K-8 Mathematics Curriculum Sub-Committee 2.9.22
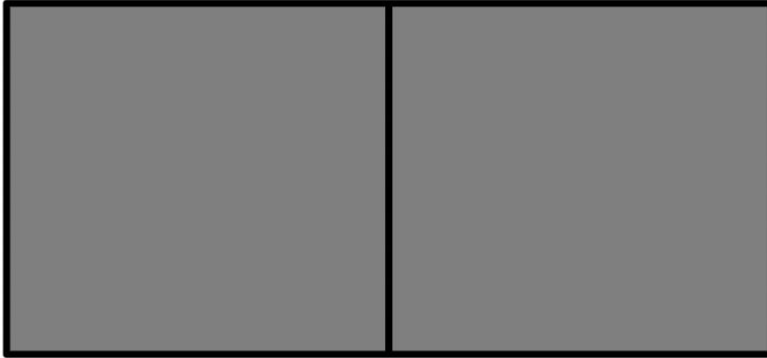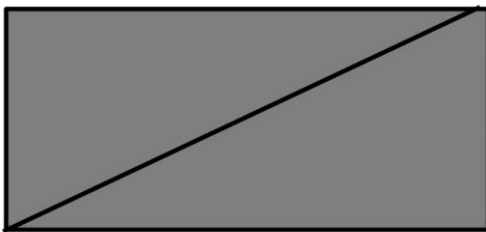
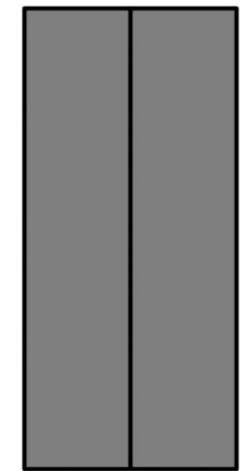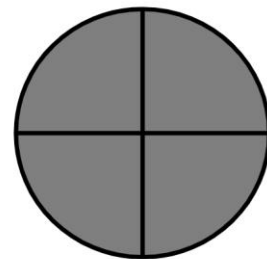Matthew Rosenthal, Ed.D.

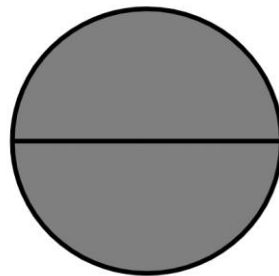# Objectives

- Provide an update on the mathematics program K-8 based on recommendations from Program Review
- Highlight work from students, teachers, and math specialists in program implementation
- Connect what is taking place in and out of classrooms to broader district themes (equity, inclusion, SEL, PD)
- Provide a pathway for future growth and development

Grade 2 - Quick Images Routine

Strips and Singles	Tens and Ones	Equation
6 singles	4 tens 6 ones	40 + 6 = 46
16 singles	3 tens 16 ones	30 + 16 = 46
singles	2 tens 26 ones	20 + 26 = 46
singles	1 ten 36 ones	10 + 36 = 46
ngles	0 tens	46

Flag	Number of Equal parts	Name of parts	Fraction
	2	halves	one half $\frac{1}{2}$
	3	thirds	one third $\frac{1}{3}$
	4	fourths	one fourth $\frac{1}{4}$
	3	thirds	two thirds $\frac{2}{3}$

Classroom Routines (Grades K,1,2) & Ten-Minute Math (Grades 3,4,5)

- Ideally used outside of math time or as a pre-lesson warm-up
- Offers ongoing skill-building, practice, review
- Reinforces previous concepts
- Helps students increase repertoire of strategies for mental computation and problem solving

What has led up to this...

Shifts in Mathematics Teaching and Learning

Stating a standard → Communicating expectations for learning

Routine tasks → Reasoning tasks

Teaching about representations → Teaching through representations

Show-and-tell → Share-and-compare

Questions that seek expected answers → Questions that illuminate & deepen understanding

Teaching so that students replicate procedures → Teaching so that students select strategies

Mathematics-made-easy → Mathematics takes time

Looking at correct answers → Looking for students' thinking

McGatha, M., Bay-Williams, J., Kobett, B., & Wray, J. (2018). *Everything you need for mathematics coaching: Tools, plans, and a process that works: Grades K-12*. Corwin.

Math Program Review Process

Phase IV

Review

Phase I

**Study and Vision
(January 2018 - April 2019)**

**Continuous
Cycle of
Improvement**

Phase III

**Implement
(summer 2020 - present)**

Phase II

**Plan
(April 2019 - June 2020)**
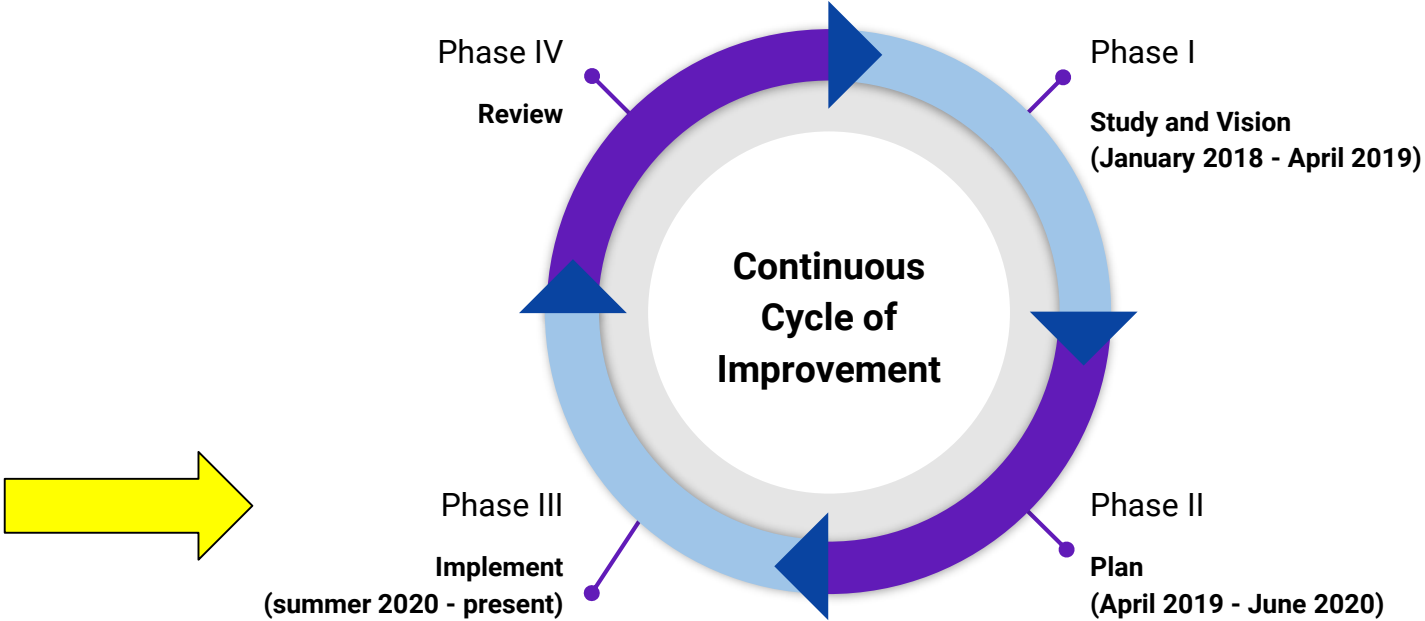
PSB PK-8 Mathematics Vision Statement

The vision for PK-8 mathematics education in the Public Schools of Brookline is to nurture a comprehensive mathematical identity in all of our students, helping them to <u>see themselves as capable mathematicians</u>. Students learn challenging and relevant mathematics through the development of conceptual understanding, procedural fluency, and application. Our heterogeneously grouped classrooms are set up as creative, collaborative, joyful, <u>student-centered learning spaces</u>. Students are active team members who engage in mathematical discussions, solve real life and theoretical problems, and use mathematics effectively in a diverse and evolving global society.
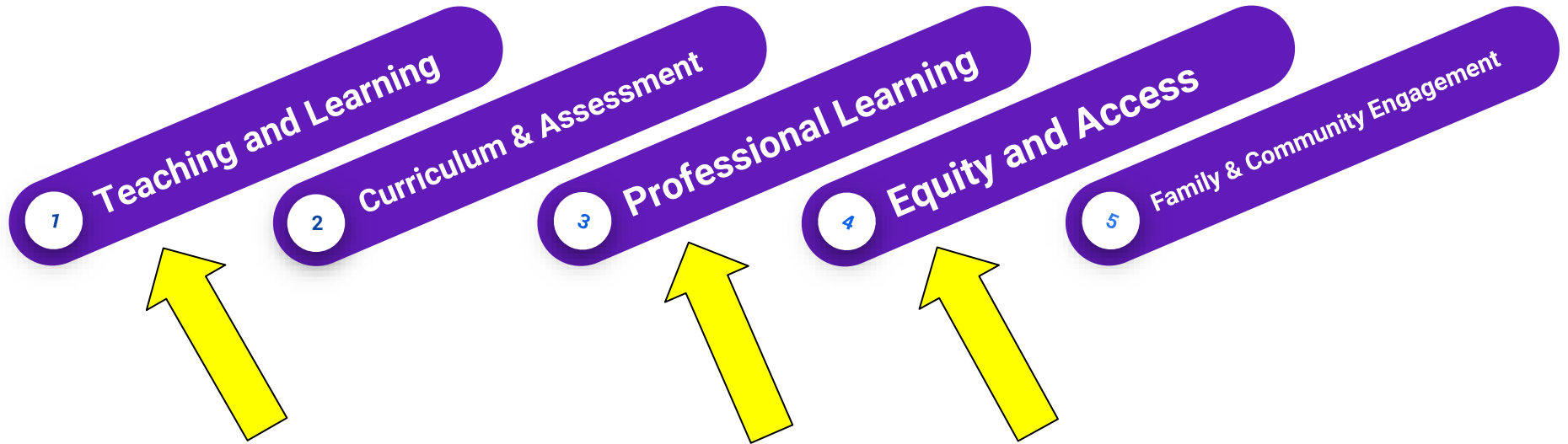
The Public Schools of Brookline believe that...

- Our PK-8 students' academic success in mathematics must not be predicated on race, ethnicity, gender, socioeconomic status, language, religion, sexual orientation, cultural affiliation, or disability status.

- All students can benefit when working collaboratively on mathematics in heterogeneously grouped classrooms.

- At every grade level, all constituents within the Public Schools of Brookline community must act on the belief that each child can and will learn challenging and relevant mathematics.

- Math competency requires the development of conceptual understanding, procedural fluency, and application, and we recognize the importance of all three areas.

- Families, educators and community members are partners in our students' mathematical development.
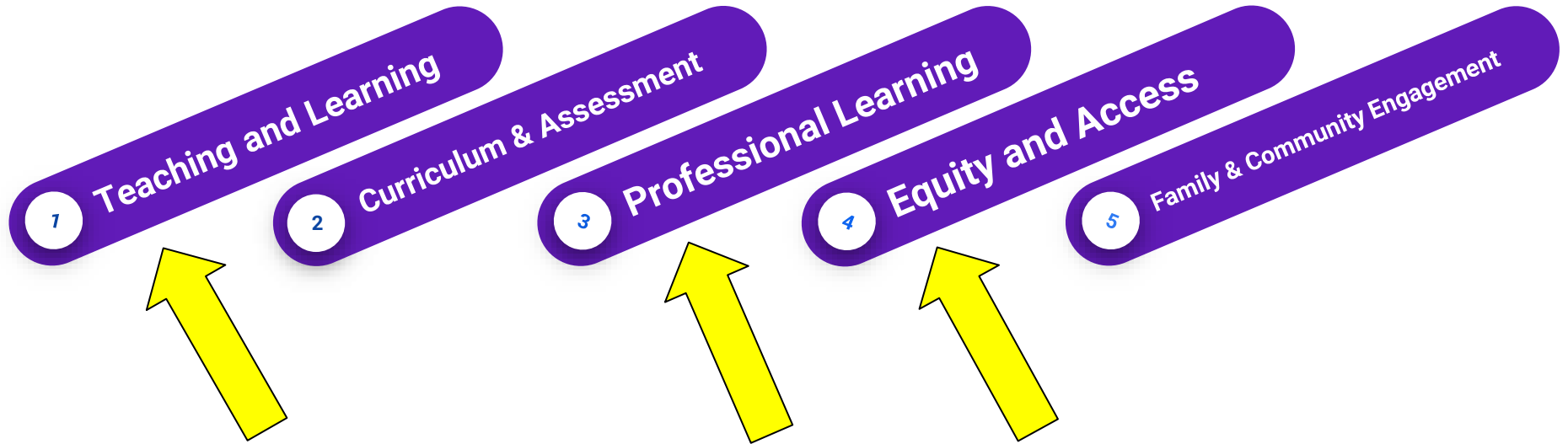
Our commitment to our students, teachers, families, and community is...

- To clearly communicate math curriculum content expectations to educators, students, and families.

- To use curricula that consists of <u>coherent units of instruction, emphasizing understanding of major mathematical ideas that deepen over multiple grade levels using consistent language, models, and tools throughout</u>.

- To recognize our students demonstrate understanding in a variety of ways, and to use a variety of both formal and informal methods to assess understanding and growth in <u>both content and mathematical practices</u>.

- To value students' varied identities and strengths.

- To provide a clear framework for support and extension in mathematics.

- To develop and support a community of educators who hold themselves accountable and support one another in effective teaching and learning to advance the mathematical growth of each student.

PSB K-8 Math Department Strategic Priorities

1 Teaching and Learning

2 Curriculum & Assessment

3 Professional Learning

4 Equity and Access

5 Family & Community Engagement

PSB K-8 Math Department Strategic Priorities + Investigations Guiding Principles

1. Teaching and Learning
2. Curriculum & Assessment
3. Professional Learning
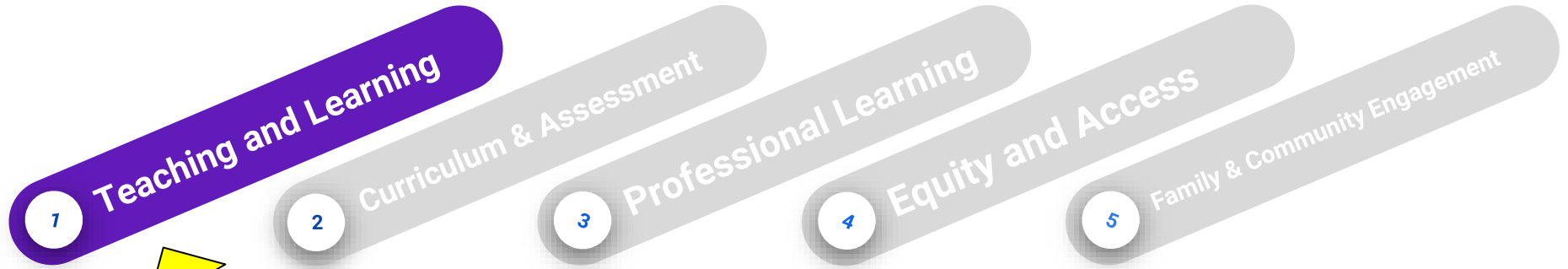4. Equity and Access
5. Family & Community Engagement

Teachers collaborate with the students and curriculum materials to observe, listen carefully, try to understand what students are thinking, make decisions.

Teachers are engaged in ongoing learning about mathematics content, pedagogy, and student learning.

All students have mathematical ideas. If the environment stresses making sense of mathematics, students build on the ideas they already have and learn about new math they have never encountered.

PSB K-8 Math Department Strategic Priorities

1. Teaching and Learning
2. Curriculum & Assessment
3. Professional Learning
4. Equity and Access
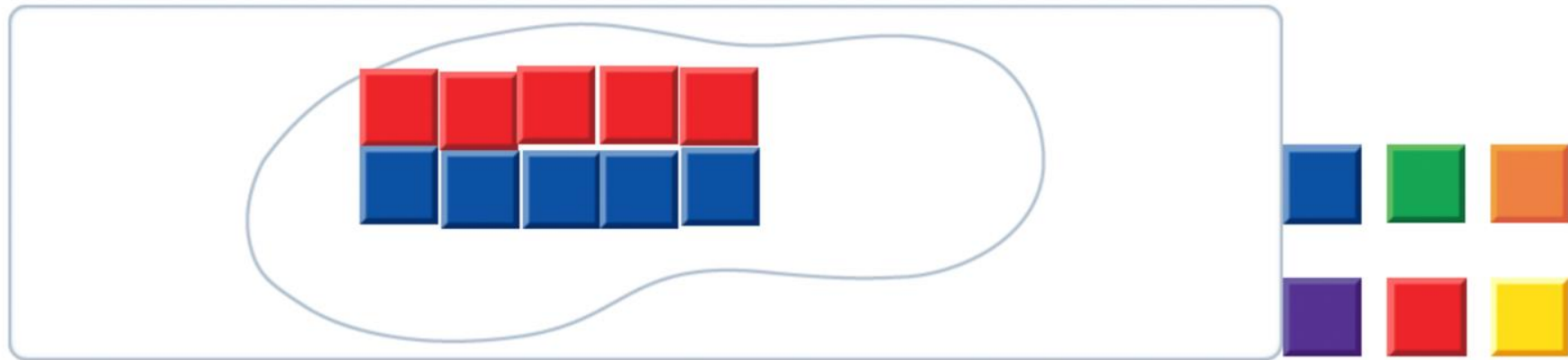5. Family & Community Engagement

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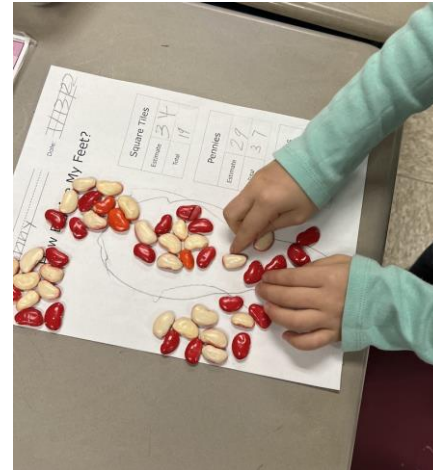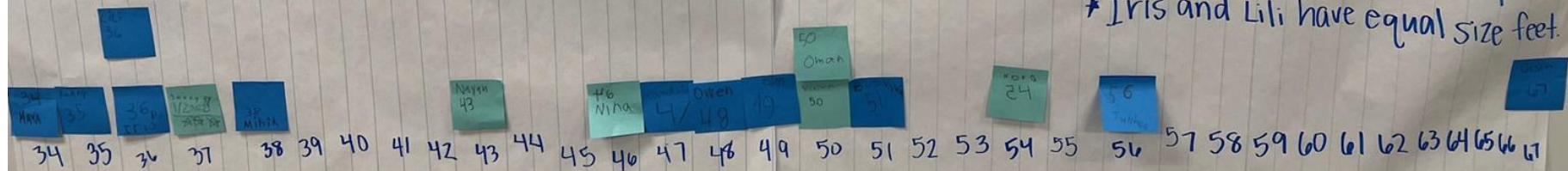
Grade 1

Extension
Describe a relationship

Can you use Problem 1 to solve/help with Problem 2? How are the problems related?

How Many Pennies Cover A Footprint?

* Oisin used the most. (67)
* Maya has the smallest foot (3)
* 67 > 34
* Omar and Vivian both used 50 pennies.
* Only Bushrah had 51 pennies
* Iris and Lili have equal size feet.

34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67
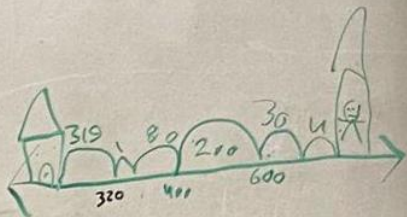
Grade 4

Grade 4

Subtraction Word Problems

Draw a picture or number line to show what is happening in each story. Then solve each problem and show your solution.

1 Jamie's family visited their grandmother, who lives 634 miles from their house. On the first day, they drov[e] 319 miles. How many miles did they have left to drive the second day?
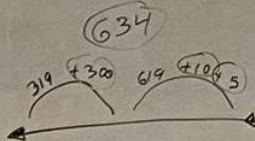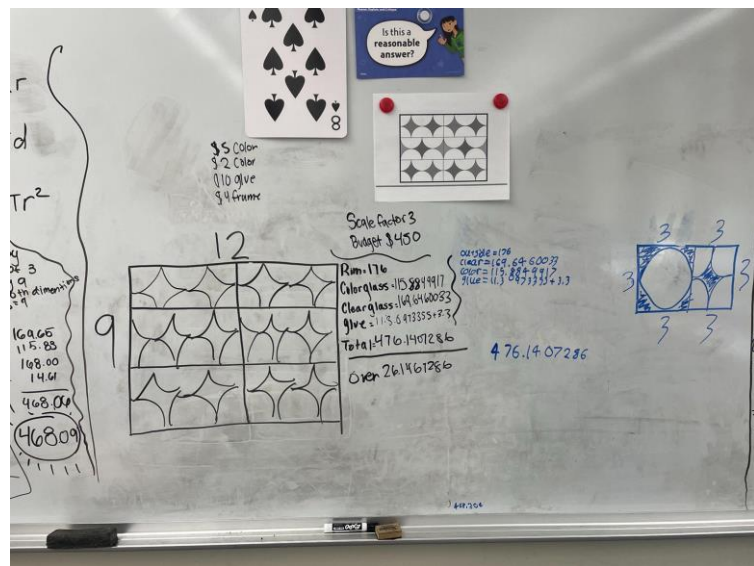
Grade 8

**Desmos
Grades 6-8**
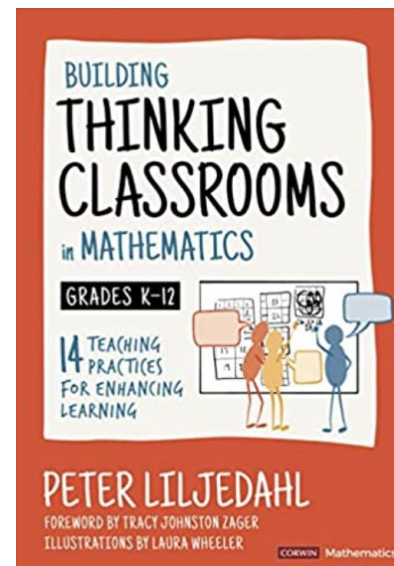
Role of the Teacher
Mathematics Teaching Practices (MTPs)

- Establish mathematics goals to focus learning
- Implement tasks that promote reasoning and problem solving
- Use and connect mathematical representations
- Facilitate meaningful mathematical discourse
- Pose purposeful questions
- Build procedural fluency from conceptual understanding
- Support productive struggle in learning mathematics
- Elicit and use evidence of student thinking

Role of the Student
Standards for Mathematical Practice (SMPs)

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure
- Look for and express regularity in repeated reasoning

Measures of Effectiveness

Priority 1 - Teaching and Learning

- All K-8 classrooms use a common math curriculum as the foundation for instruction
- [Effective Math Teaching Practices](#) are observed across all K-8 classrooms
- Students regularly engage with content through the [Standards of Mathematical Practice](#)

PSB K-8 Math Department Strategic Priorities
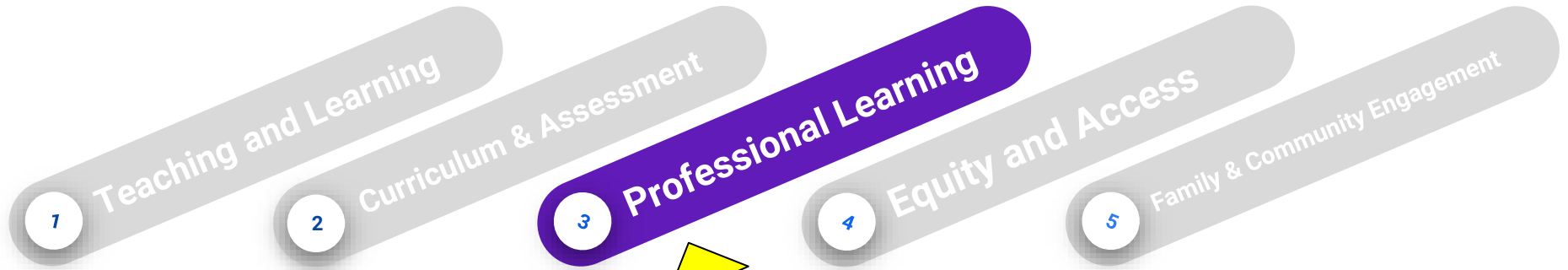
1. Teaching and Learning

2. Curriculum & Assessment

3. Professional Learning

4. Equity and Access

5. Family & Community Engagement

Teachers are engaged in ongoing learning about mathematics content, pedagogy, and student learning.
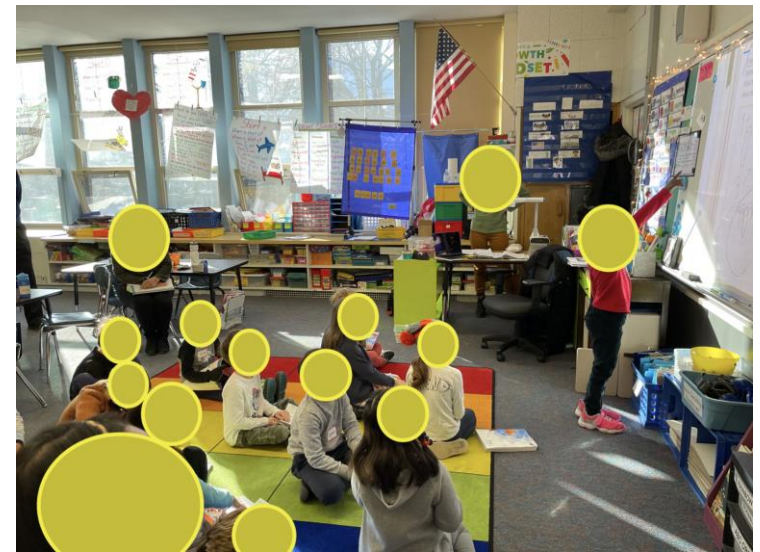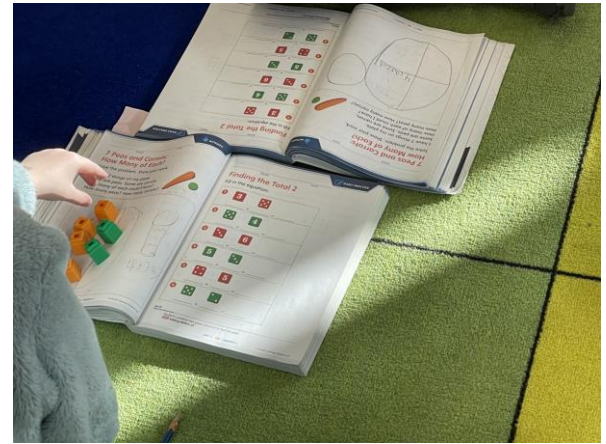
Lesson Study

A major goal for <mark>K-5 math specialists</mark> is to support the effective implementation of the Investigations curriculum and instructional routines that are embedded in the program. As a department we are providing a variety of different approaches to strengthen student learning.

The support from math specialists could include:

- Co-planning or co-teaching lessons
- Modeling lessons to highlight equitable teaching practices
- Working in the classroom with small groups of students or stations
- Providing curriculum-related resources
- Supporting assessment and analysis of student learning
- Supporting the planning and implementation of differentiated instruction
- Facilitating professional development experiences
- Providing direct support to students

PD Experiences for Investigations (prior to this year)

- Virtual 2-day institute (TERC) - summer 2020
- Virtual 7-week summer course (TERC) - summer 2020
- Virtual workshops for math specialists (TERC) - 10+ hours 2020-21 school year
- Savvas Realize webinar - summer 2020 and ongoing
- Virtual grade-level workshops for soon-to-be users (TERC) - spring 2021
- Virtual workshop on differentiation for 1-year users (TERC) - spring 2021
- Virtual 2-day institute for beginning users (TERC) - summer 2021
- Virtual 2-day institute for second-year users (TERC) - summer 2021

PD Experiences for Investigations (this year)

- In-person Lesson Studies (TERC)
- In-person Lesson Studies (Math Specialists)
- District workshops on Differentiation (Math Specialists)
- District/school workshops on Unit/Lesson Planning (Math Specialists)
- Ongoing support from Math Specialists
- Upcoming workshops for Special Educators and Paraprofessionals

Measures of Effectiveness

Priority 3 - Professional Learning

- Access to relevant professional learning opportunities in content, pedagogy, curriculum implementation, and meeting diverse student needs
- Formalized opportunities for math specialists, teachers, and special educators to learn together and collaborate
- Culture of and commitment to ongoing job-embedded professional growth through coaching, collaboration, and shared practice

Challenges

- Scarcity of substitutes to cover for teachers
- Limited time for professional development
- Pandemic
- Contract

PSB K-8 Math Department
Strategic Priorities

1 Teaching and Learning

2 Curriculum & Assessment

3 Professional Learning

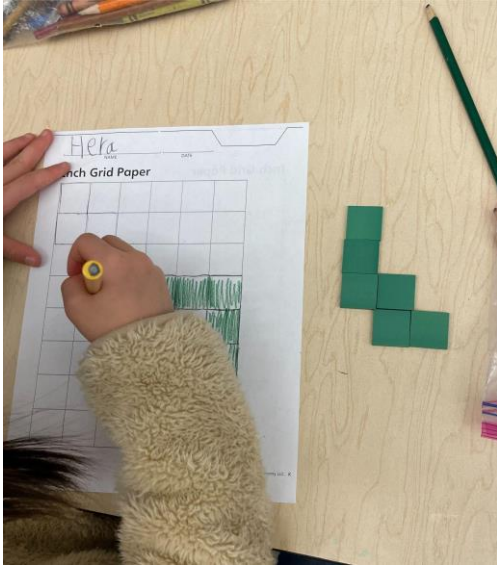**4** Equity and Access

5 Family & Community Engagement

SFUSD: "Every student is seen as mathematically brilliant."

All students have mathematical ideas. If the environment stresses making sense of mathematics, students build on the ideas they already have and learn about new math they have never encountered.
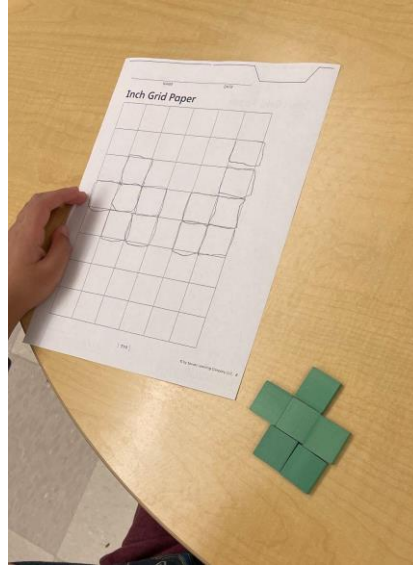
Kindergarten - Arrangements of 6

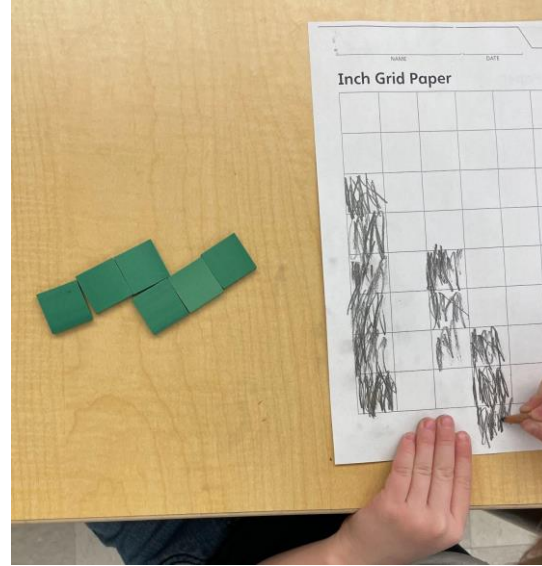1 + 1 + 2 + 2 = 6

1 + 3 + 2 = 6

3 + 3 = 6

Grade 8

Results

Here are your results from this practice set.

*Includes work Desmos could not evaluate.

Select a question to answer:

○ Describe a mistake you made when completing this practice. What did you learn from the mistake?

○ What questions do you still have about this practice?

● Which problem are you most proud of and why?

I am proud of the graphing problems because I understand graphs better

✎ Edit my response

Problem	Feedback
1.1	Correct
1.2	Correct
1.3	Correct
1.4	Correct
2	Correct
3.1	Correct
3.2	Correct
3.3	Completed*
4	Completed*

Lesson Feedback

Good for the table.
In the graph, the solution is found in the coordinates of the point (h, m), where the graphs of the two relationships intersect.
In the equations, it is the value of h when we set the two expressions for m equal to each other: $8.4h = 7h + 14$.

Jan 6 at 8:20 am ▾   Go to screen 8

Good!

Jan 6 at 8:25 am ▾   Go to screen 9

That's great!

Jan 6 at 8:26 am ▾   Screen 10

Send feedback to Robert Richard

√‾   Send

Which problem are you most proud of and why?

Results

Here are your results from this practice set.

*Includes work Desmos could not evaluate.

Select a question to answer:

● Describe a mistake you made when completing this practice. What did you learn from the mistake?

○ What questions do you still have about this practice?

○ Which problem are you most proud of and why?

i know i

my response

Problem	Feedback
1.1	Correct
1.2	Correct
1.3	Incorrect
1.4	Correct
2	Incorrect ⚠
3.1	Incorrect

Lesson Feedback

same entry for h and m in both tables.
In the graph, the solution is found in the coordinates of the point (h, m), where the graphs of the two relationships intersect. In the equations, it is the value of h when we set the two expressions for m equal to each other: $8.4h = 7h + 14$.

Jan 6 at 8:23 am ▾   Go to screen 8

If we multiply both sides by 8, on the left it cancels out completely. On the right, we have $\frac{8}{4}$ which equals 2, so it's

$4p + 3 = 2(p + 2)$ which is a much easier equation to solve.

Jan 6 at 8:26 am ▾   Go to screen 9

See if my notes help. If not, please come talk to me.

Send feedback to Dani Lyons

√‾   Send

Describe a mistake you made when completing this practice. What did you learn from the mistake?

Results

Here are your results from this practice set.

*Includes work Desmos could not evaluate.

Select a question to answer:

○ Describe a mistake you made when completing this practice. What did you learn from the mistake?

◉ What questions do you still have about this practice?

○ Which problem are you most proud of and why?

I am confused about the last part of problem 2. If both expressions are equal, x is true for all values. If the expressions are unequal, but x is the same, it is true for no values. What else is there?
If x is the same in both expressions, then there can't be one solution to the equation, right?

✎ Edit my response

Problem	Feedback
1.1	Correct
1.2	Correct
1.3	Correct
1.4	Correct
2	Incomplete
3.1	Correct
3.2	Correct
3.3	Completed*
4	Completed*

💬 **Lesson Feedback**

there are a different number of x's on each side of the equation.

Jan 6 at 8:12 am ▾   Go to screen 5

Great!

Jan 6 at 8:22 am ▾   Go to screen 8

Good!

Jan 6 at 8:25 am ▾   Go to screen 9

See my note. You change it by adding another x term

Jan 6 at 8:32 am ▾   Screen 10

Send feedback to Lucy Wolpin

√▯   Send

◉ What questions do you still have about this practice?
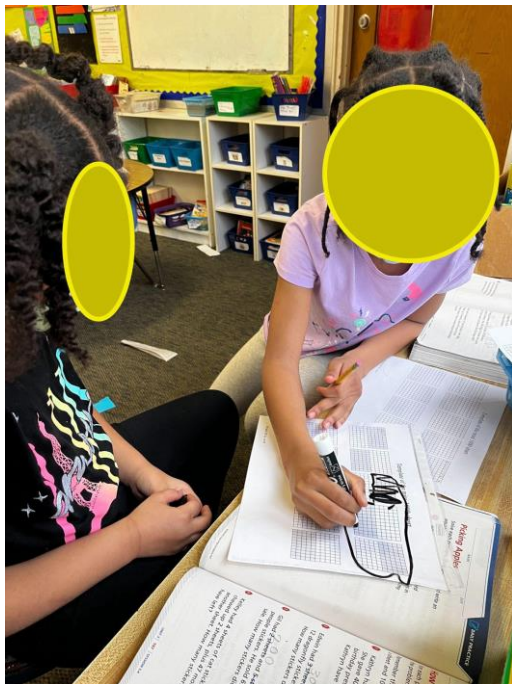
Extension
Are you ready for more?

Math Workshop in Investigations

- Gives students an opportunity to develop and practice concepts and skills
- Helps students develop independence and learn to take responsibility for their own learning as they choose activities, keep track of their work, use and take care of classroom materials, and work with others
- Provides time for the teacher to work with individuals/small groups and to assess students' learning and understanding

In order for differentiation to impact student learning, we need to first make sure that our classrooms are places where making sense of mathematics is at the center of the work for both students and teachers, and that we believe that all students are capable of doing important mathematics. This is where differentiation begins.

Grade 3

Extension
Support and justify one's thinking

Are you sure? How would you convince someone else?

Extension
Conjecture

What happens when (you add two odd numbers)?

Measures of Effectiveness

Priority 4 - Equity and Access

- Consistent access to effective teaching practices and differentiated learning opportunities across all pK-8 schools
- Regular personalized feedback and reflection
- Increased student responsibility, independence, and confidence

Summary

Key Actions	2020-2021	2021-2022	2022-2023
Build an understanding of Effective Mathematical Teaching Practices for teachers and administrators	Ongoing through new curriculum and specialists		
Implement new 6-8 curriculum with ongoing PD (summer, job-embedded, department meetings)	All teachers 7-8	All teachers 6-8	
Implement new K-5 curriculum with ongoing PD (summer, job-embedded, workshops)	All teachers 3-5; New teachers and opt-in K-2	All teachers K-5	
Engage in Lesson Study PD for K-5 teachers			
Utilize key embedded assessments and gather data on student performance K-5; provide updated guidelines for assessment and intervention **PRIORITY 2**			
Provide parent information sessions and workshops **PRIORITY 5**		PTO coffees	School-based or district-wide parent series connected with K-5 curriculum