

# Making the Most of Measurement

How to meet the  
measurement standards  
while building  
Number Sense

---

with **CHRISTINA TONDEVOLD**



**Shout out what you  
are learning and  
tag  
@BuildMathMinds**



# Christina Tondevold



Elementary Education at  
LCSC  
Traditional Learner & Teacher  
Until getting my Master's  
degree at BSU  
Now a Recovering  
Traditionalist  
Work with elementary  
teachers on Building Math  
Minds

**@BuildMathMinds**

# During our Time



- Measurement Standards
- 8 Number Sense Concepts
- 3 Math Experiences we should be giving students
- Examples that combine Measurement & Number concepts

# Measurement Standards

# CCSS WHERE TO FOCUS KINDERGARTEN MATHEMATICS



This document shows where students and teachers should spend the large majority of their time in order to meet the expectations of the Standards.

Not all content in a given grade is emphasized equally in the Standards. Some clusters require greater emphasis than others based on the depth of the ideas, the time that they take to master, and/or their importance to future mathematics or the demands of college and career readiness. More time in these areas is also necessary for students to meet the Standards for Mathematical Practice.

To say that some things have greater emphasis is not to say that anything in the Standards can safely be neglected in instruction. Neglecting material will leave gaps in student skill and understanding and may leave students unprepared for the challenges of a later grade.

Students should spend the large majority<sup>1</sup> of their time on the major work of the grade (■). Supporting work (▣) and, where appropriate, additional work (●) can engage students in the major work of the grade.<sup>2,3</sup>

## MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR KINDERGARTEN

Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Key: ■ Major Clusters    ▣ Supporting Clusters    ● Additional Clusters

- K.CC.A ■ Know number names and the count sequence.
- K.CC.B ■ Count to tell the number of objects.
- K.CC.C ■ Compare numbers.
- K.OA.A ■ Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
- K.NBT.A ■ Work with numbers 11–19 to gain foundations for place value.
- K.MD.A ● Describe and compare measurable attributes.
- K.MD.B ▣ Classify objects and count the number of objects in categories.
- K.G.A ● Identify and describe shapes.
- K.G.B ▣ Analyze, compare, create, and compose shapes.

## HIGHLIGHTS OF MAJOR WORK IN GRADES K–8

K–2	Addition and subtraction – concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions – concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

## REQUIRED FLUENCIES FOR KINDERGARTEN

K.OA.A.5	Add/subtract within 5
----------	-----------------------

# Grade Level Focuses

<https://achievethecore.org/category/774/mathematics-focus-by-grade-level>

<sup>1</sup> At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade. For more information, see Criterion #1 of the K–8 Publishers’ Criteria for the Common Core State Standards for Mathematics [www.achievethecore.org/publisherscriteria](http://www.achievethecore.org/publisherscriteria).

<sup>2</sup> Refer also to criterion #3 in the K–8 Publishers’ Criteria for the Common Core State Standards for Mathematics [www.achievethecore.org/publisherscriteria](http://www.achievethecore.org/publisherscriteria).

<sup>3</sup> Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

# Grade Level Focuses

<sup>1</sup> At least 65% and up to approximately 85% of class time, with Grades K–2 nearer the upper end of that range, should be devoted to the major work of the grade. For more information, see Criterion #1 of the K–8 Publishers' Criteria for the Common Core State Standards for Mathematics [www.achievethecore.org/publisherscriteria](http://www.achievethecore.org/publisherscriteria).

<sup>2</sup> Refer also to criterion #3 in the K–8 Publishers' Criteria for the Common Core State Standards for Mathematics [www.achievethecore.org/publisherscriteria](http://www.achievethecore.org/publisherscriteria).

<sup>3</sup> Note, the critical areas are a survey of what will be taught at each grade level; the major work is the subset of topics that deserve the large majority of instructional time during a given year to best prepare students for college and careers.

## MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR KINDERGARTEN

Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Key: ■ Major Clusters    □ Supporting Clusters    ○ Additional Clusters

- K.CC.A ■ Know number names and the count sequence.
- K.CC.B ■ Count to tell the number of objects.
- K.CC.C ■ Compare numbers.
- K.OA.A ■ Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
- K.NBT.A ■ Work with numbers 11–19 to gain foundations for place value.
- K.MD.A ○ Describe and compare measurable attributes.
- K.MD.B □ Classify objects and count the number of objects in categories.
- K.G.A ○ Identify and describe shapes.
- K.G.B □ Analyze, compare, create, and compose shapes.

# Grade Level Focuses

## MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 1

Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Key: ■ Major Clusters    □ Supporting Clusters    ○ Additional Clusters

- 1.OA.A ■ Represent and solve problems involving addition and subtraction.
- 1.OA.B ■ Understand and apply properties of operations and the relationship between addition and subtraction.
- 1.OA.C ■ Add and subtract within 20.
- 1.OA.D ■ Work with addition and subtraction equations.
- 1.NBT.A ■ Extending the counting sequence.
- 1.NBT.B ■ Understand place value.
- 1.NBT.C ■ Use place value understanding and properties of operations to add and subtract.
- 1.MD.A ■ Measure lengths indirectly and by iterating length units.
- 1.MD.B ○ Tell and write time.
- 1.MD.C □ Represent and interpret data.
- 1.G.A ○ Reason with shapes and their attributes.

# Grade Level Focuses

## MAJOR, SUPPORTING, AND ADDITIONAL CLUSTERS FOR GRADE 2

Emphases are given at the cluster level. Refer to the Common Core State Standards for Mathematics for the specific standards that fall within each cluster.

Key: ■ Major Clusters    □ Supporting Clusters    ○ Additional Clusters

- 2.OA.A ■ Represent and solve problems involving addition and subtraction.
- 2.OA.B ■ Add and subtract within 20.
- 2.OA.C □ Work with equal groups of objects to gain foundations for multiplication.
- 2.NBT.A ■ Understand place value.
- 2.NBT.B ■ Use place value understanding and properties of operations to add and subtract.
- 2.MD.A ■ Measure and estimate lengths in standard units.
- 2.MD.B ■ Relate addition and subtraction to length.
- 2.MD.C □ Work with time and money.
- 2.MD.D □ Represent and interpret data.
- 2.G.A ○ Reason with shapes and their attributes.

# Grade Level Focuses

# PreK

- identifies things that are big or small, heavy or light, tall or short, with assistance
- looks at two objects and identifies which one is bigger or smaller
- orders objects by size, volume, height, weight, and length with assistance
- uses some conventional vocabulary of measurement (e.g., inch, cup, pound), though may not have exact understanding of meaning

# Measurement Standards

**Preschool:** developing vocabulary, comparing & ordering objects

**Kindergarten:** sort & count objects in categories, describe & compare based on measurement

**1st grade:** measure by iterating units, tell & write time, represent & interpret data

**2nd grade:** measure in standard units, relate add/subtract to length, solve problems with time & money, represent & interpret data

# PreK-2 Measurement

comparing/sorting

vocabulary/describe

count

ordering

real-life time, money,  
measurements

iterating lengths

data

measuring

# Number Sense Concepts

# Number Sense is...

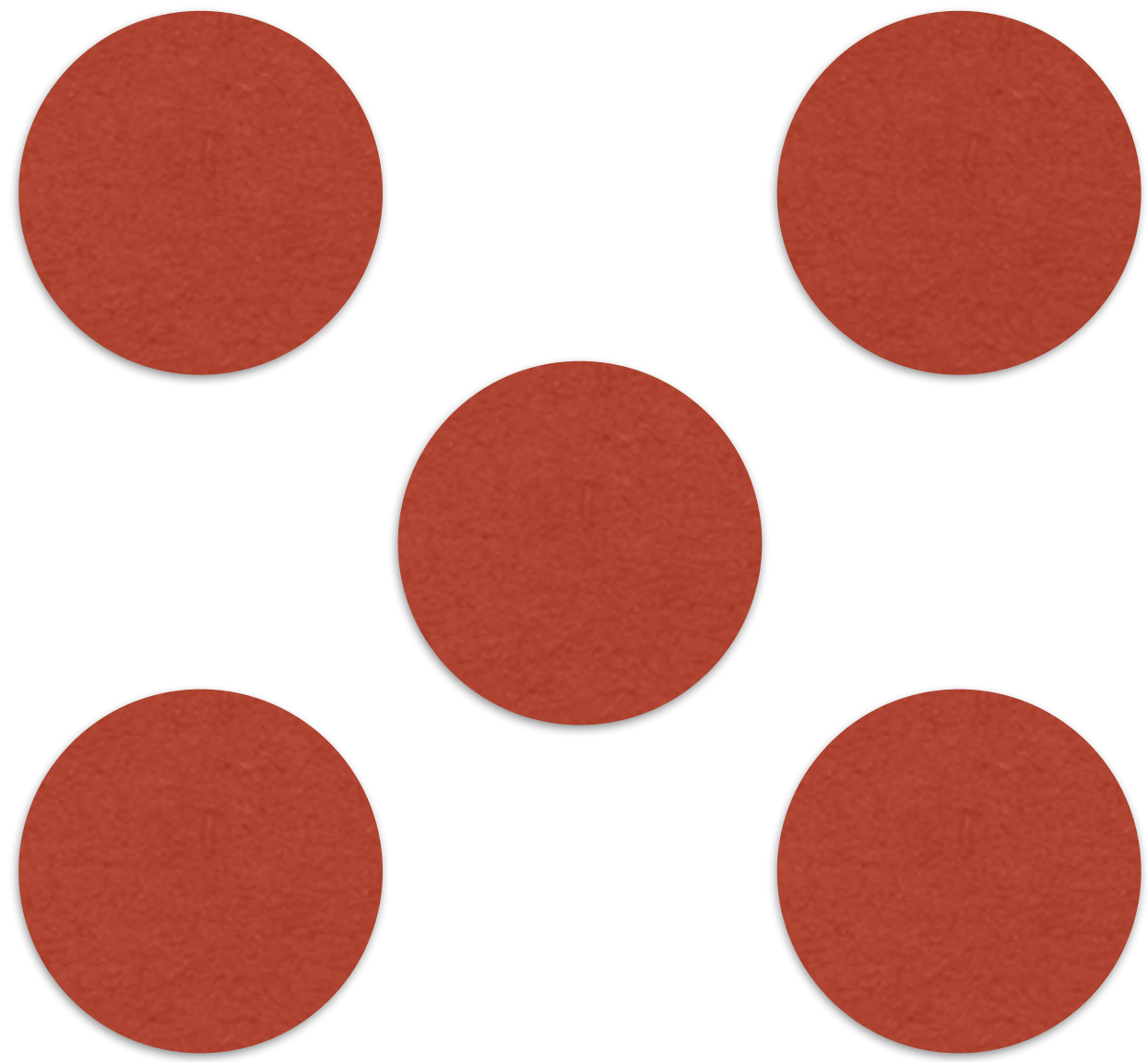
“...good intuition about numbers and their relationships. It **develops gradually** as a result of **exploring numbers, visualizing them** in a variety of contexts, and **relating them** in ways that are not limited by traditional algorithms.”

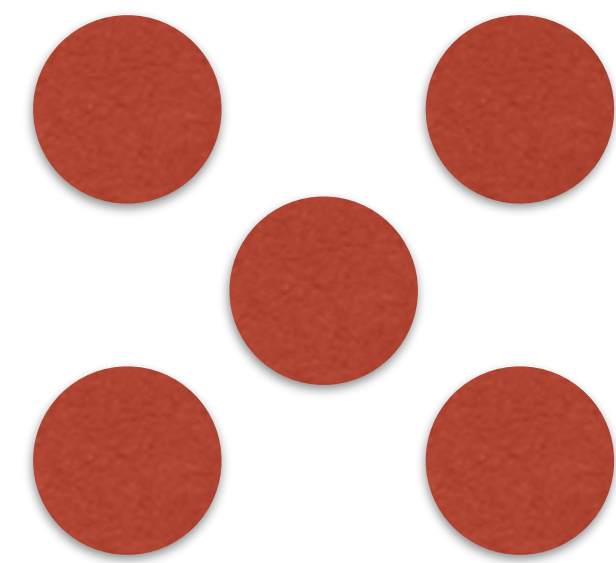
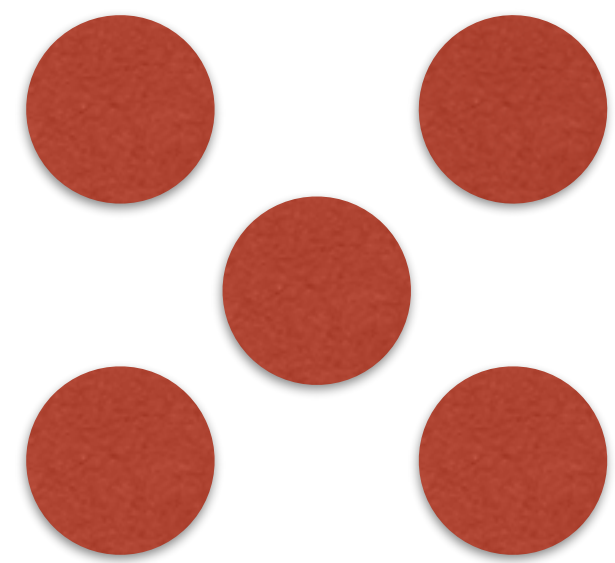
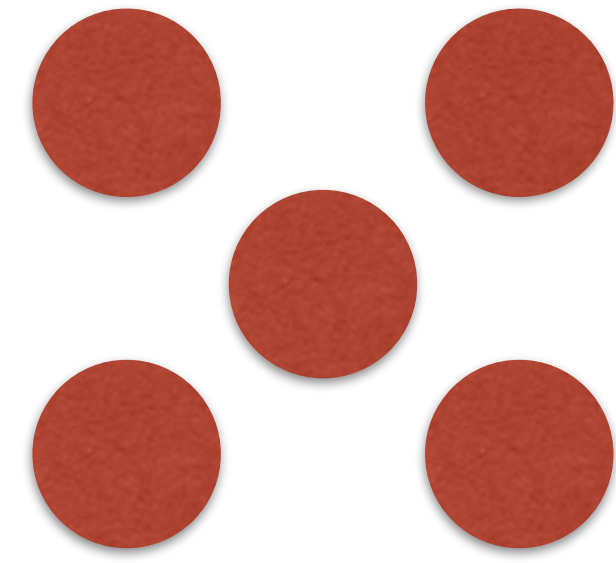
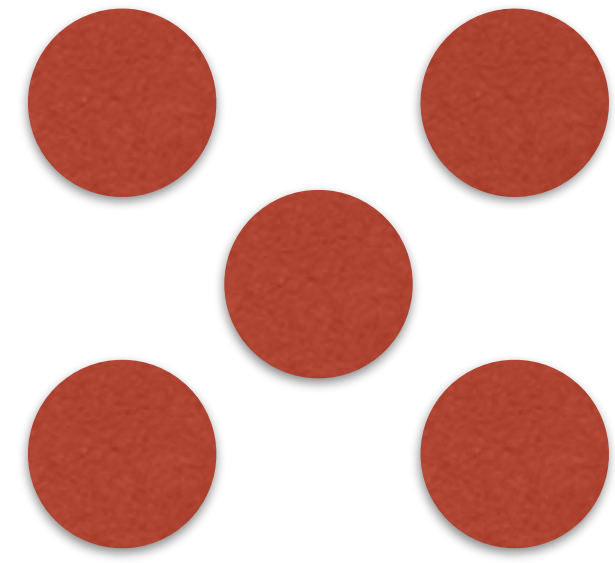
Howden, 1989

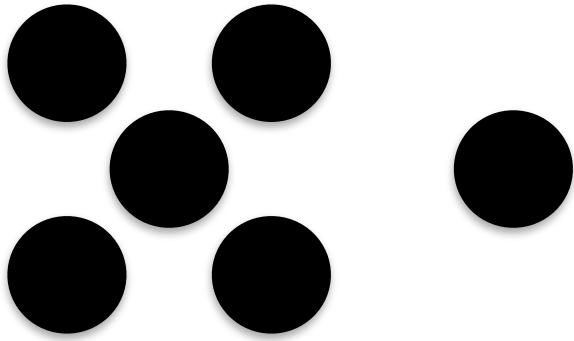
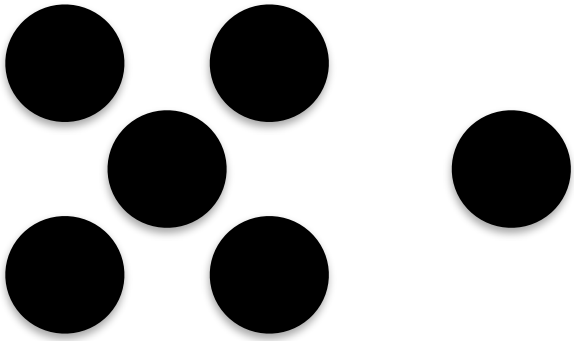
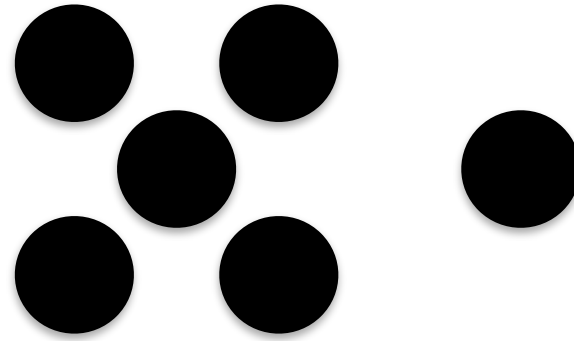
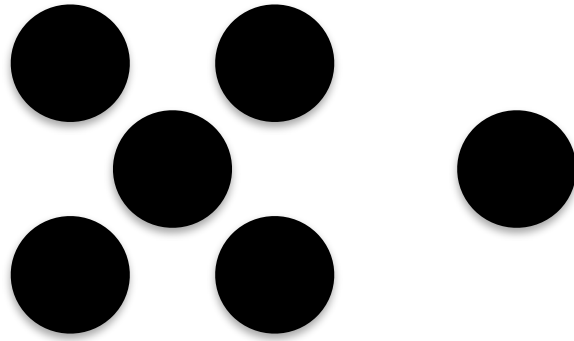
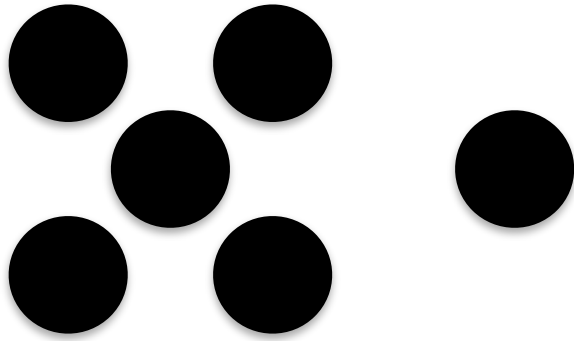
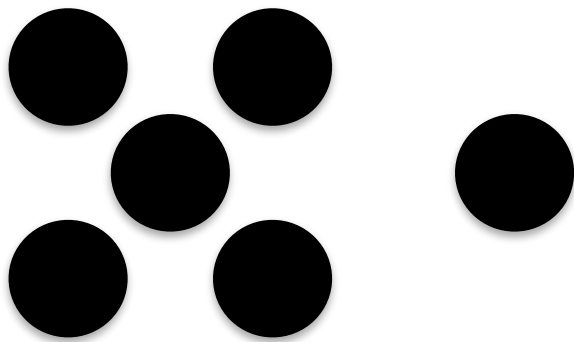
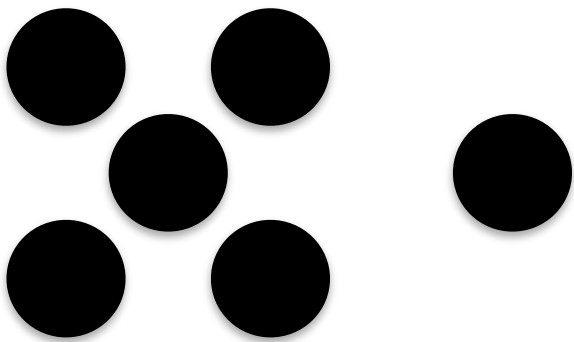
Clements &  
Sarama



Object Counting

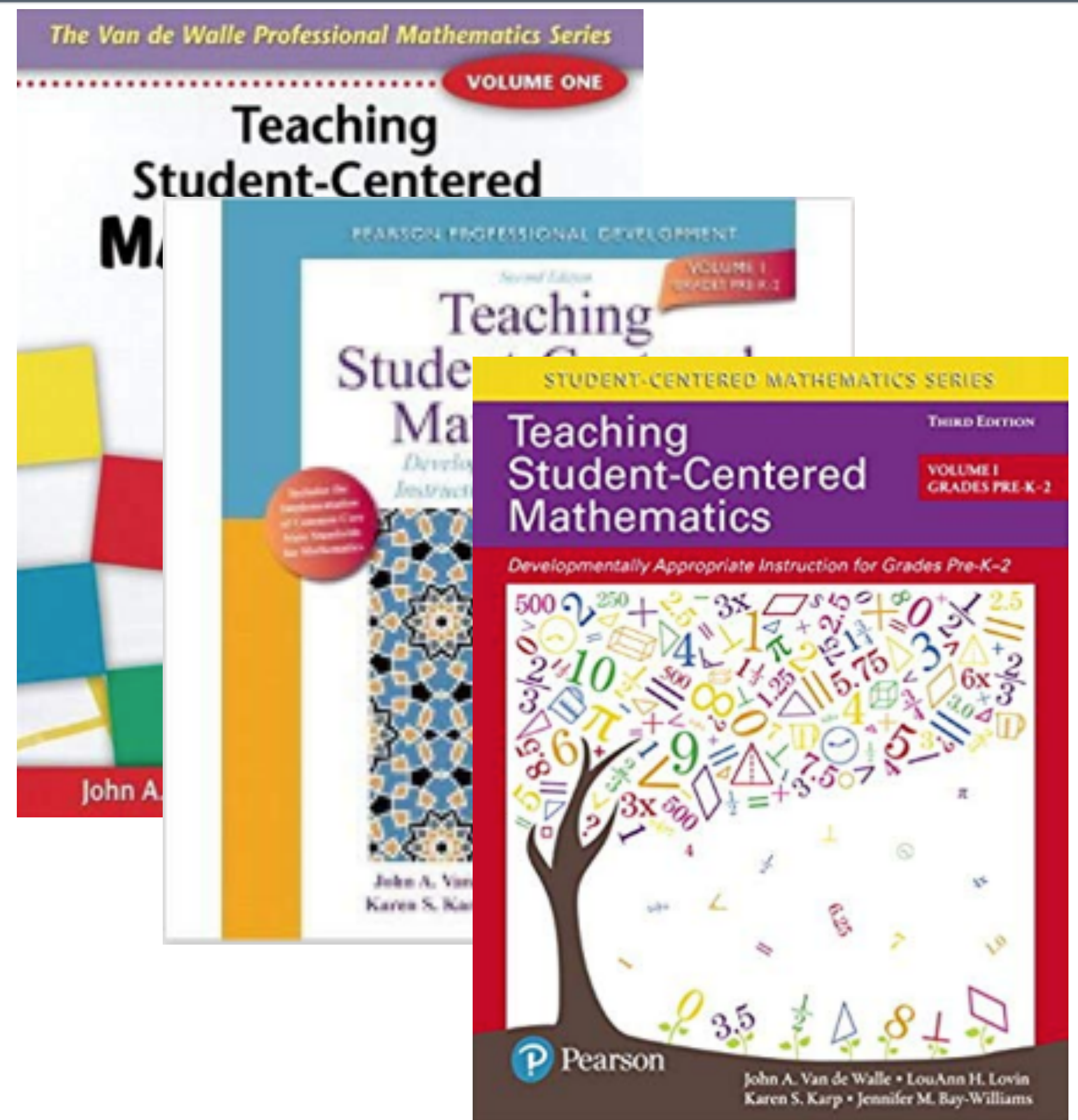




“...good intuition about numbers and **their relationships**. It develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms.”

Howden, 1989



01

# *Spatial Relationship*

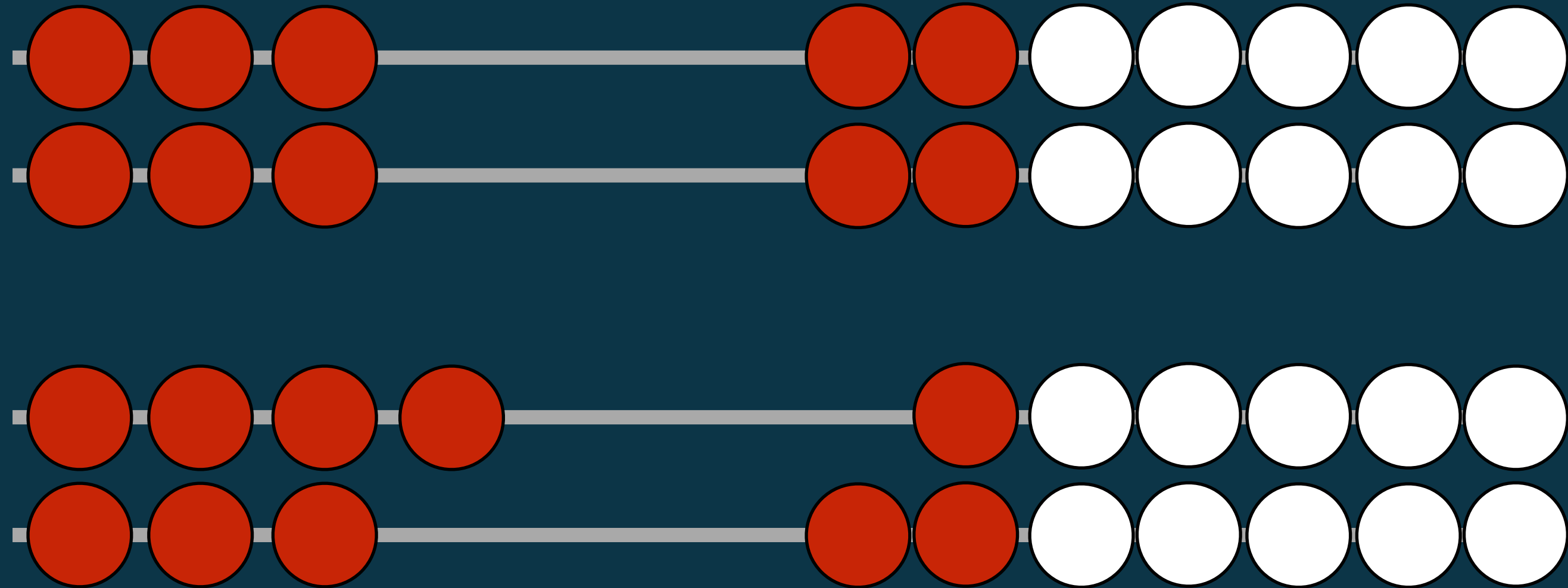


**Having a visual to go with a numeral to help you see relationships**

Van de Walle, et al,  
2013

# 02

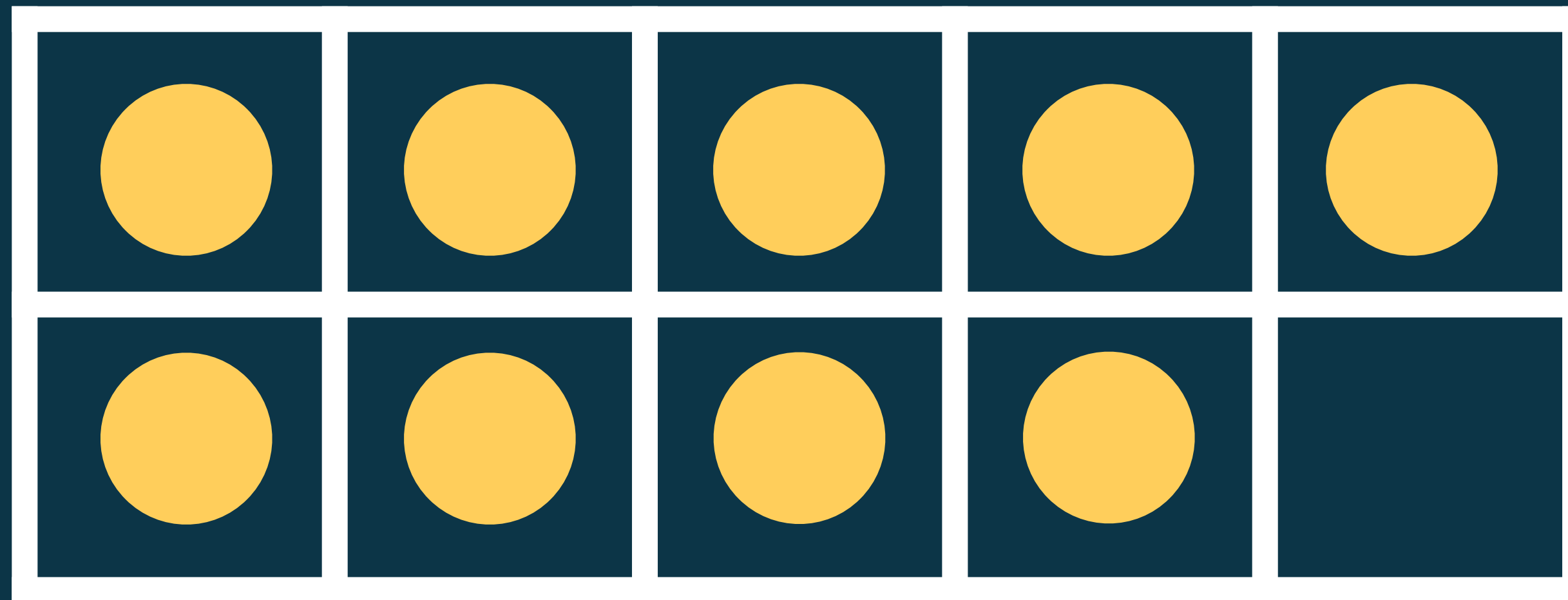
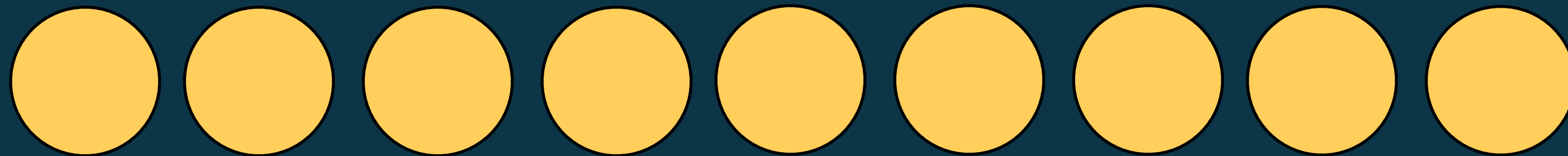
## One Two More & Less



Instantly knowing the amount that is One or Two More & Less

03

# Benchmarks of 5 & 10



Knowing how a number relates to  
5 & 10

04

# Part-Part-Whole

7

$$0 + 7$$

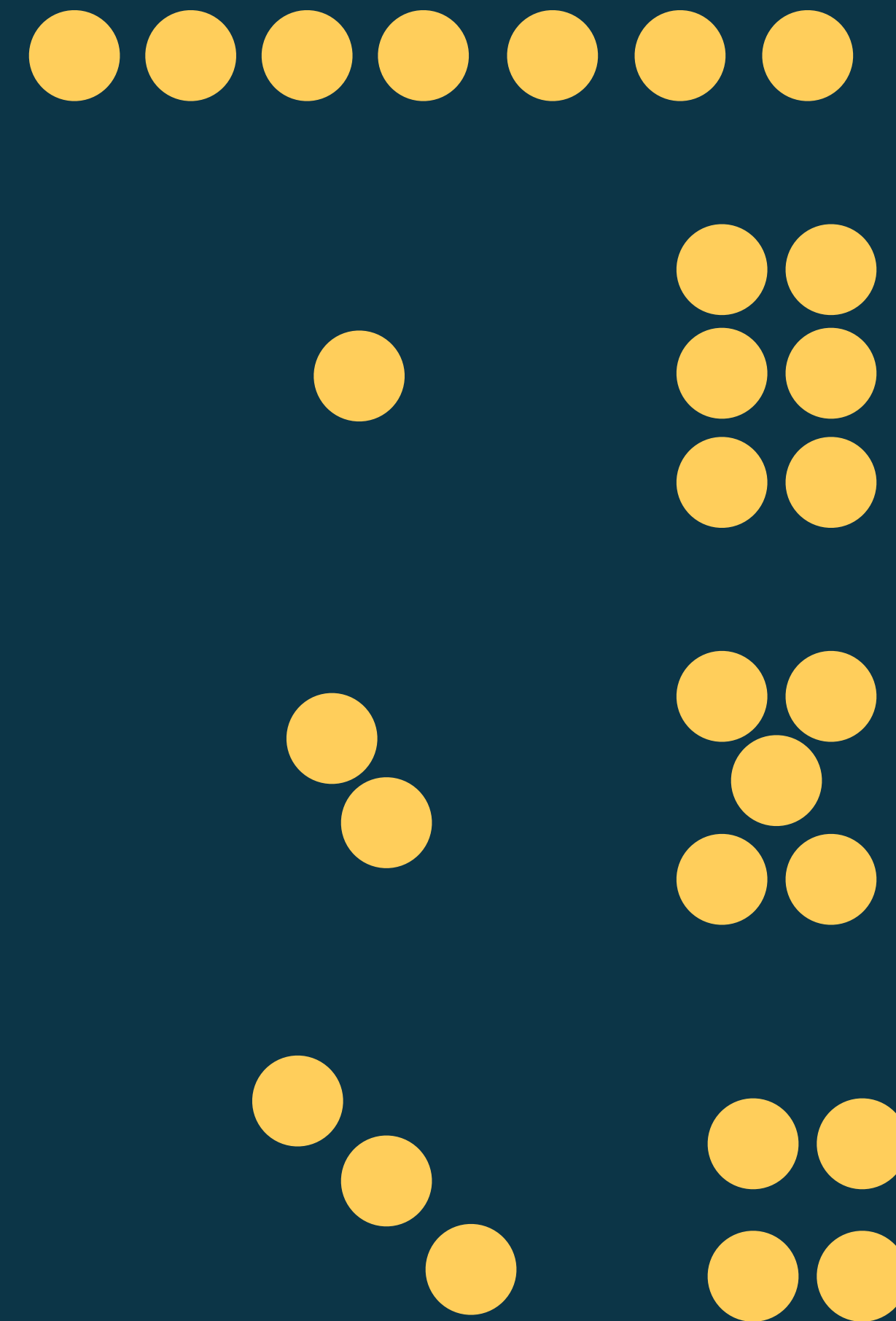
$$1 + 6$$

$$2 + 5$$

$$3 + 4$$

...

Understanding how a Whole can be broken into Parts



# 3 Math Experiences

**1** Systematic Instruction: Provide systematic instruction during intervention to develop student understanding of mathematical ideas.

▼ Show More



STRONG EVIDENCE

TIER

1

STRONG

**2** Mathematical Language: Teach clear and concise mathematical language and support students' use of the language to help students effectively communicate their understanding of mathematical concepts.

▼ Show More



STRONG EVIDENCE

TIER

1

STRONG

**3** Representations: Use a well-chosen set of concrete and semi-concrete representations to support students' learning of mathematical concepts and procedures.

▼ Show More



STRONG EVIDENCE

TIER

1

STRONG

**4** Number Lines: Use the number line to facilitate the learning of mathematical concepts and procedures, build understanding of grade-level material, and prepare students for advanced mathematics.

▼ Show More



STRONG EVIDENCE

TIER

1

STRONG

**5** Word Problems: Provide deliberate instruction on word problems to deepen students' mathematical understanding and support their capacity to apply mathematical ideas.

▼ Show More



STRONG EVIDENCE

TIER

1

STRONG

**6** Timed Activities: Regularly include timed activities as one way to build fluency in mathematics.

▼ Show More



STRONG EVIDENCE

TIER

1

STRONG

Number Routines

Word Problems

Games

# Examples that Combine Measurement & Number Concepts

# PreK-2 Measurement

comparing/sorting

vocabulary/describe

count

ordering

real-life time, money,  
measurements

iterating lengths

data

measuring

# Daily Number Routine

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## How LONG is the number?

- When doing Number of the Day or your Calendar, ask students to predict how long the number will be if you build it with cubes, paper clips, sticky notes, etc.
- Have students use referents like “It will be about the length of my pencil.” Record their predictions.
- Choose a student to build it (with the class counting the amount as it gets built) and then as a class compare the length to their predictions.

# Daily Number Routine

## Situation: Estimation

- Establish benchmark measurements that they can use to help with estimating. Use things like finger width (1cm), thumb width (1 inch), sticky note (3 inches), etc.
- For the daily routine, display a new object to measure. Have student individually estimate using their preferred 'benchmark' measurement. Share their thinking with a partner and revise if wanted.
- Have students share with the group their estimate for each of the benchmark measurements. Then do the actual measurement using each of the 'benchmark' tools.
- Extend this by putting the data into a bar graph poster that displays the length of items. Have a poster for each of the benchmark tools.

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

# Daily Number Routine

Quick Images - Measurements



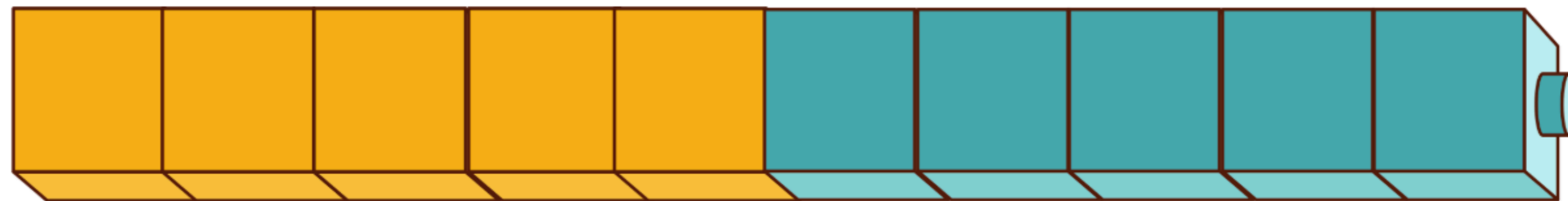
# Daily Number Routine

Quick Images - Measurements



# Daily Number Routine

Quick Images - Measurements



# Daily Number Routine

## Quick Images - Measurements

- Have images that show an object next to some kind of measuring tool. Flash the image for 3 seconds or less
- Once the image is no longer visible, have students write down the measurement, draw what they saw, and/or share with a partner
- Discuss as a whole group to get students describing what they saw and how they determined the measurement
- Show the image again to discuss accuracy and to clarify any misconceptions
- Repeat with more images

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

# Daily Number Routine

Quick Images - Time



# Daily Number Routine

Quick Images - Time



# Daily Number Routine

## Quick Images - Time

- Have images that show times on analog clock (on the hour, quarter or half hour). Flash one image for 3 seconds or less
- Once the image is no longer visible, have students write down the time, draw what they saw, and/or share with a partner
- Discuss as a whole group to get students describing what they saw and how they determined the time shown
- Show the image again to discuss accuracy and to clarify any misconceptions
- Repeat with more images

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

# Daily Number Routine

Quick Images - Money



# Daily Number Routine

Quick Images - Money



# Daily Number Routine

## Quick Images - Money

- Have images that show coins arranged in subitiz-able visuals. Flash one image for 3 seconds or less
- Once the image is no longer visible, have students write down the amount, draw what they saw, and/or share with a partner
- Discuss as a whole group to get students describing what they saw and how they determined the amount of the coins
- Show the image again to discuss accuracy and to clarify any misconceptions
- Repeat with more images

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

# Daily Number Routine

## Slow Reveal Graphs

- Take any graph and hide all the labels and numbers
- Ask your students to share what they notice & wonder about the graph
- Slowly reveal the labels and numbers by showing one 'layer' of the graph (axis label, data points, title, etc)
- As you reveal each new layer of information, lead a discussion with your class about what they now think about the graph
- Once all information is shown on the graph you can ask them questions about the data in the graph

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

<https://slowrevealgraphs.com/>

# Word Problems

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Comparison problems

-Contextual problems comparing lengths, money, or time.

	Difference Unknown	Bigger Unknown	Smaller Unknown
<b>Compare</b>	<p><i>(more version)</i> The red tower is 7 blocks tall. The blue tower is 10 blocks tall. How much taller is the blue tower?</p> <p><i>(fewer version)</i> The red tower is 7 blocks tall. The blue tower is 10 blocks tall. How much shorter is the red tower?</p>	<p><i>(more version)</i> Chris starts school at 7:45am. Ciera starts school a half hour later. What time does Ciera start school?</p> <p><i>(fewer version)</i> Chris starts school at 7:45am. That's a half hour earlier than when Ciera starts. What time does Ciera start school?</p>	<p><i>(more version)</i> The yellow ribbon is 43 inches long. The yellow is 10 inches longer than the green ribbon. How long is the green ribbon?</p> <p><i>(fewer version)</i> The yellow ribbon is 43 inches long. The green ribbon is 10 inches shorter. How long is the green ribbon?</p>

# Word Problems

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Comparison problems

-Contextual problems comparing lengths, money, or time.

### Compare

#### Difference Unknown

*Measurement Example:* John sawed off 6 inches of a board to make a shelf, but decided that was too small. So he cut one that was 5 times longer. How long was the new board?

#### Bigger Unknown

*Measurement Example:* John sawed off a board to make a shelf, but decided that it was too small. So he cut one 30 inches and that was 5 times longer than the first one. How long was the first board cut?

#### Smaller Unknown

*Measurement Example:* John sawed off 6 inches of a board to make a shelf, but decided that was too small. So he cut one 30 inches. How many times as long is the new board than the first one?

# Word Problems

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Part-Part-Whole problems

-Contextual problems where two (or more) parts make the 'whole'.

Put Together/ Take Apart (Part-Part-Whole)	Total Unknown	Addend Unknown	Both Addends Unknown
	Cam and Cal worked together to measure the width of the classroom by each starting on opposite sides. Cam got out to 17'7" when he met Cal. Cal's measurement was 14'6". How wide is the room?	Jax exercised for 1 hour 15 minutes. He lifted weights for 45 minutes and the rest of the time he spent on the treadmill. How long was he on the treadmill?	John has some red blocks and some blue blocks in his tower of 10 blocks. How many of each color could he have in his tower?

# Word Problems

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Data Collection problems

-Contextual problems based off a graph your students have investigated.

# Games

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Measurement Scavenger Hunt

- Students go around the room to find objects of certain lengths, mass, or volume. Can be done in groups instead of individually.
- You can give them measurement tools to start or you can have them estimate and then when they get all items they can measure to see if they are correct.
- Categories can be specific (find something 11 inches) or more broad (items smaller than 6 inches).

# Games

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Race to \_\_\_\_\_

- Players roll dice to build towers or lengths, to try to be the first to the designated measurement. First player to reach the target height/length wins.
- In RACE TO 10, partners take turns rolling dice and they build a tower of blocks with how many they roll on the dice. The first player to get 10 in their tower wins.
- In RACE TO 1 FOOT, each player has a ruler (or other measuring tool) and paper clips. On their turn they lay out how many they rolled of the paper clips and each turn they add to their length of clips until one person gets their length of paper clips to the foot mark.

# Games

vocabulary/describe  
comparing/sorting  
count  
ordering  
iterating lengths  
time & money  
data  
measuring

## Estimation Challenge

- Teacher shows any object to the whole class and gives them a measuring item they will be using for that object.
  - Example: Teacher holds up a math textbook and tells the class they will be using dice to measure the width.
  - Students work in small groups to estimate how many of the measuring item the object's length (or width) is.
  - Teacher records the groups guesses on the board.
  - Groups work to measure the object to see the actual number it takes.
  - Compare estimates to actual.
- \*can use standard measurement units (inches, cm, etc) if students are ready for that*

# PreK-2 Measurement

SUBITIZING

vocabulary/describe

comparing/sorting

OBJECT COUNTING & CARDINALITY  
count

ordering

VERBAL  
COUNTING

SPATIAL REASONING

iterating lengths

ONE/TWO MORE & LESS

real-life time, money,  
measurements

BENCHMARKS

measuring

data

PART-PART-WHOLE

Action Item #1: Include the 3 Types of Experiences

Action Item #2: Keep Focusing on Number, Infuse Measurement

**Math**

**Understanding  
comes through the**

*experiences*

**you provide**