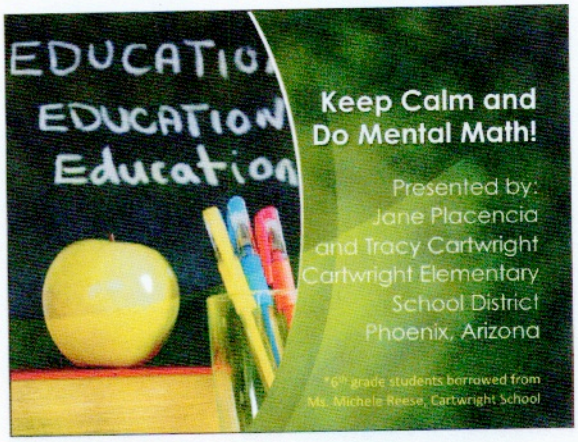
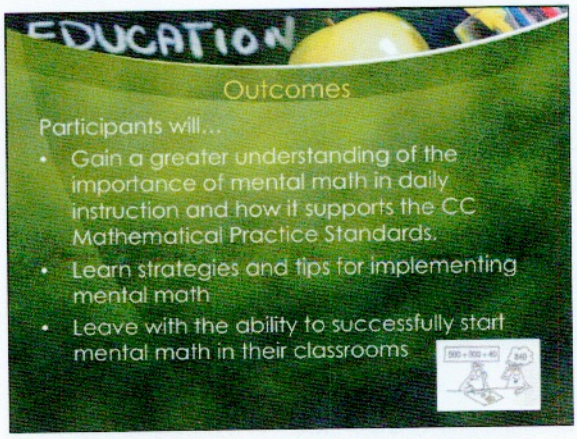
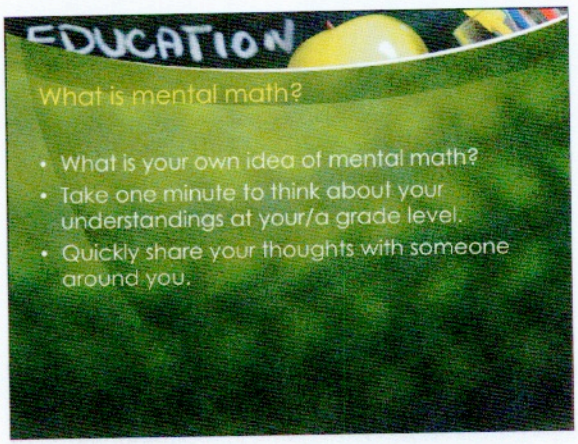
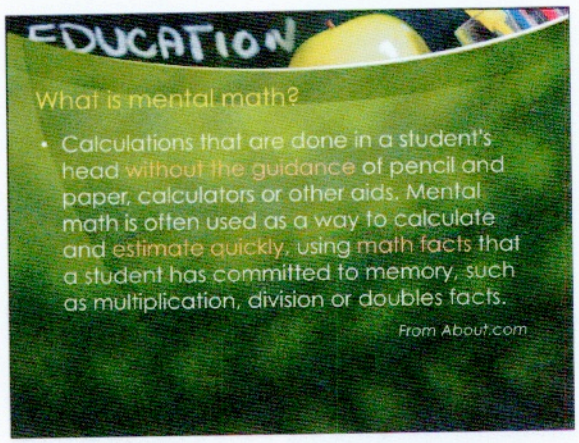
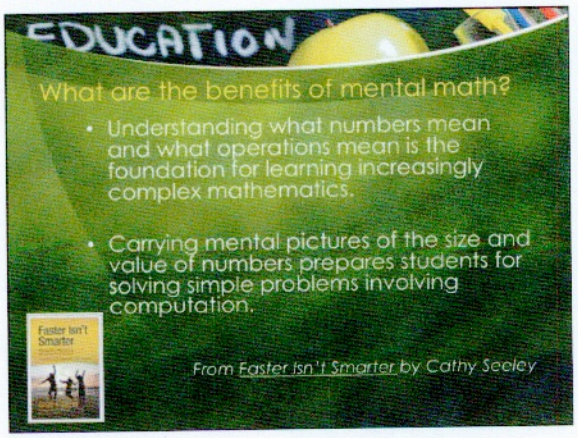

EDUCATION
EDUCATION
Education
Keep Calm and Do Mental Math!
Presented by:
Jane Placencia
and Tracy Cartwright
Cartwright Elementary
School District
Phoenix, Arizona
*6th grade students borrowed from
Ms. Michele Reese, Cartwright School

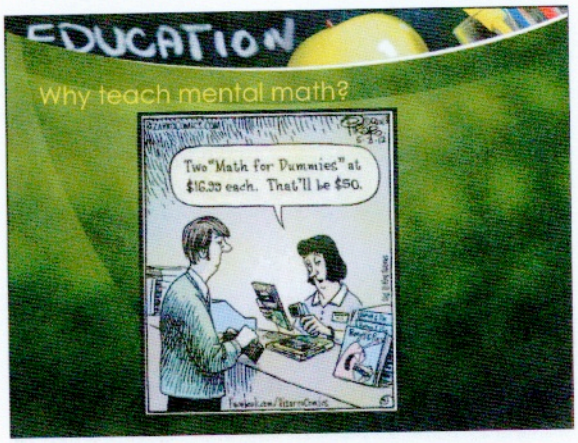

EDUCATION
Welcome!
Lots of mental math = Big brains!
Tracy
Jane

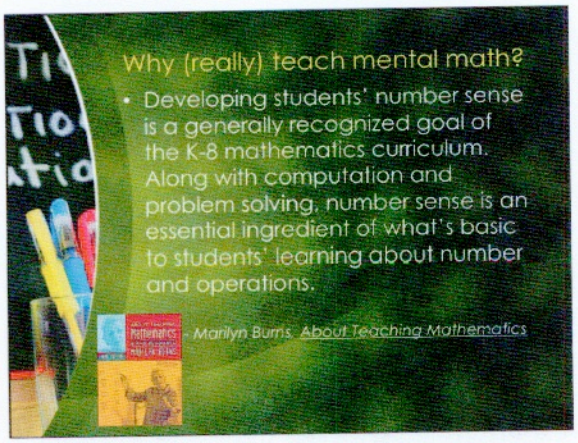

EDUCATION
Outcomes
Participants will…
• Gain a greater understanding of the importance of mental math in daily instruction and how it supports the CC Mathematical Practice Standards.
• Learn strategies and tips for implementing mental math
• Leave with the ability to successfully start mental math in their classrooms

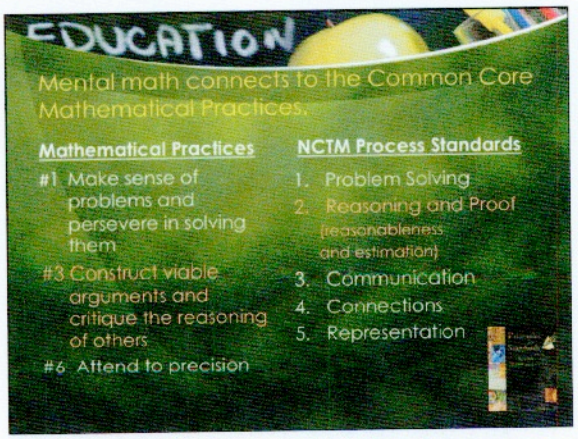

EDUCATION
What is mental math?
• What is your own idea of mental math?
• Take one minute to think about your understandings at your/a grade level.
• Quickly share your thoughts with someone around you.


EDUCATION
What is mental math?
• Calculations that are done in a student's head without the guidance of pencil and paper, calculators or other aids. Mental math is often used as a way to calculate and estimate quickly, using math facts that a student has committed to memory, such as multiplication, division or doubles facts.
From About.com


EDUCATION
What are the benefits of mental math?
• Understanding what numbers mean and what operations mean is the foundation for learning increasingly complex mathematics.
• Carrying mental pictures of the size and value of numbers prepares students for solving simple problems involving computation.
Faster Isn't Smarter
From Faster Isn't Smarter by Cathy Seeley


EDUCATION
Why teach mental math?
Two "Math for Dummies" at $16.99 each. That'll be $50.


Why (really) teach mental math?
• Developing students' number sense is a generally recognized goal of the K-8 mathematics curriculum. Along with computation and problem solving, number sense is an essential ingredient of what's basic to students' learning about number and operations.
- Marilyn Burns, About Teaching Mathematics


EDUCATION
Mental math connects to the Common Core Mathematical Practices.
Mathematical Practices
#1 Make sense of problems and persevere in solving them
#3 Construct viable arguments and critique the reasoning of others
#6 Attend to precision
NCTM Process Standards
1. Problem Solving
2. Reasoning and Proof (reasonableness and estimation)
3. Communication
4. Connections
5. Representation

EDUCATION

So how does the process work?

1. Pose a computational or problem-solving situation.
2. Give students time to solve it mentally.
3. Have students share their strategy(ies) with a partner.
4. Teacher listens to partners as they share.
5. Teacher picks a few students with different strategies to share with the class.
6. Students and teacher ask "good" questions.

EDUCATION

So what are considered "good" questions?

- Open ended – requires more than a one word answer (Why did you pick that strategy?)
- Based on student misconceptions (What is the equal sign used for?)
- Intentional and has a clear destination in mind (How can we decompose the numbers to make the problem easier to solve?)

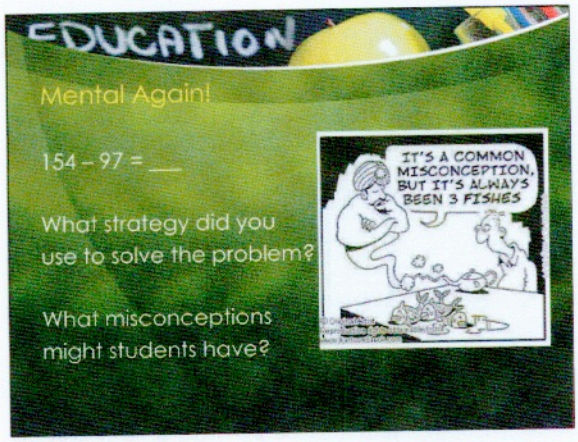
EDUCATION

Let's Get Mental!

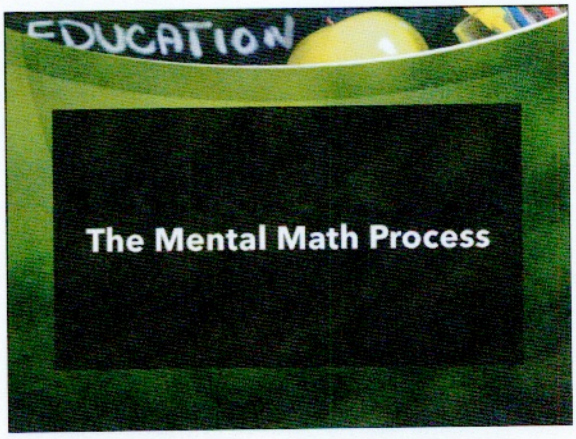
913 + 427 = ___ + 912

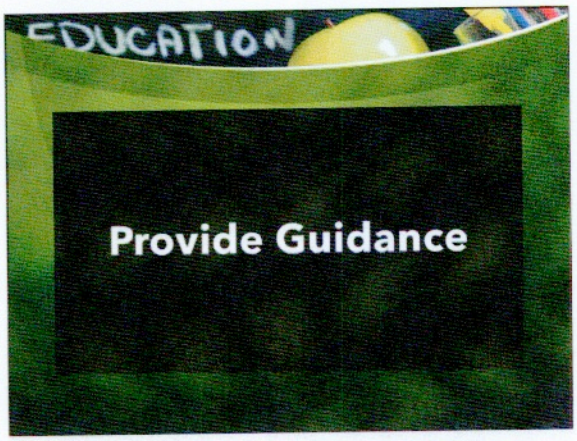
What strategy did you use to solve the problem?

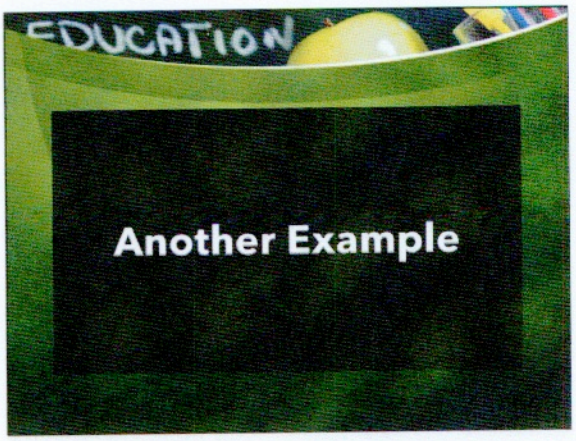
What misconceptions might students have?

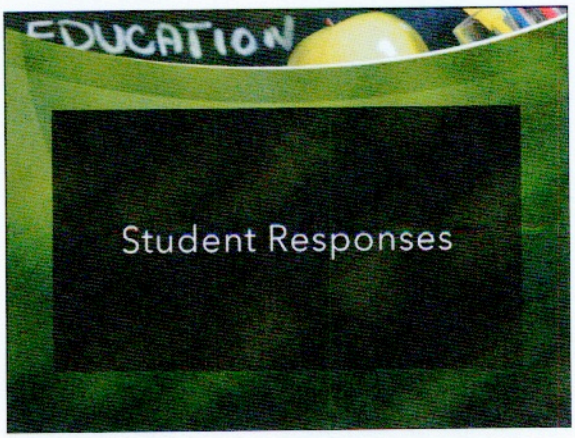

EDUCATION
Mental Again!
154 – 97 = ___
What strategy did you use to solve the problem?
What misconceptions might students have?
IT'S A COMMON MISCONCEPTION, BUT IT'S ALWAYS BEEN 3 FISHES

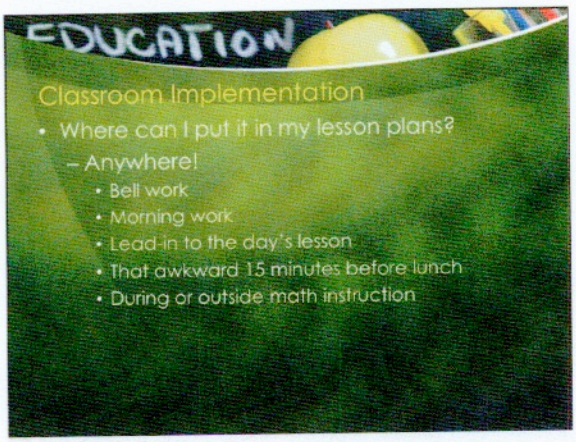

EDUCATION

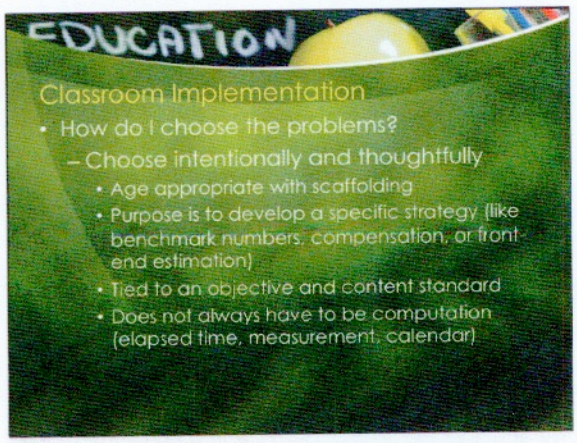

EDUCATION
The Mental Math Process

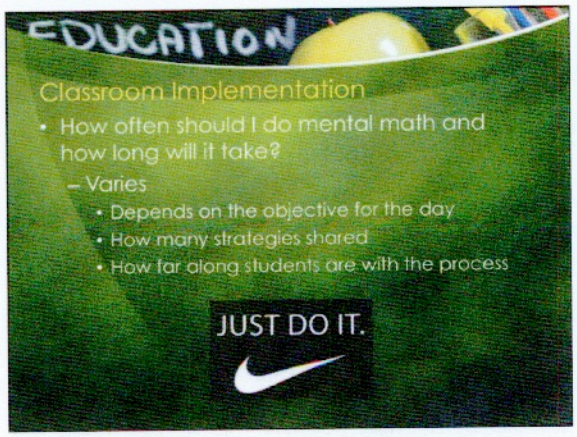

EDUCATION
Provide Guidance

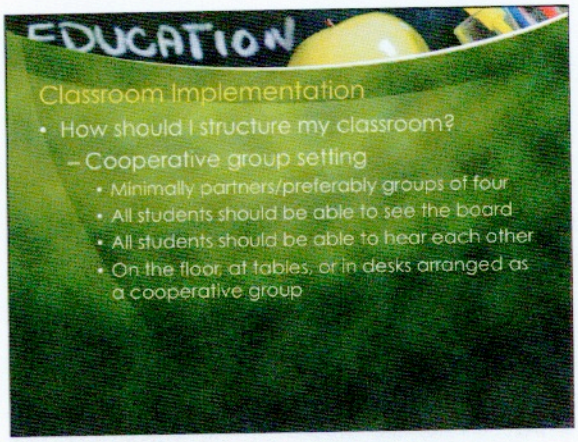

EDUCATION
Another Example

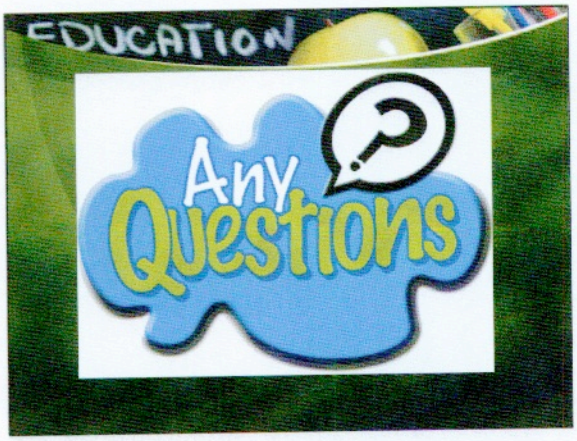

EDUCATION
Student Responses

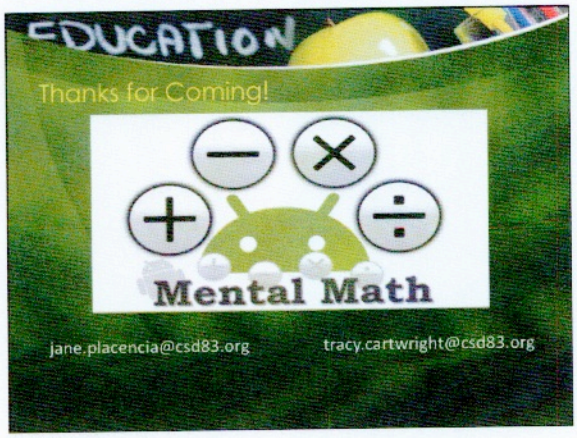

EDUCATION
Classroom Implementation
• Where can I put it in my lesson plans?
– Anywhere!
• Bell work
• Morning work
• Lead-in to the day's lesson
• That awkward 15 minutes before lunch
• During or outside math instruction


EDUCATION
Classroom Implementation
• How do I choose the problems?
– Choose intentionally and thoughtfully
• Age appropriate with scaffolding
• Purpose is to develop a specific strategy (like benchmark numbers, compensation, or front-end estimation)
• Tied to an objective and content standard
• Does not always have to be computation (elapsed time, measurement, calendar)


EDUCATION
Classroom Implementation
• How often should I do mental math and how long will it take?
– Varies
• Depends on the objective for the day
• How many strategies shared
• How far along students are with the process
JUST DO IT.


EDUCATION
Classroom Implementation
• How should I structure my classroom?
– Cooperative group setting
• Minimally partners/preferably groups of four
• All students should be able to see the board
• All students should be able to hear each other
• On the floor, at tables, or in desks arranged as a cooperative group


EDUCATION
Any Questions


EDUCATION
Thanks for Coming!
Mental Math
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Mathematical Questions to Support Classroom Discourse & Mathematical Thinking

DEVELOPING MATHEMATICAL THINKING WITH EFFECTIVE QUESTIONS

To promote problem solving, ask…

What do you need to find out?
What information do you have?
What strategies are you going to use?
Will you do it mentally? With paper and pencil? Using a number line?
Will a calculator help?
What tools will you need?
What do you think the answer or result will be?

To help when students get stuck, ask…

How would you describe the program in your own words?
What do you know that is not stated in the problem?
What facts do you have?
How did you tackle similar problems?
Could you try it with simpler numbers? Fewer numbers? Using a number line?
What about putting things in order?
Would it help to create a diagram? Make a table? Draw a picture?
Can you guess and check?
Have you compared your work with anyone else? What did other members of your group try?

To make connections among ideas and applications, ask…

How does this relate to…?
What ideas that we have learned before were useful in solving this problem?
What uses of mathematics did you find in the newspaper last night?
Can you give me an example of…?

To encourage reflection, ask…

How did you get your answer?
Does your answer seem reasonable?
Can you describe your method to all of us? Can you explain why it works?
What if you started with ____ rather than ____?
What if you could only use _____?
What have you learned or found out today?
Did you user or learn any new words today? What do they mean? How do you spell them?

Mathematical Questions to Support Classroom Discourse & Mathematical Thinking

QUESTIONS TO STIMULATE STUDENTS' MATHEMATICAL THINKING

To make sense of mathematics…

- Do you agree (disagree) with this?
- What do you think about what she just said?
- Do you understand what she said?
- Can you convince us that that makes sense?
- Would you ask that to the rest of the class?

To rely on themselves to determine correctness…

- Why do you think that?
- Why is that true?
- How did you reach that conclusion?
- Does that make sense?
- Can you show that with a model?

To learn to reason mathematically…

- Is that true for all cases?
- Can you think of a counterexample?
- Does that always work?
- Can you prove that? How?
- What assumptions are you making?

To learn to conjecture, invent and solve problems…

- What would happen if?
- Do you see a pattern?
- How did you think about this?
- What is the same and what is different about your methods?
- What can you predict from this? The next one? The last one?
- What are some possibilities here?

To connect mathematics and its applications…

- Have you ever solved a problem like this before?
- How does this relate to…?
- What have you learned before that is useful in solving this problem?
- Can you give a good example of…?
- What uses of mathematics did you find in (a specific activity)?