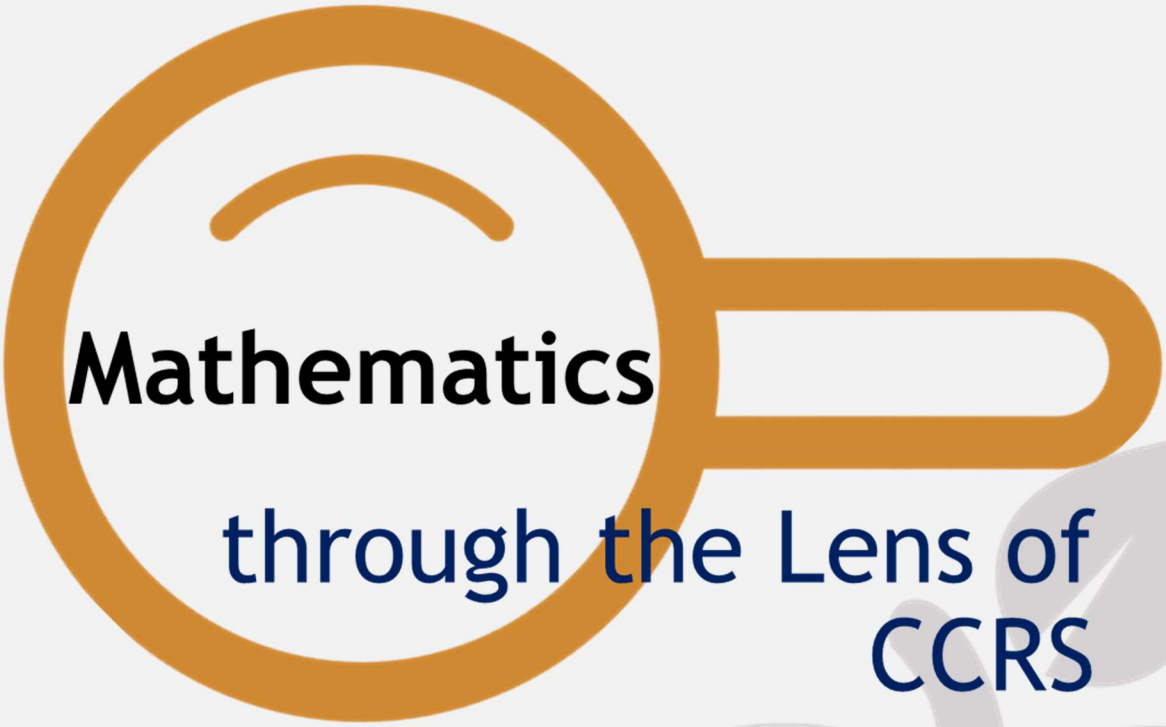


**Webinar**
**February 6, 2019**

**Activity Book**
Institute for the Professional Development of Adult Educators

WEBINAR ACTIVITY BOOK

# Mathematics through the Lens of the College and Career Readiness Standards


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Career and Adult Education, Department of Education

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**Resources Developed and Designed By**
Ronald Cruz



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# Key Shifts in the Standards

1. Focus - Focusing strongly where the standards focus
2. Coherence - Designing learning around coherent progressions level to level
3. Rigor - Pursuing conceptual understanding, procedural skill and fluency, and application —all with equal intensity
    a. Conceptual Understanding
    b. Procedural Fluency
    c. Application

# Standards for Mathematical Practice

1. MP1: Make **sense** of problems and persevere in solving them.
2. MP2: Reason **abstractly** and **quantitatively**.
3. MP3: Construct viable **arguments** and **critique** the reasoning of others.
4. MP4: **Model** with mathematics.
5. MP5: Use appropriate **tools** strategically.
6. MP6: Attend to **precision**.
7. MP7: Look for and make use of **structure**.
8. MP8: Look for and express **regularity** in repeated reasoning.

# Shift 1: Focus

Focusing strongly where the standards focus

Instructors need to:

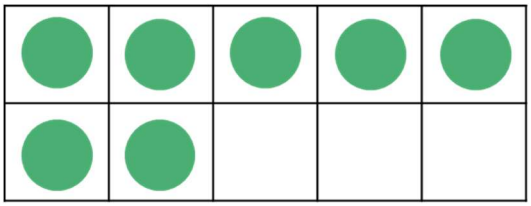
- narrow significantly and to deepen the manner in which they teach mathematics
- focus deeply on the major work of each level
- select priority content which addresses clear understanding

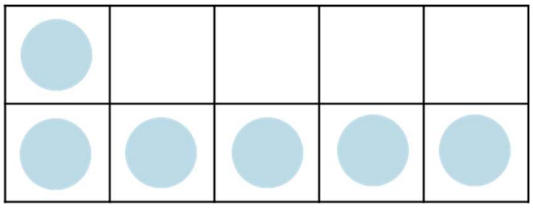
# “Make-a-10” Strategy

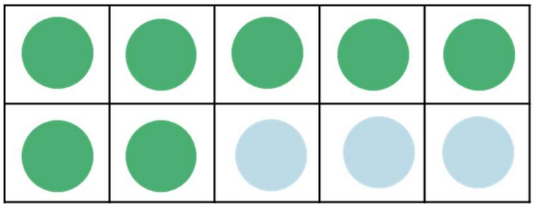
Visually show the addition process using the templates below.

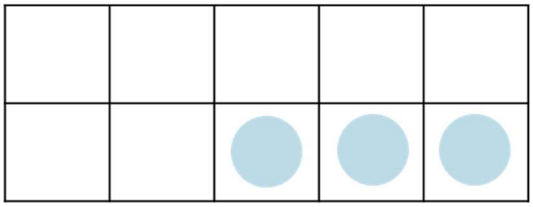
Example:

## 7 + 6



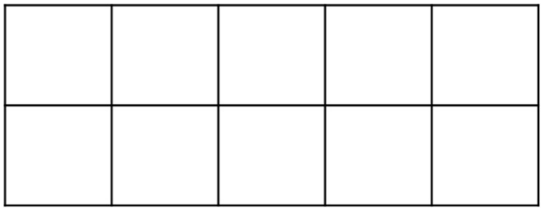


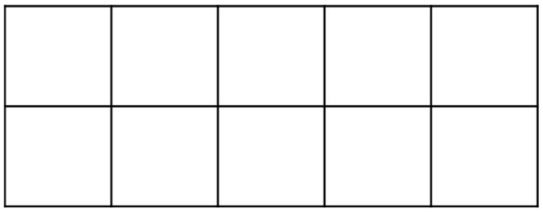


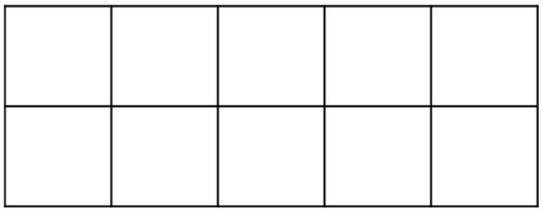


## 9 + 5

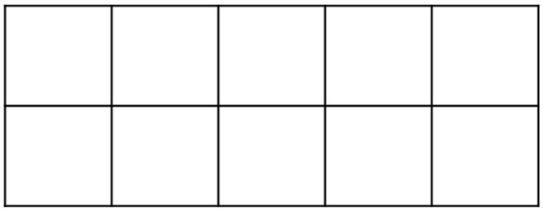
8 + 9

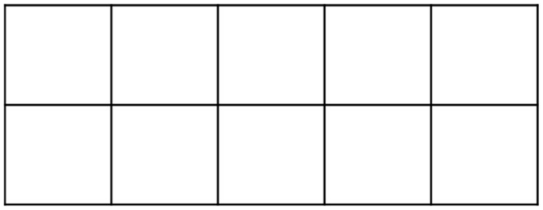


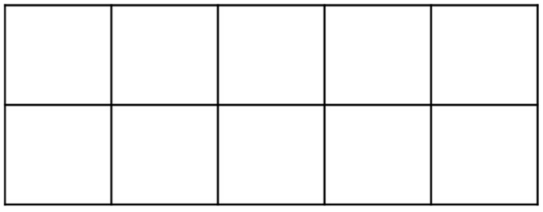




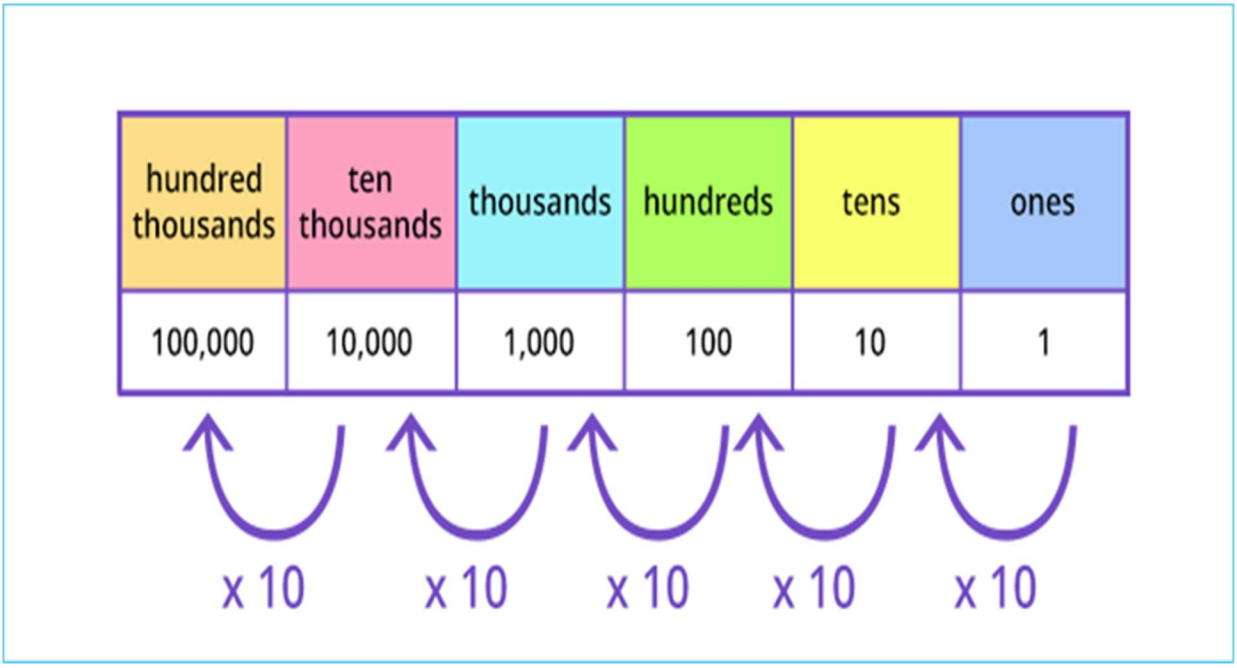
6 + 5



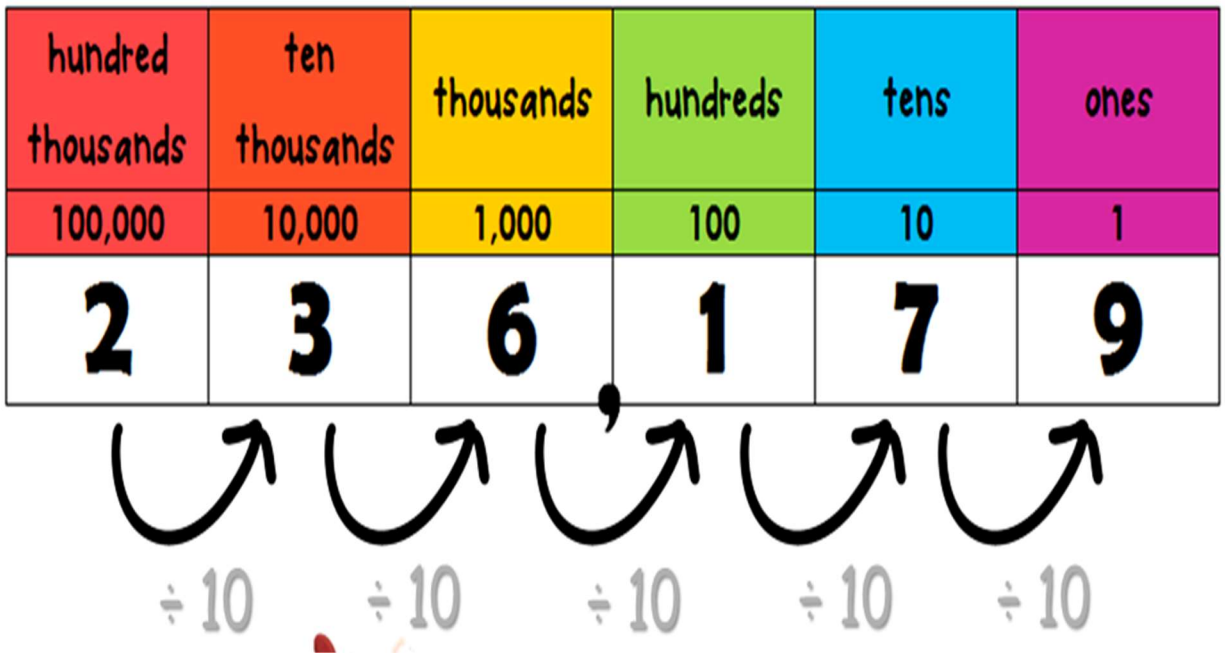




# Place Value Visuals

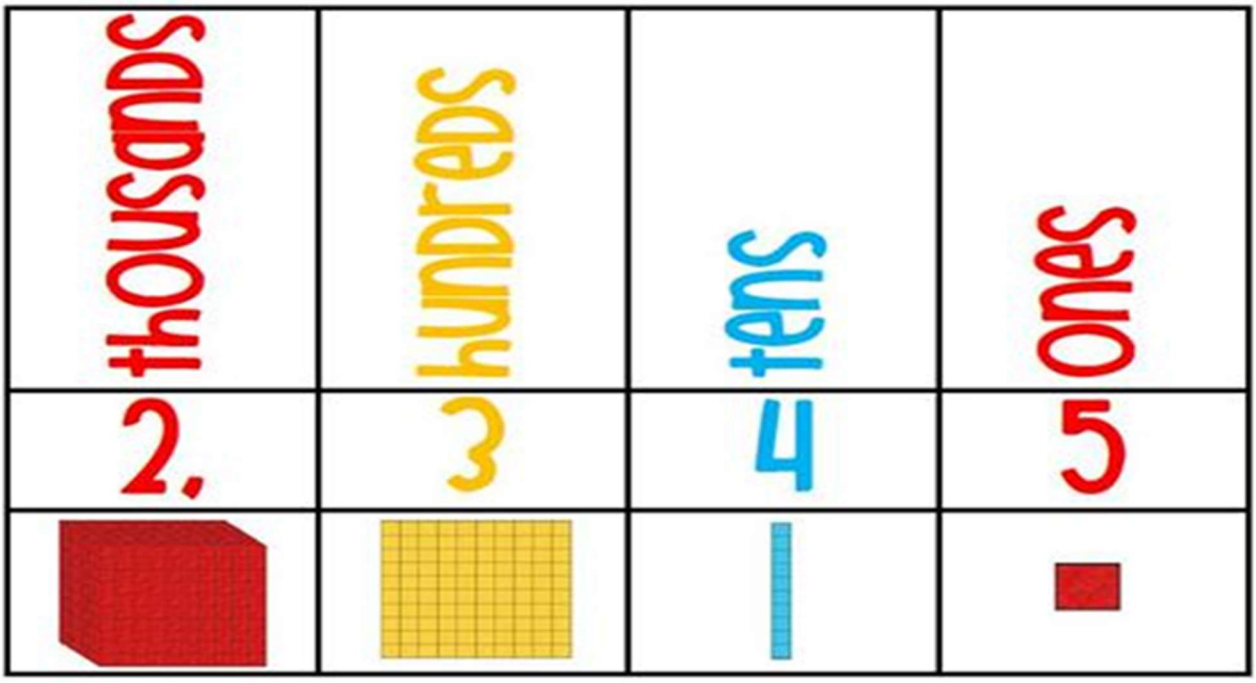



https://www.splashmath.com




https://katyisd.instructure.com/


https://www.youtube.com/




http://langevingradefive.weebly.com/

## Properties of Operations

| Commutative | Associative |
|---|---|
| $5 + 3 = 3 + 5$<br>$24 \cdot 3 = 3 \cdot 24$ | $(5+3)+1 = 5+(3+1)$<br>$(5 \cdot 3) \cdot 1 = 5 \cdot (3 \cdot 1)$ |
| **Identity** / **Inverse** | **Distributive** |
| $7 + 0 = 7$ / $7 - 7 = 0$<br>$2 \cdot 1 = 2$ / $2 \cdot \frac{1}{2} = 1$ | $3(5+2) = (3 \cdot 5)+(3 \cdot 2)$<br>$(8+6) \cdot 4 = (8 \cdot 4)+(6 \cdot 4)$ |

## Shift 2: Coherence

Designing learning around coherent progressions from level to level

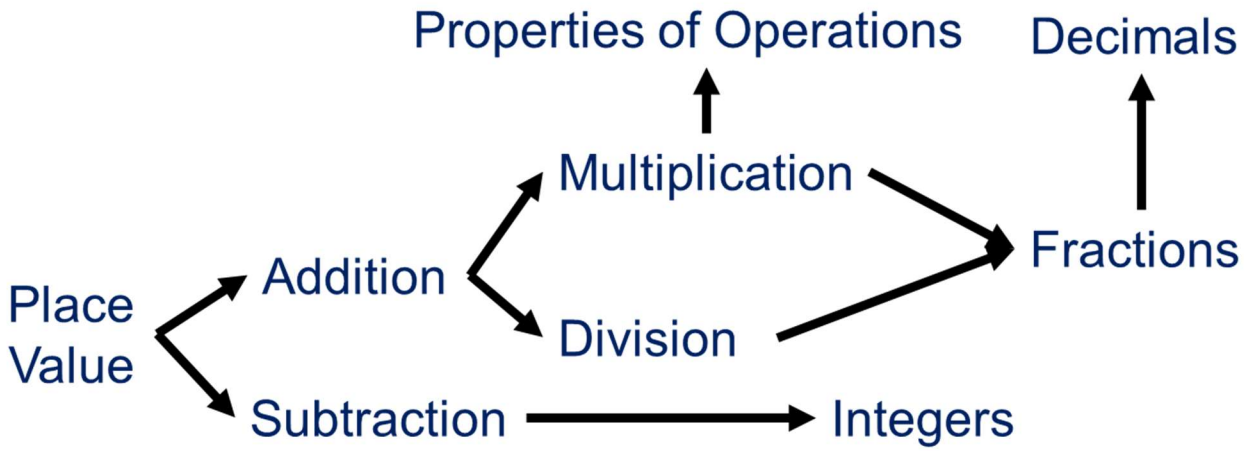
Instructors need to:

- create coherent progressions in the content within and across levels
- establish strong conceptual understanding of core content
- use standards at higher levels as extensions of previous learning rather than signaling a new concept or idea

# Activity: Sequencing Lessons

Instructions:

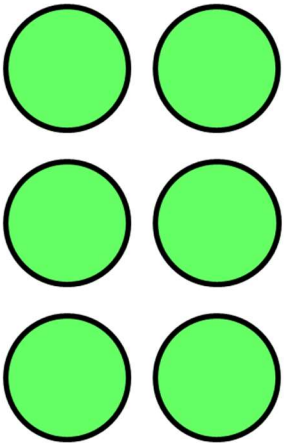
1. Form groups of 5-7 members.
2. Arrange the math lessons in a sequence or a map according to how they should be taught in order. See example below.
3. Be prepared to explain your work.



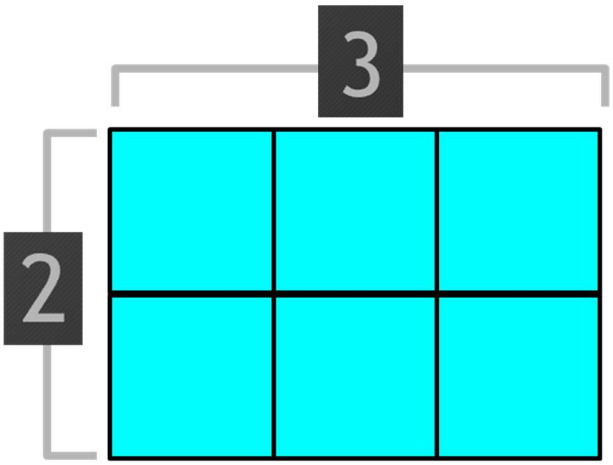

| | |
|---|---|
| Properties and Operations on:<br>• Whole Numbers<br>• Fractions and Decimals<br>• Integers | Write and Evaluate Algebraic Expressions |
| Solve Linear Models | Write, Graph and Solve Linear Equations |
| Solve Perimeter Problems | Solve Area Problems |
| Exponents and Roots | Solve Rational Equations |
| Solve Proportion Problems | Solve Probability Problems |

## Modeling Multiplication as Area

$2 \cdot 3 = 6$

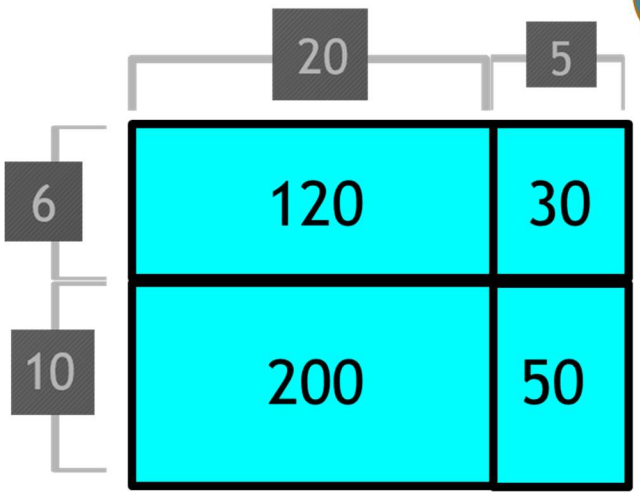


$A = L \cdot W$




## Area Method of Multiplication

$16 \cdot 25 = (10+6) \cdot (20+5) = 400$




$$\begin{array}{r} 120 \\ 200 \\ 30 \\ +\quad 50 \\ \hline 400 \end{array}$$

# Activity: Area Method of Multiplication



| | |
|---|---|
| 1. 32 x 42 = | 5. 19 x 41 = |
| 2. 54 x 28 = | 6. 43 x 42 = |
| 3. 61 x 24 = | 7. 55 x 28 = |
| 4. 17 x 62 = | 8. 65 x 33 = |

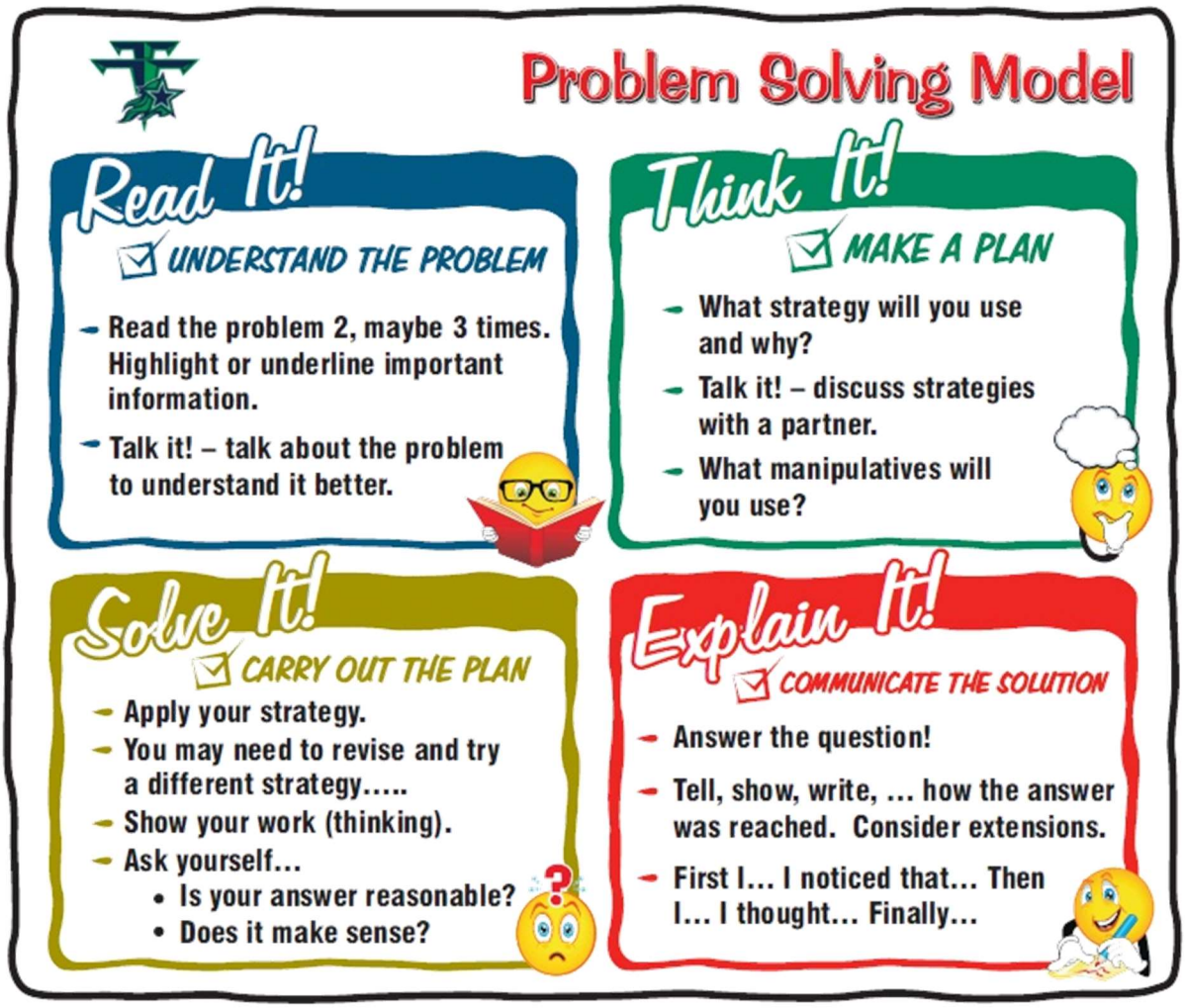
# Shift 3: Rigor

Pursuing conceptual understanding, procedural skill and fluency, and application—all with equal intensity

Instructors need to:

- focus equally on conceptual understanding of key concepts, procedural skill and fluency, and rigorous application of mathematics in real-world contexts.
- show mathematics as more than just a set of procedures
- teach more than just “how to get the answer”
- employ concepts from several perspectives
- demonstrate and develop the use of appropriate concepts and procedures, even when not prompted, and in content areas outside of mathematics

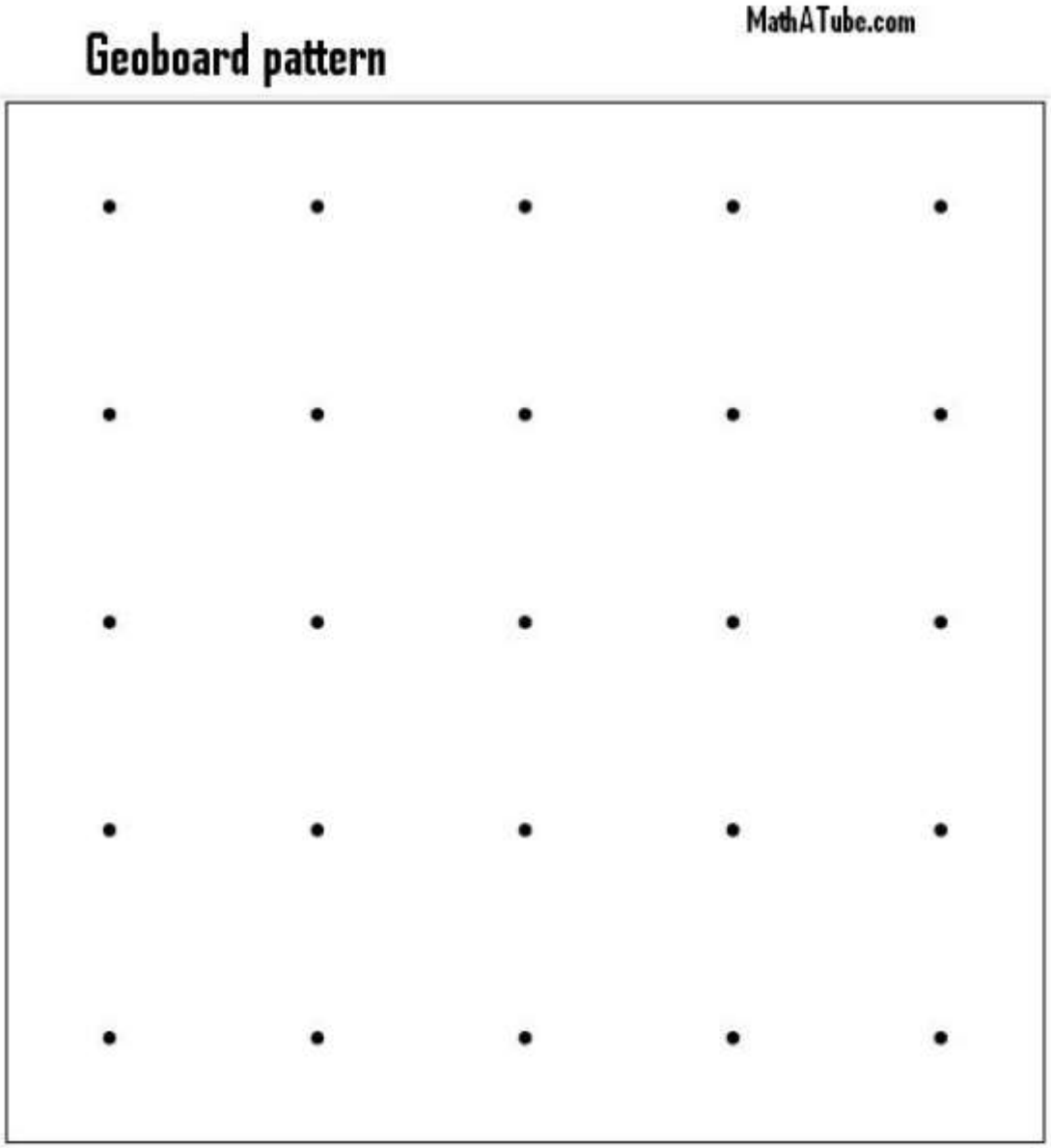
# Steps for Problem Solving




http://broomfield.ultranet.school.nz/ClassSpace/494/

# Multiplying Fractions

A cupcake recipe asks for 3/4  of a cup of butter. Tony wants to make 1/2 of the original recipe. How many cups of butter will Tony need?



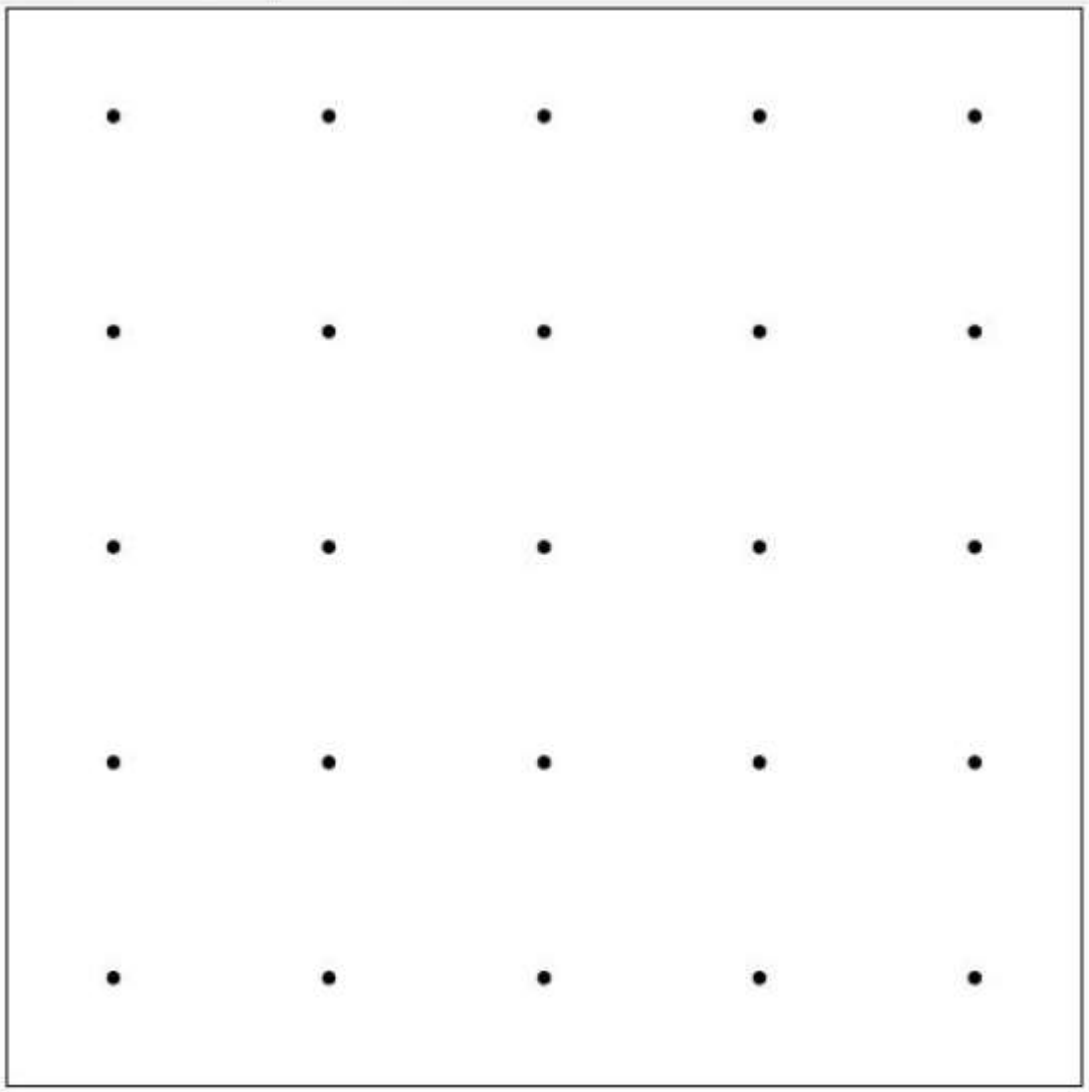
Your Turn

Use the visual method of multiplying fractions to solve:

$$\frac{2}{3} \cdot \frac{1}{4} =$$

MathATube.com

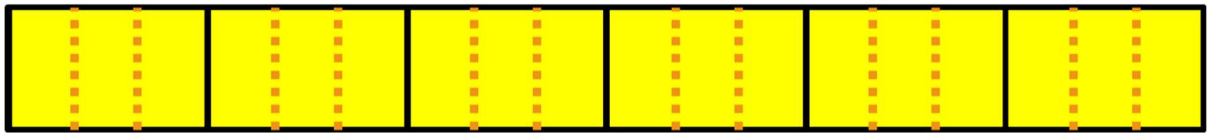
Geoboard pattern



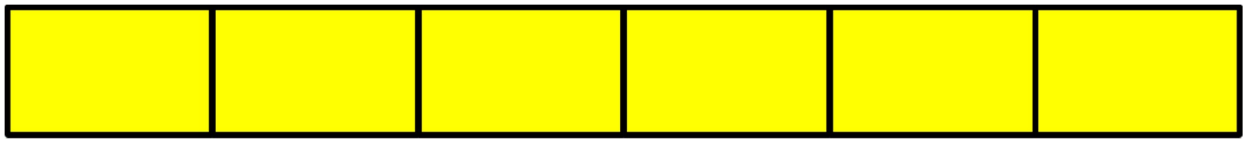
# Dividing Fractions

When building his deck, John needed several decking boards 1/3 ft in length. How many 1/3 ft decking boards can he make by cutting a 6ft decking board sold at a local hardware?

$$6 \div \frac{1}{3} = 6 \cdot \frac{3}{1} = \frac{6}{1} \cdot \frac{3}{1} = \frac{18}{1} = 18$$



A couple of days later, John needed some decking boards 2/3 ft in length. How many 2/3 ft decking boards can he make if he bought the same 6ft decking board sold at the local hardware?



# CCRS Content Matrix

Conceptual Understanding:

- Number and Operations in Base 10
- Operations and Algebraic Thinking
- Expressions and Equations
- Ratios and Proportional Reasoning
- Functions

Procedural Fluency

- Number and Operations in Base 10
- Operations and Algebraic Thinking
- Number and Operations: Fractions
- The Number System

Application of Mathematics

- Measurement and Data
- Geometry
- Expressions and Equations
- Ratios and Proportional Reasoning
- Statistics and Probability

# Standards for Mathematical Practice in Detail

***MP1. Make sense of problems and persevere in solving them.***

- Restating problem in own words
- Looking for entry points in the solution
- Analyze givens, contraints, relationships and goals.
- Analyze different perspectives (representations)
- Monitoring and evaluating progress
- Checking for “reasonableness” of answers.

***MP2. Reason abstractly and quantitatively.***

- Decontextualize – represent a given situation symbolically
- Manipulating equations by knowing and using different properties of operations to find the unknown
- Contextualize – reviewing what variables represent
- Creating a coherent representation of the problem at hand
- Considering the units involved and the meaning of quantities

***MP3. Construct viable arguments and critique the reasoning of others.***

- Understanding and using stated assumptions, definitions, and previously established results in constructing arguments
- Making conjectures and building a logical progression of statements
- Analyzing situations by breaking them into cases, and can recognize and use counterexamples
- Justifying conclusions
- Responding to the arguments of others

***MP4. Model with mathematics.***

- Writing an equation to describe a situation
- Applying proportional reasoning to solve a problem
- Using geometry to represent a problem or a design
- Using a function or a table of values to describe the behavior of a quantity
- Graphing relationships between quantities to get a different perspective towards a solution

***MP5. Use appropriate tools strategically.***

- Considering the available tools when solving a mathematical problem such as pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a statistical package, or dynamic geometry software.
- Deciding about when each tool(s) might be helpful, recognizing can be gained and their limitations.

***MP6. Attend to precision.***

- Communicating precisely to others, using clear definitions
- Stating the meaning of the symbols
- Using the equal sign consistently and appropriately
- Specifying units of measure, and labeling axes
- Expressing numerical answers with a degree of precision appropriate for the problem context

***MP7. Look for and make use of structure.***

- Looking closely to discern a pattern or structure
- Recognizing and applying properties of operations
- Using or identifying a consistent criteria for classfication
- Drawing auxiliary lines to existing geometric figures to solve problems
- Decomposing or chunking equations into recognizable elements
- Identifying the domain and range of a given function

***MP8. Look for and express regularity in repeated reasoning.***

- Noticing if calculations are repeated
- Looking both for general methods, formulas and shortcuts
- Writing an equation to describe a pattern

## Activity: What's My Math Practice?

Instructions:

1. Pair with another person in the audience.
2. Read each situation silently.
3. Discuss with your partner all possible mathematical practice demonstrated in the situation. Use your presentation handouts as a reference.
4. Record your answers in your workbook.

MP1
MP3

*Mario recognized the word "regular polygon" in the problem he is solving. He immediately made the assumption that all the sides and angles of the polygon are equal in measure.*

Identify the mathematical practice(s) being demonstrated in each situation below.

| | |
|---|---|
| | After solving a word problem, Lisa re-read the word problem to make sure that she maintained the units throughout the solution and the final answer. She also made sure that her final answer is in the same unit as outlined in the question. |
| | Sue asked Maria to check her work. Maria saw that Sue had a different method of solution than hers. In order to make sense of Sue's solution Maria reworked the problem by graphing and saw that their answers came up to be the same anyway. |
| | Jim and Susan drew conjectures about the form and meaning of their solution, going back through their solution pathway to make sure that their answer follows the guidelines of the problem. |
| | Clara was working on a problem with a graph of a line through (1, 2) with a slope of 3. She remembered the formula for slope and created the equation $(y - 2)/(x - 1) = 3$. She then used this formula to check if any point (x, y) on the problem falls on the same line. |
| | In Rick's solution, he applied the distributive property and rewrote 7 x 8 as (7 x 5) + (7 x 3). |
| | Sabine was looking at the expression $5 - 3(x - y)^2$. She saw this as 5 minus a positive number times a square. She realized that the value of this expression cannot be more than 5 for any real numbers x and y. |
| | After solving a word problem, Mike considers an analogous problem, and tries a simpler form of the original problem in order to make sure of his solution. |
| | To double-check his answer, James used a graphing calculator. He graphed the two equations and found the intersection of the two graphs was the same as his original answer. |

# Links to Videos

8 Jobs Every Company will be Hiring for by 2020 (Highest Paying jobs of future)

https://www.youtube.com/watch?v=DdXLlJV6kM4

The Digital Skills Gap and the Future of Jobs 2020 - The Fundamental Growth Mindset

https://www.youtube.com/watch?v=Y9FOyoS3Fag

Future of Jobs

https://www.youtube.com/watch?v=-MiHr16Xrsg

How the World of Work is Changing

https://www.youtube.com/watch?v=HYPxrzHJhF8

What will future jobs look like? | Andrew McAfee

https://www.youtube.com/watch?v=cXQrbxD9_Ng

Apple CEO Tim Cook talks Chinese supply chain, censorship and more in interview

https://www.youtube.com/watch?v=gWGDVPzrkkc

The big debate about the future of work, explained

https://www.youtube.com/watch?v=TUmyygCMMGA

Economic Systems & the Labor Market: Crash Course Sociology #29

https://www.youtube.com/watch?v=wslCc0Di978

Place Value to the Tune of “Shake It Off”

https://www.youtube.com/watch?v=t_RCtcqha5U

# Links to Resources

The College and Career Readiness Standards

https://lincs.ed.gov/professional-development/resource-collections/profile-521

Singapore Math: Place Value in Math in Focus

http://storage.cloversites.com/nextgenerationschool/documents/PlaceValue.pdf

Geoboard Web App

https://apps.mathlearningcenter.org/geoboard/

2-digit by 2-digit Multiplication Area Model

https://www.teacherspayteachers.com/Product/2-digit-by-2-digit-multiplication-homework-area-model-1594412

Florida Institute of Professional Development of Adult Educators

http://www.floridaipdae.org

Florida IPDAE: ABE Math Curriculum Matrix Webinar Part 1

https://www.youtube.com/watch?v=hKs-obd0ufI

Florida IPDAE: ABE Math Curriculum Matrix Webinar Part 2

https://www.youtube.com/watch?v=gZ1MEKVppZY

## 3 – 2 – 1 Takeaways

| Write 3 things that you learned today. |
| --- |
| |
| Write 2 things you plan to do upon your return to your classroom. |
| |
| Write 1 question you may still have about this workshop. |
| |

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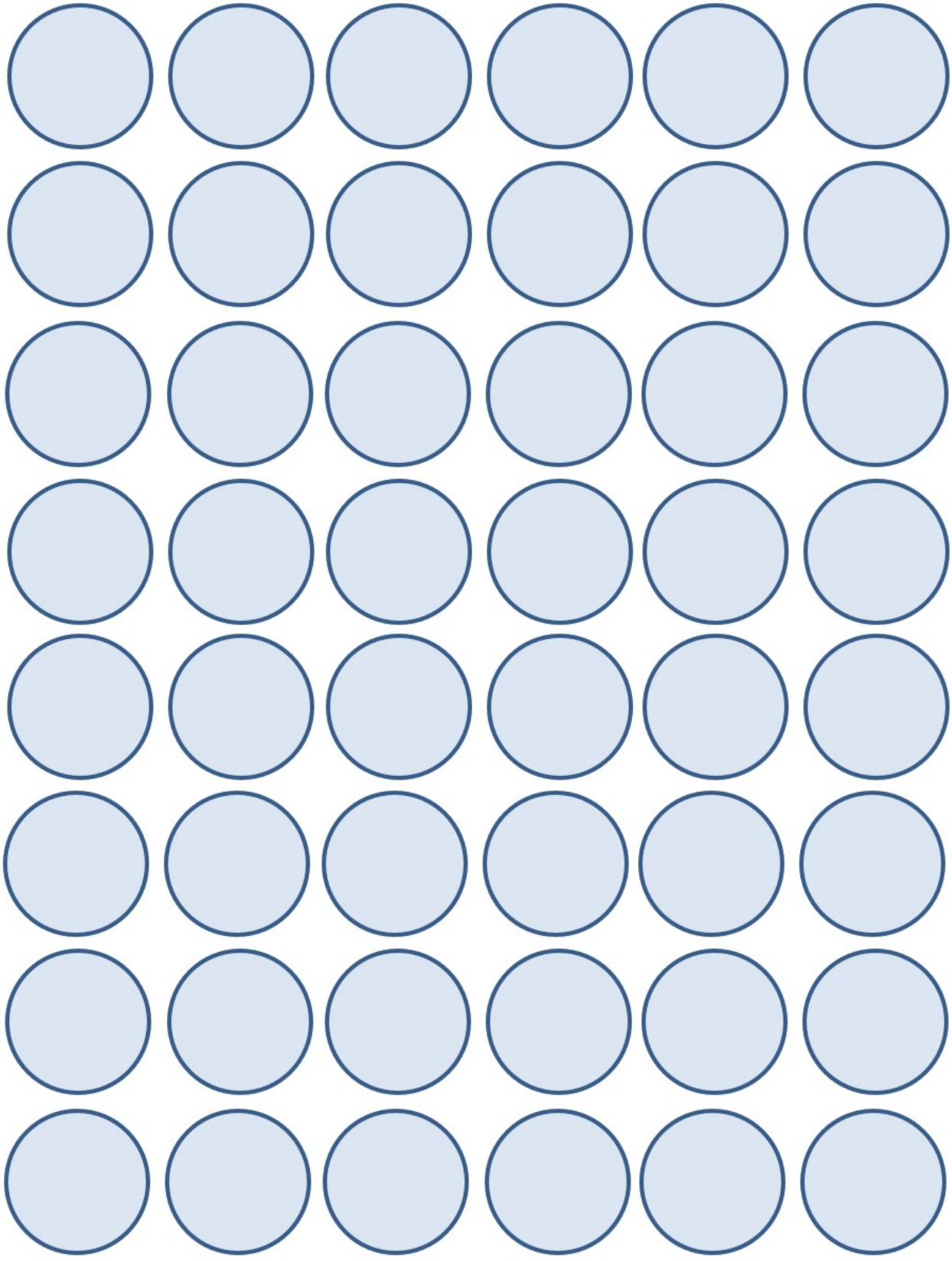
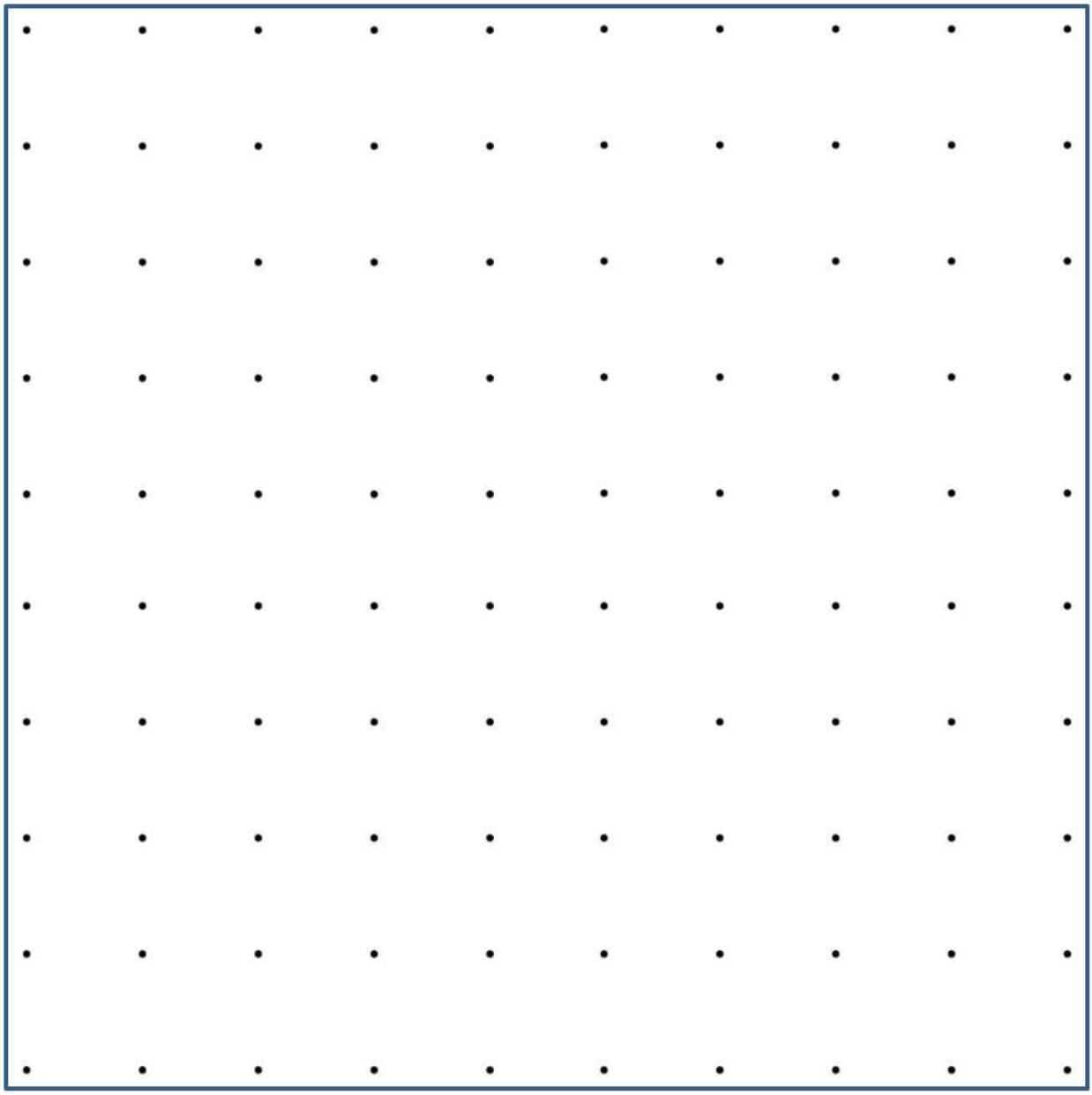
# Counters Template



# Geoboard Template (10 x 10)



Name: _____

Group: _____