



# Cutting to the Core with the Standards for Mathematical Practice

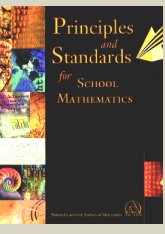
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- Problem solving be the focus of school mathematics
- Basic skills -- more than computational facility
- Power of calculators and computers at all grade levels
- Stringent standards of both effectiveness and efficient
- Student learning be evaluated by a wider range of measures than conventional testing
- More mathematics for students
- High level of professionalism
- Public support for mathematics



1989 NCTM Curriculum and Evaluation Standards

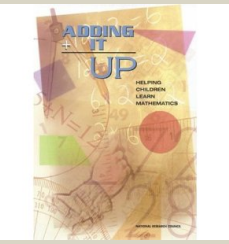


2000 NCTM Principles and Standards for School Mathematics

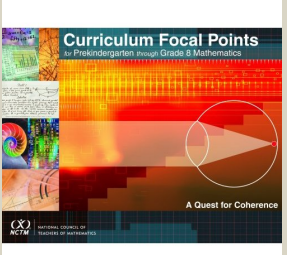
## NCTM Process Standards

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

How do the processes impact instruction?



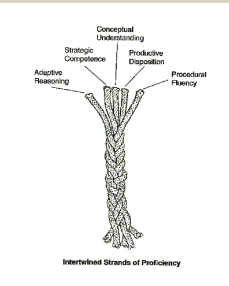
2001 National Research Council  
www.nap.edu



2006 NCTM

### National Research Council's Strands of Proficiency

*Adding It Up, 2001*



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

## NCTM Process Standards and the CCSS Mathematical Practice Standards

NCTM Process Standards	CCSS Mathematical Practices
Problem Solving	<ul style="list-style-type: none"> <li>Make sense of problems and persevere in solving them.</li> <li>Use appropriate tools strategically</li> </ul>
Reasoning and Proof	<ul style="list-style-type: none"> <li>Reason abstractly and quantitatively.</li> <li>Critique the reasoning of others.</li> <li>Look for and express regularity in repeated reasoning</li> </ul>
Communication	<ul style="list-style-type: none"> <li>Construct viable arguments</li> </ul>
Connections	<ul style="list-style-type: none"> <li>Attend to precision.</li> <li>Look for and make use of structure</li> </ul>
Representations	<ul style="list-style-type: none"> <li>Model with mathematics.</li> </ul>

How do we incorporate the processes/practices into our everyday instruction?

Every student must believe....

**“Everything you do in mathematics should make sense to you!”**

## Number Talk

- ▶ A Number Talk is a short, ongoing daily routine that provides students with meaningful ongoing practice with computation
  - helping students develop computational fluency
  - the expectation is that they will use number relationships and the structures of numbers as well as reasoning and sense making to develop a deeper understanding of mathematical ideas

## The Goal of Number Talks

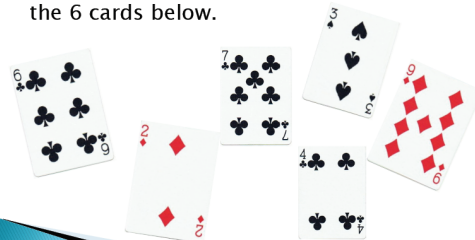
- ▶ Develop conceptual understanding and computational fluency.
- ▶ Student think and reason like mathematicians.
- ▶ Students make connections and look for relationships
- ▶ Student share their strategies, learning to clarify and express their thinking which leads to developing mathematical language.

Here is a sample:

$$\begin{array}{r} 76 - 54 \\ 76 - 55 \\ 76 - 48 \\ 75 - 48 \end{array}$$

## Close to 100

Write an equation using 2 two digit numbers with a sum that is closest to 100. Use 4 of the 6 cards below.



a.	$\begin{array}{r} 43 \\ \times 2 \\ \hline \end{array}$	b.	$\begin{array}{r} 37 \\ \times 9 \\ \hline \end{array}$	c.	$\begin{array}{r} 20 \\ \times 8 \\ \hline \end{array}$
d.	$\begin{array}{r} 58 \\ \times 7 \\ \hline \end{array}$	e.	$\begin{array}{r} 65 \\ \times 8 \\ \hline \end{array}$	f.	$\begin{array}{r} 32 \\ \times 5 \\ \hline \end{array}$
g.	$\begin{array}{r} 99 \\ \times 4 \\ \hline \end{array}$	h.	$\begin{array}{r} 87 \\ \times 3 \\ \hline \end{array}$	i.	$\begin{array}{r} 42 \\ \times 7 \\ \hline \end{array}$
j.	$\begin{array}{r} 38 \\ \times 4 \\ \hline \end{array}$	k.	$\begin{array}{r} 13 \\ \times 5 \\ \hline \end{array}$	l.	$\begin{array}{r} 39 \\ \times 6 \\ \hline \end{array}$
m.	$\begin{array}{r} 89 \\ \times 7 \\ \hline \end{array}$	n.	$\begin{array}{r} 74 \\ \times 3 \\ \hline \end{array}$	o.	$\begin{array}{r} 62 \\ \times 7 \\ \hline \end{array}$

### Less ... is More

Have a conversation about students' thinking.

$$28 \times 7 =$$

### Growing an idea...

$$\begin{array}{l} 3 \times 6 \\ 3 \times 60 \\ 3 \times 62 \\ 3 \times 68 \\ 3 \times 70 \end{array}$$

### Reasoning with Fractions

$$\frac{1}{2} + \frac{2}{3} =$$

### Reasoning with Fractions

$$\begin{array}{r} 5 \\ -2\frac{3}{5} \\ \hline \end{array}$$

### Connections: Division of Fractions



$$\frac{4}{5} \div \frac{2}{5}$$



$$\begin{array}{l} \frac{5}{4} \times \frac{2}{5} \\ \frac{4}{5} \times \frac{5}{2} \end{array}$$

### Connections: Division of Fractions



$$\frac{4}{5} \div \frac{2}{5}$$

### Making Connections

$$7.836 \times 4.92 = 3855312$$

$$534.6 \times 0.545 = 291357$$

$$51.1875 \div 1.05 = 4875$$

$$3.75 \div .05 = 750$$

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### Deal or No Deal

- ▶ Marty offers his parents a new deal for his allowance. Rather than getting \$5 a week, he suggests they give him 1¢ for the first day, 2¢ for the second day, 4¢ for the third day and so on for the entire month of February. Should Marty's parents accept his deal?

