

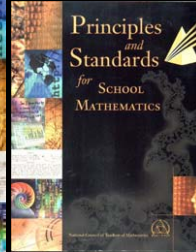
Charting a Course Through the NCTM Navigations Series

Number and Operations, Grades 3-5

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Principles and Standards for School Mathematics



Content Standards
Process Standards
Principles



Process Standards

- ◆ Problem Solving
- ◆ Communication
- ◆ Connections
- ◆ Representation
- ◆ Reasoning & Proof



Content Standards

- ◆ Number and Operations
- ◆ Algebra
- ◆ Geometry
- ◆ Measurement
- ◆ Data Analysis and Probability

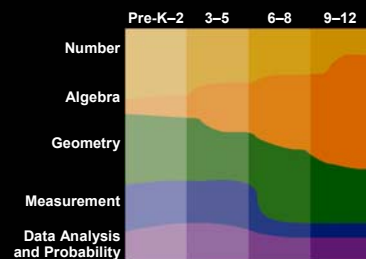


Principles

- ◆ Equity
- ◆ Assessment
- ◆ Teaching
- ◆ Learning
- ◆ Curriculum
- ◆ Technology



Emphasis across the Grades



The Navigations Series

- ◆ An instructional **resource** for the implementation of the *Principles & Standards*
- ◆ Illustrative guide to the development of ideas in each of the content strands
- ◆ Tools to incorporate the instructional principles identified in the Standards
- ◆ A source of professional development content

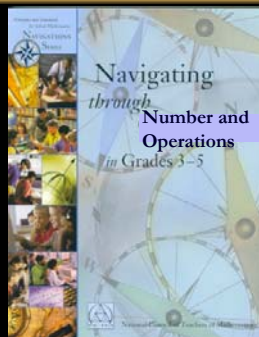


Charting a Course



Navigating *through* Number and Operation in Grades 3-5

A Production
in Progress



Number and Operations Standard

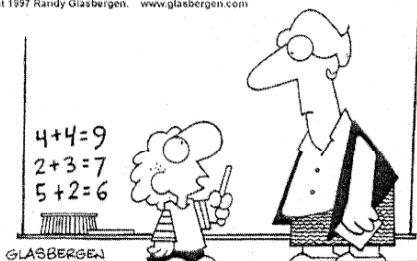
Instructional programs from prekindergarten through grade 12 should enable all students to—

- ◆ Understand numbers, ways of representing numbers, relationships among numbers, and number systems;
- ◆ Understand meanings of operations and how they relate to one another;
- ◆ Compute fluently and make reasonable estimates.



The scary side...

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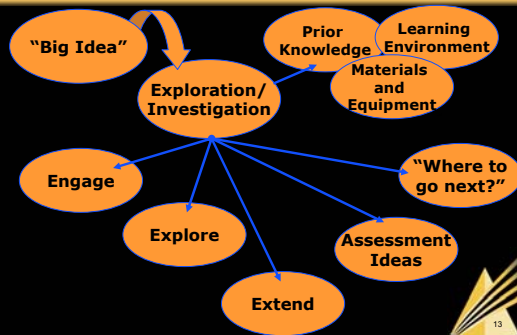
"My generation will be running the world soon. If we say $4+4=9$ then that's the way it's going to be!"

Table of Contents may include:

- ◆ Introduction
- ◆ Place Value Activity
- ◆ Number Sense Activity
- ◆ Computational Fluency Activity
- ◆ Calculating/Estimating Activity
- ◆ Blackline Masters
- ◆ References
- ◆ CD ROM with Applets



Organization of Lessons



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Place Value

- ◆ Activities in this chapter may enable students to explore strategies for developing place value ideas that will transfer to the development of number sense and computational fluency.
- ◆ It may provide opportunities for students to represent and compare whole numbers and to develop their ability to sequence numbers in ascending and descending order.

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Place Value

- ◆ Students should develop fluency in the sequencing of decimals. Newspapers can be used to illustrate the use of decimals in the real world.
- ◆ Calculators may allow students to develop strategies for changing one specific multi-digit number to another number accurately.

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Number Sense

- ◆ Students should understand the place-value structure of the base ten number system and be able to represent and compare whole numbers
- ◆ In addition, they should be able to sequence multi-digit numbers in descending and ascending order

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The Meaning of Numbers

- ◆ Possible activities may extend the understanding of place value to emphasize what numbers are, how they can be represented, and how they relate to one another.
- ◆ Students can be provided with the opportunity to compose and decompose three-digit numbers.
- ◆ Fractions, decimals, and percents are explored and compared.

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The Meaning of Numbers

- ◆ Activities may provide students with the opportunity to represent debit/credit situations with positive and negative numbers.
- ◆ They should also be able to demonstrate their knowledge in the area of prime numbers, factors, and products.
- ◆ Multiple problem solving strategies may be practiced while solving puzzles and heuristic problems which provide students with the opportunity to reflect on their thinking.

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Number Puzzles: What's My Decimal?

1. It is a three digit number that includes a decimal.
2. There are two places to the right of the decimal.
3. The ones digit is $\frac{1}{2}$ of the tenths digit.
4. It is an odd number.
5. Each digit is different.
6. No digit is a one.



What's My Decimal?

7. The total value is between 3 and 8.
8. The hundredths digit is one greater than the ones digit.
9. The sum of the digits is 17.
10. The ones digit is a 4.

What's my decimal?

Extend

- ◆ Can be played in teams. Students can create puzzles.



The clever side...



Developing Computational Fluency

- ◆ Varied activities may assist students to explore strategies for developing reliable algorithms and approaches for selecting appropriate computational methods or tools. Students select mental computation, calculators, estimation, or paper and pencil to best fit the problem solving situations.
- ◆ Students require multiple opportunities to develop fluency in the four basic operations. They also need to explore strategies to judge the reasonableness of computational results.



Calculating Approximately

- ◆ Estimation provides a natural way to develop number sense. Good estimating skills require making comparisons, using benchmarks and judging the reasonableness of an answer.
- ◆ Estimating how many jellybeans are in the jar or how much money will be earned babysitting for six hours at a rate of \$4.25 per hour are situations that stimulate thinking, invite involvement and enhance the development of number sense and estimating skills.
- ◆ Conceptual knowledge of numbers plays an important role in estimation. Therefore, estimation should be integrated with the study of concepts underlying whole numbers, fractions and decimals so that these concepts can be constructed meaningfully by the learner.



Estimation in Calculations

◆ Goals

The students will:

- ◆ develop and use strategies to estimate the results of whole-number computations and judge the reasonableness of estimated computation results.
- ◆ develop and use strategies to estimate the results of computations involving fractions and decimals in situations relevant to students' experiences and judge the
- ◆ reasonableness of estimated computation results.



Estimations in Calculations

◆ Engage

- Show the class one of the “Estimations in Calculations” BLM playing cards.
- Ask the students to decide whether they think the estimate is an overestimate, an underestimate or if it is too close to tell.
- Discuss the results of the students’ decisions. Asking students to explain how they obtained their estimates provides immediate feedback to students on how well they have done in providing estimates.
- Ask students to explain how they figured out whether the solution was an overestimate, an underestimate or if it was too close to tell.



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Estimations in Calculations

◆ Explore

- The task is to quickly decide whether the solution amount shown on the Estimations in Calculations card is an overestimate, underestimate or if it is too close to tell. The first student who responds correctly scores a point for his/her team. A team wins the game when the team scores 5 points.

◆ Extend

- After the game ends, have students write the strategy or strategies that they used to make reasonable estimates.



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Estimations in Calculations

$$87 + 45 + 23 + 55 =$$

200

is an overestimate
an underestimate
or too close to call



27

Estimations in Calculations

$$28 \times 53 =$$

1000

is an overestimate
an underestimate
or too close to call



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Estimations in Calculations

$$156 - 89 =$$

100

is an overestimate
an underestimate
or too close to call



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Estimations in Calculations

$$156 - 89 =$$

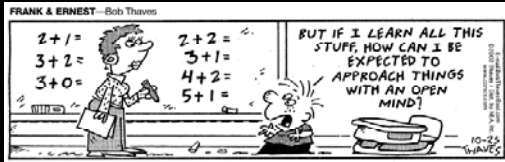
100

is an overestimate
an underestimate
or too close to call



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On the lighter side...



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Keep watching:

*Navigating through
Number and Operations
Grades 3-5...*

COMING SOON!

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