Bridging the Parent Math Gap

Engaging K-2 Parents in Conceptual Mathematics Supports K-2 students

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Our goal today is for you to

plan a framework of

engaging parent mathematics education to

support student learning and

mathematics instruction.

Rationale

Mathematics these days requires

- Conceptual understanding
- Flexibility and fluency
- Collaboration
- Communication
- Cross-curricular connections

Rationale

"Parents these days…" are

- Math anxious
- Procedural
- Anxious

Research

Math anxiety

- First informal research, 1957 Dreger and Aiken
- First formal research, 1972 MARS Richardson and Suinn
- May lead to math avoidance Ashcraft, 2002
- Doesn't mean lower aptitude Ashcraft, 2002
- Disrupts cognitive process Ashcraft, 2002
- Blocks working memory Ashcraft, 2002

Research

Math anxiety

- Math anxiety can occur at various stages from young children to young adults

Beilock and Willingham, 2014

- Researched by educators, neuroscientists, and psychologists

Beilock and Maloney, 2015

Research

- Math anxiety
  - fMRI brain images of higher math anxious children working math problems showed:
    - Less activity in the region governing working memory
    - Increased activity in the regions governing negative emotions

Young, Wu, and Menon, 2012

Research

- Parents with math anxiety negatively impact:
  - Children before formal schooling even begins
  - Home environment and building a foundation of early childhood math experiences:
    - Developing spatial awareness
    - Comparing size or quantity
    - Comparing and classifying

(Geist, 2003)

Research

Who is most significantly impacted?

- Children in lower SES whose parents have lower educational backgrounds

  Maloney and Beilock, 2012; Vukovic, Roberts, Wright, 2013

- Girls whose parents have negative attitude about math Ma, 2003; Scarpello, 2007; Turner, et al, 2002

- Children whose math anxious parents help them with homework

  Maloney, Ramirez, Gunderson, Levine, and Beilock, 2015

Research

- Two intersecting strands impact students
  - Parent Math Anxiety
  - Student Equity and Access
    - Children from lower SES
    - Girls

We are ethically bound to attend to both.

Parents need help understanding mathematics today:

- Currrent Math standards include Content *and* Practice
- Teachers value mathematical practices:
  - Sense making, reasoning, problem solving
  - Constructing, critiquing
  - Persevering

Ball and Hill, 2009; Boaler, 2015; Fosnot, 2012

Real Life - Starting small, 2002

Back to school night

- Parents shared their personal math anxieties
- Parents worked a math exercise
- I shared philosophy
  - More focus on learning, less on grades
  - "disequilibrium"

Piaget, 1936

Starting small, 2002

Staying connected – personal connections via email, phone, face to face

- Gratitude sandwich, always
- Learning goals
- Sample exercises, questions, and more

Starting small, 2002

Students and their work were communicating to parents even when I *wasn't*:

- Emphasis on process seen in graded work
- Writing and portfolios
- "disequilibrium" continued

Real life

- Growing effort, 2004 – MS Math Dept. Head
  - Half-time algebra teacher; half-time supporting MS math curriculum and instruction
  - More teachers and grade levels
  - About 500 students, 450 families, 800 adults

Real life

Growing the growing effort, 2005

- Expanding with intentionality
- Back to School events
  - Teachers shared vertically-aligned philosophy
  - Parents did math! ☺
  - Parents shared their math anxieties

Real life

Real life (bears repeating…)

- Teachers' continuing parent math dialogue:
  - Teacher time, workload, technology
  - Parent perspective, awareness, beliefs
- Parents shared math anxieties with teachers, who in turn shared them with me
- Necessary adjustments

Real life

Growing the growing effort, 2005 to date

How do we reach more parents?

- Parent math seminars (2005-present)
- Parent packets (2005-2012)
- School website postings/ videos/emails/ other online sharing tools (2010-present)

Real life results

Parent math anxiety is lower - not gone, but lower.

- Seminars balance direct instruction and parents collaborating to do math!
- Most parents talk openly in real-time at the seminars about revelatory learning and/or deeper understanding

Real life results

(Continued)

- Some share how alone they felt as children because they either were made to feel less or thought conceptually and were told to follow procedures
- Some parents still seek 1:1 support

Real life results

Parent anxiety about their child's math learning/ our math curriculum is lower:

- They *heard* it firsthand from a professional
- They *saw* K - algebra vertical connections
- They *did* the math, experienced learning
- They *have* high-quality resources

What?

- What do you wish your students' parents knew about "math these days"?
- What recurring questions do they ask that shine a spotlight on the resources they need?
- What do you desperately wish your students' parents would stop telling/showing them: "but my dad/mom/big brother/big sister/ babysitter, grandpa, uncle showed me a short cut for…"?

Some Real-life "What?"

- Counting isn't evidence of *meaning*
- Memorizing isn't evidence of *knowing*
- Faster is not evidence of better
- Borrowing and carrying
- Traditional algorithms without conceptual understanding
- Trust us, we're educated professionals, we have a plan, and it works!

What?

- Your “what” will drive your “how”.
- If you’re newly embarking on parent education, then consider sharing philosophy and some vertical alignment/ connections.

Some examples of PK-2 "Whats?"

We want parents to know the instructional sequence/ progression we will use with their children:

Concrete – build, manipulate, explore

Representational – draw, illustrate

Abstract – symbolic

PK-2

PK-2

Numeracy, like literacy, is important.

- Number sense : Mathematics
  as Phonemic awareness : Reading
- Number Sense : Number Concept
  as Decoding : Early reading
- Fluency : Computation
  as Words : Sentences

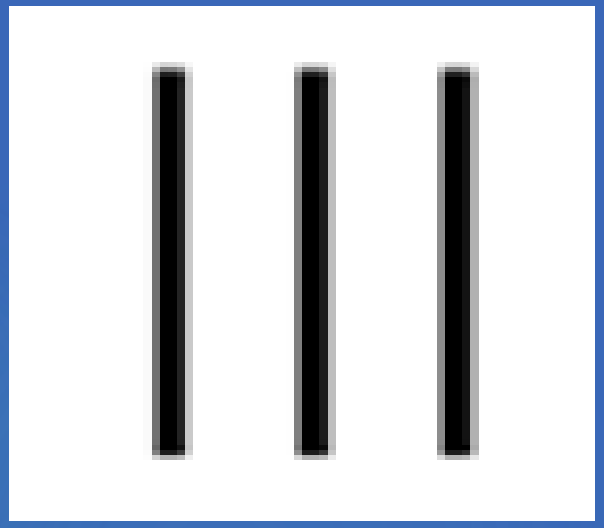
Franshaw, 2015

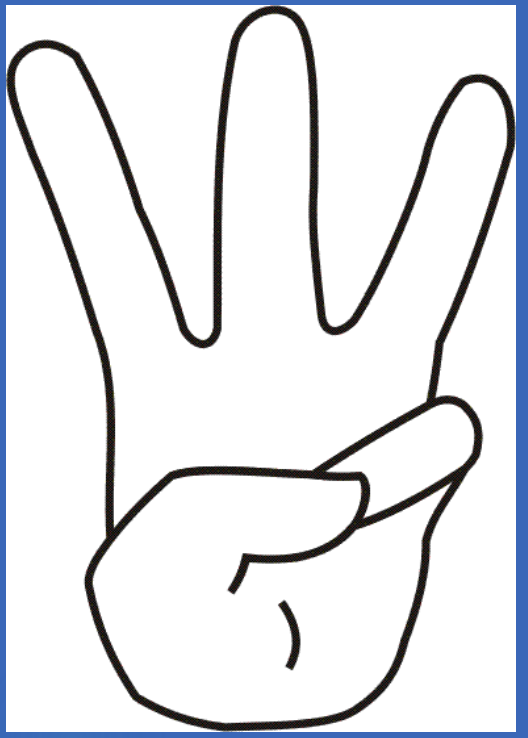
PK-2

- We want parents to know we value and expect students to communicate mathematically.
- This begins in early childhood.

PK-2

Perceptual subitizing

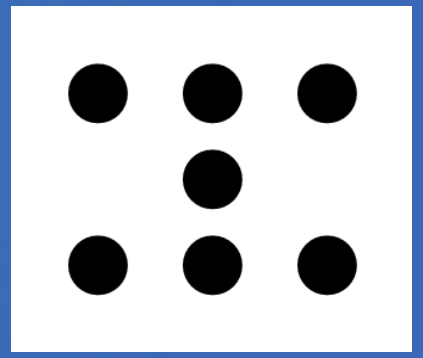




PK-2

Why conceptual subitizing?

- Internalize a sense of quantities 0-5
- Build on this from 6-10, then 11-20, gaining flexibility with larger quantities



2 + 2 + 3 = 7

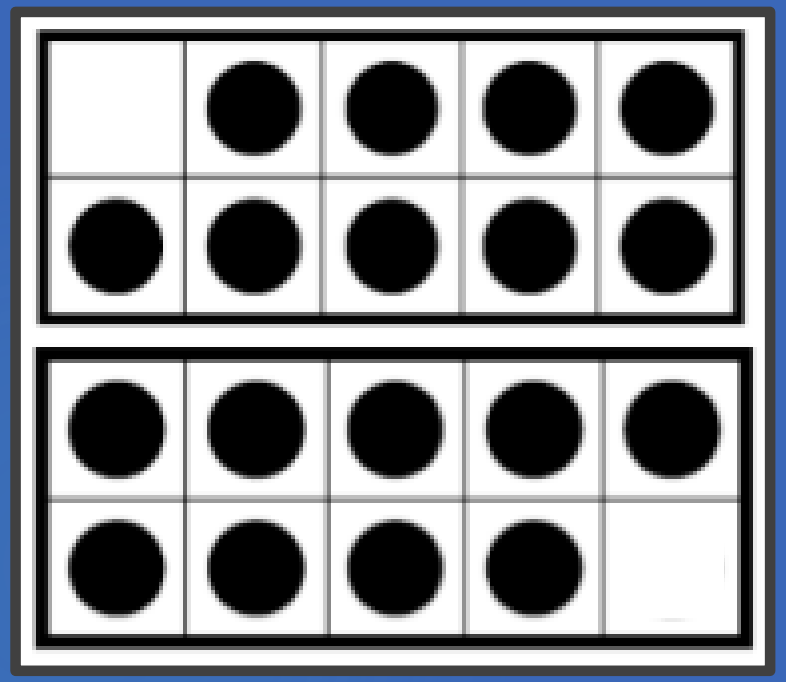
3 + 3 + 1 = 7

3 + 2 + 2 = 7

4 + 3 = 7

PK-2

Why conceptual subitizing?



$5 + 5 + 4 + 4 = 18$

$4 + 5 + 4 + 5 = 18$

$3 + 3 + 3 + 3 + 3 + 3 = 18$

$20 - 1 - 1 = 18$

$20 - 2 = 18$

$9 + 9 = 18$

PK-2

Conceptual subitizing supports the development of:

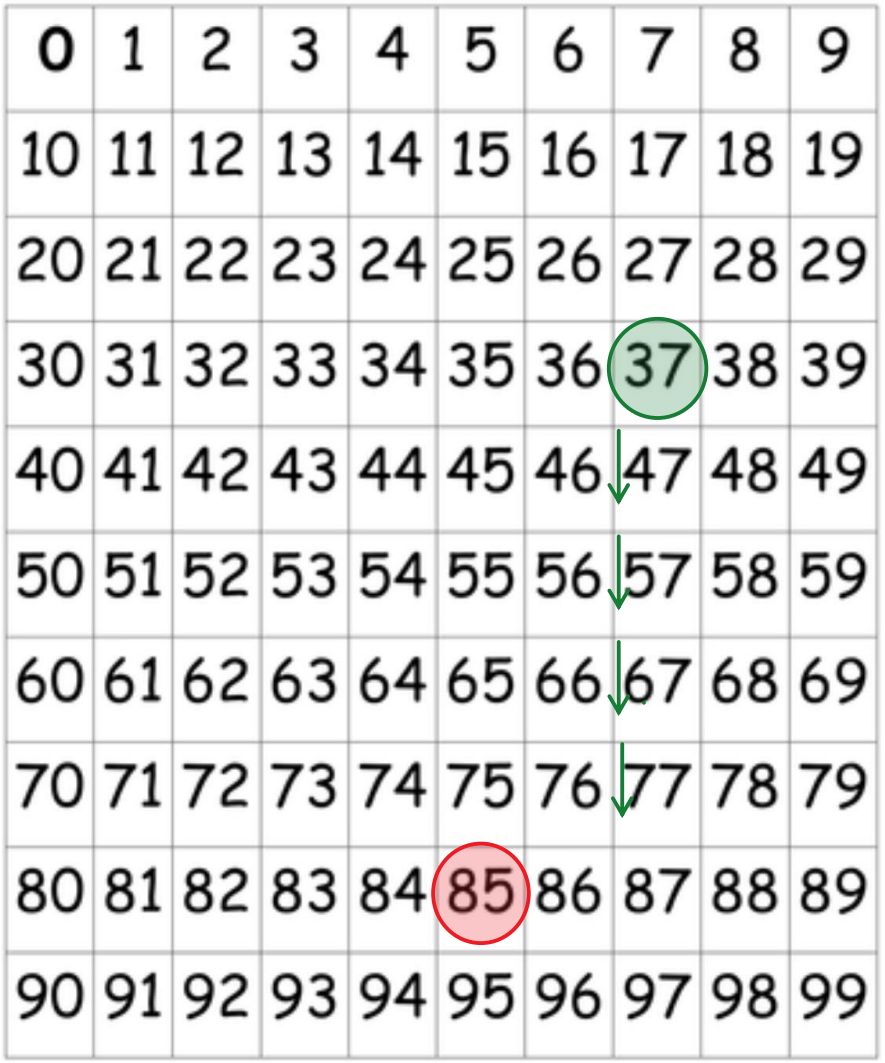
- Cardinality
- Increased flexibility
- Fluency
- Efficiency

PK-2

37 + 48

PK-2

37 • 48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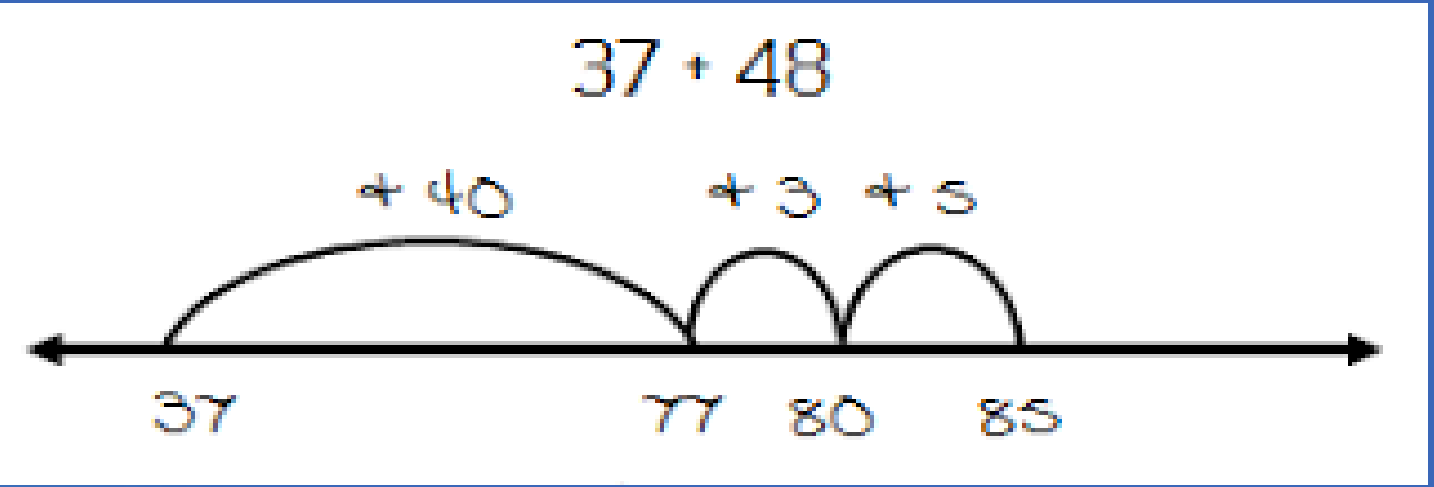
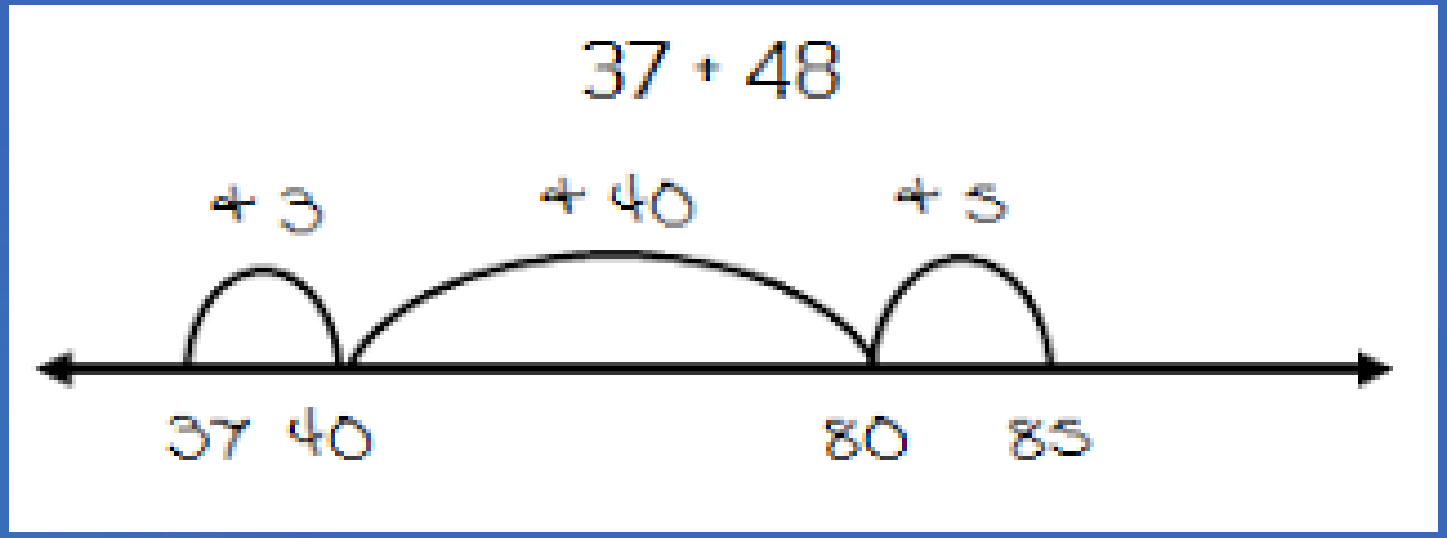
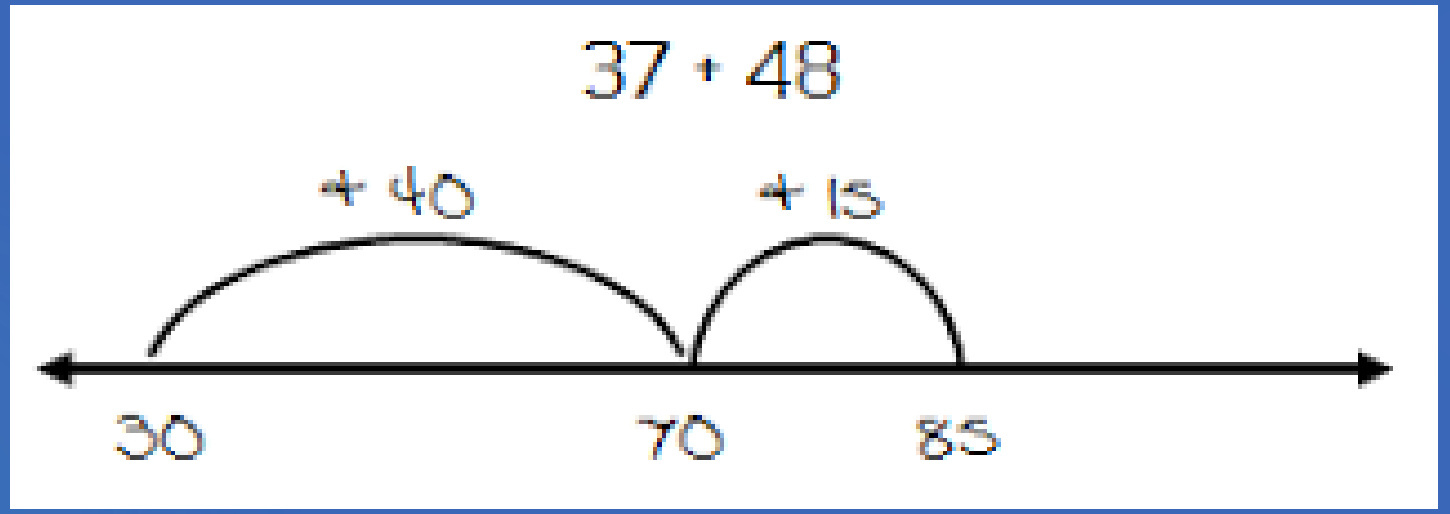
PK-2



PK-2



PK-2

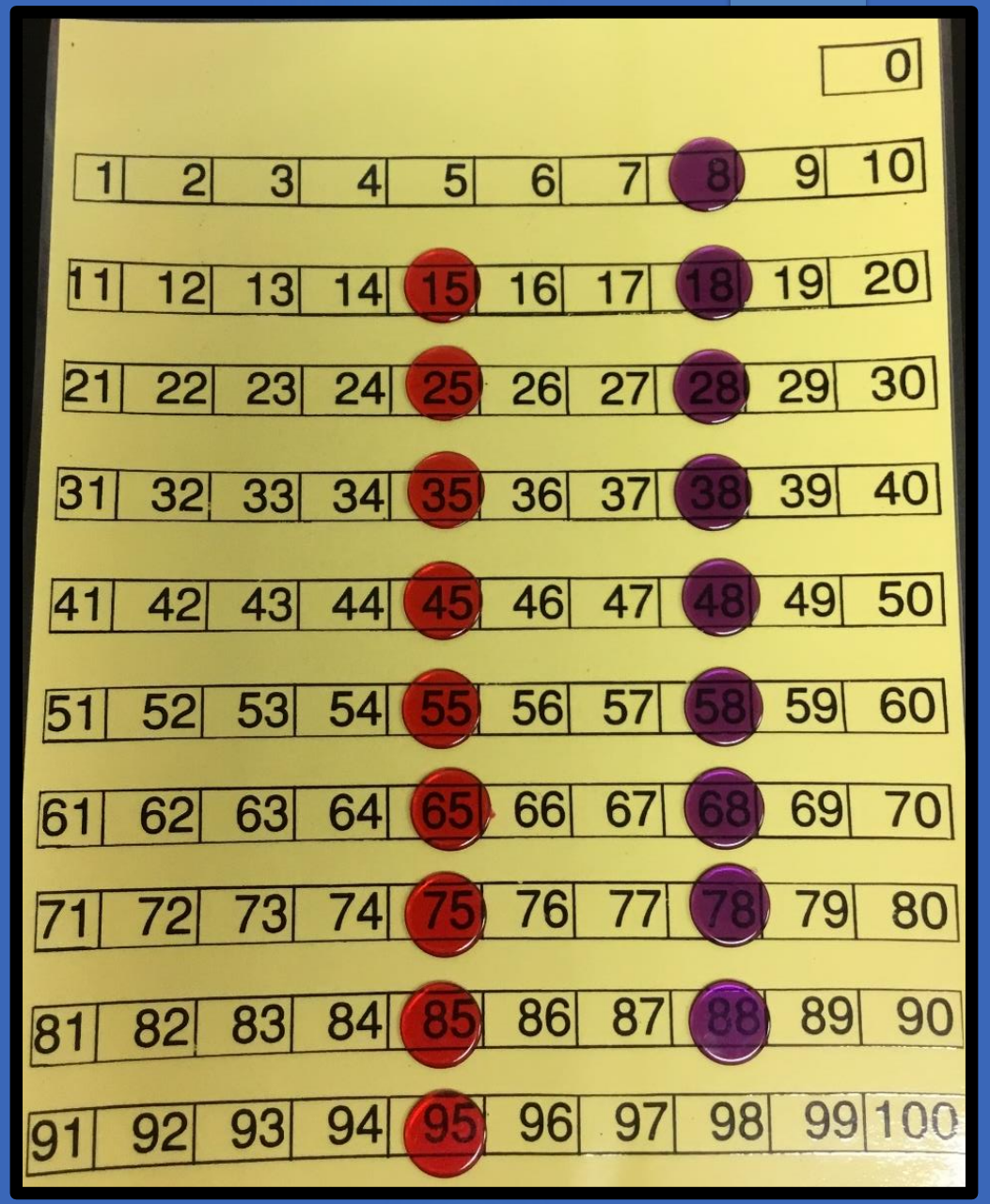


PK-2

Flexibility leads to extending and patterns:

Fact:

8 + 7 = 15
18 + 7 = 25
28 + 7 = 35



PK-2 to 3-5

Flexibility, fluency, and extending:

Fact: $5 + 7 = 12$

Extensions:

$5 + 17 = 22$

$52 = 15 + 37$

$72 = 17 + 55$

$25 + 67 = 92$

$120 = 70 + 50$

$250 + 370 = 620$

$1{,}200 = 500 + 700$

$3.5 + 1.7 = 5.2$

Prioritize your "what"

- Talk with your colleagues
- Share ideas
- Prioritize your "what" to maximize parents' learning to better support student learning and your mathematics curriculum and instruction

Determine “how”

- Talk with your colleagues
- Share ideas
- Determine the best “how” at your school, for your grade band, with your parents

Vertical Connections: Addition

$$37 + 48 = 30 + 7 + 40 + 8$$
$$= 30 + 40 + 7 + 8$$
$$= 70 + 15$$
$$= 85$$

$$(11x + 4) + (5x + 17) = 11x + 5x + 4 + 17$$
$$= 15x + 21$$

Vertical connections: multiplication

Multiplication strategies:

- Base-10 blocks to Algebra tiles
- Partial products (horizontal or vertical)
- Area Model (multiplication *and* division)

Who?

- Who on your campus or in your district?
- How can this be an opportunity to build capacity on your campuses and in your district for teacher leaders to participate, co-lead, or lead?

When?

- Do you already have opportunities through which this information can be shared?
- Is there a way to start small and expand?
- How can you create a stand-alone event that becomes an anticipated event in your community?

When at my school?

- Back to School Night – philosophy and activity
- Parent Seminars
  - Fall and spring for PK and K; fall for 1-2 and 3-5
  - Parents attend, take aways, shared resources
- Ongoing
  - School website – as often as we need, usually monthly; videos, work samples, literature connections, etc.
  - Online tools – vary by grade and needs

What for Parents?

How to Help Your Child With Math

- Positive talk
- Notice and wonder **#noticewonder**
- Play games!
- Ask your child where they see number and shape in their worlds
  talk math with your kids **#tmwyk**
- Cook, build, measure, sew, create, take a walk and collect/compare/count found objects
- Talk about zero, act out zero

What for Parents?

How to Help Your Child With Math

- Do math games and puzzles, many are free!
- Play games!
  - Board games
  - Games involving spatial skills
  - Card games
- Complete 2D and 3D puzzles to support the development of spatial reasoning

Why?

Literacy *and* numeracy

Effective math education for all

Local, state, national and world economies

References

Ashcraft, M. H. (2002). Math Anxiety: Personal, Educational, and Cognitive Consequences. *Current Directions in Psychological Science*, *11*(5), 181-185.

Ball, D. L. , & Hill, H. (2009). The curious—and crucial—case of mathematical knowledge for teaching. *Phi Delta Kappan*, *91*(2), 68–71.

Beilock, S. L., & Maloney, E.A. (2015). Math Anxiety: A factor in Math Achievement Not to Be Ignored. *Policy Insights from the Behavioral and Brain Sciences*, *2*(1), 4-12.

Beilock, S. L., & Willingham, D. (2014). Ask the cognitive scientist - math anxiety: can teachers help students reduce it? *American Education, 38*, 28-33.

Boaler, J. (2015). *What's Math Got To Do With It? How Teachers and Parents Can Help Transform Mathematics Learning and Inspire Success*. New York: Penguin.

Dreger, R. M., & Aiken, L. R., Jr. (1957). The identification of number anxiety in a college population. *Journal of Educational Psychology, 48*(6), 344-351. http://dx.doi.org/10.1037/h0045894

Fosnot, C. T. (2016). *Conferring with Young Mathematicians at Work*. Connecticut: New Perspectives Learning.

Geist, E. (2003). Infants and toddlers exploring mathematics. *Young Children, 58*(1), 10-12.

Ma, L. (1999). *Knowing and Teaching Elementary Mathematics.* Boston, MA: Houghton Mifflin Company.

Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: who has it, why it develops, and how to guard against it. *Trends in Cognitive Science, 16,* 404-406. doi:10.1016/j.tics.2012.06.08

Maloney, E. A., Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2015). Intergenerational Effects of Parents' Math Anxiety on Children's Math Achievement and Anxiety. *Psychological Science,* 1-9. doi:10.1177/0956797615592630

Piaget, J. (1936). *Origins of intelligence in the child.* London: Routledge & Kegan Paul.

Richardson, F. C., & Suinn, R. M. (1972). The Mathematics Anxiety Rating Scale. *Journal of Counseling Psychology, 19,* 551-554.

Scarpello, G. (2007). Helping students get past math anxiety. *Techniques: Connecting Education & Careers, 82*(6), 34.35.

Turner, J. C., Midgley, C., Meyer, D. K., Gleen, M., Anderman, E. M., Kang, Y., & Patrick, H. (2002). The classroom environment and students' reports of avoidance strategies in mathematics: A multimethod study. *Journal of Educational Psychology*, *94*, 88-106.

Vukovic, R. K., Roberts, S. O., & Wright, L. G. (2013). From Parental Involvement, to Children's Mathematical Performance: The Role of Mathematics Anxiety. *Early Education and Development, 24,* 446-467. doi:10.1080/10409289.2012.693430

Young, C. B., Wu., S., & Menon, V. (2012). Neurodevelopmental basis of math anxiety. *Psychological Science, 23,* 492-501.

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