Strategies for Linking the Standards for Mathematical Practice with the Common Core State Standards

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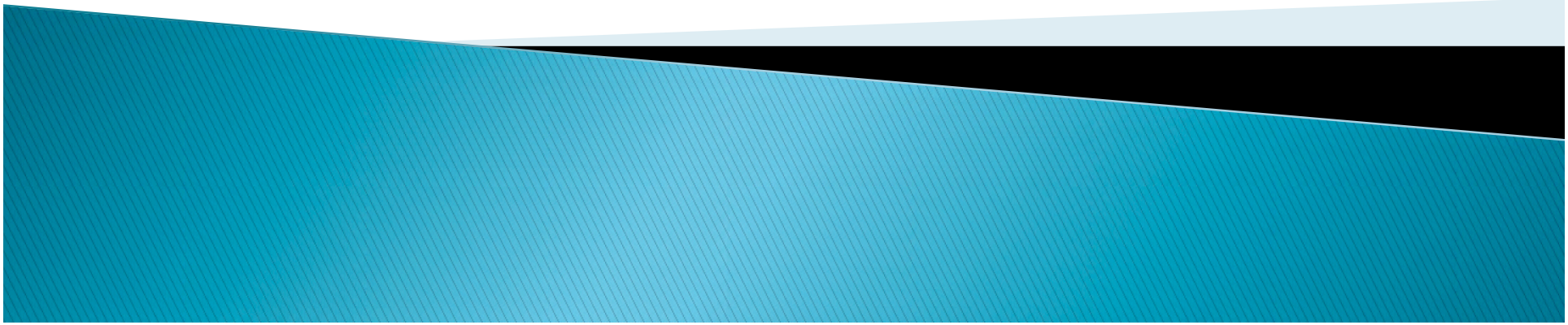
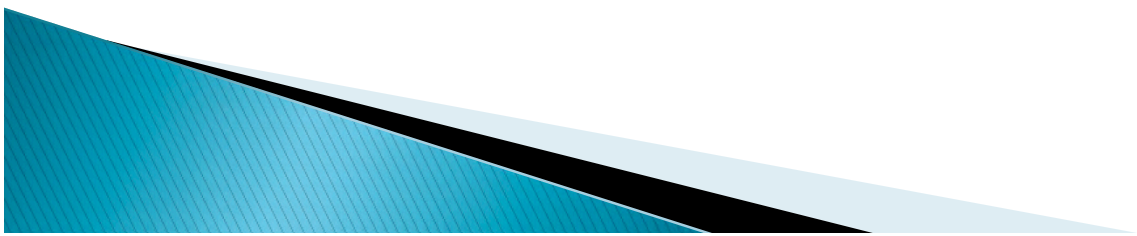


Standards

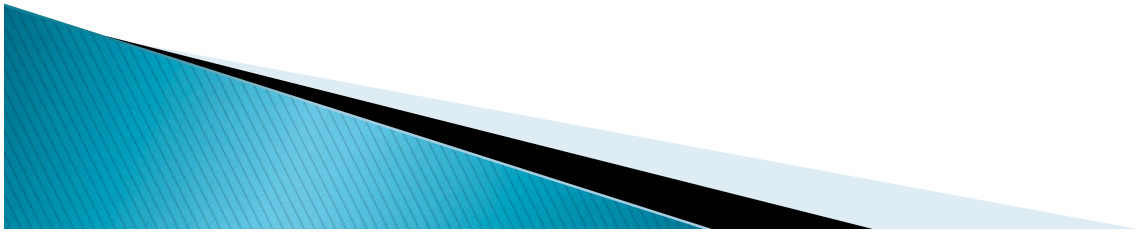
- For Content
- For Mathematical Practice
  - For ALL students to become proficient in mathematics, they must internalize the eight mathematical practices as the means to learn, understand, and retain the content standards. The practices sustain mathematics as the content evolves. They define what is needed to be a quantitatively literate citizen.

Conference on Curriculum Design and Implementation Report 10/1-3/2010



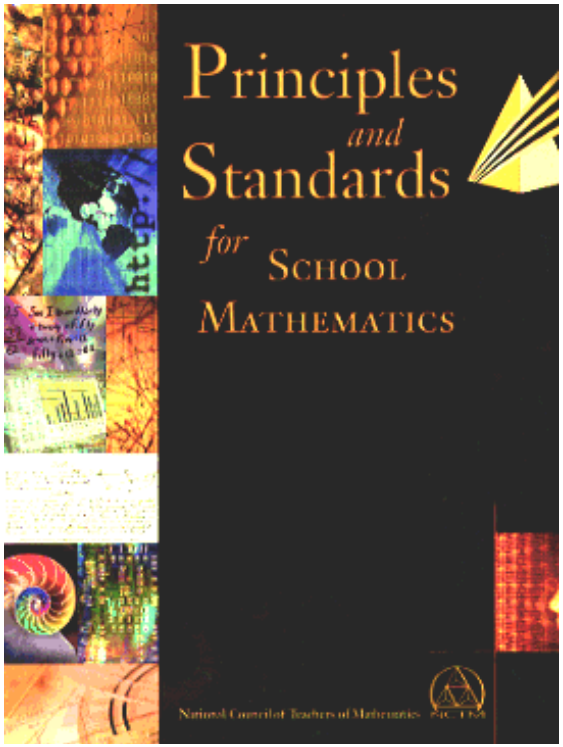
CCSSM Mathematical Practices

The Common Core proposes a set of Mathematical Practices that all teachers should develop in their students. These practices are similar to NCTM's Mathematical Processes from the *Principles and Standards for School Mathematics*.



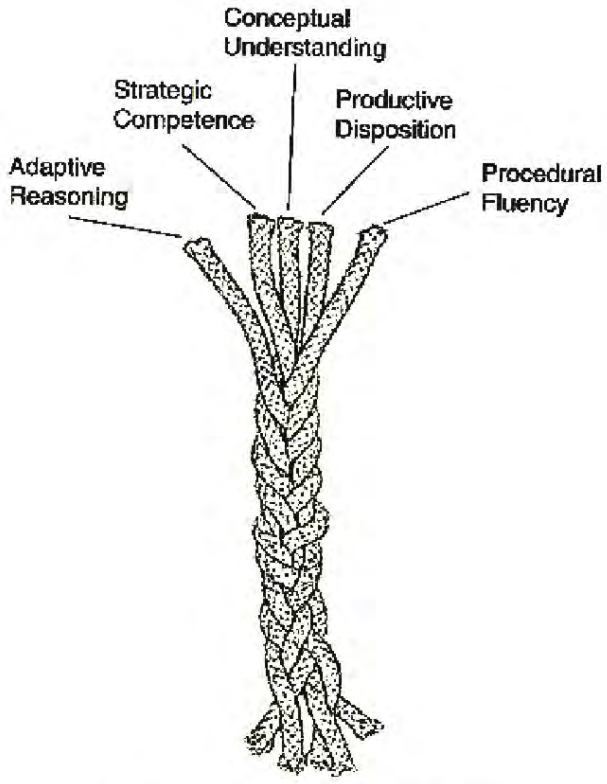
NCTM Process Standards

- Connections
- Communication
- Problem Solving
- Reasoning and Proof
- Representation



National Research Council's Strands of Proficiency

Adding It Up, 2001



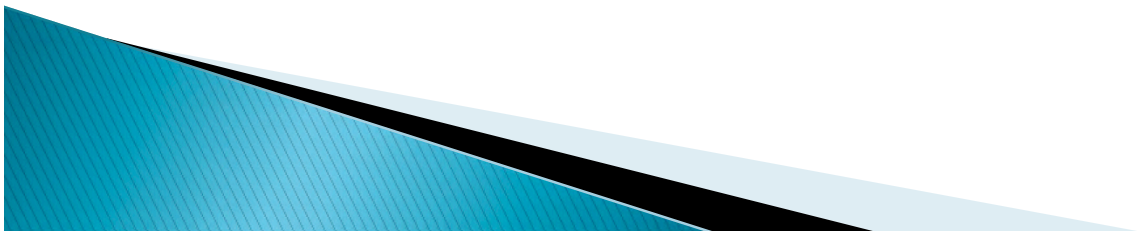
Intertwined Strands of Proficiency

- Adaptive Reasoning
- Strategic Competence
- Conceptual Understanding
- Productive Disposition
- Procedural Fluency

What have you heard???

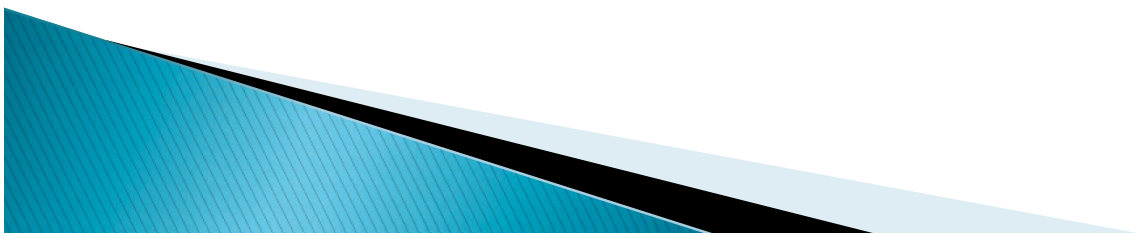
8 CCSSM Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.



8 CCSSM Mathematical Practices

6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.



Each group has one standard of practice to explore.

- Individually, read and underline a key idea
- **As a group discuss your ideas and make a poster of the ideas that your group underlined.**
- **List any questions your group has about the standard.**

1. Make sense of problems and persevere in solving them.

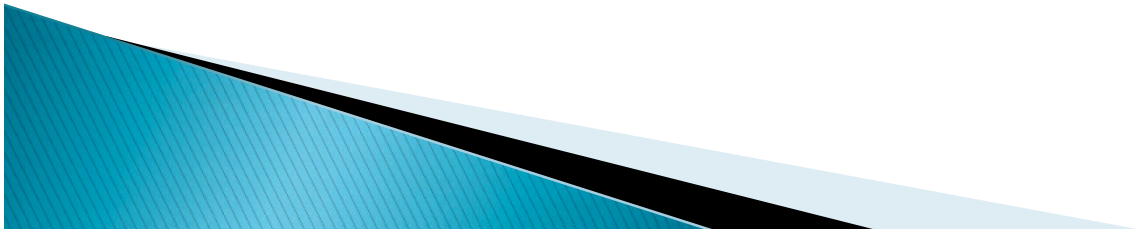
Students should be able to:

- Explain the meaning of the problem. May use concrete objects and/or pictorial representations.
- Come up with a strategy for solving the problem.
- Identify the connections between two different approaches to a problem.
- Determine whether or not the solution makes sense.

1. Make sense of problems and persevere in solving them.

To problem solve, students will need:

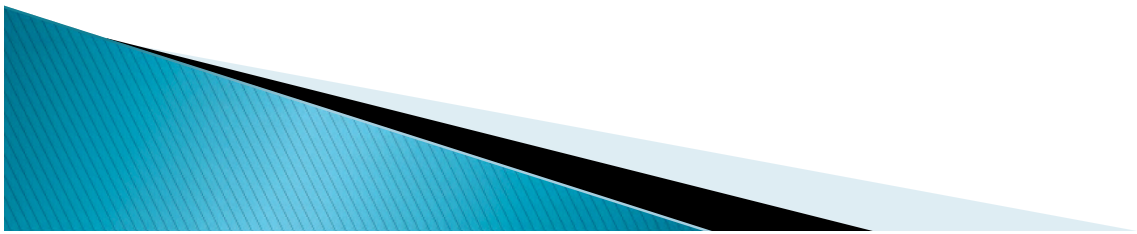
- Rich problems to consider.
- Time to reflect on their own thinking.
- Opportunities to dialogue with other students
- A safe environment to share their solutions with other students.



2. Reason abstractly and quantitatively.

Students should be able to:

- De-contextualize – represent problems or situations mathematically (using pictures numbers, words, concrete objects, graph)
- Contextualize – explain the meanings of numbers, words, pictures, graphs you use to solve a problem.



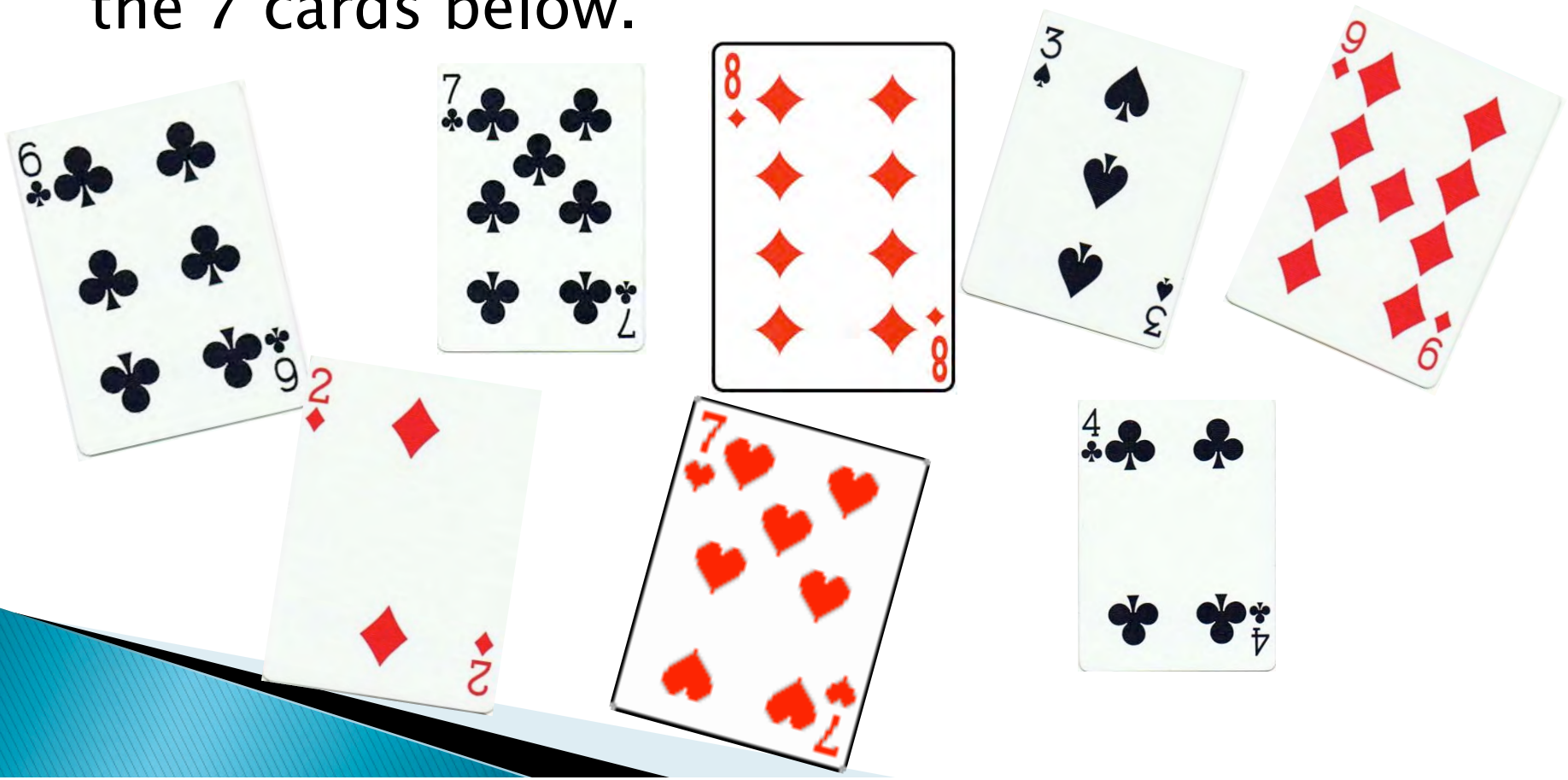
3. Construct viable arguments and critique the reasoning of others.

Students should be able to:

- Make conjectures.
- Use counterexamples in their arguments.
- Explain what to do and why it works.
- Listen and/or read others' explanations and determine if they make sense.
- Ask questions to get clarification of an idea or explanation.

Close to 1000

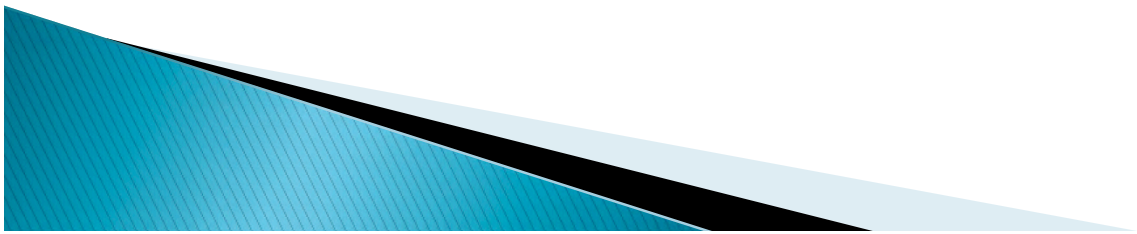
Write an equation using 2 three digit numbers with a sum that is closest to 1000. Use 6 of the 7 cards below.



4. Model with mathematics.

Students should be able to:

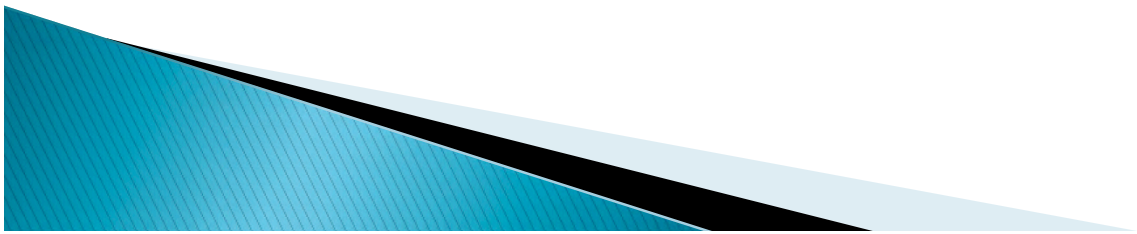
- Apply mathematics to solve everyday problems.
- Use equations, graphs, tables, diagrams, etc., to show the mathematical relationships in their model.
- Think about whether the model they have created makes sense and modify it if necessary.



5. Use appropriate tools strategically.

Students should be able to:

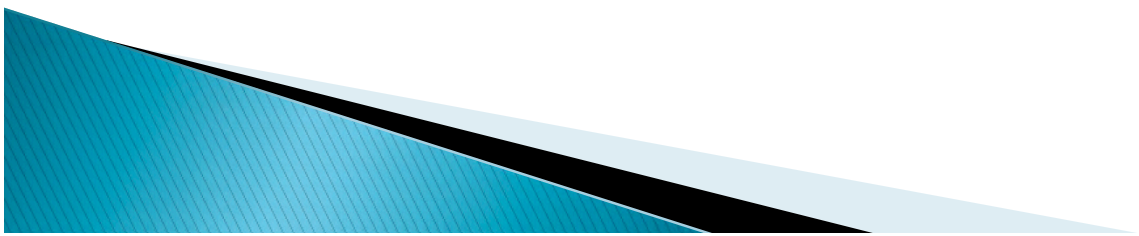
- Consider which available tools (calculator, ruler, concrete objects,…) they might use when solving a problem.
- Recognize the strengths and limitations of the tools they are using.
- Identify additional external resources, such as a website.



36 chairs

- Chairs in the new auditorium will be arranged in rows with the same number of chairs in each row.

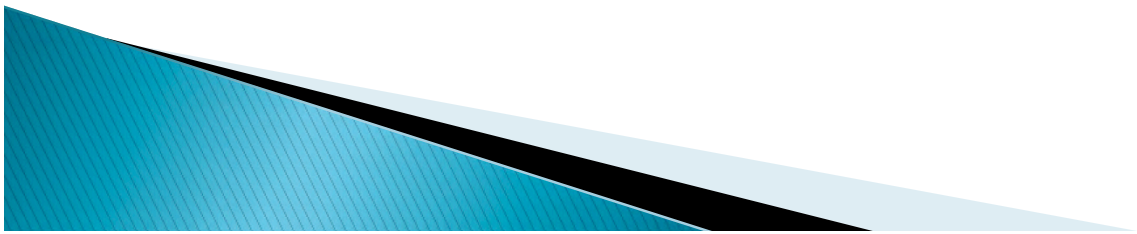
- Find all of the different ways 36 chairs can be arranged.



6. Attend to precision.

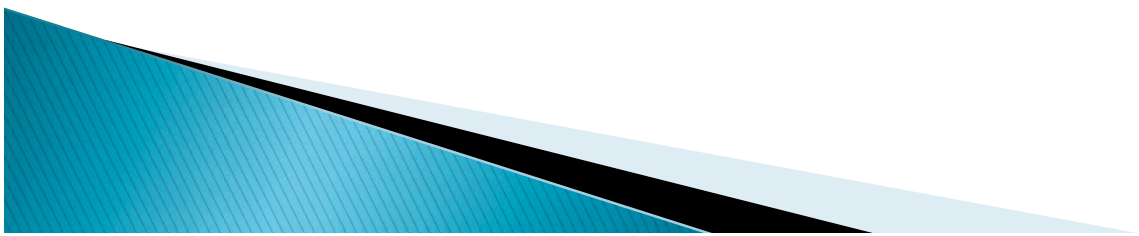
Students should be able to:

- Communicate precisely to others.
- Use clear definitions in discussion.
- Explain the meaning of the symbols they choose.
- Specify units of measure and label axes.
- Calculate accurately and efficiently.



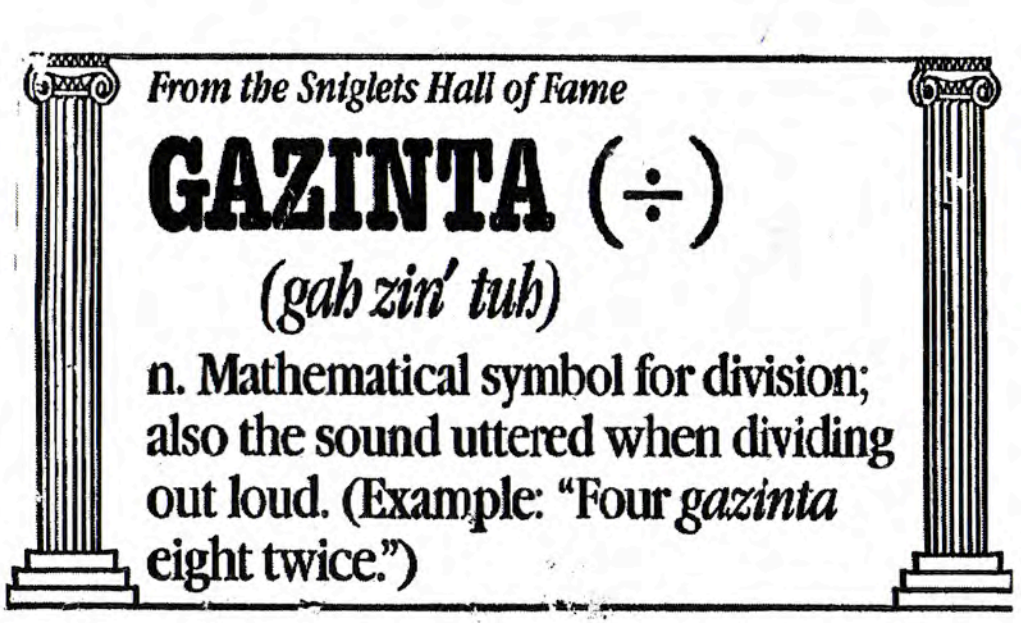
"Reducing" Fractions

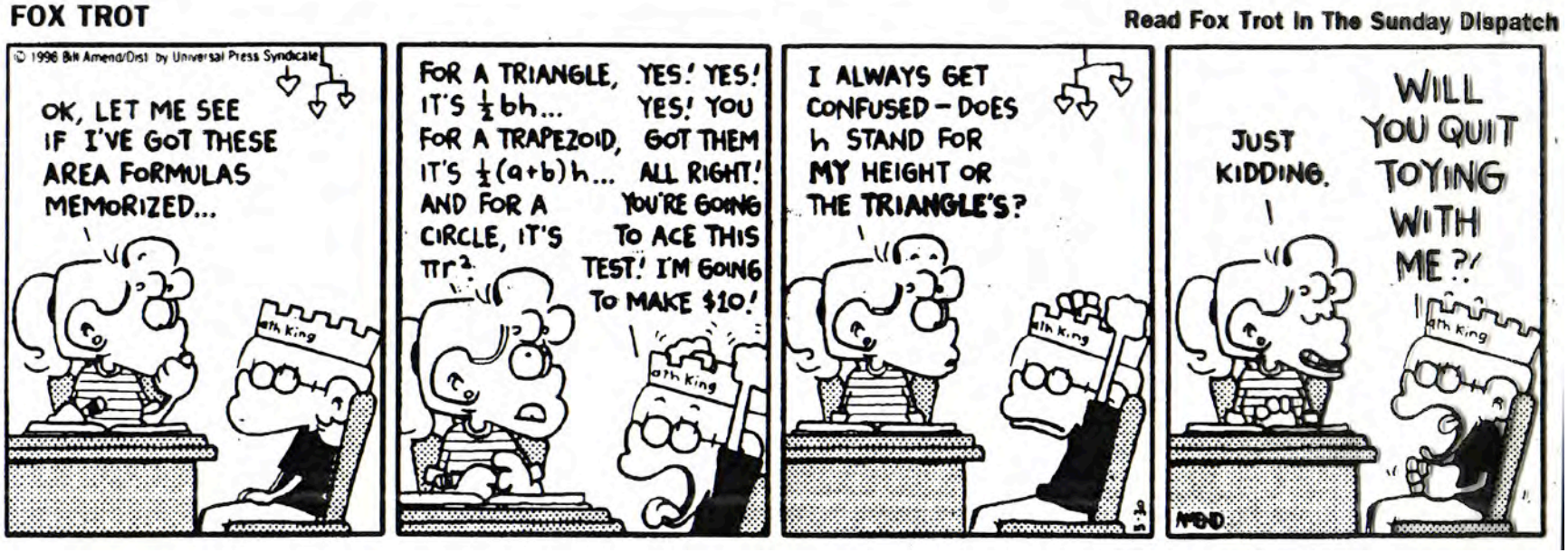
$$\frac{15}{25} = \frac{3}{5}$$



Watch your language...

$$9\overline{)27}\quad 3$$

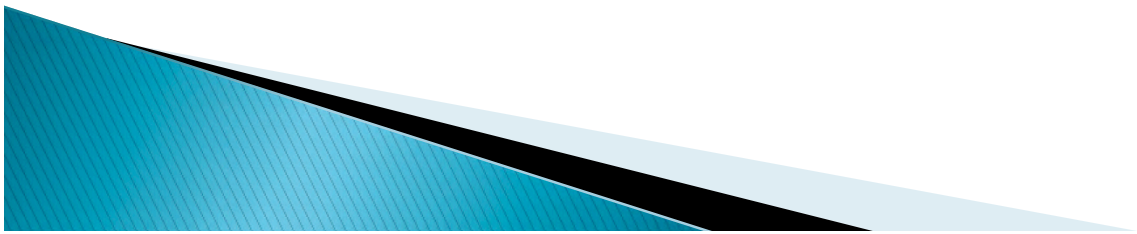



FOX TROT
Read Fox Trot In The Sunday Dispatch
© 1998 Bil Amend/Dist. by Universal Press Syndicate
OK, LET ME SEE IF I'VE GOT THESE AREA FORMULAS MEMORIZED...
FOR A TRIANGLE, IT'S $\frac{1}{2}bh$...
FOR A TRAPEZOID, IT'S $\frac{1}{2}(a+b)h$...
AND FOR A CIRCLE, IT'S πr^2.
YES! YES! YES! YOU GOT THEM ALL RIGHT! YOU'RE GOING TO ACE THIS TEST! I'M GOING TO MAKE $10!
I ALWAYS GET CONFUSED – DOES h STAND FOR MY HEIGHT OR THE TRIANGLE'S?
JUST KIDDING.
WILL YOU QUIT TOYING WITH ME?!
4th King

7. Look for and make use of structure.

Students should be able to:

- Find, extend, analyze and create patterns.
- Step back for an overview and shift perspective.
- Use patterns and structures to solve problems.



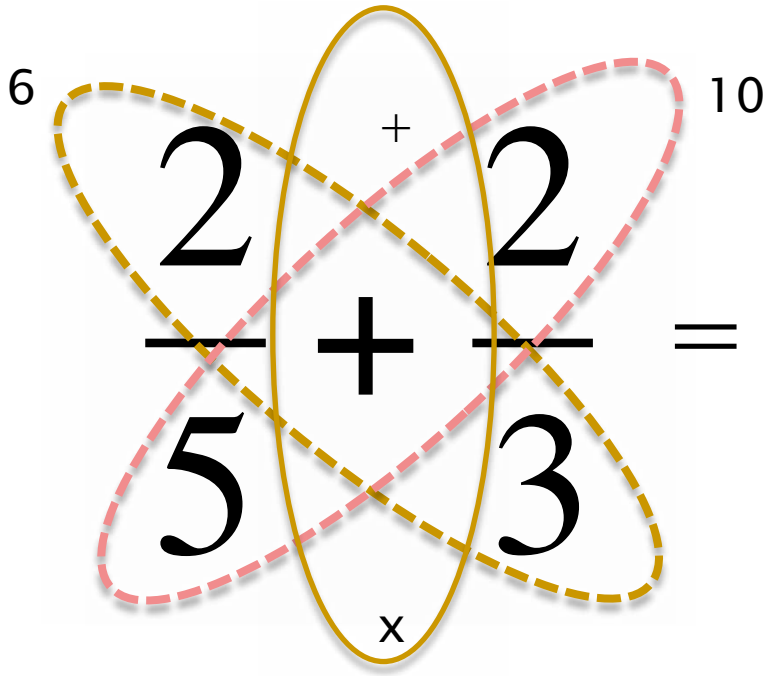

Peanuts
YES, MA'AM..HE'S MY DOG... NO, IF HE SITS WAY IN THE BACK, HE WON'T BOTHER ANYONE
1-15
© 1992 United Feature Syndicate, Inc.
WHAT WAS THAT THING ABOUT "I BEFORE C" OR SOMETHING? I SHOULD KNOW IN CASE SHE CALLS ON ME....
"E BEFORE M EXCEPT AFTER 6," OR IS IT "THREE BEFORE TWO EXCEPT AFTER TEN"?
SCHULZ

8. Look for and express regularity in repeated reasoning.

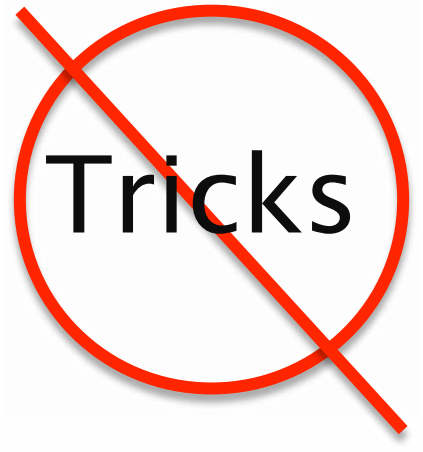
Students should be able to:

- Use patterns and structures to create and explain rules and shortcuts
- Use properties, rules to solve problems
- Reflect on your thinking before, during and after you solve a problem.

The butterfly method of adding fractions:



$$\frac{2}{5} + \frac{2}{3} = \frac{16}{15}$$



300
x 20

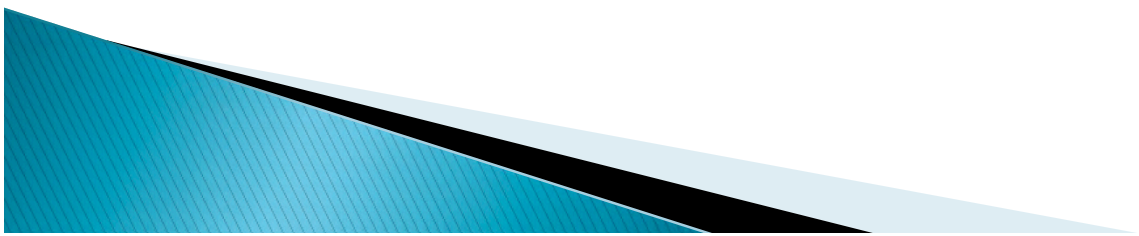
400
x 50

Number Talks

$7 \times 2 =$

$7 \times 20 =$

$7 \times 27 =$



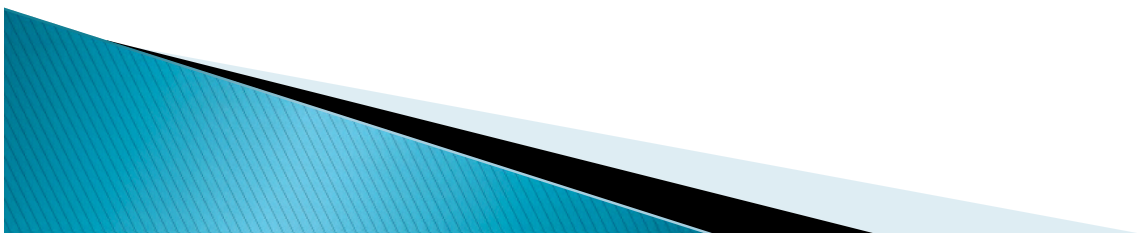
Tell all you know about the solutions to these problems

146 x .76

7.8 x .98

45.1 x 1.05

0.52 x 15.6



Mixed Numbers

$$5$$
$$-\ 2\ \frac{3}{4}$$


PEANUTS
by Charles Schulz
"7+3=10"...THAT'S AN EASY ONE, MARCIE...
© 1961 United Feature Syndicate, Inc.
ANYTHING WITH A "3" IS EASY BECAUSE YOU JUST TAKE THE FIRST NUMBER AND THEN COUNT THE LITTLE POINTY THINGS ON THE "3," AND YOU HAVE THE ANSWER!
WHAT ABOUT "TWELVES," SIR?
NO ONE CAN BE EXPECTED TO ANSWER A PROBLEM WITH A "TWELVE" IN IT!
IF A PROBLEM HAS REALLY BIG NUMBERS IN IT, THE ANSWER IS ALWAYS "ONE MILLION"!
MATH IS LIKE LEARNING A FOREIGN LANGUAGE, MARCIE...NO MATTER WHAT YOU SAY, IT'S GOING TO BE WRONG ANYWAY!
LET'S SEE..."NINE PLUS THREE"...I TAKE THE NINE AND COUNT THE LITTLE POINTY THINGS ON THE THREE...TEN, ELEVEN, TWELVE...THE ANSWER IS "TWELVE"...HA!!
SCHULZ

Last three paragraphs

- Connecting the Standards for Mathematical Content and the Standards for Mathematical Practice.
- “Expectations that begin with the word ‘understand’ are often especially good opportunities to connect the practices to the content.”