usually skip counting) 3- using known facts and strategies 4- automatic recall
Comments:			

Math Running Records by Dr. Nicki Newton 2016 © Routledge

Student knew the answer immediately and was accurate.

Student counted on fingers.

Student skip counts in their head.

Student took time and did not provide an answer.

Student took a bit of time and when asked in Part Two student said they thought about multiplying by 10 and compensating.

Part Two:

1. Does the student understand the fact you are asking?
2. What are the main strategies they know?
3. Where does the student use inefficient strategies?
4. What happens when a student doesn't know a question?

Students can be in a "mastery" stage for one set of facts and a "counting" stage for another.

Part 2:
Multiplication Flexibility Assessment

Teacher: We are now going to administer Part II of the Running Record. In this part of the Running Record we are going to talk about what strategies you use when you are solving basic multiplication facts. I am going to tell you a problem and then ask you to tell me how you think about it. I am also going to ask you about some different types of facts. Take your time as you answer and tell me what you are thinking as you see and do the math. I am going to take notes so I can remember everything that happened during this Running Record.

Multiplying by 0 What do you do when you are multiplying by zero? *For example:* 1 x 0 5 x 0 **M0**	**Multiplying by 1** What do you do when you are multiplying by 1? *For example:* 3 x 1 12 x 1 **M1**	**Multiplying by 10** What do you do when you are multiplying by 10? *For example:* 8 x 10 10 x 10 **M10**	**Multiplying by 5** What do you do when you are multiplying by 5? *For example:* 7 x 5 4 x 5 **M5**
Multiplying by 2 What do you do when you are multiplying by 2? *For example:* 2 x 4 2 x 9 **M2**	**Multiplying by 4** What do you think and do when you are multiplying by 4? *For example:* 4 x 2 4 x 9 **M4**	**Multiplying by 8** If I didn't know 8 x 3 what is a way that I could solve this problem? How about 8 x 9? **M8/MHN**	**Multiplying by 3** What strategies do you use when you are multiplying by 3? *For example:* 3 x 3 3 x 6 **M3**
Multiplying by 6 What do you think and do when you are multiplying a number by 6? *For example:* 6 x 5 6 x 9 **M6/MHN**	**Multiplying by 9** If I didn't know 9 x 4, what is a way I could think about and solve this problem? **M9/MHN**	**Multiplying by 7** If I were stuck on 7 x 9, what would you tell me to do? *How about:* 7 x 2 or 7 x 3? **M7/MHN**	**Multiplying by doubles** What do you do think and do when you are multiplying a number by itself? *For example:* 5 x 5 8 x 8 **MD**
Comments/Notes about gestures, behaviors, remarks:		**Question Prompts:** That's interesting/fascinating: tell me what you did. That's interesting/fascinating: tell me how you solved it. That's interesting/fascinating: tell me what you were thinking. How did you solve this problem? Can you tell me more about how you solve these types of problems? What do you mean when you say _____? (i.e. ten friends/neighbor numbers etc.)	

Part Three:

Part 3: **Mathematical Disposition:** **Quick Interview**
Do you like math?
What facts are easy? Which facts do you just know? (Point to the benchmark problems.)
What facts are tricky? Do you use any strategies on the tricky problems?
What do you do when you get stuck?

Making Sense of the Data

Level 0	Level 1	Level 2	Level 3	Level 4
Unable to solve	Students can solve by counting strategies	Students use verbal and mental counting strategies	Students mainly use derived facts	Students have automatic retrieval

This scale is adapted from Carpenter and Moser, 1984
in Math Running Records, p.g.,155

Teachers must look very carefully at the information because although a student might have accuracy, they could be using very inefficient strategies.

Keeping a record of the different stages students are at with the various facts is important, as it informs our instruction, allowing us to be responsive.

Figure 10.4 Recording Sheet for Looking at Multiplication Strategy Levels

Name:	Level 0 Can't do yet			Level 1 Counting all/Counting on/Skip counting on fingers			Level 2 Mental strategies			Level 3 Derived fact strategies			Level 4 Automatic		
Dates	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
0 x 4													x		
1 x 2													x		
5 x 3										x					
10 x 7													x		
2 x 6										x					
3 x 9				x											
4 x 8	x														
6 x 7	x														
4 x 4				x											
7 x 8	x														
8 x 5				x											
9 x 6	x														
Comments What do you notice? What are the trends? What is your next instructional move?	***Timothy is coming along. He has automaticity with a few facts. The focus of the work right now should be to move him to automaticity with his 5s and then his 2s.***														

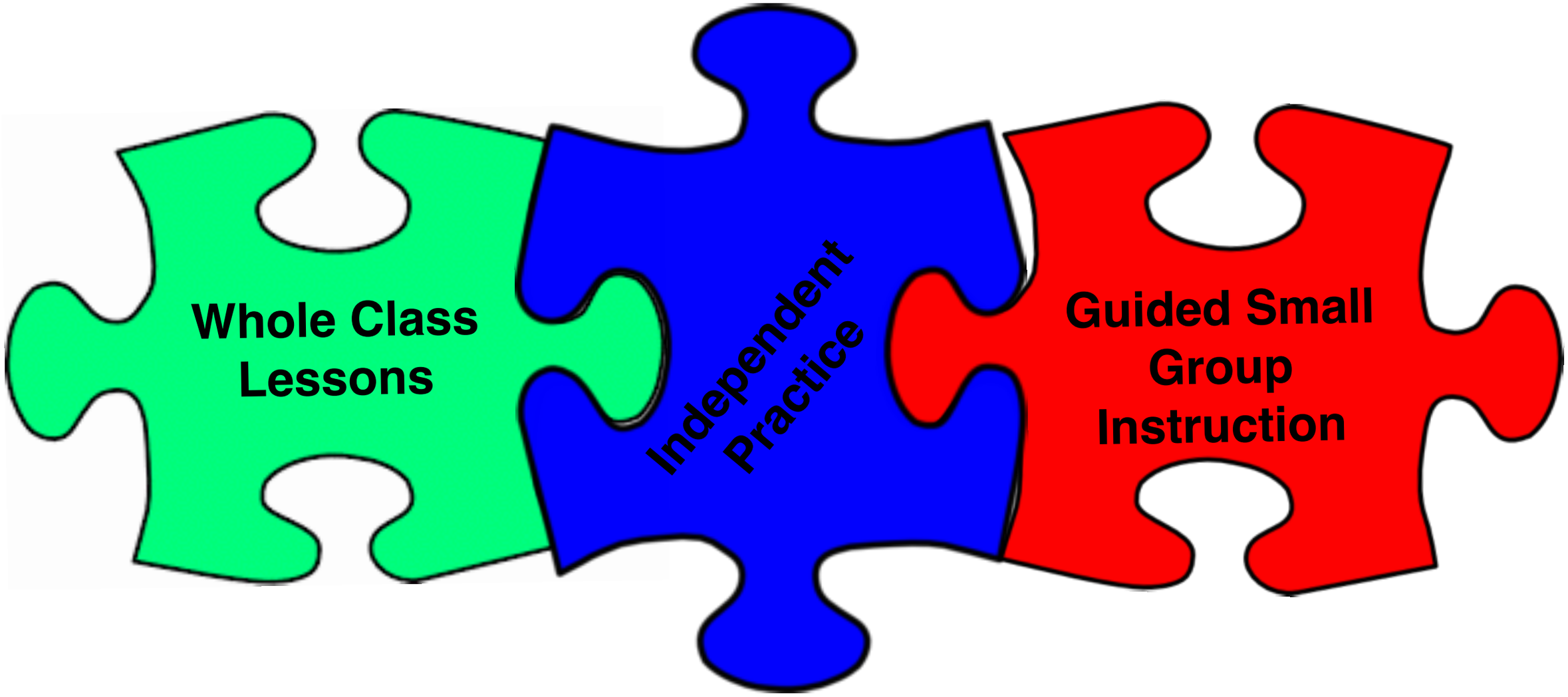
- Math Running Records, p.g., 162

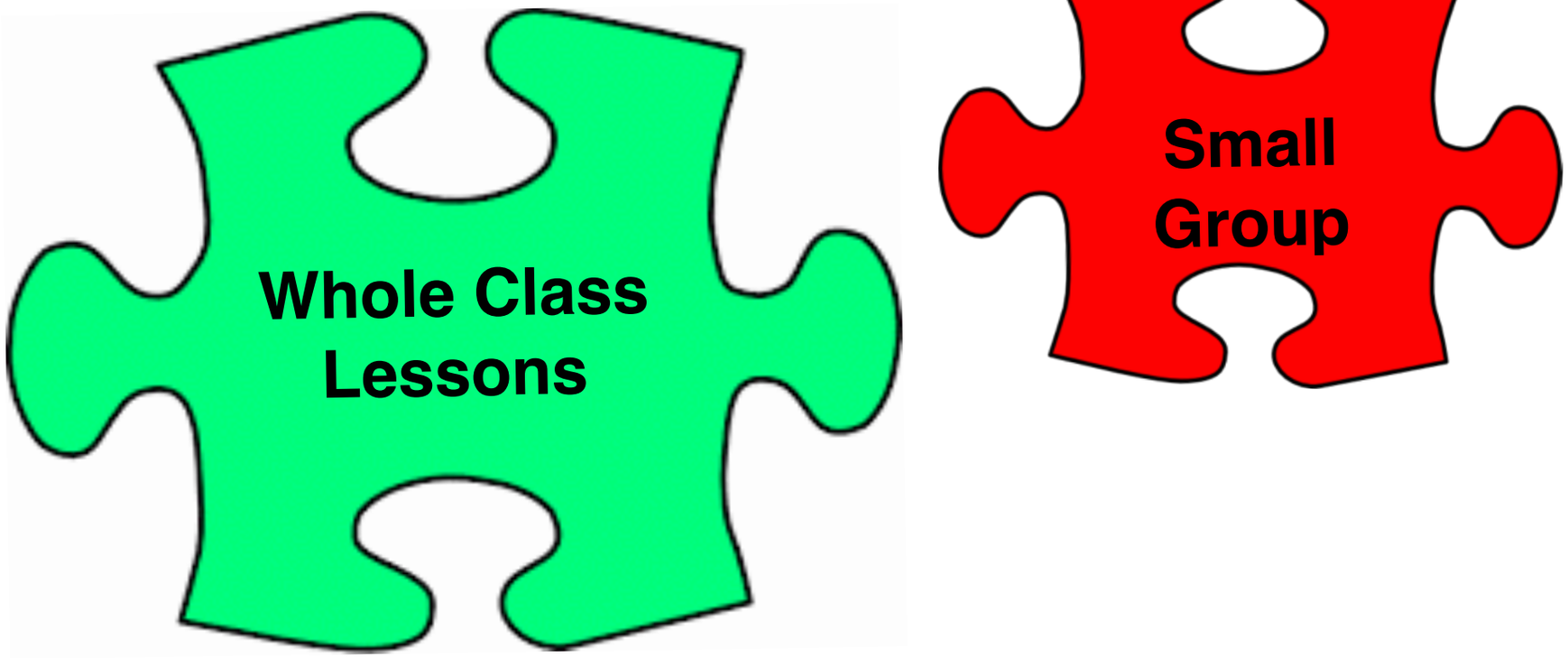
Beginning

Middle

End

How do I use the information to provide specific, targeted, responsive instruction?





What learning opportunities can teachers provide?

- Teaching for conceptual understanding
- Thoughtful sequencing and development of strategies (e.g., Number Talks)
- Meaningful practice through games

Teaching Conceptually

Concretely:

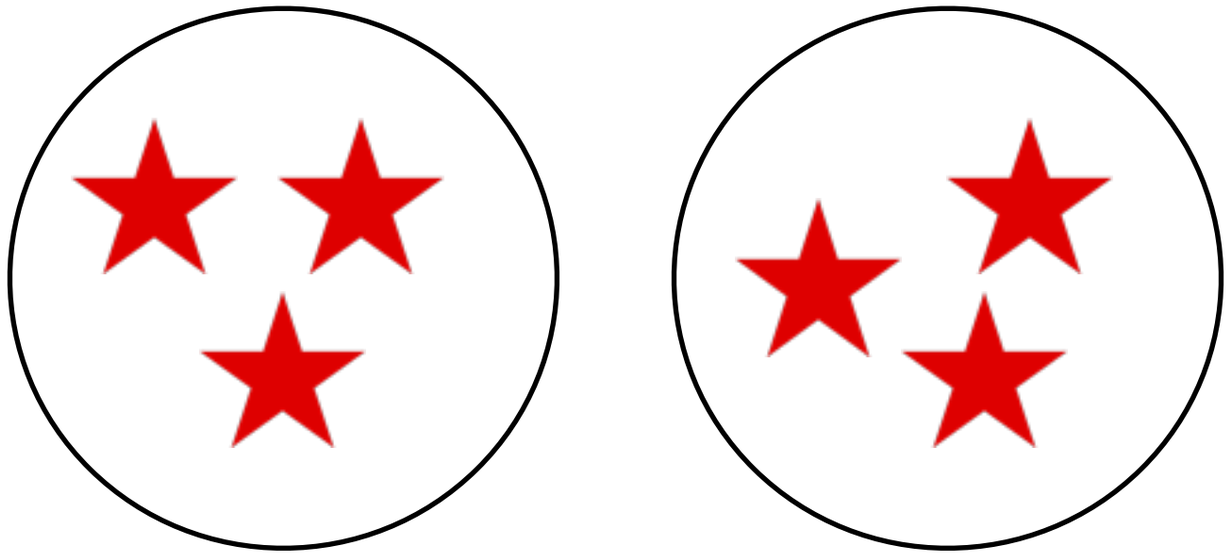
Develop understanding of “groups of”, making connections to repeated addition and skip counting

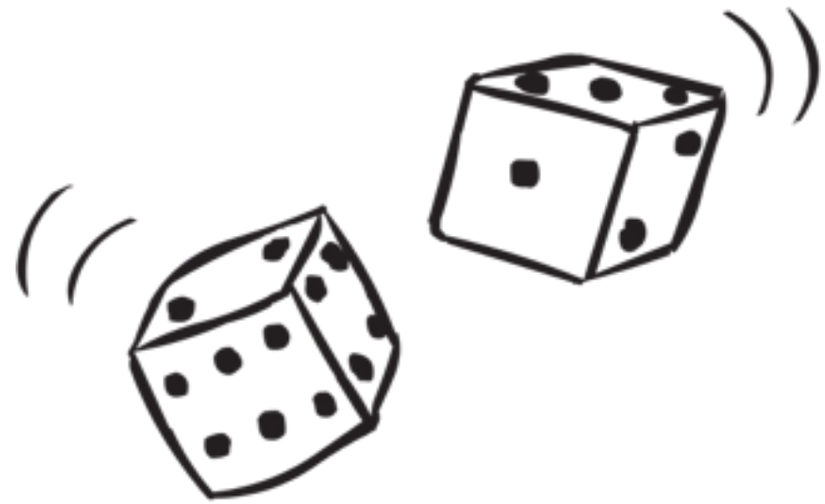
4 groups of 2 = 8

4 x 2 = 8

Representations (Pictorial):

Circles and Stars: A Marilyn Burns classic! Play with a partner. Each game has eight rounds.

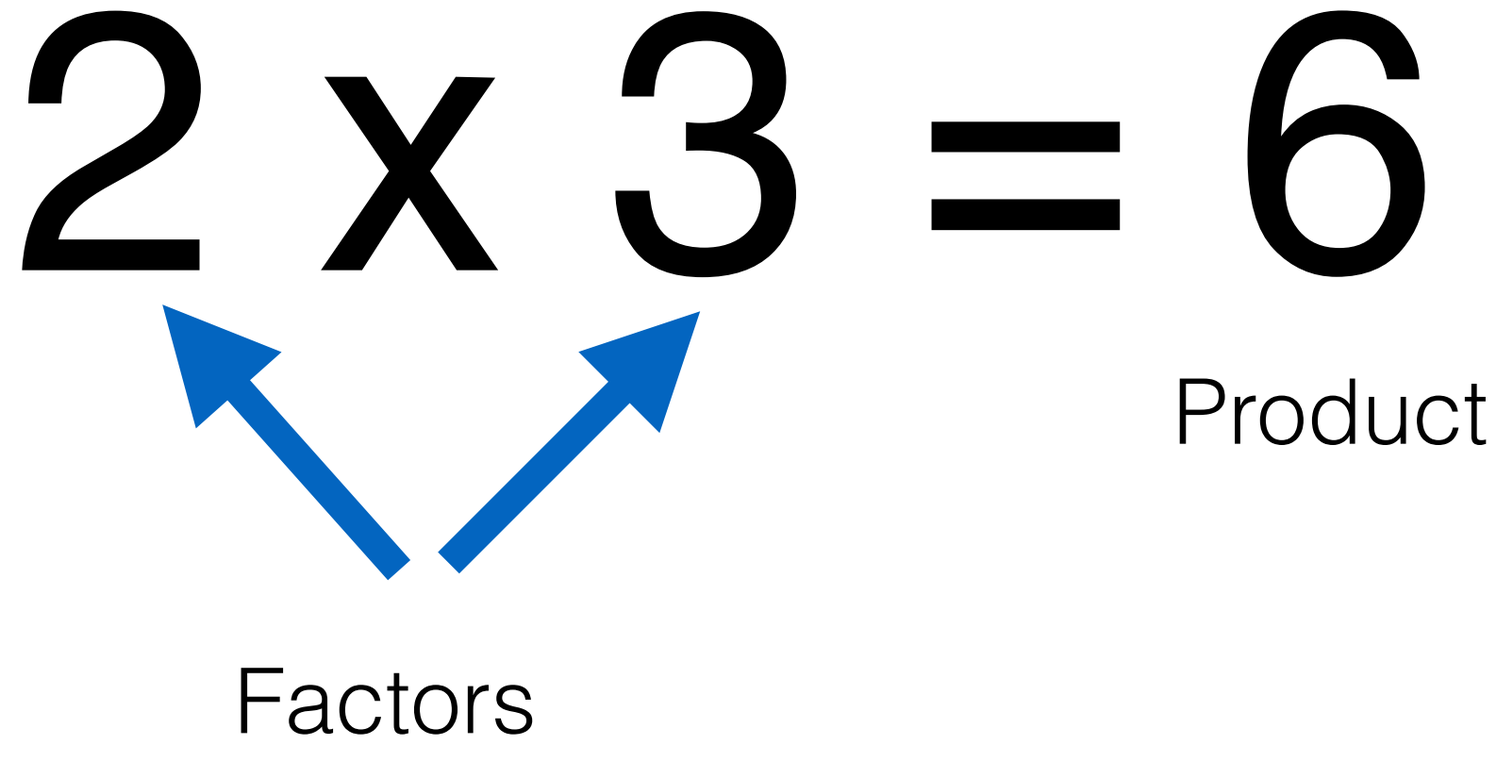




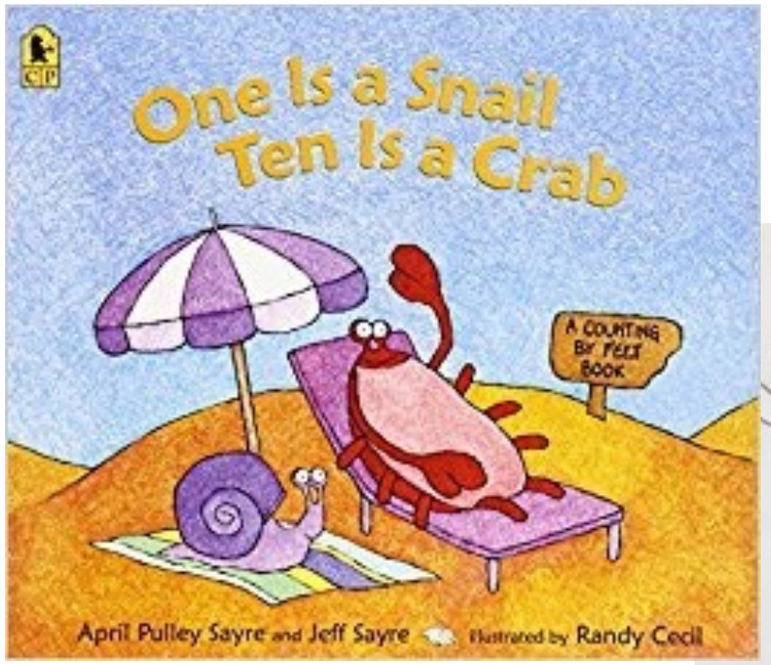
https://www.kyrene.org/cms/lib/AZ01001083/Centricity/Domain/1309/Circles%20and%20Stars%20Directions.pdf

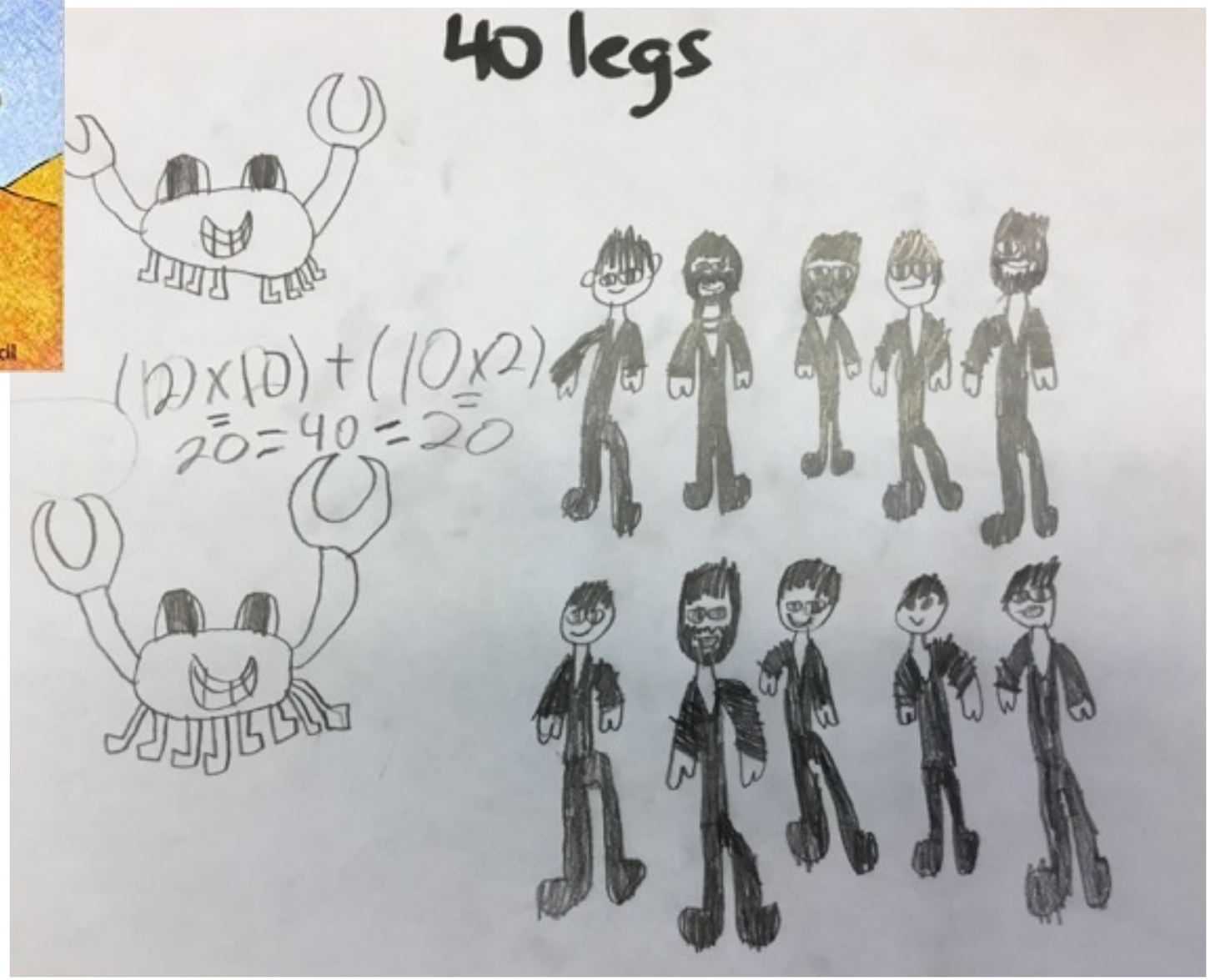
Abstract:

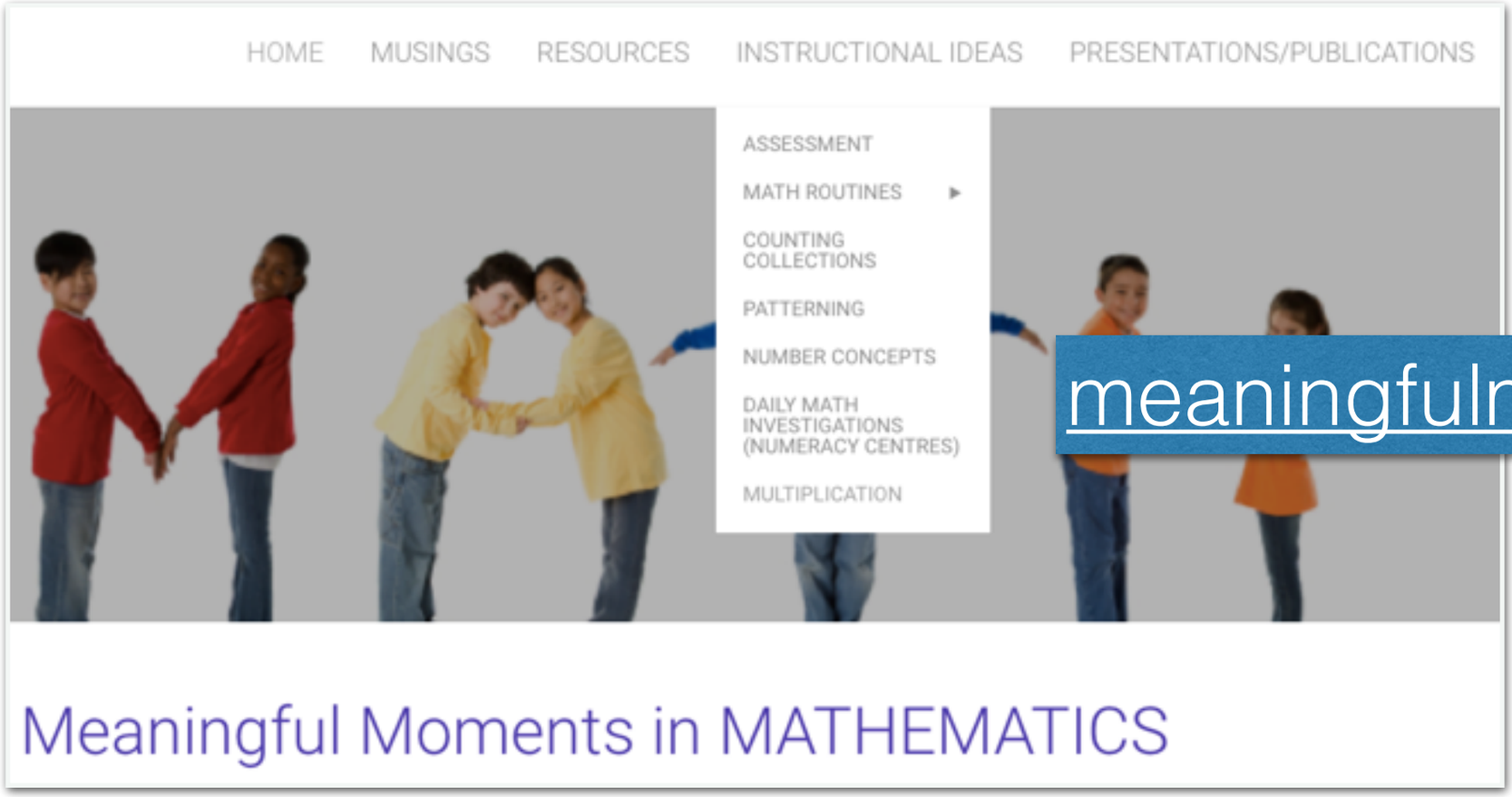
Develop understanding of representing multiplication with numbers and symbols



Use Literature







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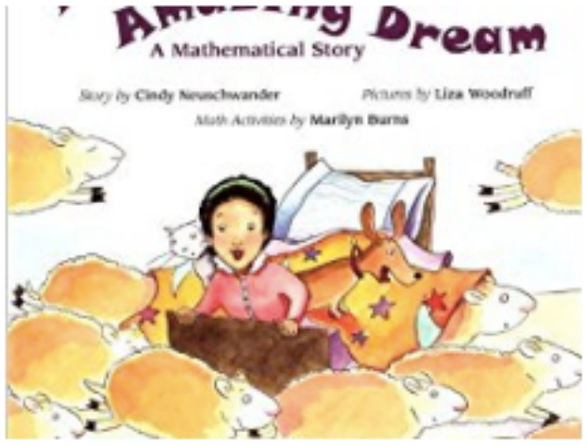
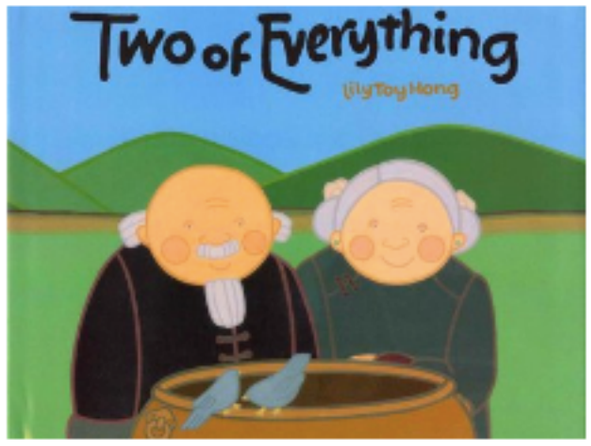
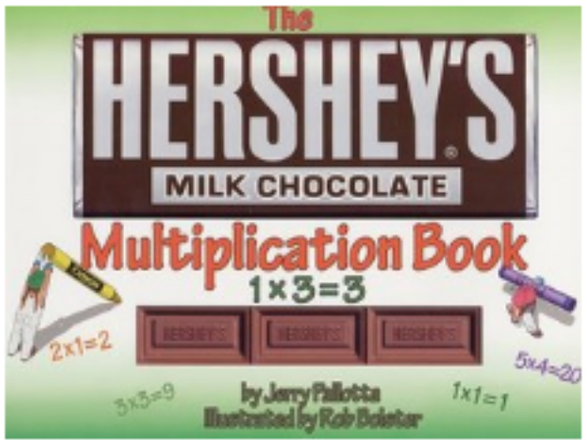
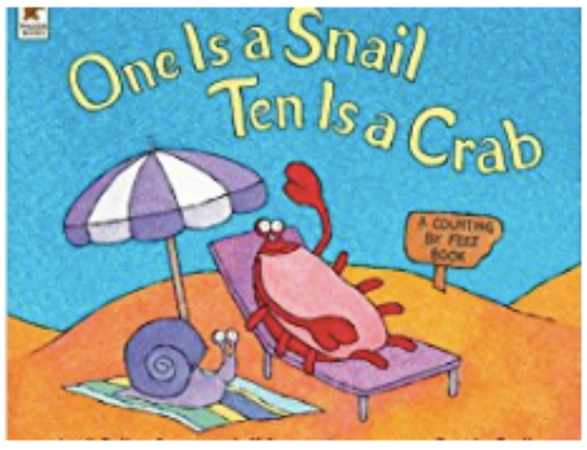
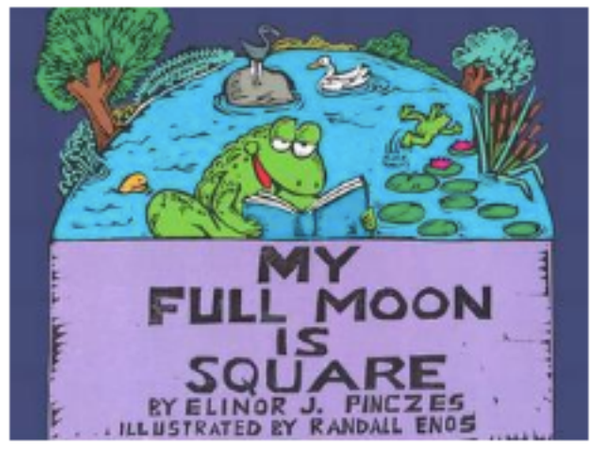


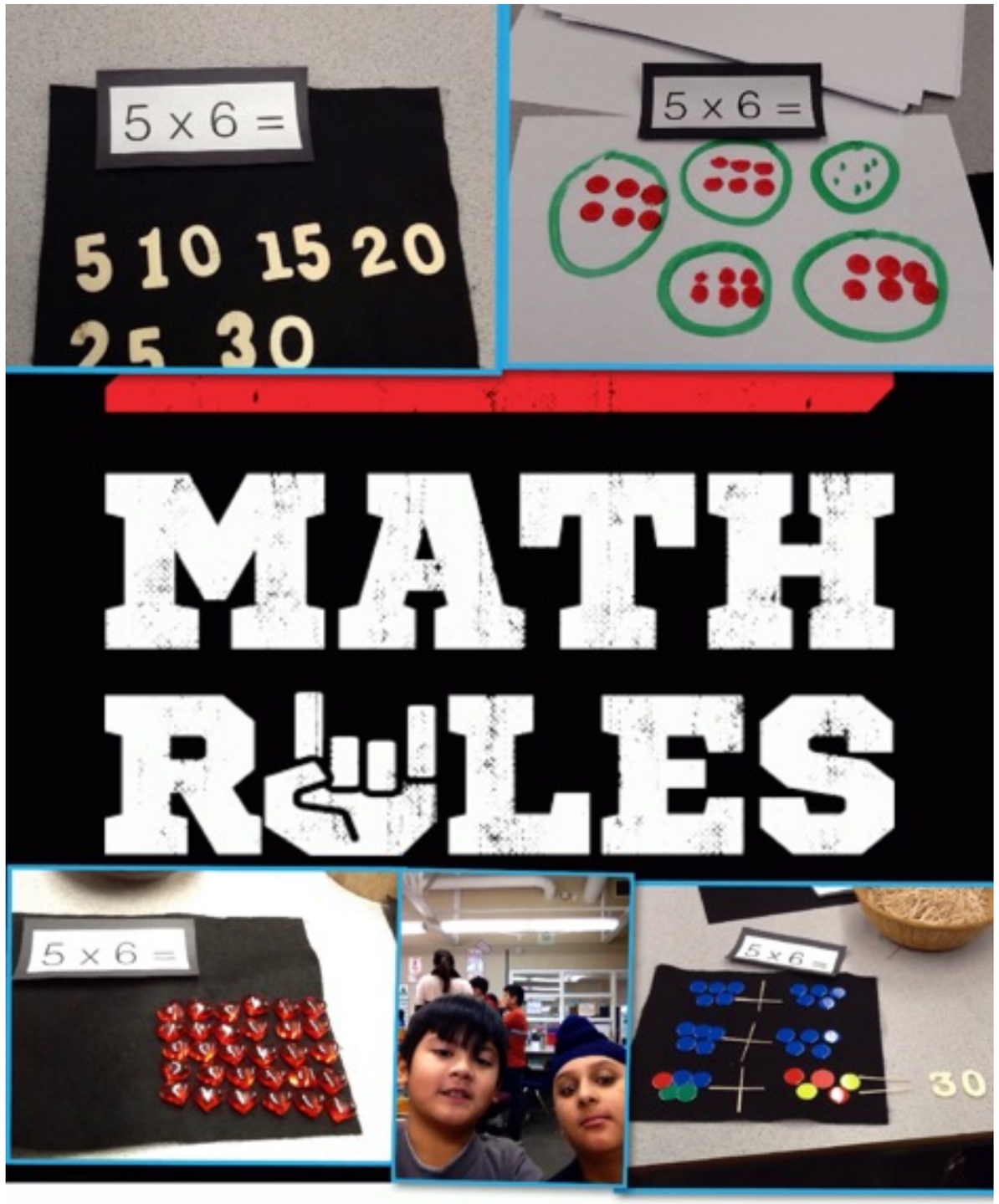


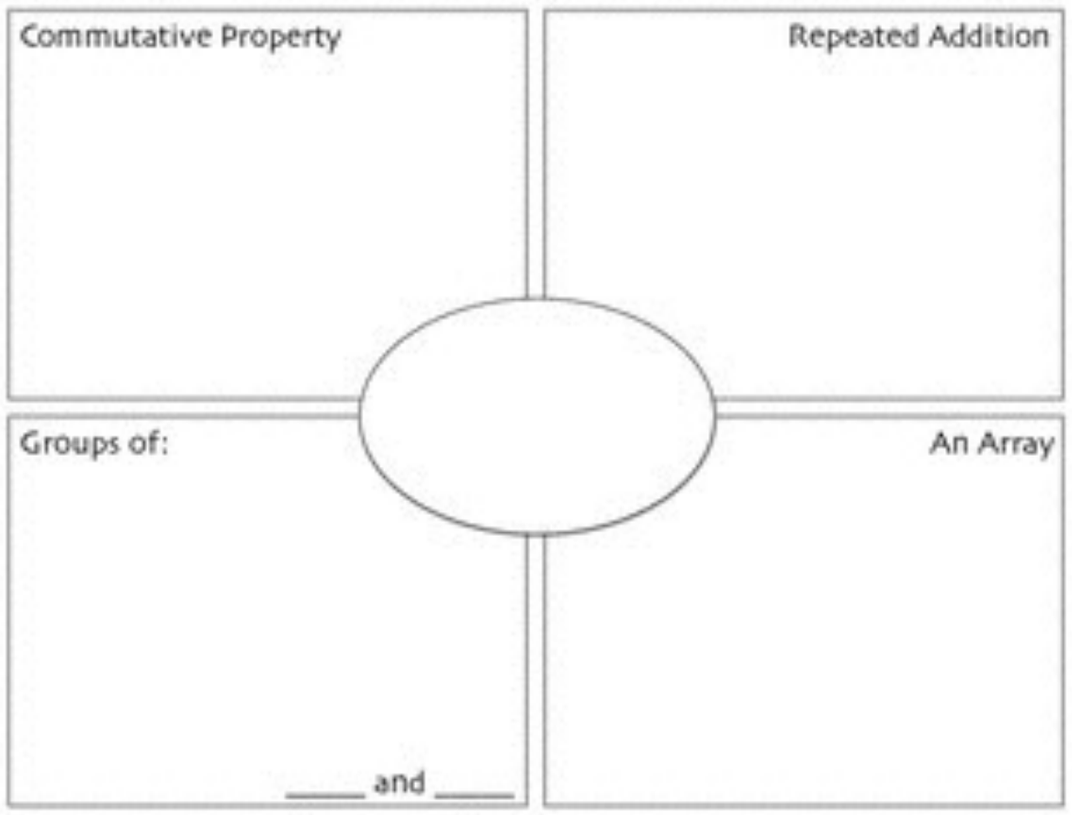






4 square model - CRA





Frayer Model

Tondevold http://www.therecoveringtraditionalist.com/order-math-facts-taught/

MULTIPLICATION TABLE

x	0	1	2	3	4	5	6	7	8	9	10
0	**0**	0	0	0	0	0	0	0	0	0	0
1	0	**1**	2	3	4	5	6	7	8	9	10
2	0	2	**4**	6	8	10	12	14	16	18	20
3	0	3	6	**9**	12	15	18	21	24	27	30
4	0	4	8	12	**16**	20	24	28	32	36	40
5	0	5	10	15	20	**25**	30	35	40	45	50
6	0	6	12	18	24	30	**36**	42	48	54	60
7	0	7	14	21	28	35	42	**49**	56	63	70
8	0	8	16	24	32	40	48	56	**64**	72	80
9	0	9	18	27	36	45	54	63	72	**81**	90
10	0	10	20	30	40	50	60	70	80	90	**100**

Order of Facts

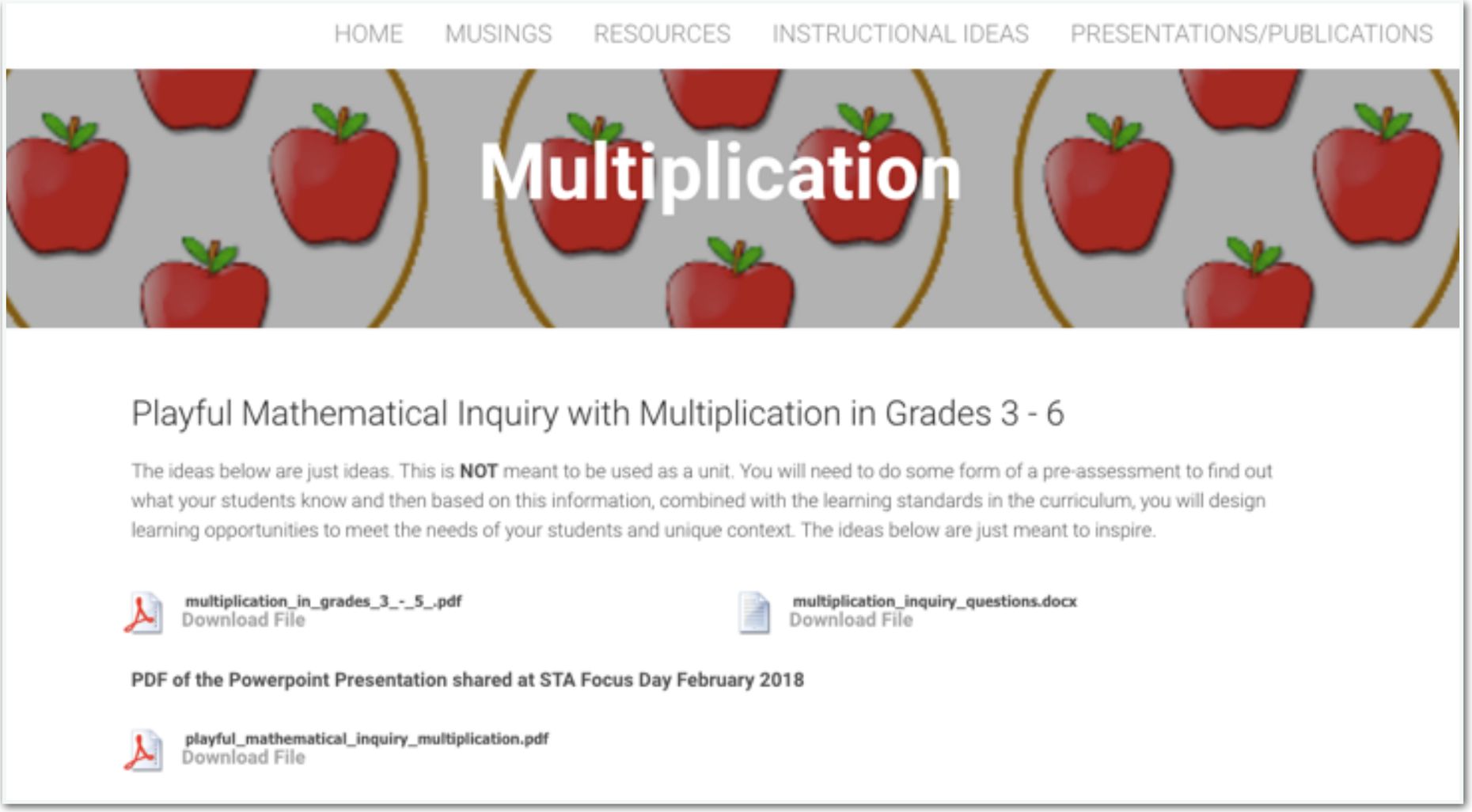
x 0 - always zero **(Purple)**
x 1 Identity Element **(Purple)**
x 2 - Doubles - connection to addition doubles **(Green)**
x 10 **(Red)**
x 5 Counting by fives relates to multiplying by tens **(Blue)**

For the other facts, students need to think
RELATIONALLY - Using what they know for what they don't

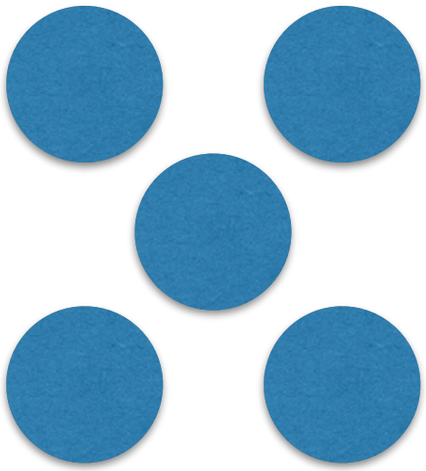
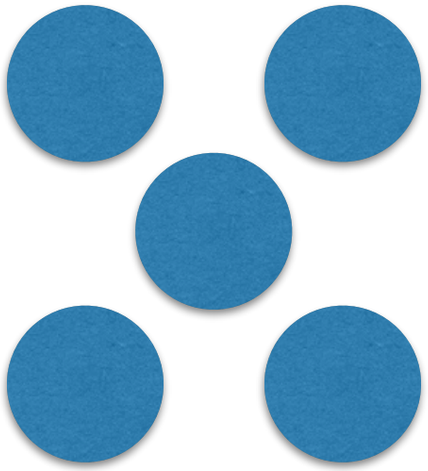
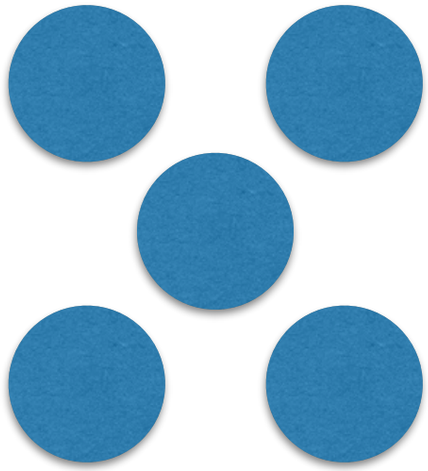
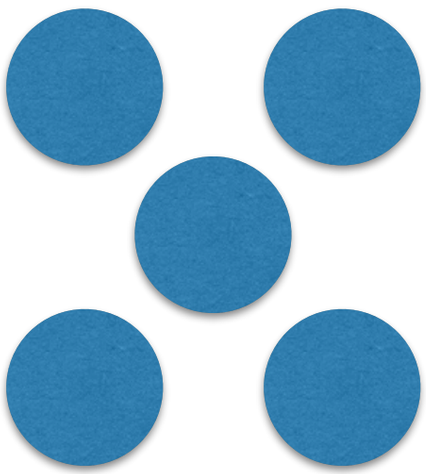
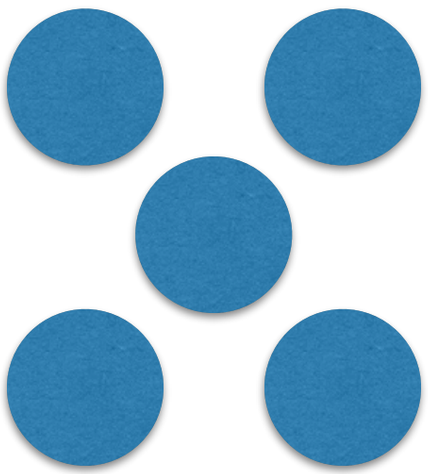
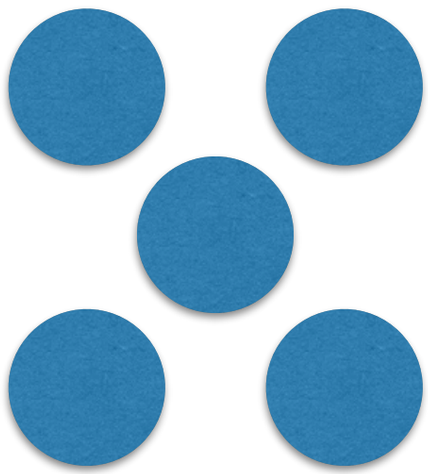
x 4 Double Double **(Light Green)**
x 6 and x 7 think about x 5 and plus one or two **(Light Blue)**
e.g, 7 x 7 = (7 x 5) + (7 x 2)
35 + 14 = 49
x 8 and x 9 think x 10 and minus one or two **(Light Red)**

Developmental Progression

Repeated Addition or Skip Counting
Making Landmark or Friendly Numbers
Partial Products - breaking one or both of the factors
Doubling and Halving
Breaking Factors into Smaller Factors - Associative Property

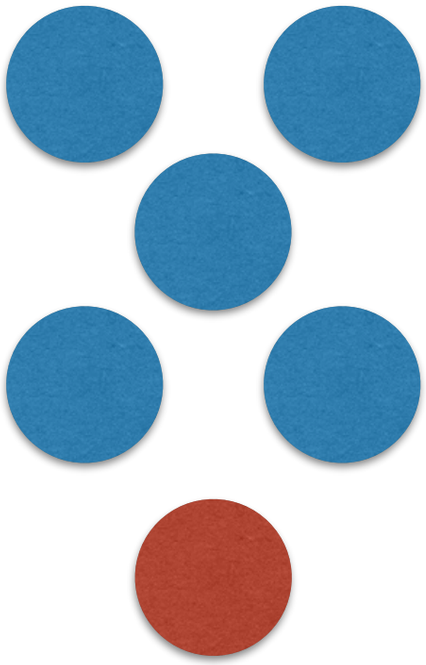
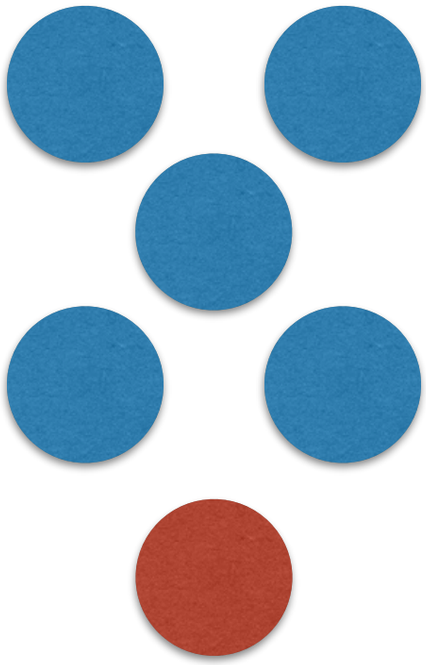
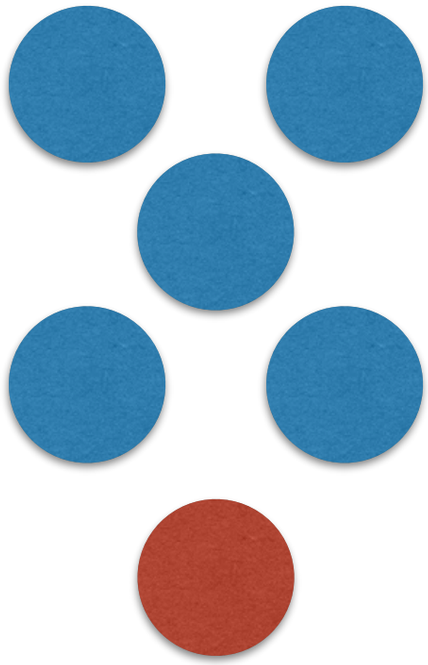
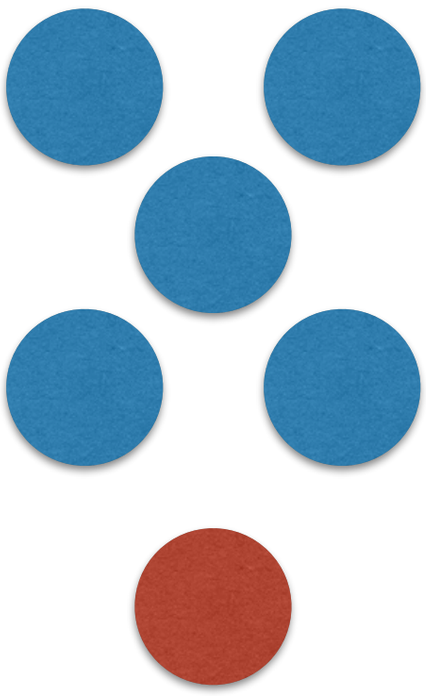
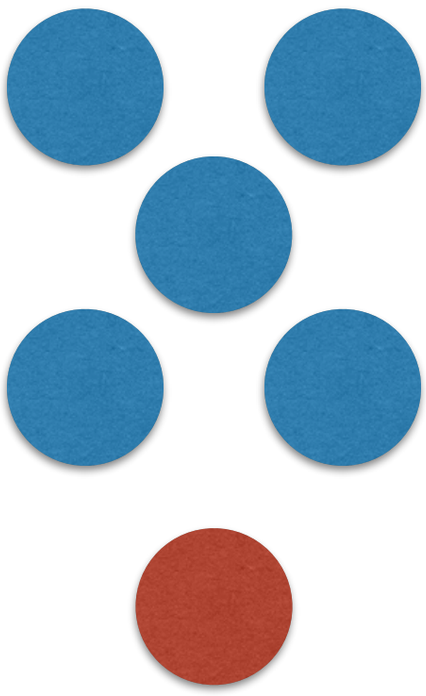
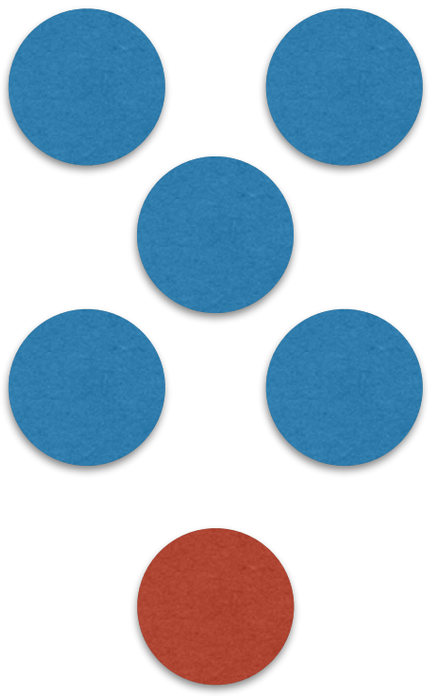


Number Talks Using Quick Images

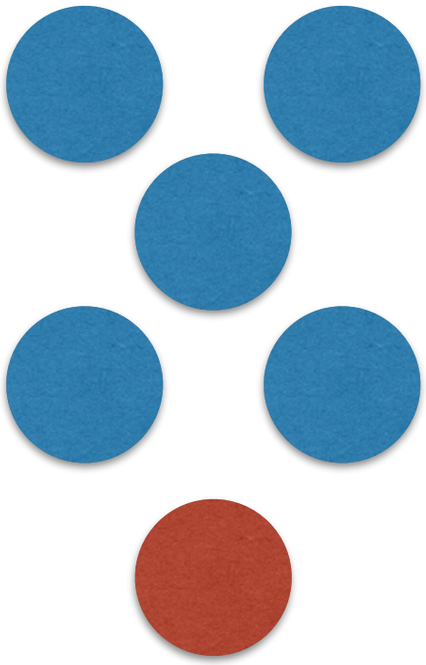
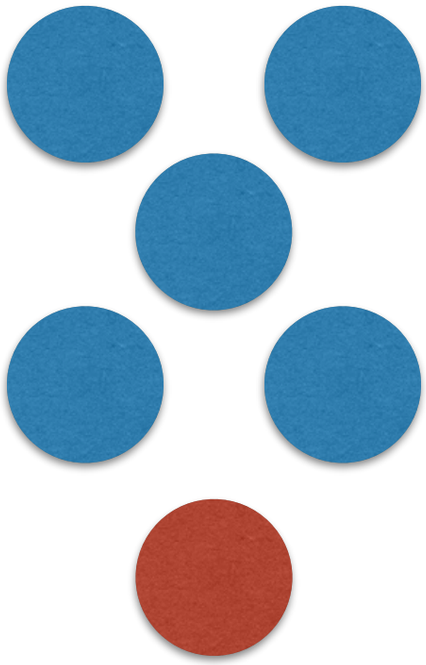
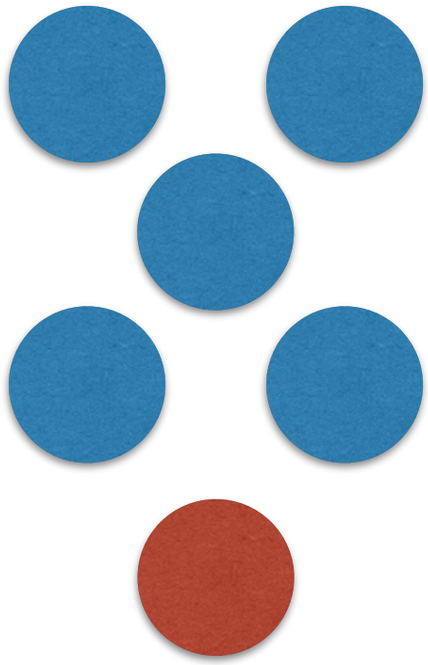
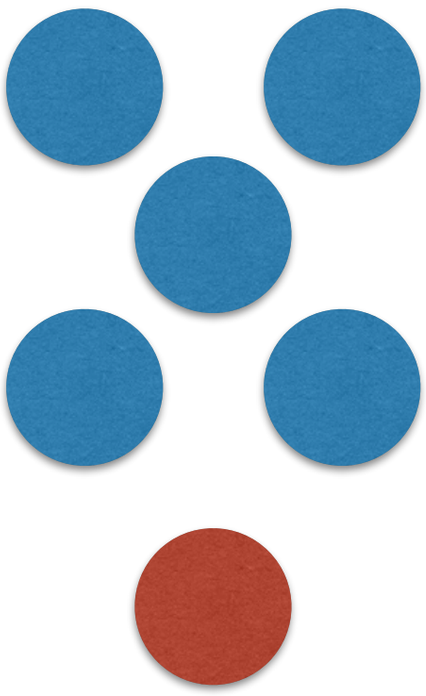
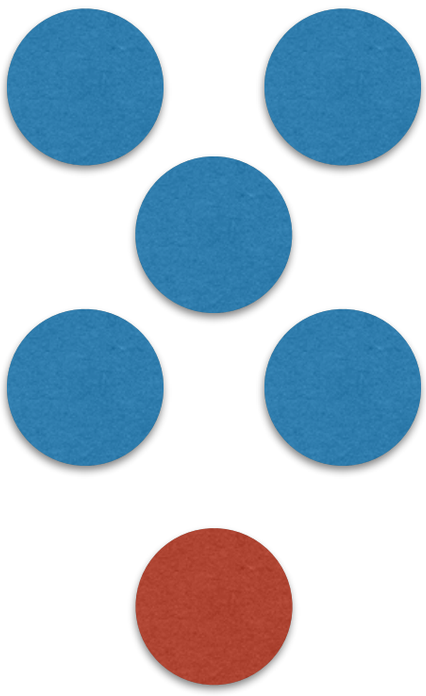
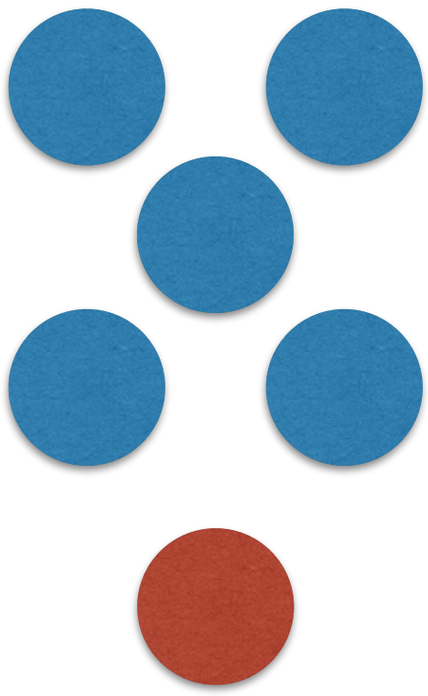
How many?

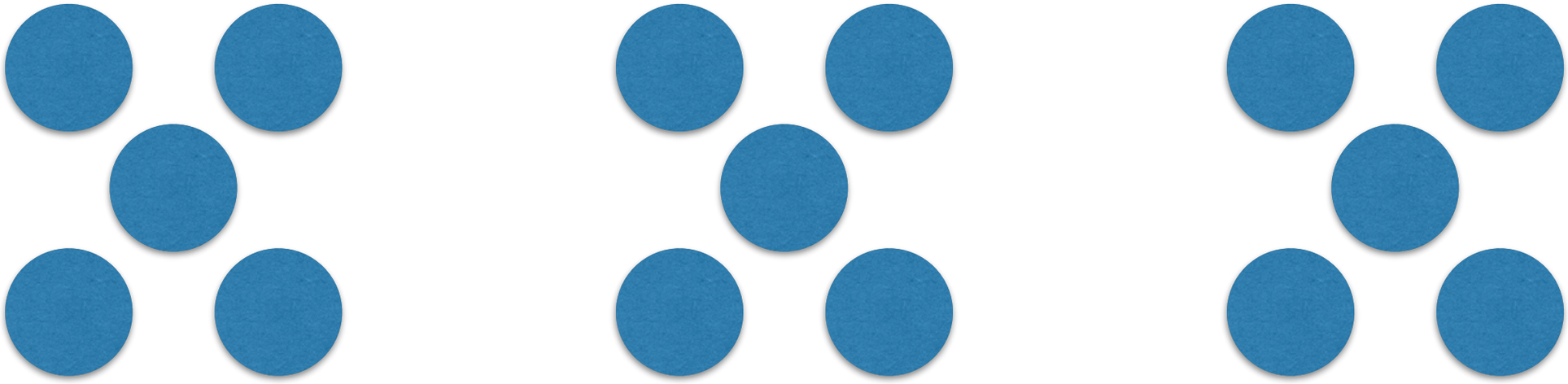
How did you see them?

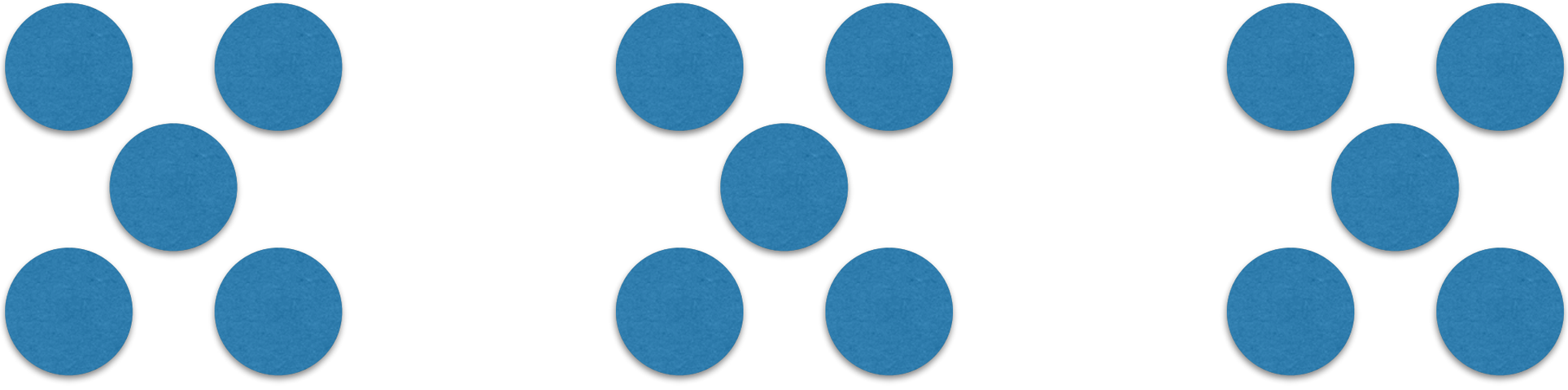







How many?

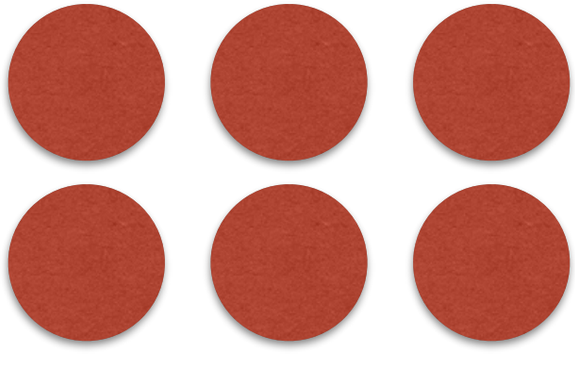
How did you see them?



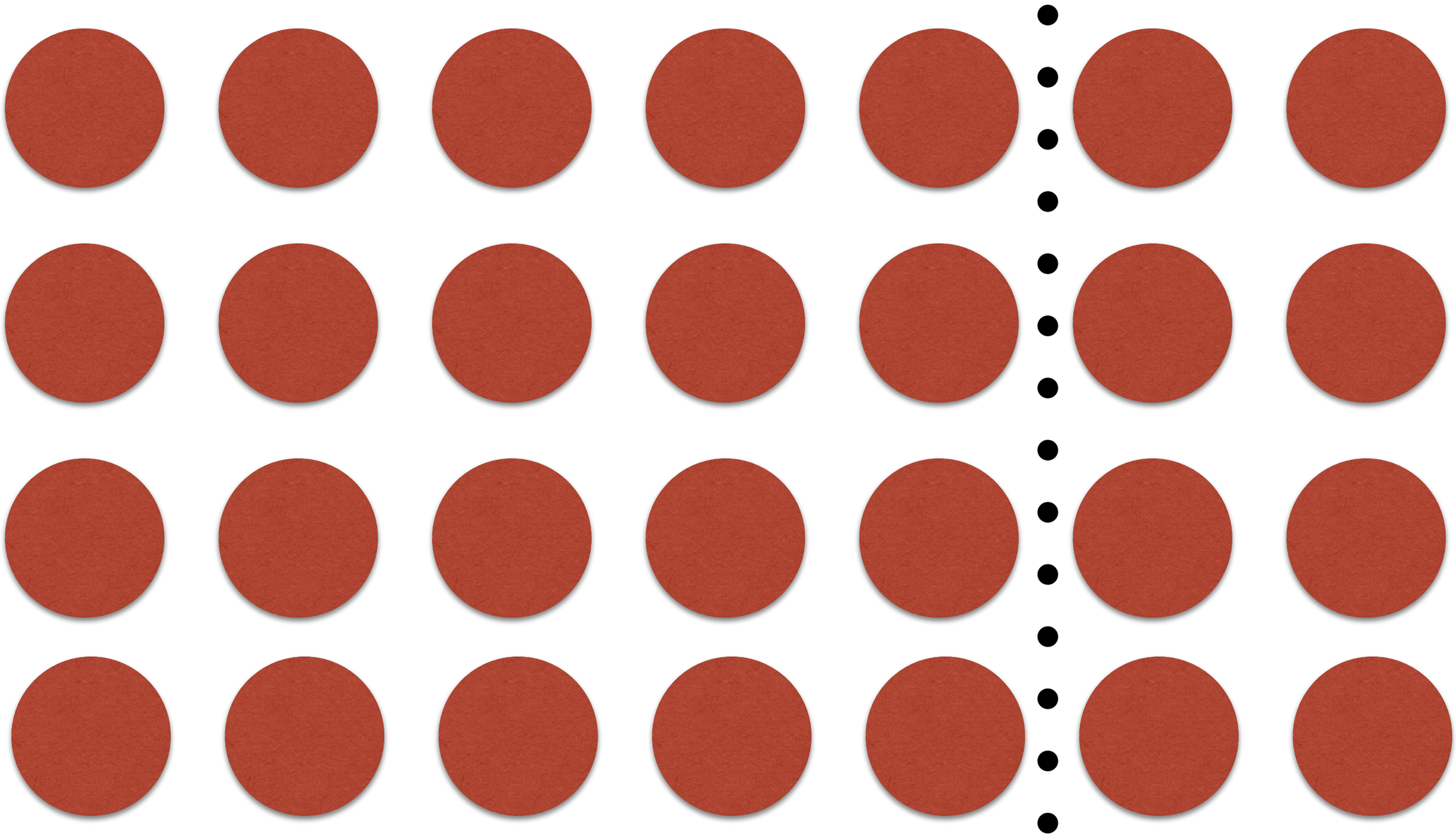


Partial Products



6

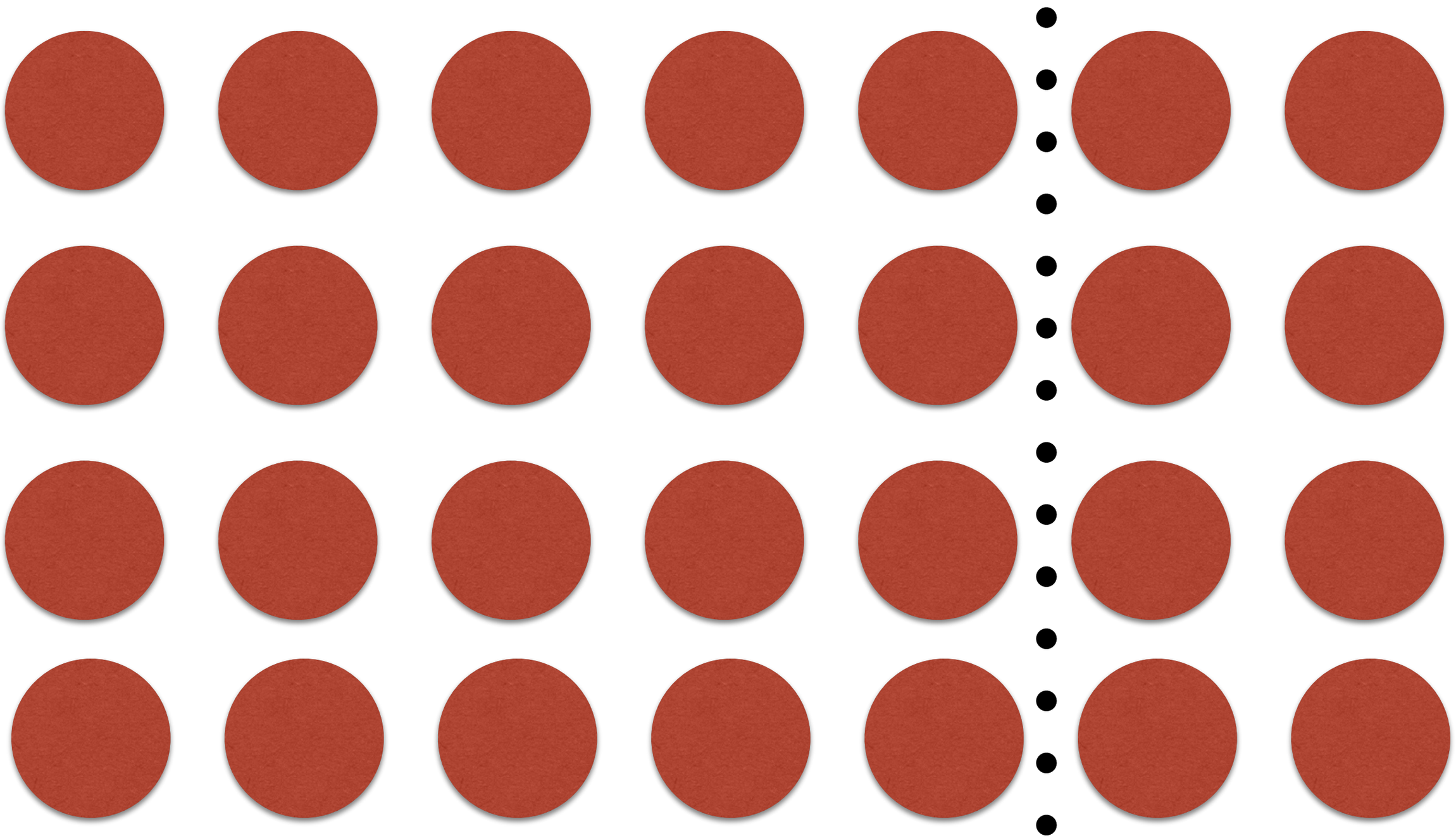
(6 x 5) + (6 x 1)

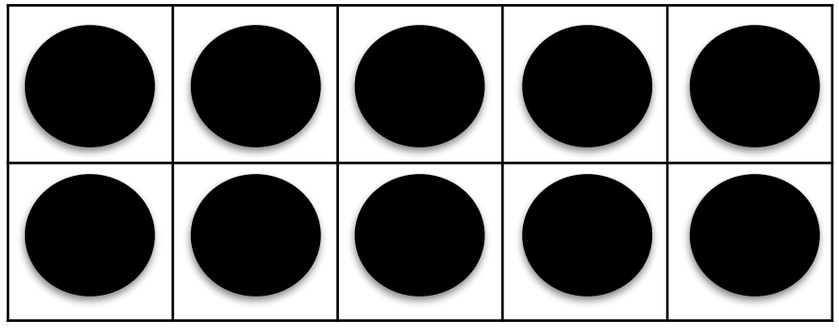


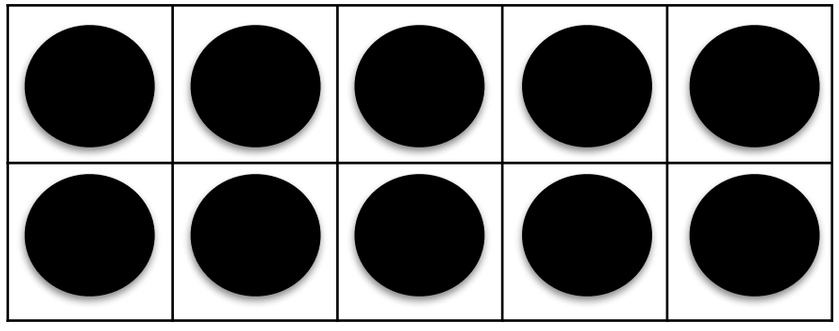
How many?

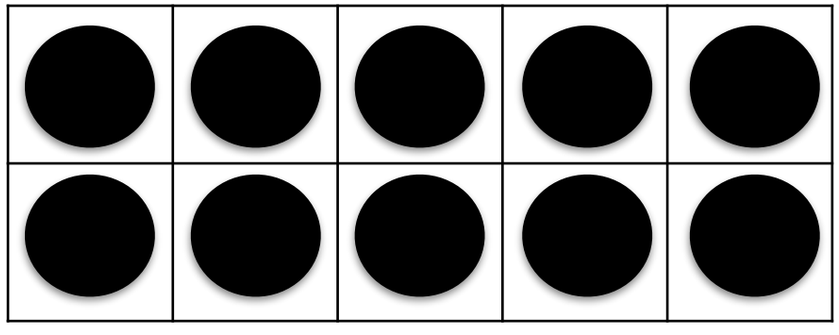
How did you see them?

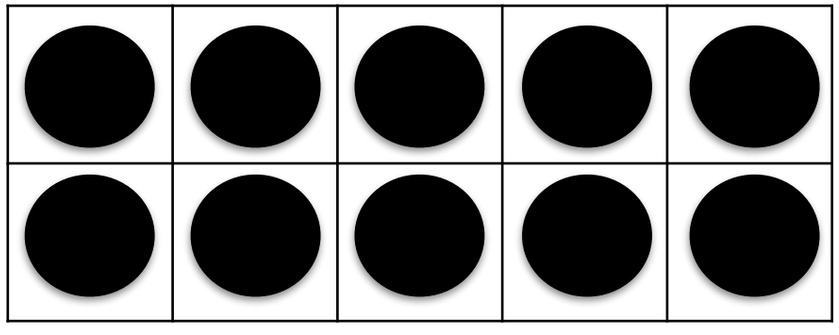
(4 x 5) + (4 x 2)

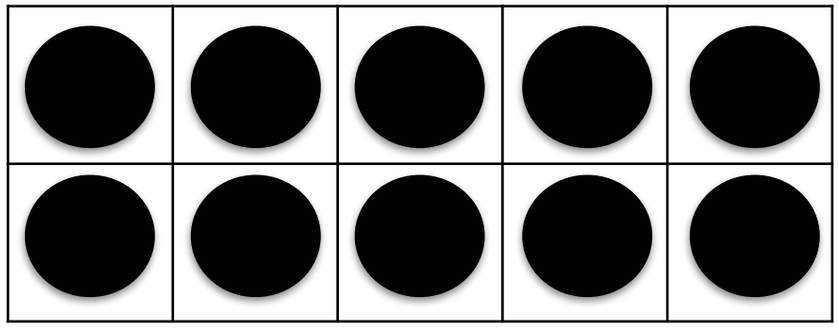


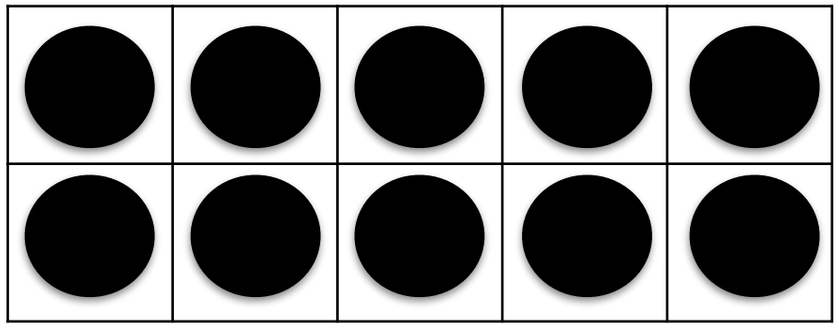


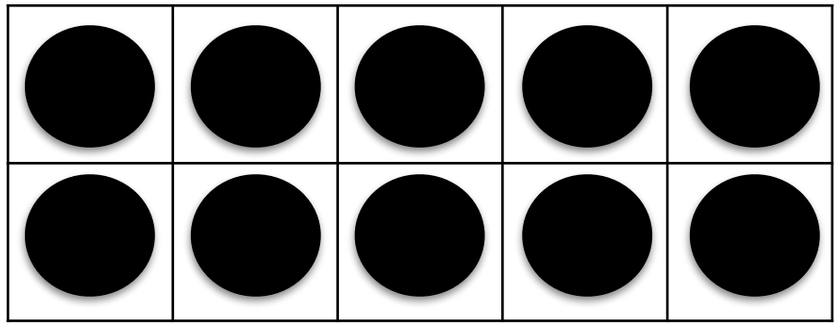


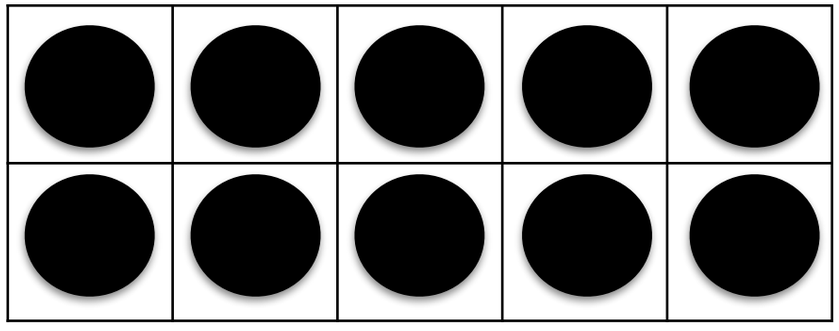






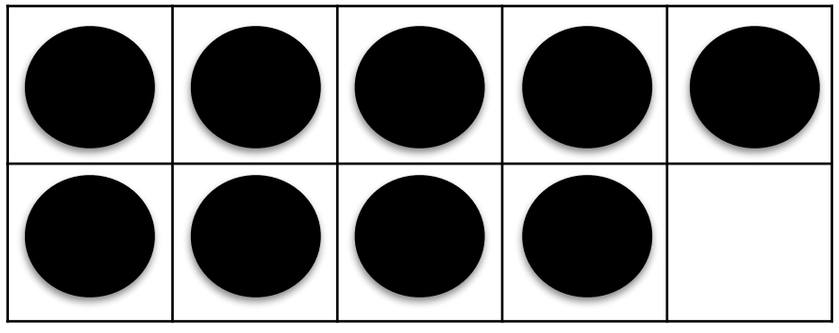


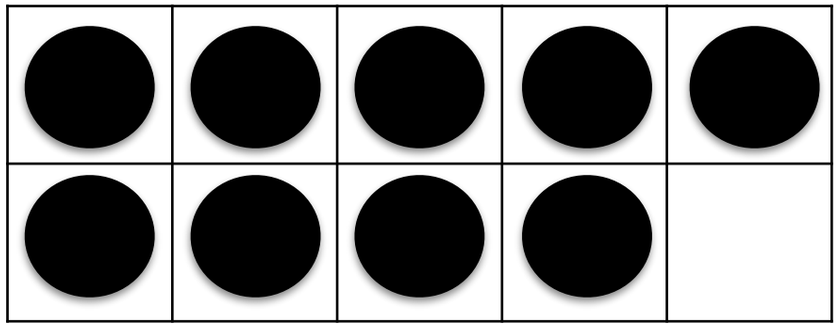


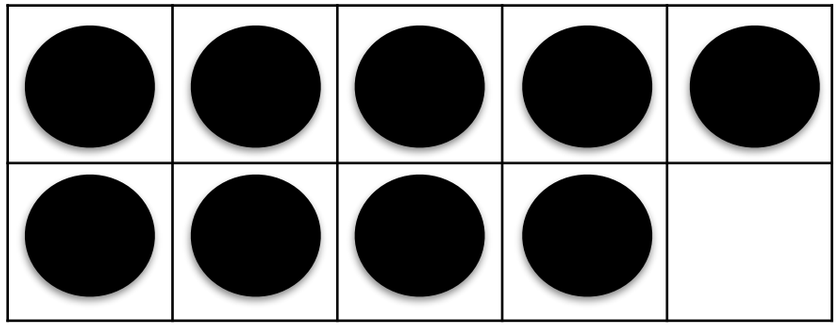


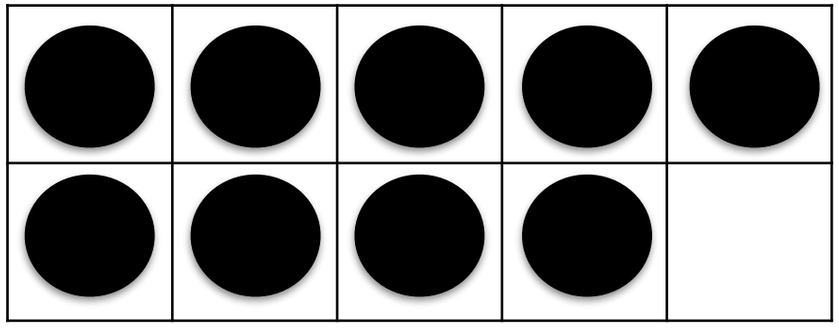
How many?

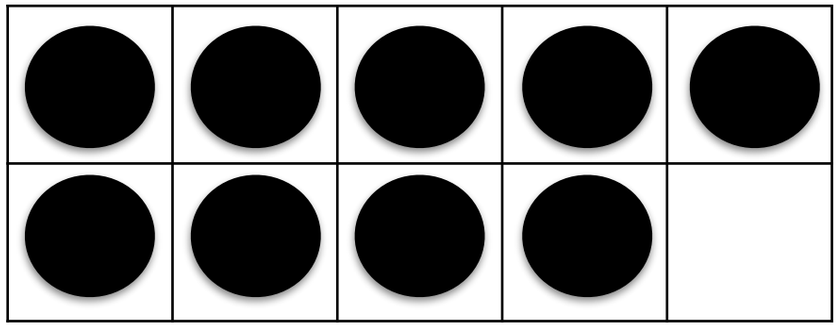
How did you see them?

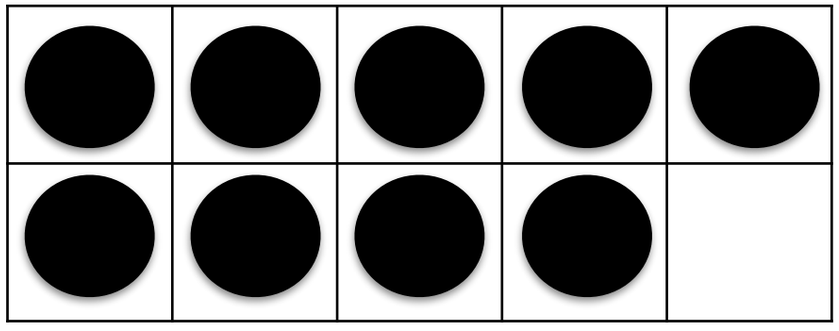


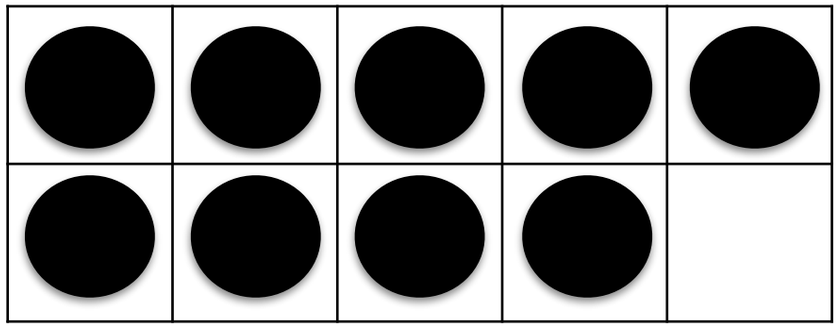


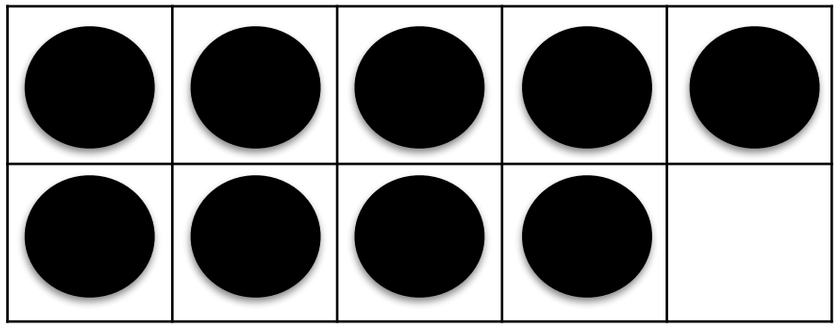




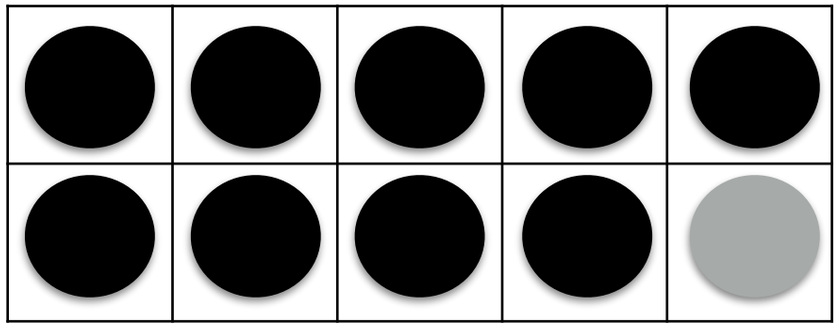


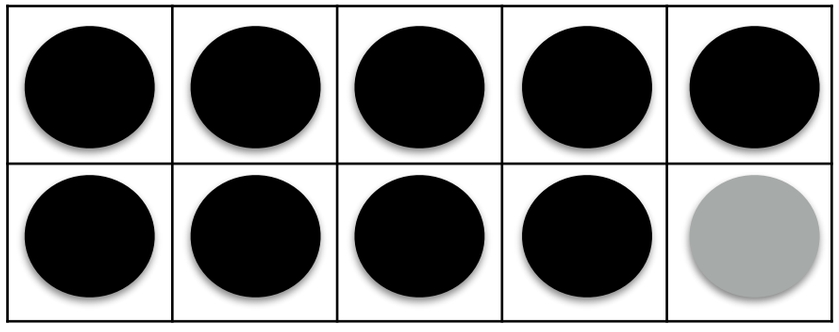


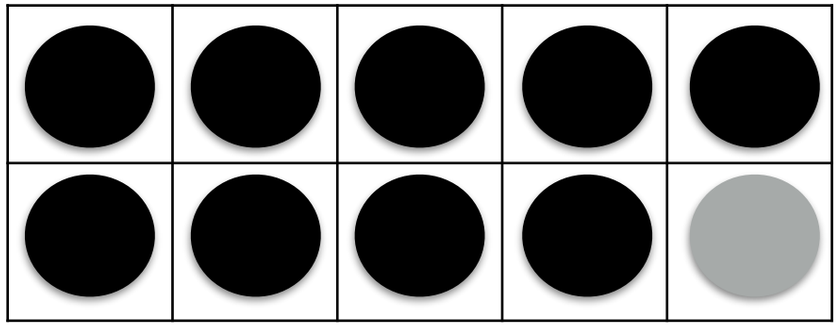


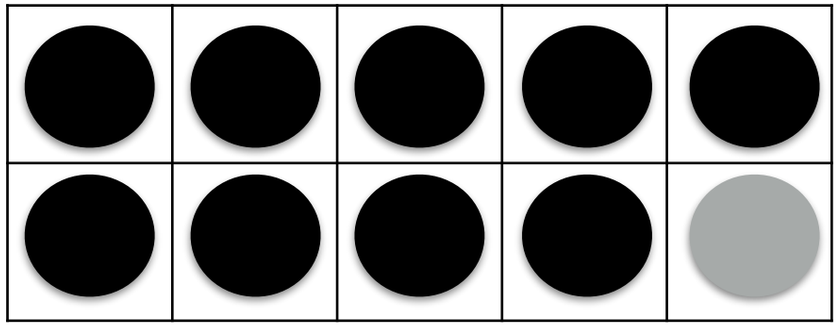


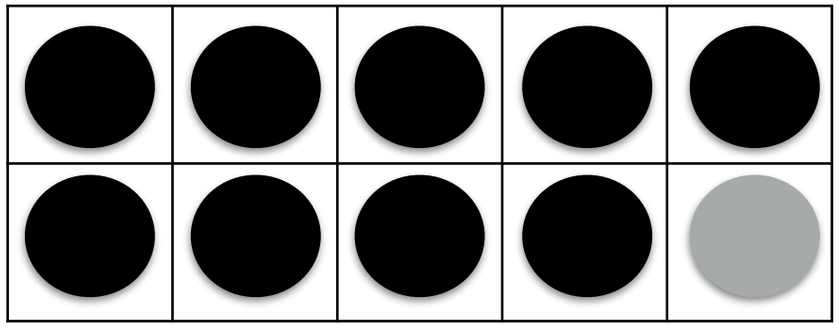
How many?
How did you see them?
How might thinking about the previous image help us with this question?

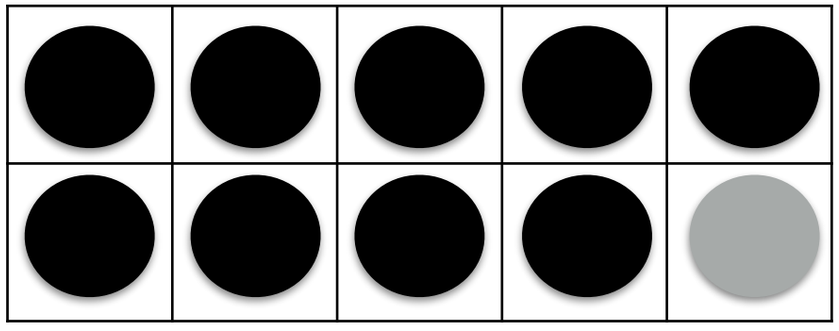


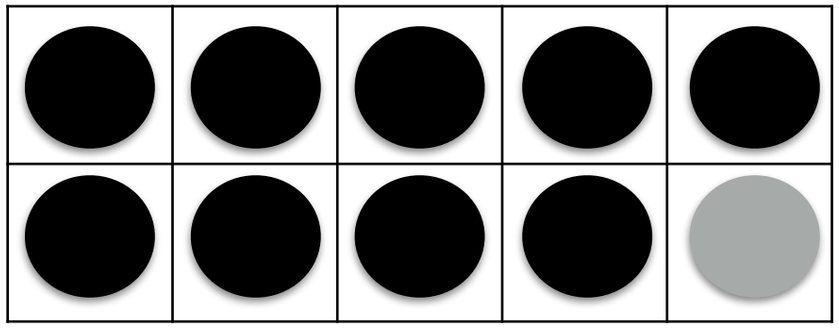


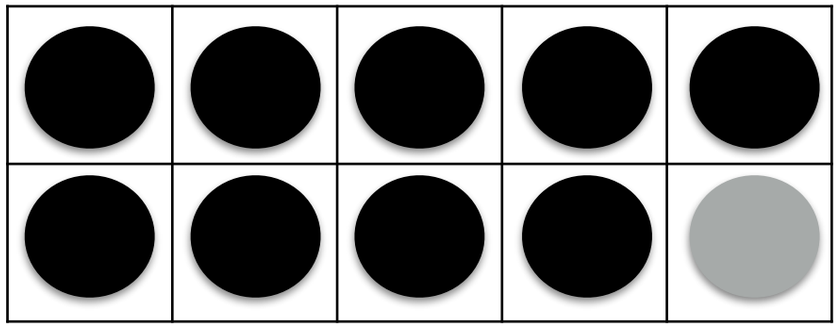


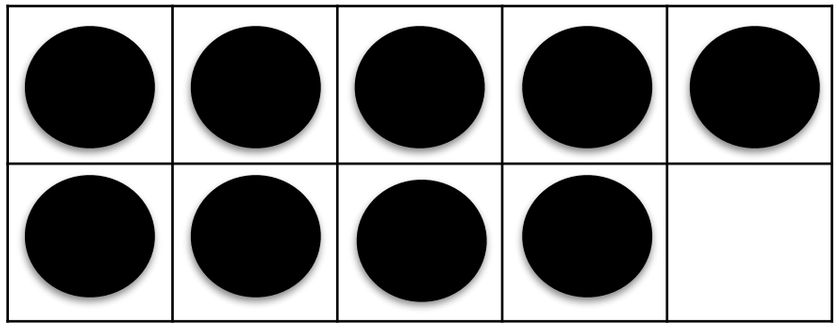
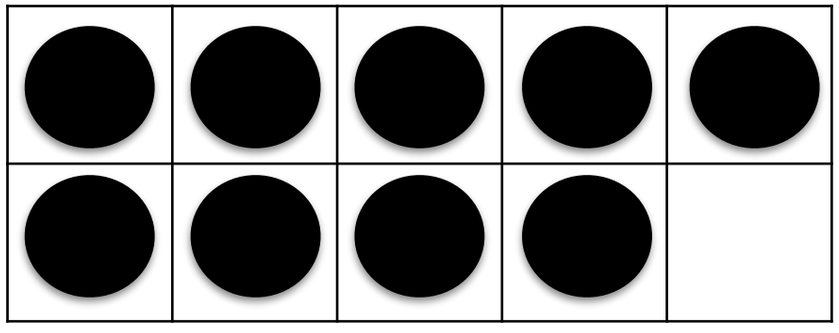
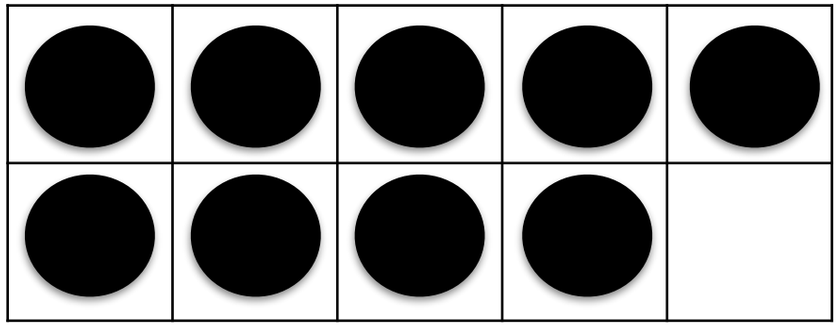
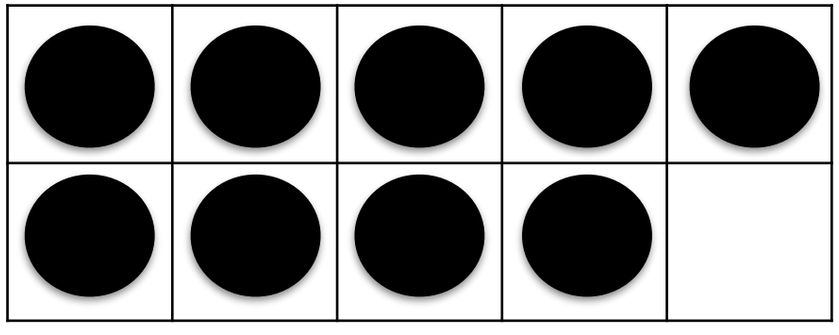
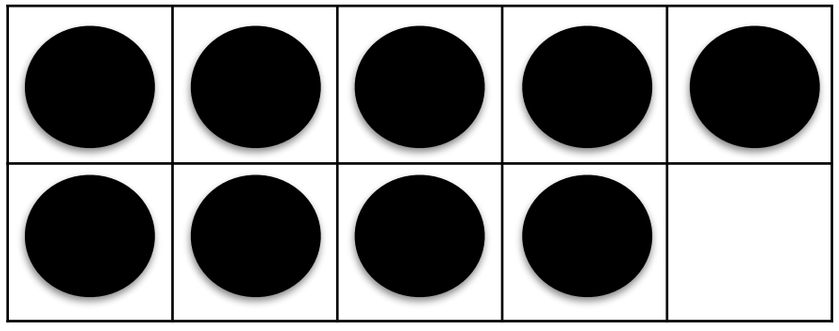
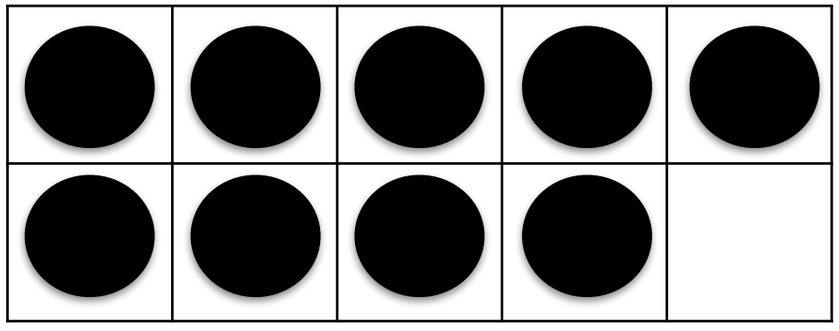
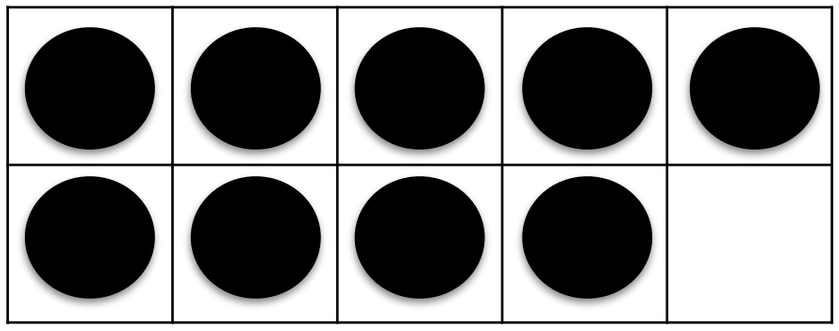
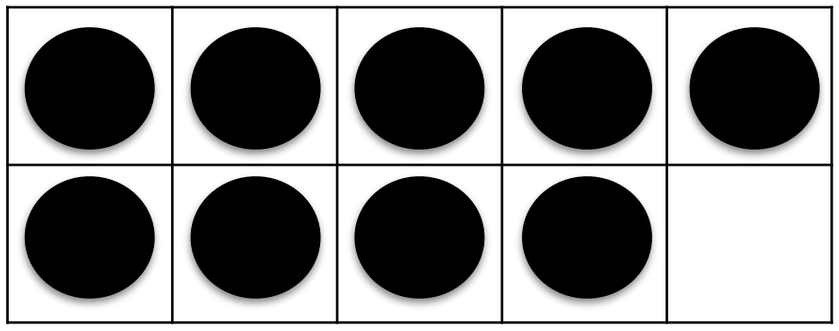




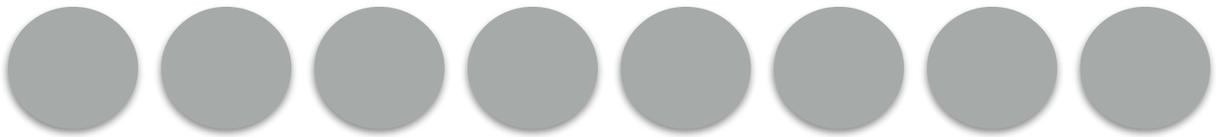


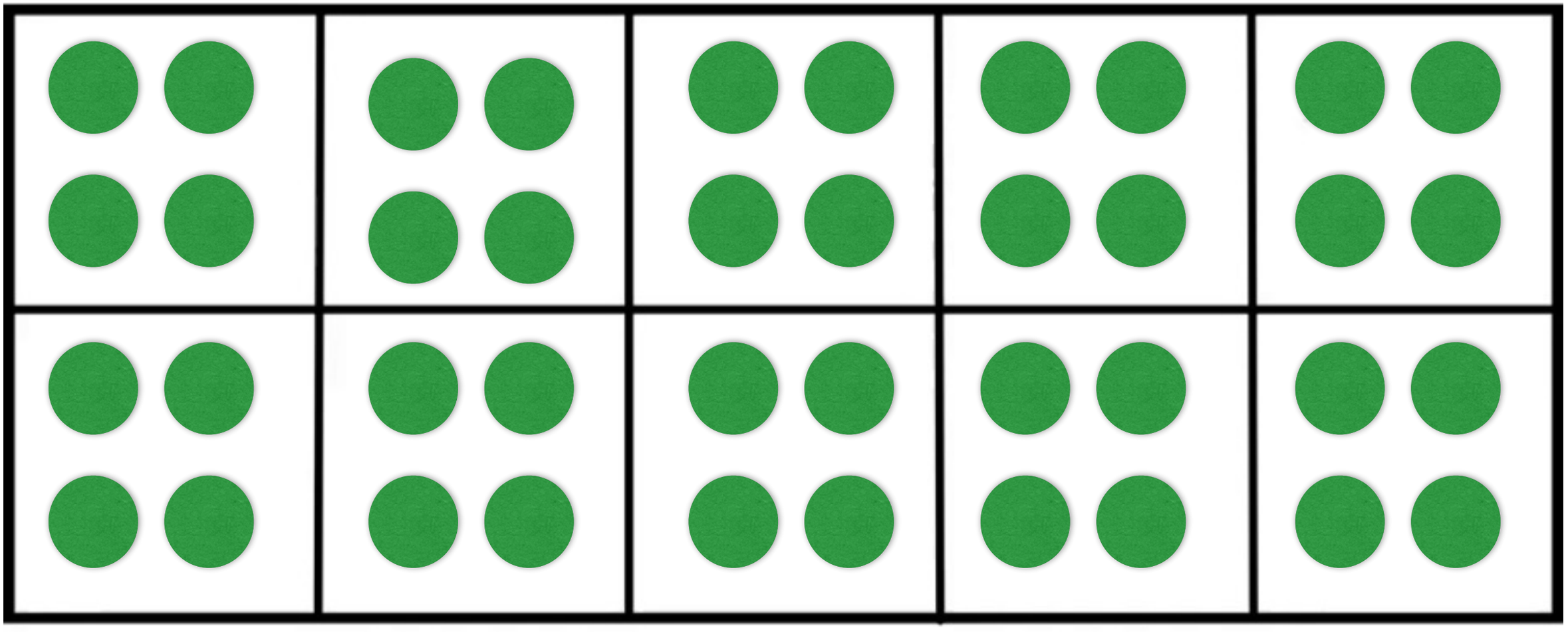




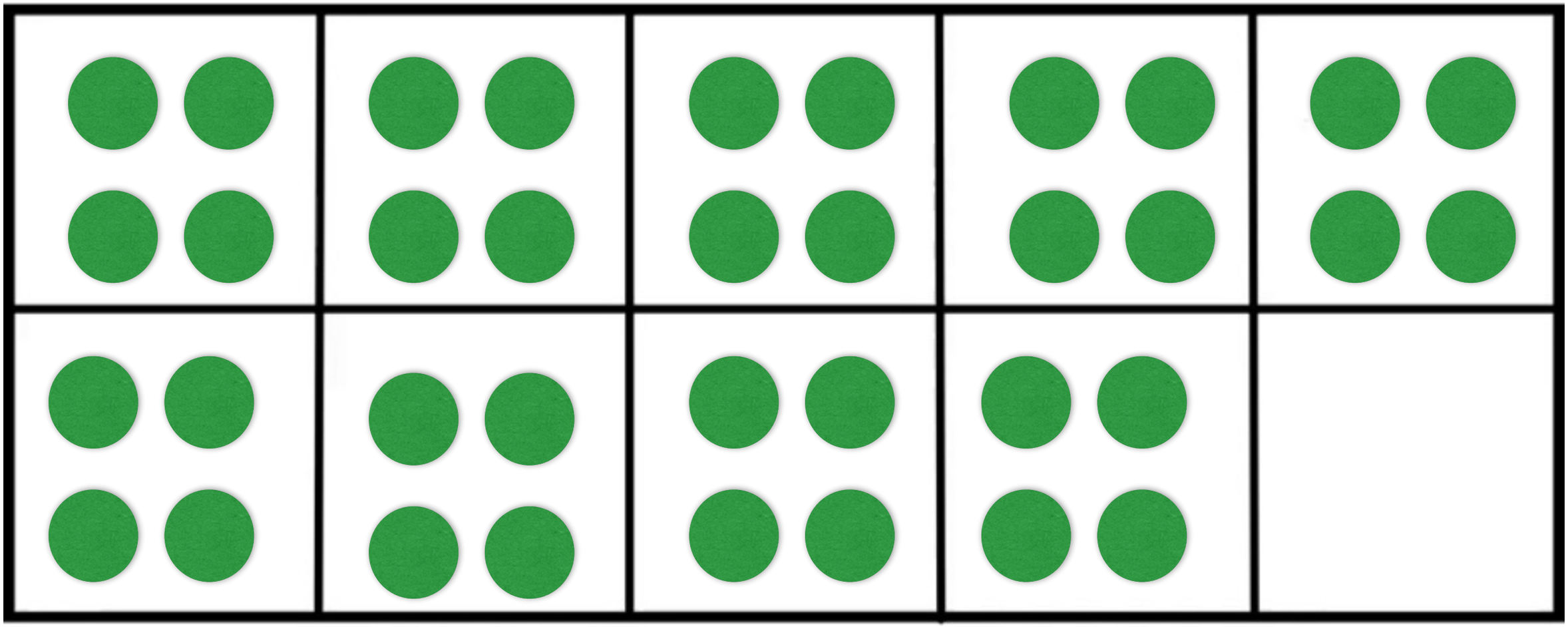
(8 x 10) - 8 = 72





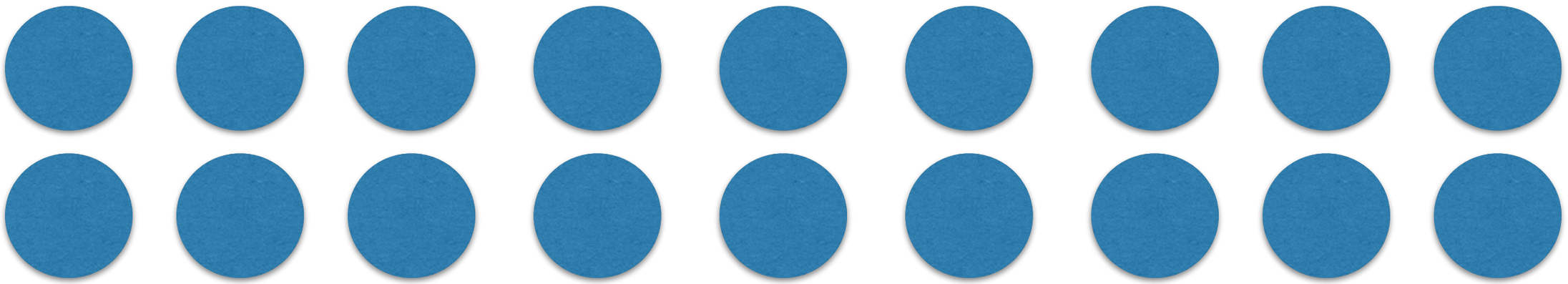
How many?

How did you see them?



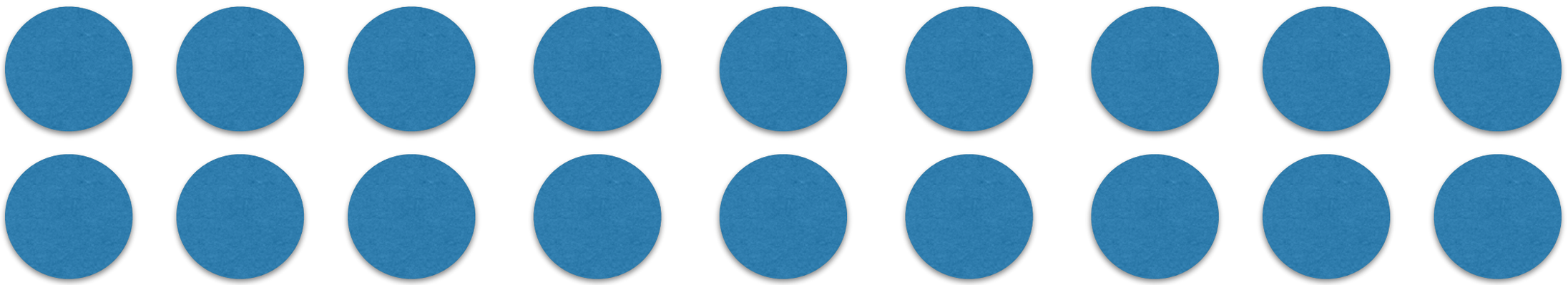
How does thinking about the first
image we saw help us
with this new image?

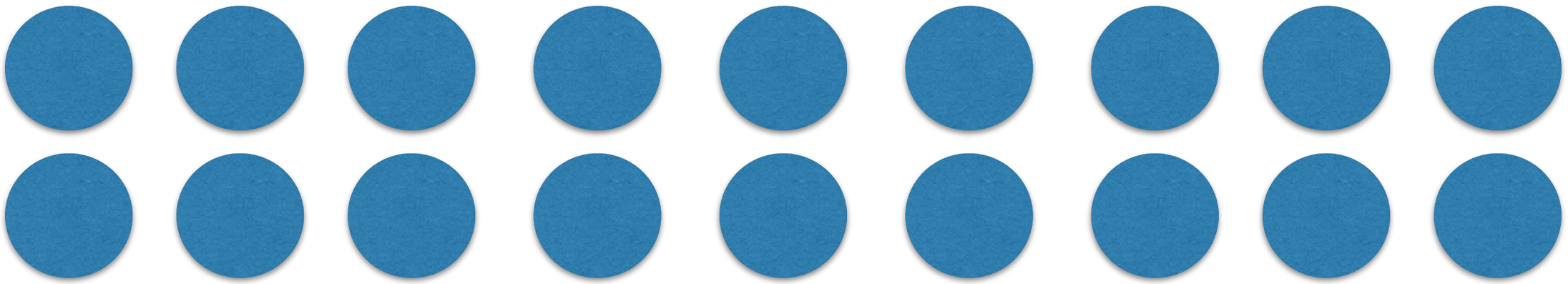
2 x 9 =



4 X 9 =

4 X 9 =



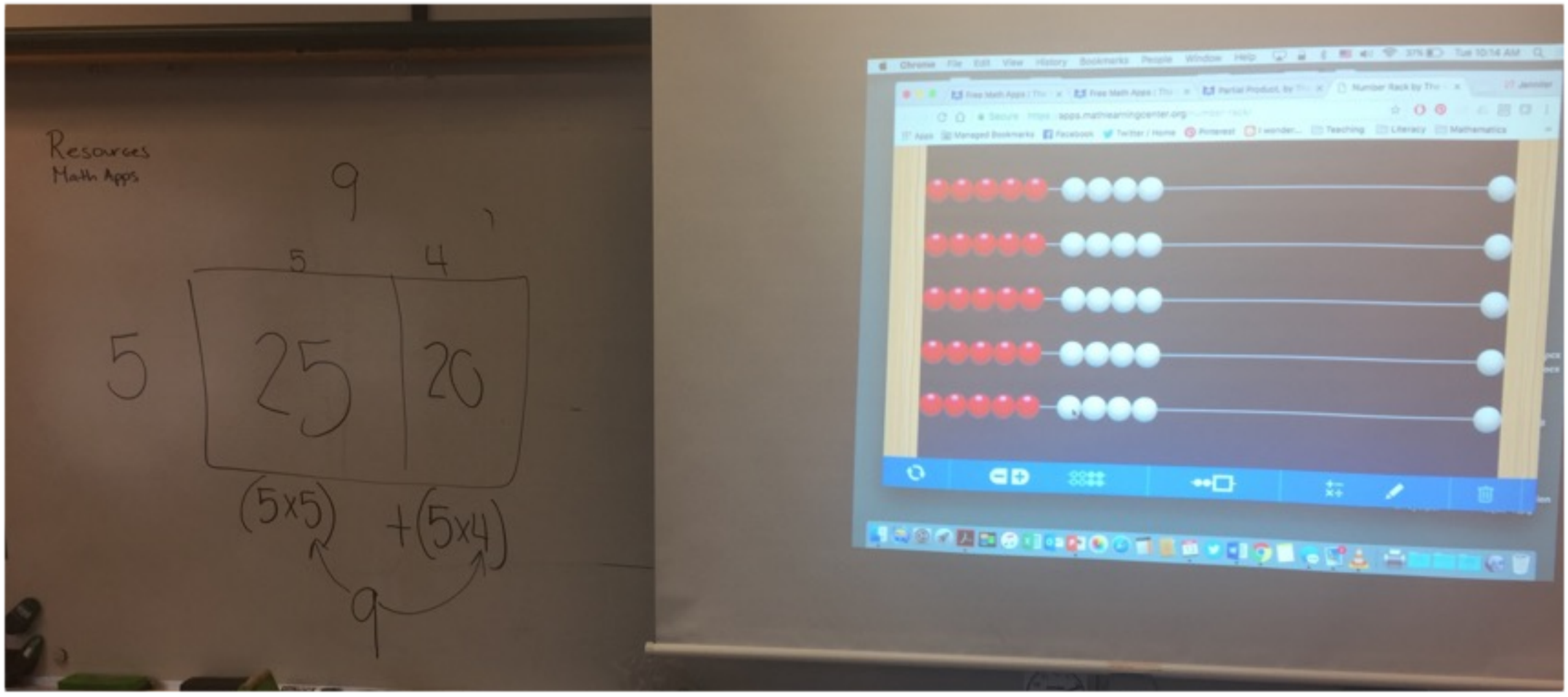


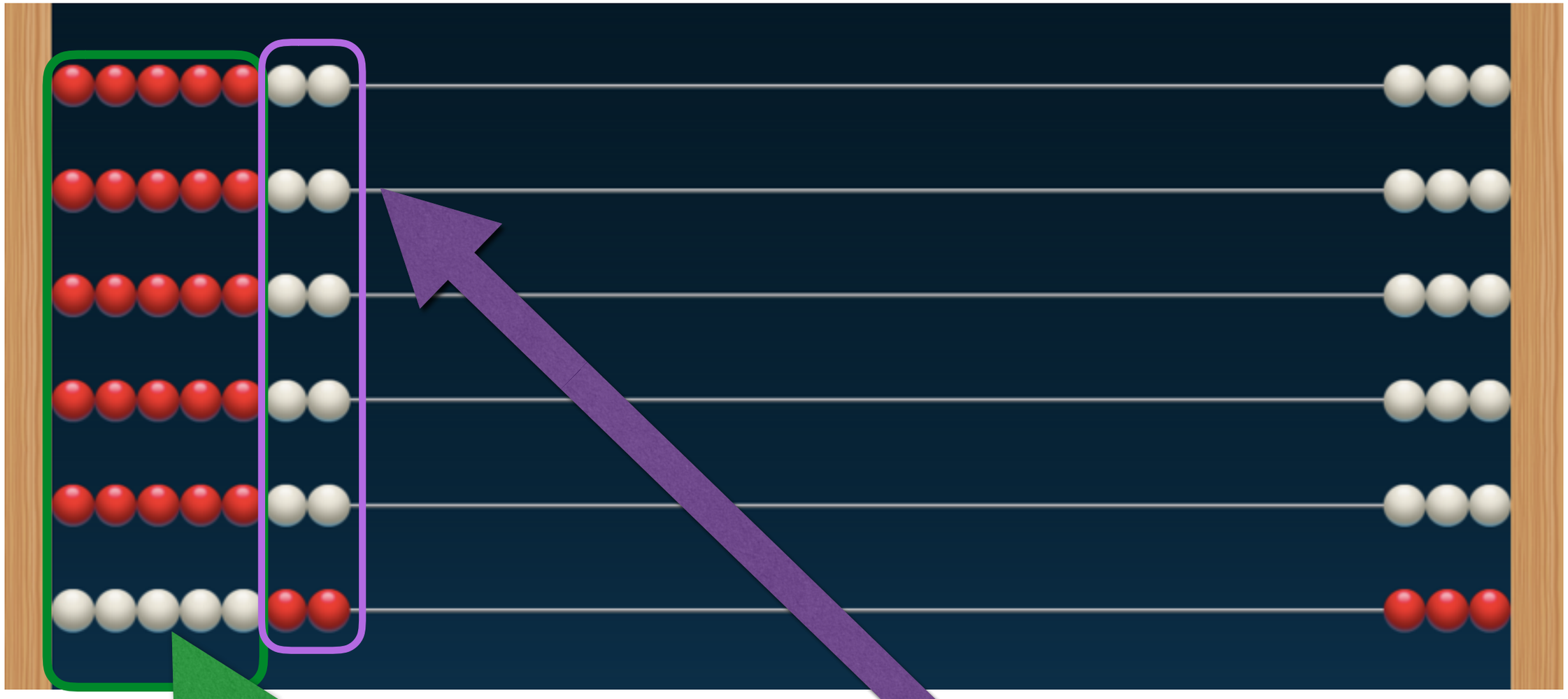
2 (2 x 9) = Double Double

Virtual Math Apps - Visual Models

Number Rack: https://apps.mathlearningcenter.org/number-rack/

Partial Products: https://apps.mathlearningcenter.org/partial-product-finder/


Resources
Math Apps
9
5
4
5
25
20
(5x5)
+(5x4)
9



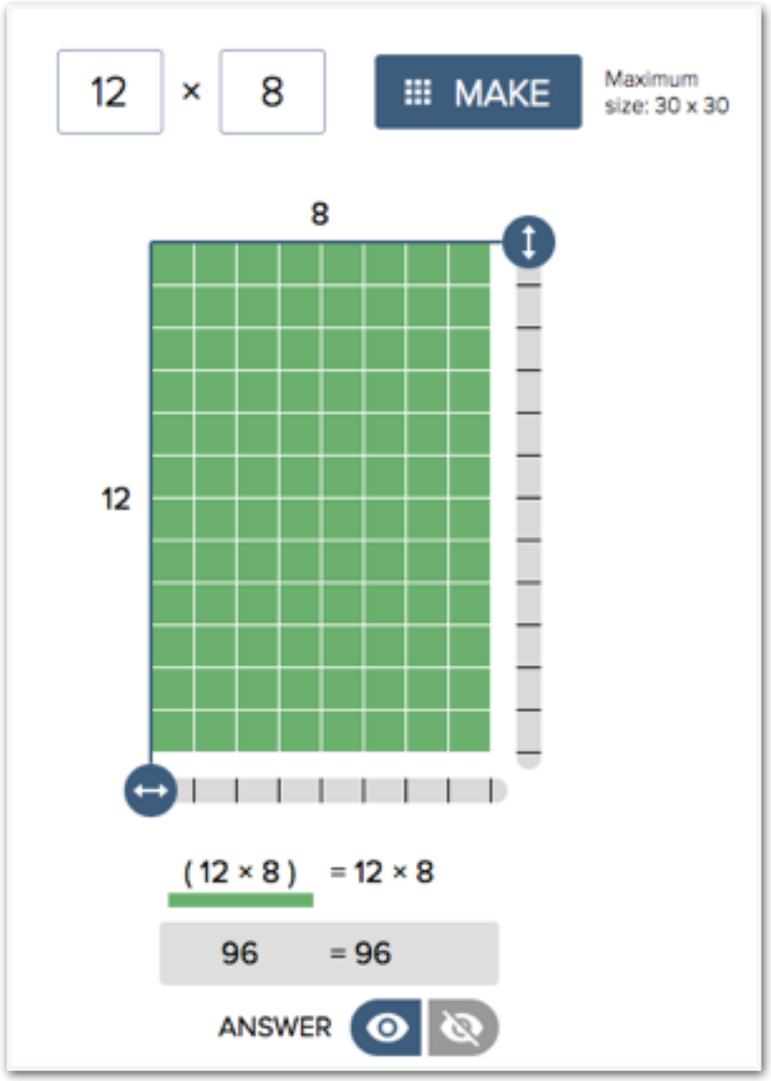
6 x 5 = 30

Plus

6 x 2 = 12

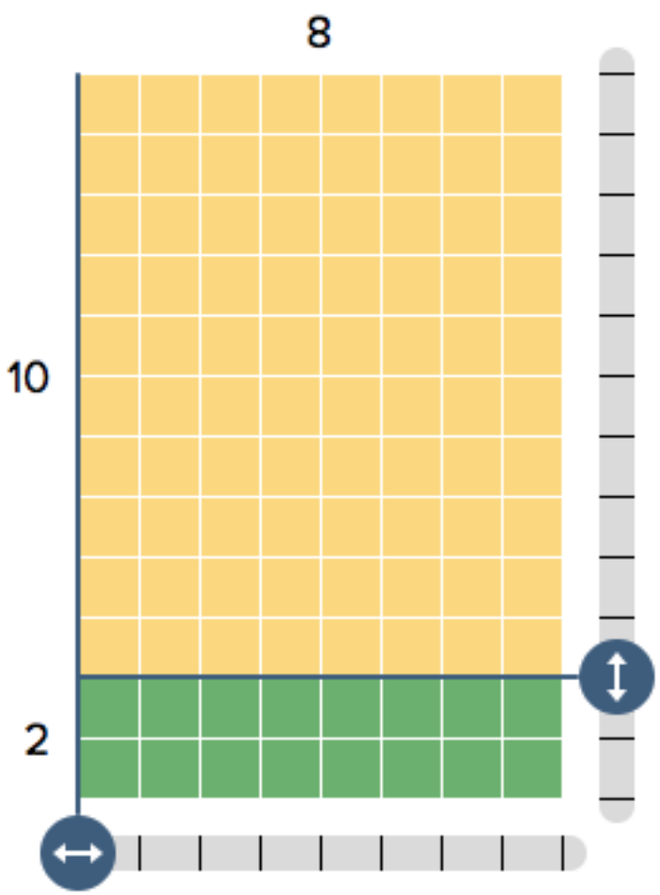
30 +12 = 42

How can you use facts you know to help you solve a question you don't know?



https://www.mathlearningcenter.org/resources/apps

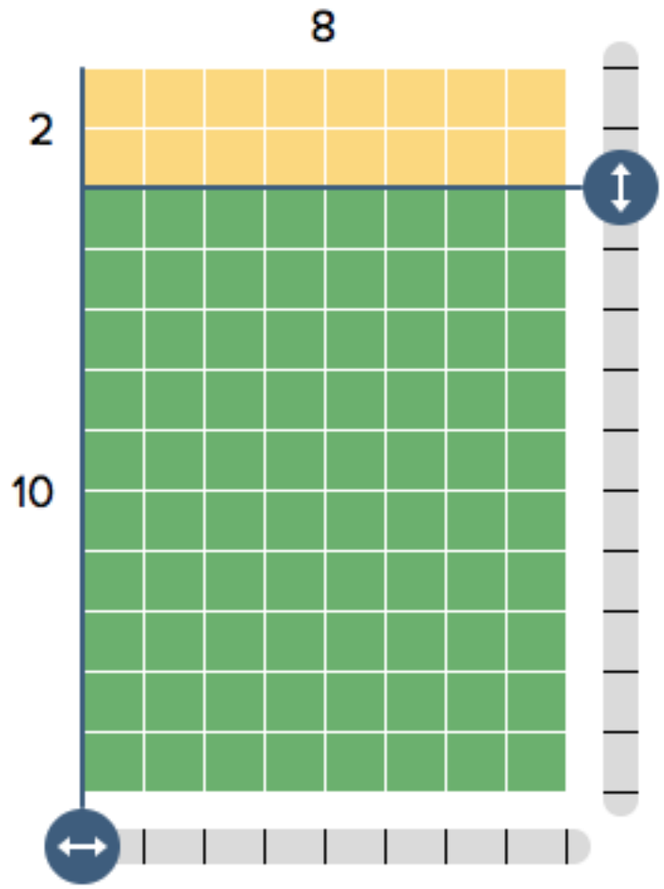
12 × 8 MAKE Maximum size: 30 x 30



(10 × 8) + (2 × 8) = 12 × 8

ANSWER

12 × 8 MAKE Maximum size: 30 x 30



(2 × 8) + (10 × 8) = 12 × 8

ANSWER

Number Talks Using Equations

Learning Intentions:

- develop multiple strategies
- develop flexibility through use of multiple strategies
- develop reasoning
- develop ability to communicate mathematical thinking

10 - 15 minutes focussed on one question or a "string" of questions

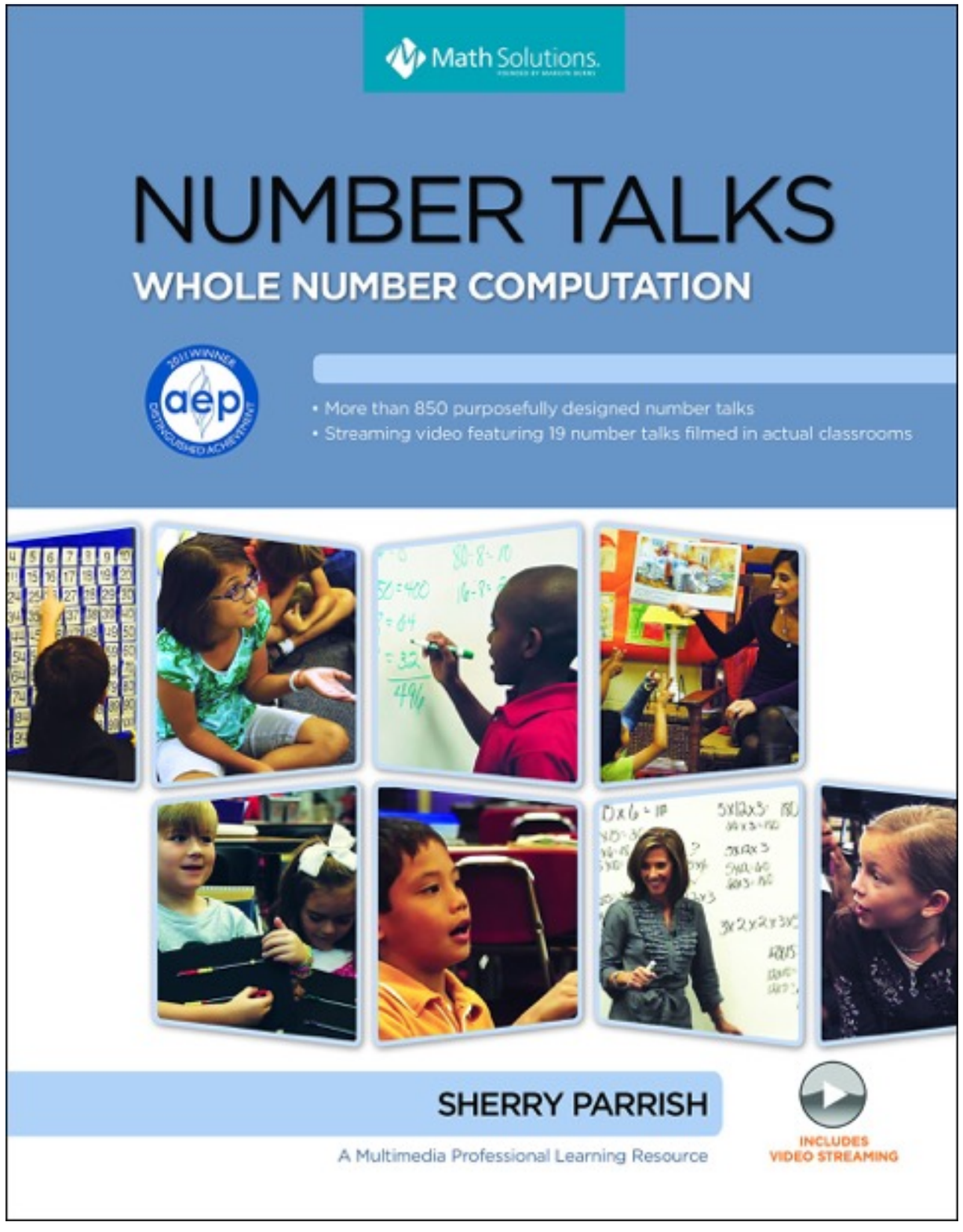
Number Talks Using Equations

Multiplication String

7 x 7 =

https://mathsolutions.wistia.com/medias/3flcbu6fnw

LRS #171347


Math Solutions.
NUMBER TALKS
WHOLE NUMBER COMPUTATION
aep
• More than 850 purposefully designed number talks
• Streaming video featuring 19 number talks filmed in actual classrooms
SHERRY PARRISH
A Multimedia Professional Learning Resource
INCLUDES
VIDEO STREAMING

Multiplication Fact Strategies

Factor	Strategy	Example
0	Any factor times 0 is always 0!	0 x 6 = 0
1	Any factor times 1 is always the other factor.	6 x 1 = 6
2	Double	6 x 2 = 6 + 6 = 12
3	Double, then add one group	6 x 3 6 x 2 = 12 12 + 6 = 18
4	Double, Double	6 x 4 6 x 2 = 12 12 x 2 = 24
5	Skip count by fives	5 x 6 = 30 5, 10, 15, 20, 25, 30
6	Multiply by 5, then add one group	6 x 7 5 x 7 = 35 35 + 7 = 42
7	Multiply by 5, then add a double	7 x 6 5 x 6 = 30 6 + 6 = 12 30 + 12 = 42
8	Double, Double, and Double!	8 x 6 6 x 2 = 12 12 x 2 = 24 24 x 2 = 48
9	Multiply by 10 and subtract one group	9 x 6 10 x 6 = 60 60 – 6 = 54
10	Write the factor in the tens place and 0 in the ones place.	10 x 6 = 60

Journaling - Strategy Page

or

Strategies We've Uncovered Anchor Charts

GOAL: Educated Citizen

LITERACY

NUMERACY

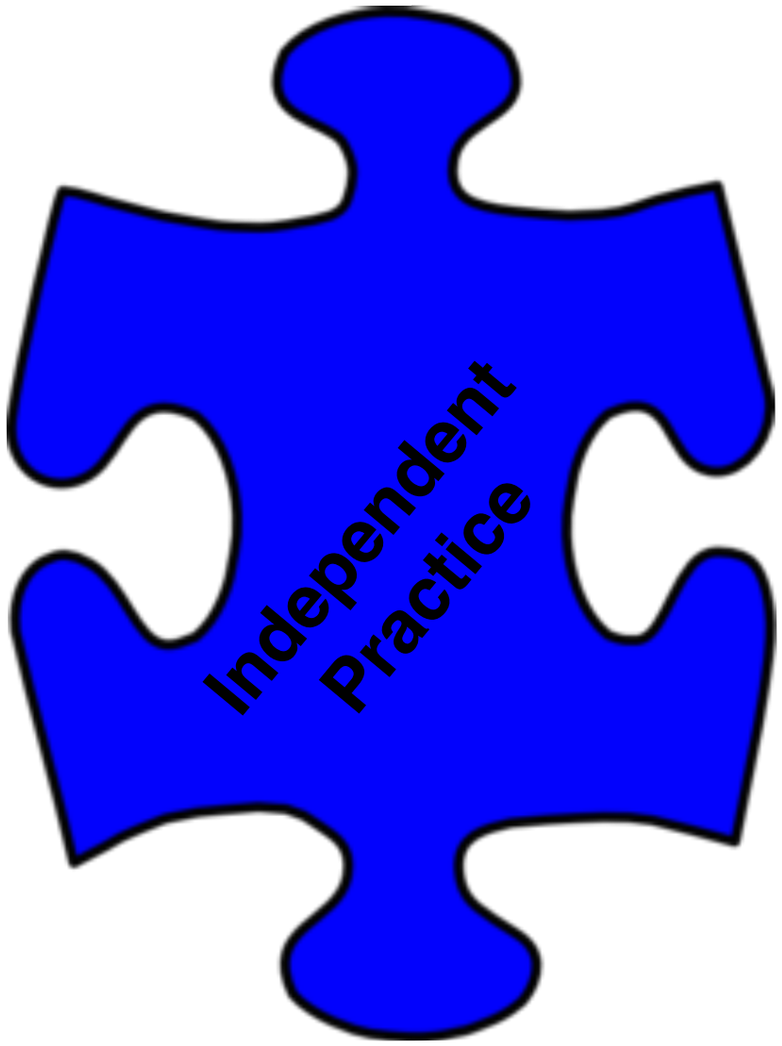
Literacy and numeracy foundations

Literacy is the ability to understand, critically analyze, and create a variety of forms of communication, including oral, written, visual, digital, and multimedia, in order to accomplish one's goals.

Numeracy is the ability to understand and apply mathematical concepts, processes, and skills to solve problems in a variety of contexts.

Literacy and numeracy are fundamental to all learning. While they are commonly associated with language learning and mathematics, literacy and numeracy are applied in all areas of learning.

https://curriculum.gov.bc.ca/curriculum/overview



<u>Meaningful practice</u>:

- Daily Math Investigations
- Games

Multiplication Games

Cover Up! A Doubles Game

How to Play

Roll a 10-sided die. Multiply your number by 2.

Find it on the grid and cover it in your color.

Partner 2 gets a turn.

The first one to have 4 in a line wins!

Roll a 0 and lose a turn!

You need
- 10 sided dice
- Counters (2 different colors)

12	6	10	12	4	8
14	18	6	16	2	6
6	10	2	12	10	14
12	4	8	18	16	10
14	16	2	14	4	12
10	8	4	2	16	18

Double or Double-Double

Pick a factor from the **Factor Box**.

Double it (multiply by 2) or double-double it (multiply by 4).

Find the product below and cover it in your colour.

Four in a row wins!

Factor Box

1	2	3	4	5	6
7	8	9	10	12	14

24	8	6	20	12	4
16	28	14	32	18	24
10	2	6	36	28	40
12	14	18	4	16	20
10	8	24	32	36	2
40	28	18	16	4	6

Multiplication – What's Inside?

1. Cover Up! – Partner Game

- doubling strategy (x2)
- place 4 markers in a row
- differentiated instruction—strategic game

2. Double or Double-Double – Individual Activity

- based on doubling strategy (x4)
- place 4 markers in a row
- differentiated instruction—strategic game

3. Doubles and Halves – Partner Game

- relating multiplication and division (x/÷2)
- create longest row of markers
- differentiated instruction—strategic game

4. Doubles in a Row – Partner Game

- doubling strategy (x2)
- limited counters, place 3 in a row
- differentiated instruction—strategic game

5. Stack 'em up for 4 – Partner Game

- based on doubling strategy (x4)
- collect most counters
- differentiated instruction—strategic game

6. Stack 'em up for 8 – Partner Game

- based on doubling strategy (x8)
- collect most counters
- differentiated instruction—strategic game

3	6	9
12	15	18
21	24	27

7. Stack 'em up for 3 – Partner Game

- based on doubling +1 more set (x3)
- collect most blocks
- differentiated instruction—strategic game

8. Thinking About Tens – Partner Game

- multiples of 10 (x10)
- place 4 markers in a row
- differentiated instruction—strategic game

9. High Roller – Partner Game

- multiples of 5 (x5)
- highest sum of multiples of 5

10. Multiply by 9 Bingo Card – Partner/small group/whole class

- multiples of 9 (x9)

Instructions

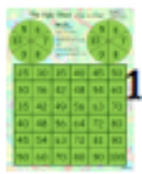
- students record multiples of 9 up to 81 on card
- repetition of multiples is permitted
- using x9 fact cards, call out multiplication facts, others find the product and cover
- line wins the game

11. Square Number Capture – Partner Game

- square numbers
- laminate or slip into page cover
- can relate to area
- variations: capture the greatest area, square spaces need to be connected to one's own continuous space

12. Four in a Line – Partner Game

- doubling/double-double strategy
- larger numbers
- strategic reasoning



13. The Ugly Ones – Partner Game

- multiplication facts not addressed by previous strategies
- encourages students to find efficient strategies based on what they know

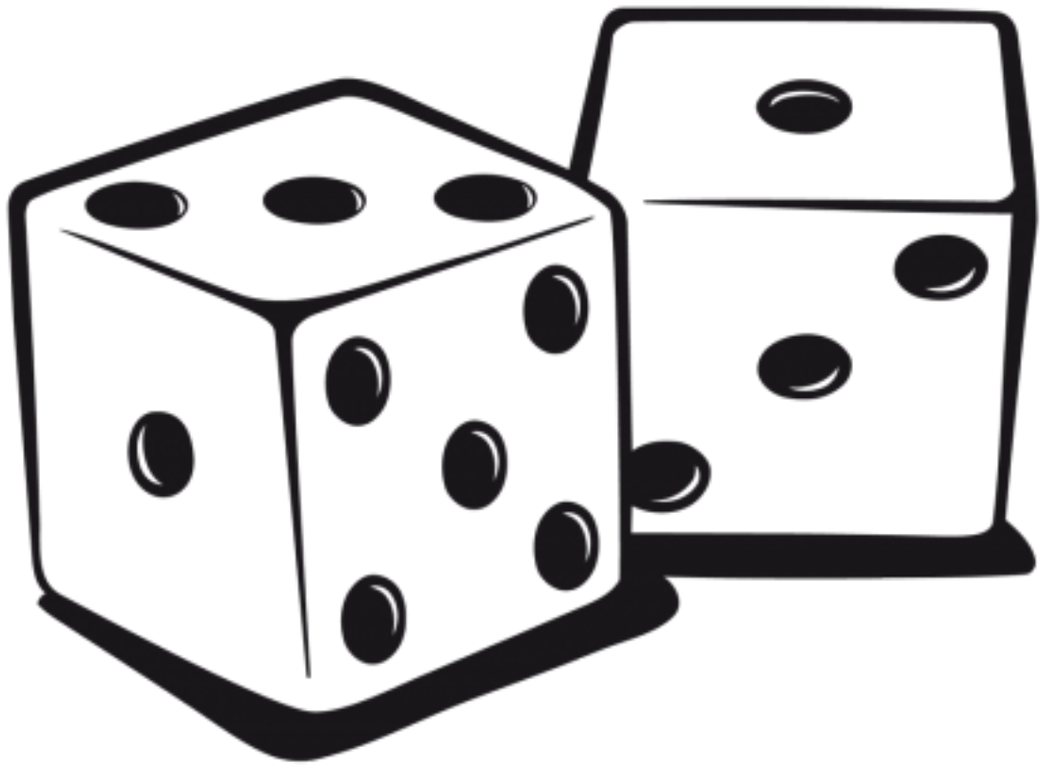
14. Wipe Out – Individual Activity/Partner Game

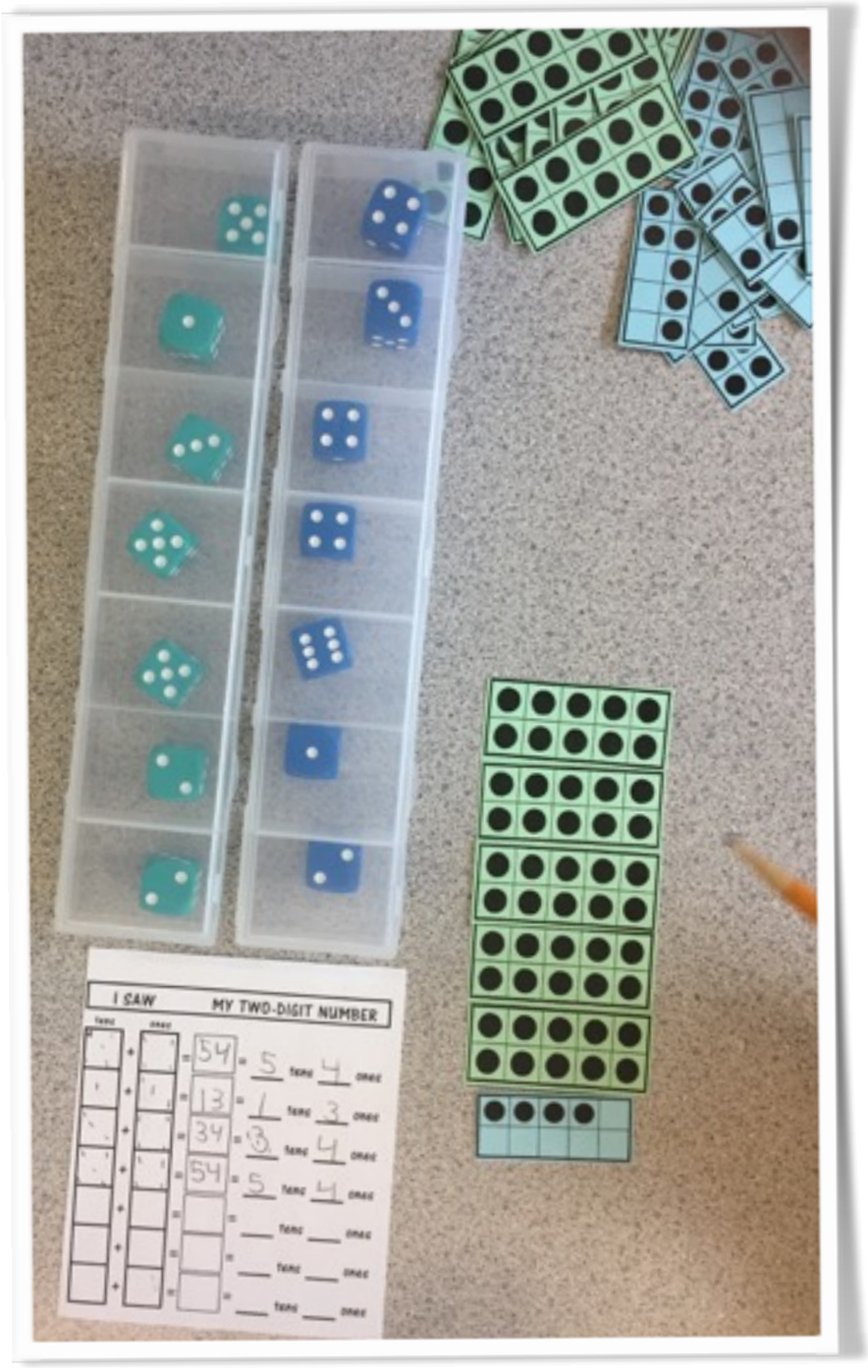
- multi-leveled students can play as partners

Instructions

- before starting, students need to identify a single factor for self
- follow instructions as written on the board

Box Cars and One Eyed Jacks





Independent Practice Time

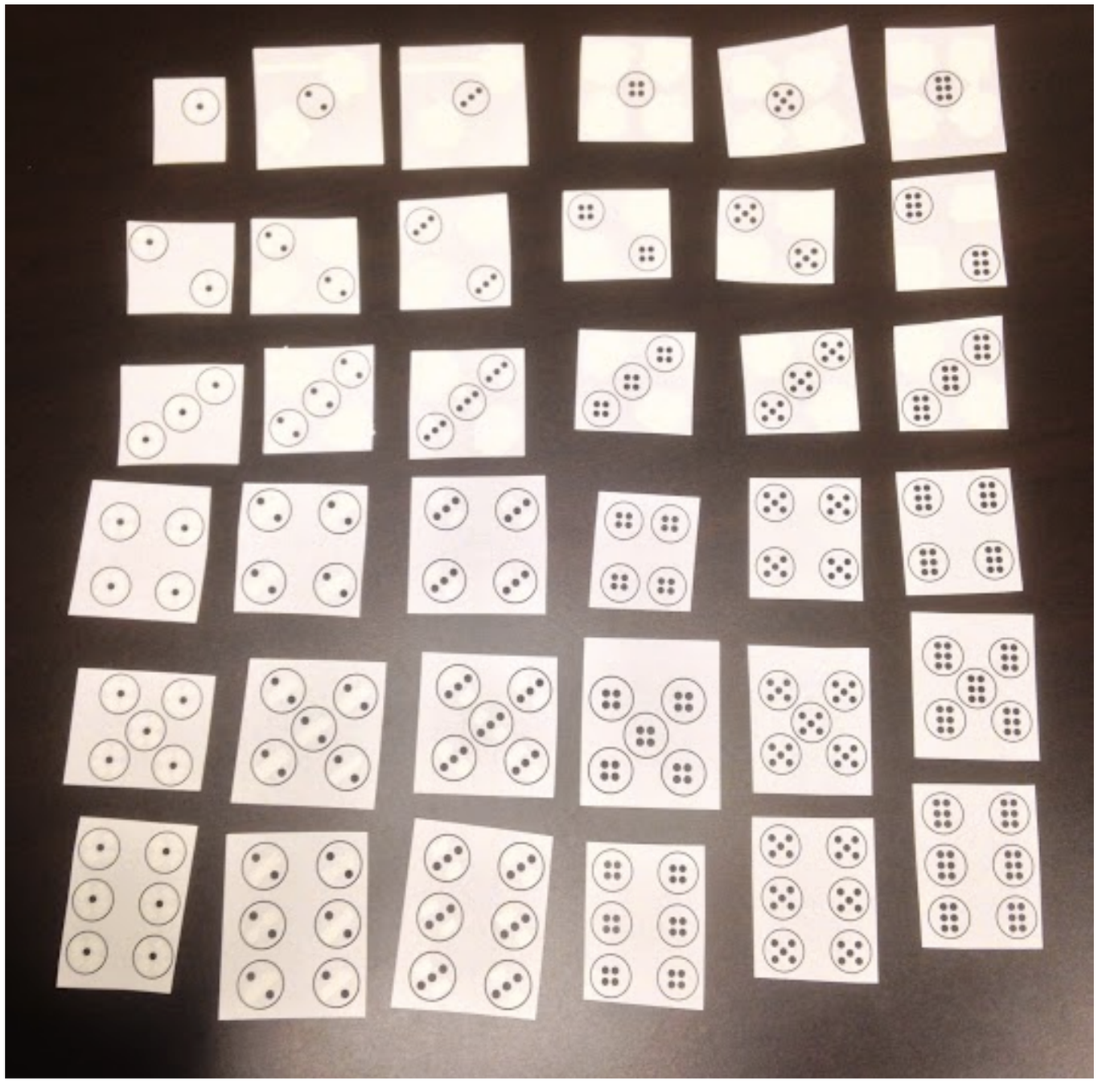
Pick a “just right” game

Self-monitoring promotes automaticity with the basic facts. Self-monitoring requires that students focus their attention on some specific aspect of their learning. As students monitor themselves, they think about what they know and what they still need to learn.

- p.g. 77 Math Running Records

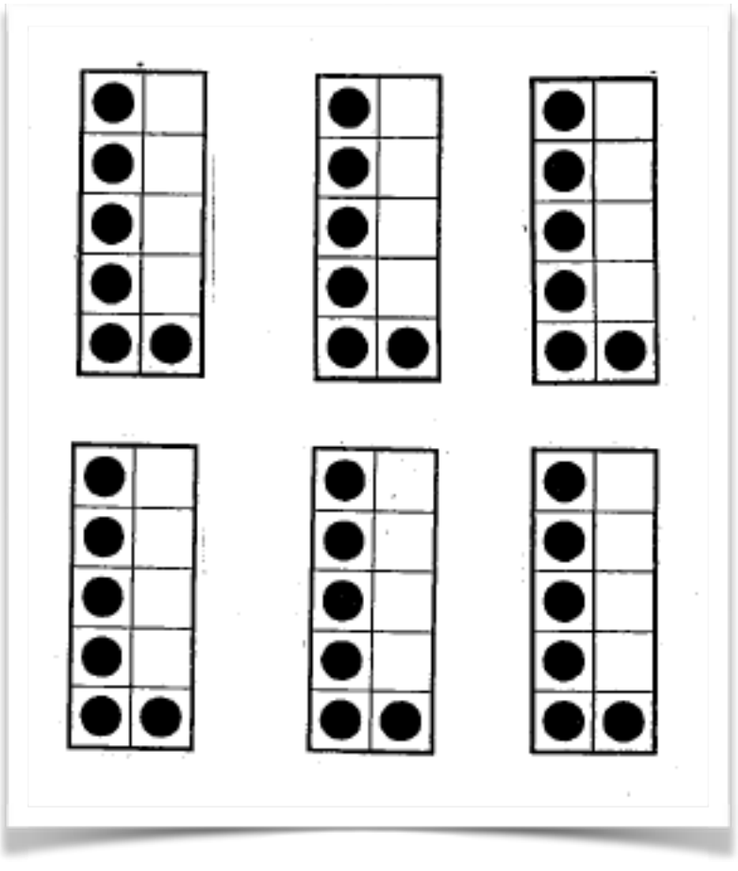
Subtizing Multiplication Cards

https://drive.google.com/drive/folders/0Byth_H-Ygu2mZnRkam5vQmR1Nnc



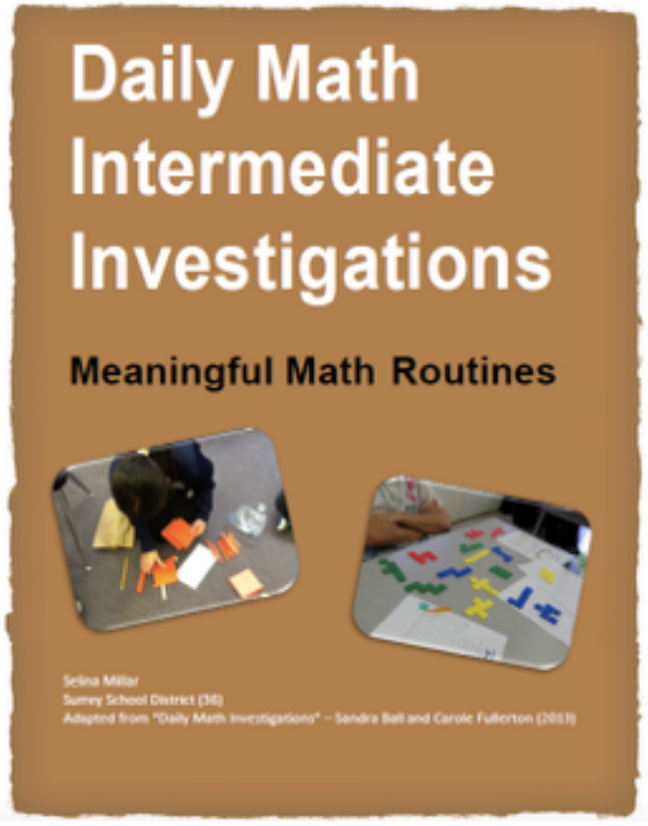
Ten Frame Multiplication Cards

https://drive.google.com/drive/folders/0Byth_H-Ygu2mSkFEcjdmS19Sbzg

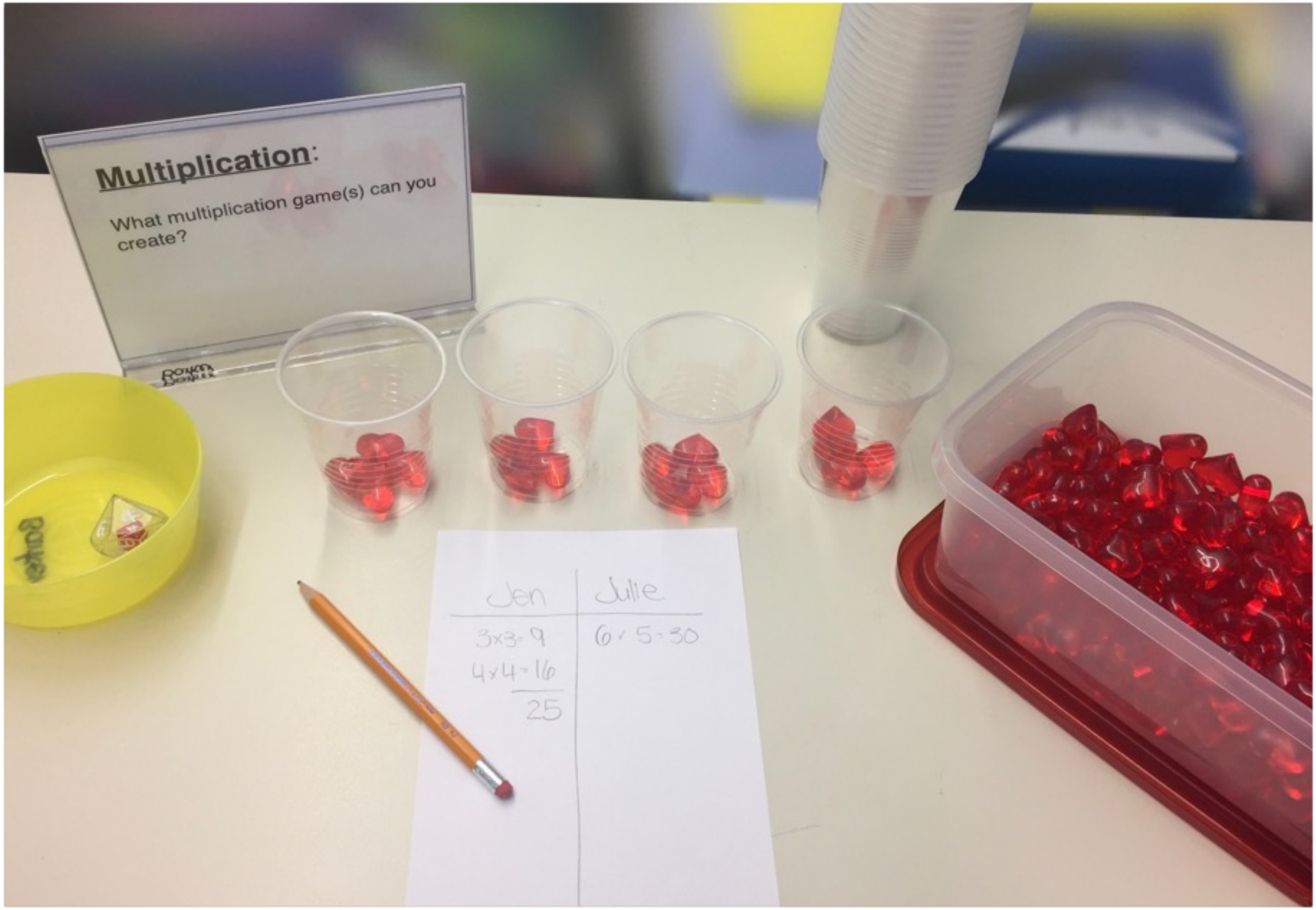


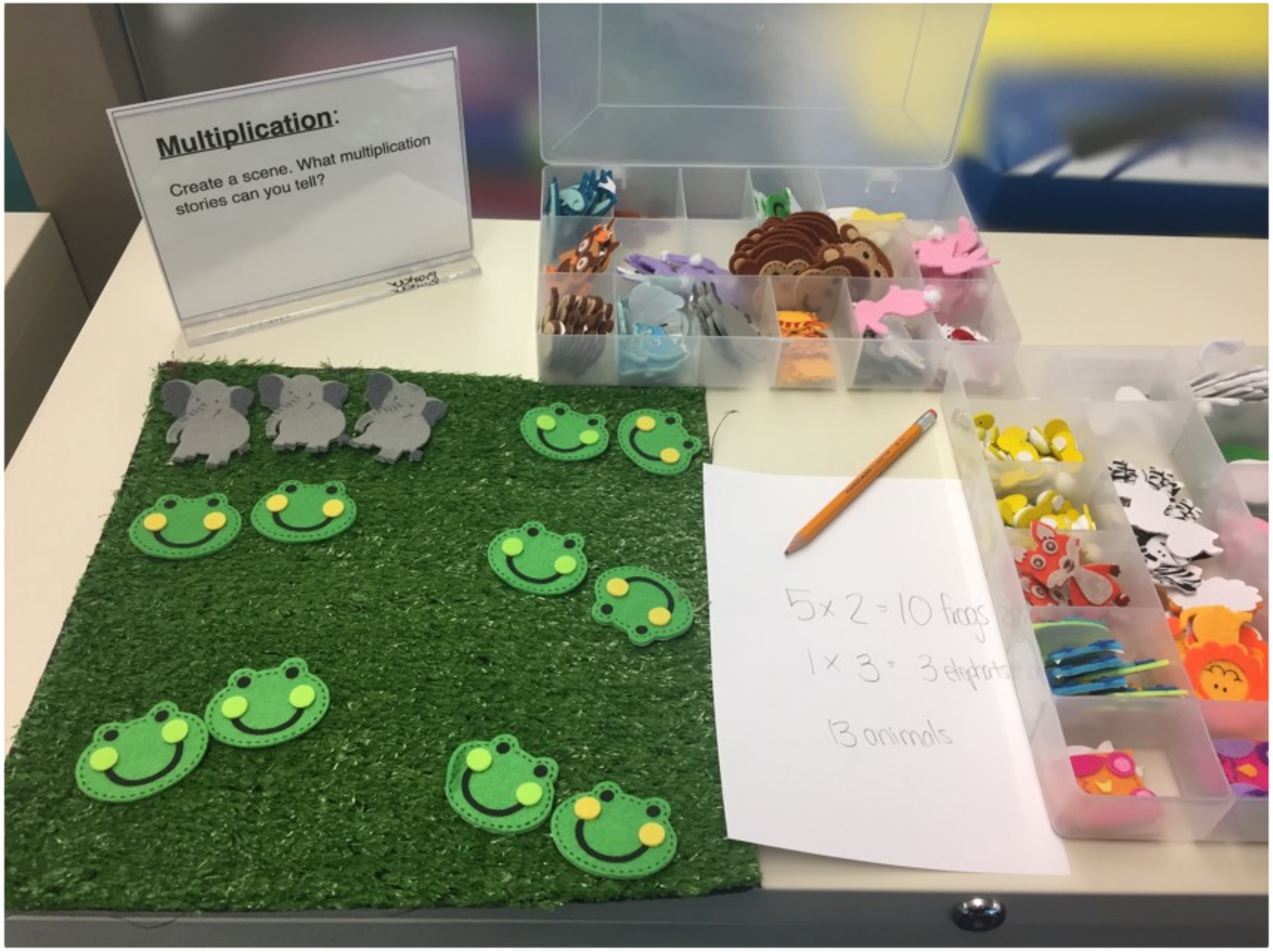
For 6 x 6 I can think 6 x 5 and add one more group. Example 6 x 5 = 30 plus 6 = 36

Daily Math Investigations
- Independent, Purposeful Practice
What does this look like?



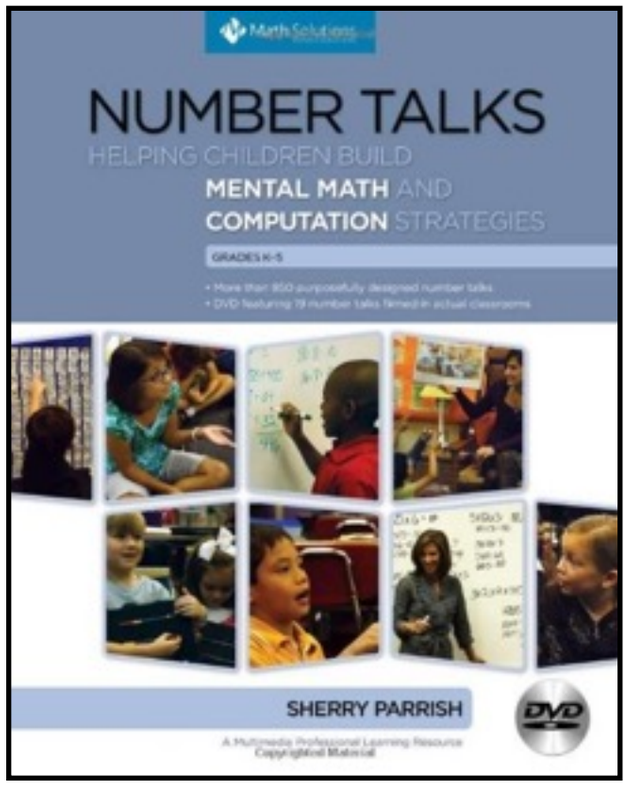
- investigations are not new - work in the activities you used in whole class lessons
- students choose where they go
- students can work alone or with others
- each investigation can be differentiated

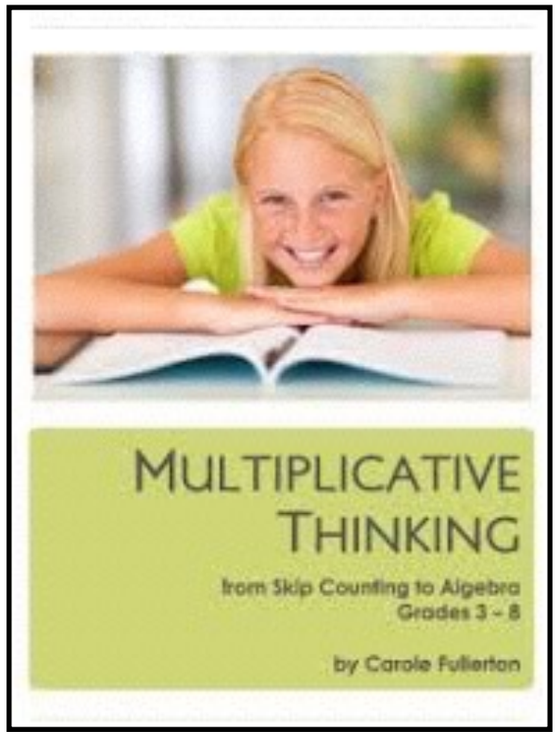

Multiplication:
What multiplication game(s) can you create?
Jen
Julie
3x3=9
4x4=16
25
6x5=30

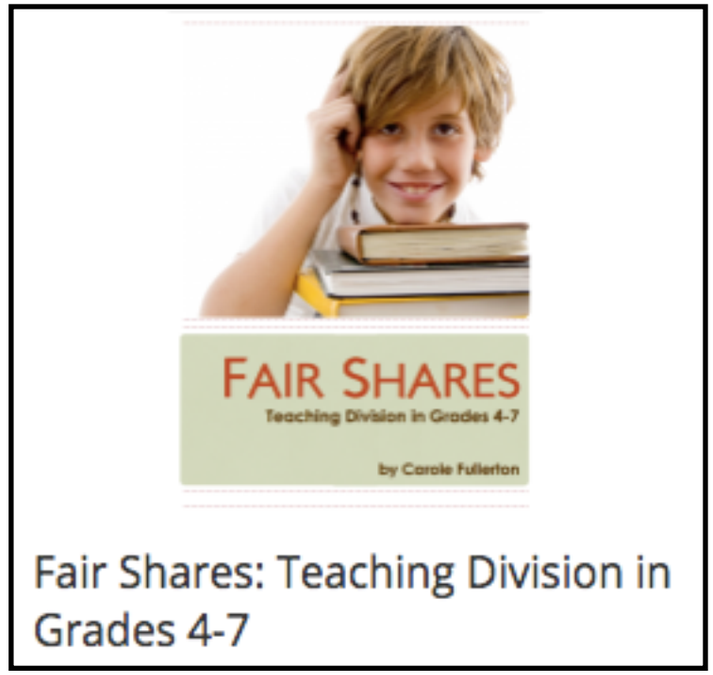

Multiplication:
Create a scene. What multiplication stories can you tell?
5 x 2 = 10 frogs
1 x 3 = 3 elephants
13 animals


Multiplication:
Using square tiles represent a multiplication question that has the same factors (e.g., 7 x 7) in an array.
What do you notice? What do you wonder?

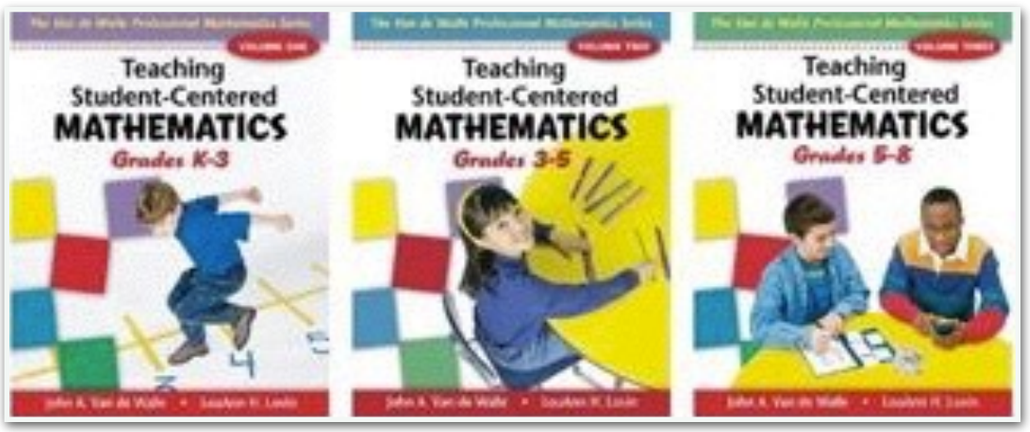
Resources:

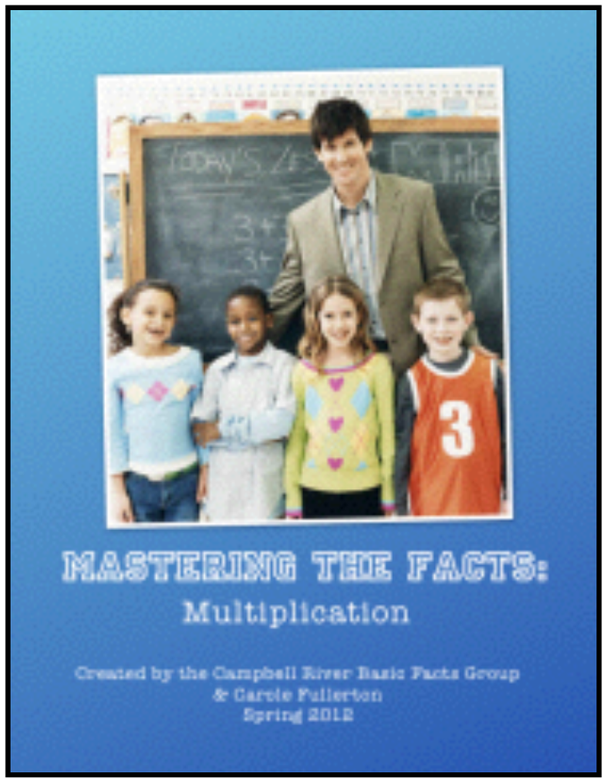


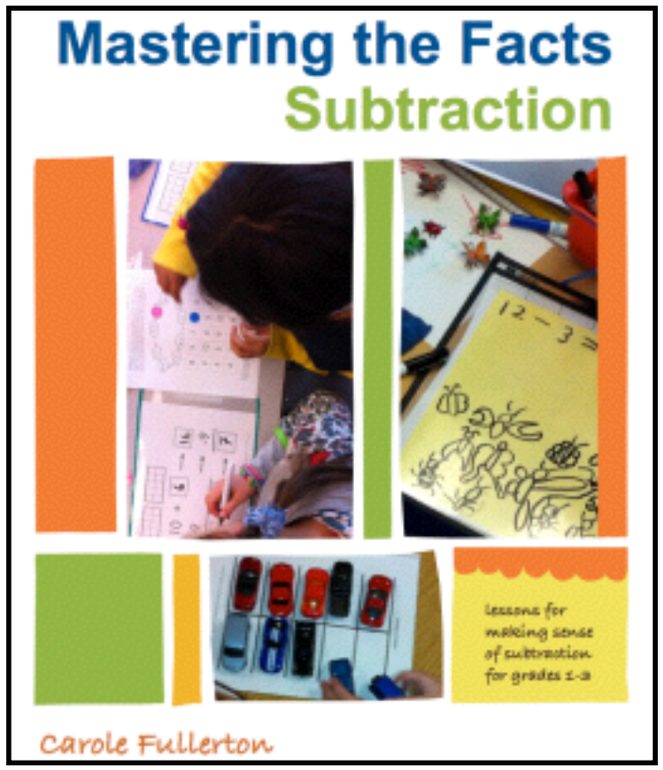




Fair Shares: Teaching Division in Grades 4-7







Learning Intentions Re-visited

- What is Computational Fluency?.
- How can I assess Computational Fluency?
- In what ways can teachers support the development of Computational Fluency?