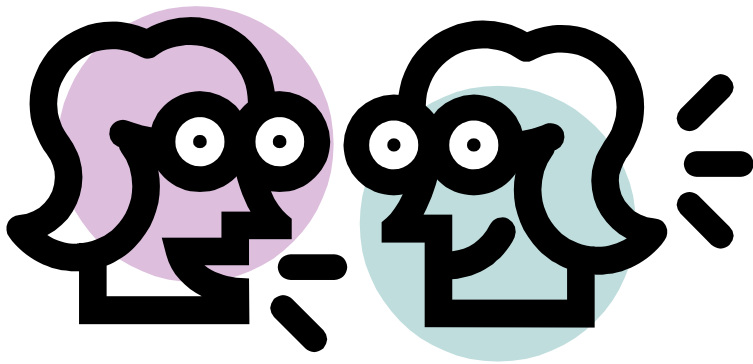# Build Student Engagement, Mental Math, and Reasoning with "Math Talks"

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Acknowledgements

- Thanks to David Foster and the work of the Silicon Valley Mathematics Initiative (SVMI)

- Thanks to many resources drawn from here

- Thanks to teachers who have welcomed me into their classrooms as part of, and my colleagues in, the South Cook Mathematics Initiative (SCMI)

- Support for SCMI is provided by the Searle Funds at The Chicago Community Trust, in partnership with the South Cook Intermediate Service Center and the UIC Learning Sciences Research Institute

Let's try a math talk

- Facilitator presents prompt
- Participants generate multiple methods
- Signal number of methods with fingers
- Participants share methods
- Facilitator scribes
- Discussion

Find the number in the blank

$3 \cdot$ ___ $= 3 + 3 + 3 + 3 + 3$

$6 \cdot$ ___ $= 6 + 6 + 6 + 6$

$8 \cdot 3 = 8 + 8 +$ ___

$5 \cdot 4 = 4 + 4 +$ ___

Discuss in your table group

- **What stood out to you about this math talk?**

- **What do you think are some potential benefits of this structure?**

- **What would it take to do a math talk in your class?**

Math Talks

Math Talks are a daily ritual with the **entire class** to develop **conceptual understanding** of and **efficiency** with numbers, operations and mathematics, in **about 10 minutes per lesson**.

Math Talks are used to:

- Review and practice procedures and concepts
- Introduce concepts and properties about numbers
- Reinforce procedures and number concepts.
- Explore mathematical connections and relationships.

Math Talks can help develop

- Sense for numbers, relationships, operations
  - Intuition
  - Judgment
  - Foundation for fluency

- Fluency
  - Efficiency
  - Accuracy
  - Flexibility

Math Talks can help develop

- Communication and explanation

- Logical thinking, reasoning, and arguments

- Student engagement

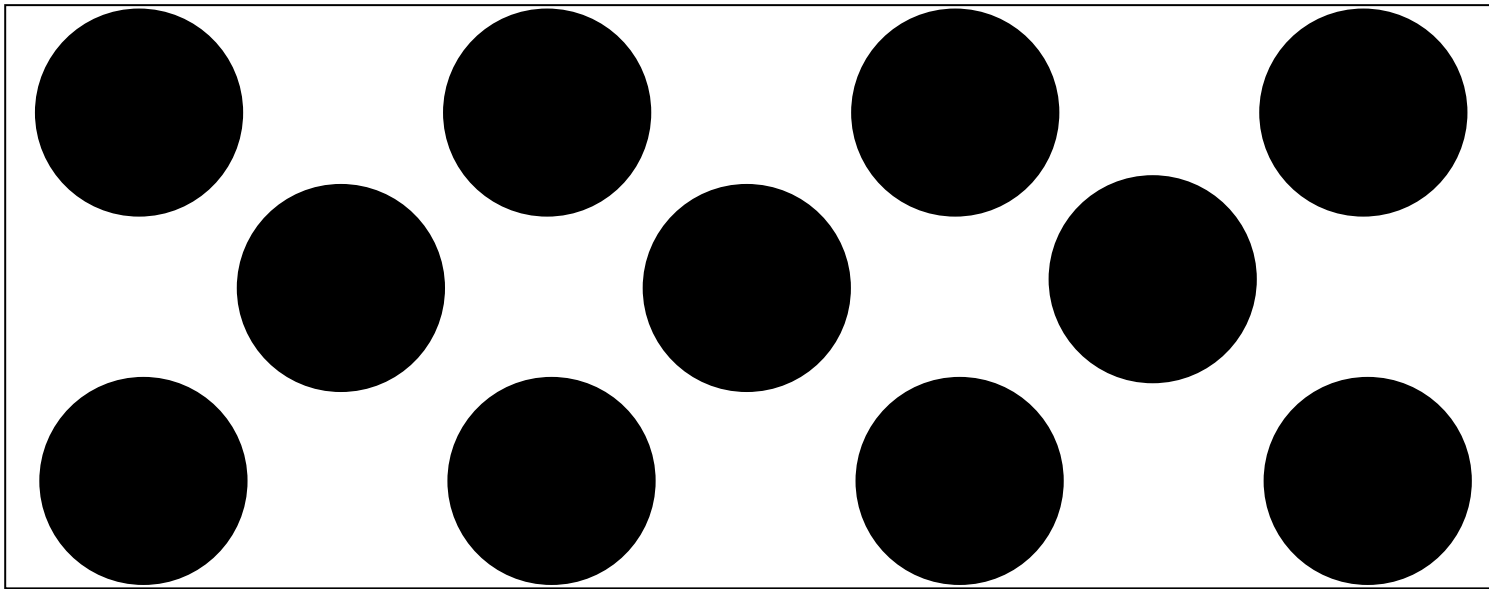- Conceptual understanding and sense-making

- Problem-solving

Math Talk: Dot Patterns

How Many Dots?

How did you see it?

Some Varieties of Math Talks

- Number of the Day
- Number Lines
- Mental Math
- Sequences of Related Expressions
- More Computation Problems
- Relational Thinking
- What's My Rule?
- Spatial Visualization

Math Talk: Number of the Day

36

Some Possible Responses

$18 + 18$

6^2

$2^2 \cdot 3^2$

$9+9+9+9$

$25.65+10.35$

$9 \div 1/4$

$-15 + 51$

$3\sqrt{144}$

Possible Constraints

- Two, three, four operations
- Exponents/roots
- Distributive properties
- Field properties
- Expressions or equations with variables
- Inequalities
- Consecutive numbers
- Integers
- Rational numbers
- Set of clue statements to identify the number

Math Talk: Number of the Day

3.25
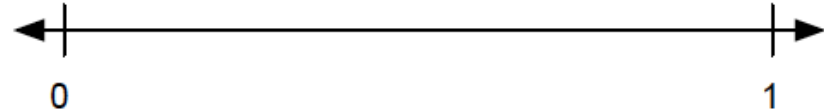
Determine equivalent expressions/representations

Math Talk: Number Line
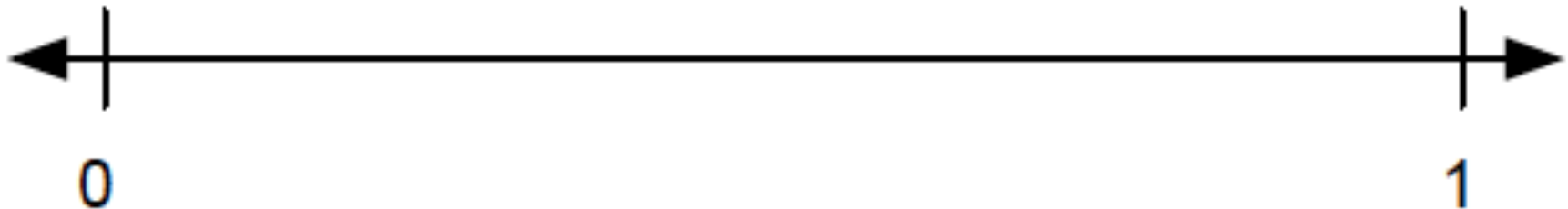
- 5/8
- 0.75%
- 0.45
- 67%
- 3/6

- 2/3
- 3/4
- 5/6
- 62.5%
- 0.65

Place the numbers on the number line

Math Talk: Number Line

```
<---+------------------------------+--->
    0                              1
```

Processing with the Class

- Student use paper to create a number line.
- They place the number in the appropriate location on the line
- Call on students to come forward and place the number on the line (post it notes).
- After all numbers are placed, ask class if anyone wants to re-arrange to be more accurate.

Math Talk: Which Two Are Closer?

1/4	1/2	3/5
0.03	0.16	0.111
1 7/8	2 1/5	1 3/8
-4.4	2.1	-1.3
3^2	2^3	$\sqrt{72}$
66.6%	2/3	0.67

Math Talk: Mental Math

$$56 + 38 =$$

$$63 + 27 =$$

$$29 \cdot 31 =$$

$$-23 - (-48) =$$

$$\frac{36 \cdot 21}{14 \cdot 27} =$$

Math Talk: More Mental Math

$3^2 - 2 \cdot 5$

25% of 80

$0.4 \times 30 + 12$

$23 - 32 + 1$

$3 \cdot 2 - 6 \div 2$

$\dfrac{3}{5} \cdot 60$

Math Talk: Number Strings

$6 \cdot 8 =$

$60 \cdot 8 =$

$60 \cdot 80 =$

$0.6 \cdot 8 =$

$0.6 \cdot 0.8 =$

$0.06 \cdot 0.8 =$

$0.06 \cdot 0.08 =$

Math Talk: Estimation

$$9.8 + 8.7$$

Math Talk: Compensation

59 + 37

Math Talk: Compensation

$$6.3 - 2.7$$

Math Talk: Relational Thinking

$$7 + 6 = x + 5$$

$$43 + 28 = x + 42$$

$$28 + 32 = 27 + x$$

$$67 + 83 = x + 82$$

$$12 + 9 = 10 + 8 + x$$

$$345 + 576 = 342 + 574 + x$$

$$46 + 28 = 27 + 50 - x$$

Math Talk: Relational Thinking

43 + 28 = 🛸 + 42

28 + 32 = 27 + 🛸

67 + 83 = 🛸 + 82

Math Talk: Relational Thinking

$3 \cdot \underline{\quad} = 3 + 3 + 3 + 3 + 3$

$6 \cdot \underline{\quad} = 6 + 6 + 6 + 6$

$8 \cdot 3 = 8 + 8 + \underline{\quad}$

$5 \cdot 4 = 4 + 4 + \underline{\quad}$

Math Talk: What's My Rule

Math Talk: Spatial Visualization

- Dot Patterns
- 2-D Geometry
- 3-D Geometry

Math Talk: Guess the Shape

- I am a closed figure.

- I have only straight sides.

- I have an even number of sides.

- An opposite pair of my sides are parallel.

- The other pair of opposite sides are not.

- My non-parallel sides are congruent.

Math Talk Jigsaw

- Groups examine different problems
- Meet with all others who have your same problem to prepare for your presentation
- Present in mixed groups
- Return to your preparation group to debrief presentation and reflect

Math Talk Jigsaw

- In like groups, brainstorm as many different **strategies and solution paths** you can come up with for your particular problem

- Share ideas about how you will **record** "student" strategies and solutions

- Share ideas about how to **handle potential pitfalls** in the presentation and recording of your particular problem

Math Talk Jigsaw Prompts

- 35% of 120

- $3\frac{1}{3} \times 18$

- What's My Rule

Devising Our Own Math Talks

- Think of an important idea or a common issue your students face in terms of conceptual understanding or fluency

- Think of a possible prompt for a math talk for that idea or issue

- Run your prompt by your partner and brainstorm possible student responses

Some Math Talk Techniques

- Individual think time

- Signals

- Organized scribing and juxtaposition

- Pair and share

- Whole-group share

- 3 × 5 card follow-up question

- Continuation or extension over days or a week

- Written formative assessment: multiple strategies

Some Math Talk Tools

- Overhead transparencies
- Charts
- Butcher paper recordings
- White boards
- Document camera
- Smart boards
- 3 × 5 cards
- Daily logs

Some Math Talk Tips

- Let students practice similar problems and routines

- Create a safe environment and encourage sharing

- Meet their needs: ways of sharing, ramp of difficulty

- Start where they are, have a goal, plan sequences

- Press students to make sense, clarify thinking

- Press students to explain and justify methods

- Purposefully choose, sequence strategies & sharers

- Record thoughtfully

- Ask questions to help students connect methods

- It's the math (not answer or variety of strategies)

- Keep them short

Sources and References

- A gold mine of examples: Secondary Number Sense Routines (San Diego) — http://goo.gl/MPp0y

- More resources on Math Perspectives, Math Solutions sites (search for Ruth Parker, Cathy Young)

- *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K-5* (Parrish)

- Two great articles from *MTMS*: "Never Say Anything a Kid Can Say" and "Orchestrating Discussions"

Integrating Math Talks

- How do you think math talks can benefit your students?

- What are some issues you might face as you try math talks?

- What will you try in your classroom in the next …week? …month? …year?

Thank You!

Please contact me for these slides or any other information.

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