With Place Value, Location Is Everything!

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Newberry County School District
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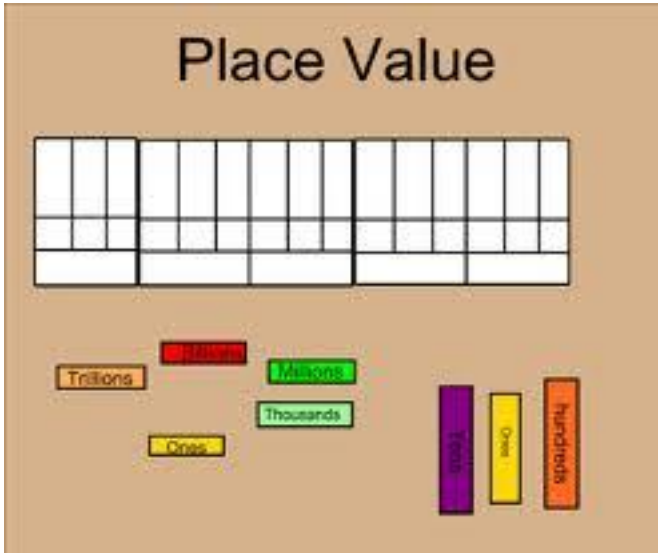
COMMON CORE
STATE STANDARDS INITIATIVE
PREPARING AMERICA'S STUDENTS FOR COLLEGE & CAREER

SOUTH CAROLINA
STATE DEPARTMENT
OF EDUCATION

Today's Goals

- Begin to unpack the NBT Domain of CCSS as it relates to place value.
- Understand the importance of integrating the concept of place value rather than presenting it as an isolated skill.
- Investigate coherence in the place value progression.
- Participate in lessons that align to CCSS and support the development of number sense.
- Leave with effective ideas and strategies to share in our home districts.

Why PLACE VALUE for today's focus?



What does teaching place value look like?

a. What do most teachers perceive as "teaching" place value? What do they think students should be able to do?

b. Do most teachers allow students to discover our place value system or do they tell the students about it?

c. Has this thinking helped most students develop number sense based on place value?

In case the idea of place value has become too commonplace to strike you as the foundational skill for ALL of mathematics, let's look at a different number system for comparison.

Roman Numerals

- What number does XXXIII represent?
- Share your reasoning with the person beside you.
- Observe that the three "X's" are in different places, yet each of them stands for 10. (not 100 or 1,000)
- Similarly, the three "I's" occupy different places, but they all represent 1.
- Contrast this with the number 111 in our numeral system.

Write nine thousand, six hundred eighty-four in Roman Numerals and our numeral system.

MMMMMMMMMDCLXXXIV

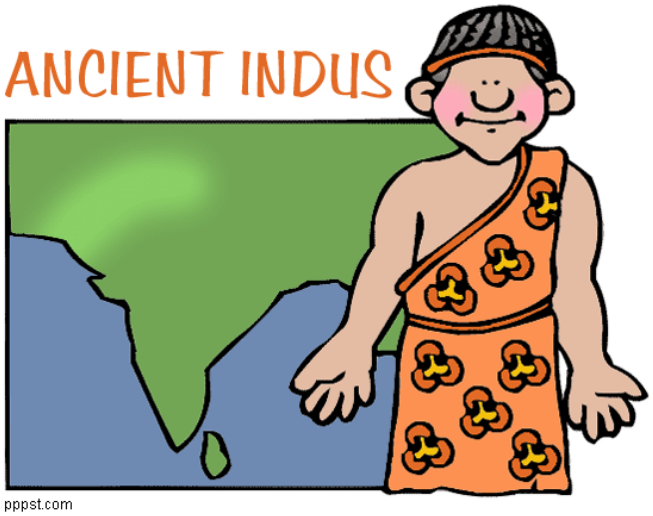
9,684

Which is easier?

628

- In our system (base ten)
  $(6 \times 10^2) + (2 \times 10) + (8 \times 1)$
- What about the Babylonian system? (base 60)
  $(6 \times 60^2) + (2 \times 60) + (8 \times 1)$
- Or the Mayans (base 20)
  dot for 1, line for 5 up to 20
- Or the Binary system? (base 2)
  1011010
- Or in Egyptian hieroglyphic script (base 1)

As time passed, ideas evolved, and by 500 A.D Indians had invented our base ten system that had unique symbols for the numbers 1 through 9, employed a place value notation, and used a zero.



So that's where place value came from.

What is it, though?

Place value is the notion that where a digit sits in a number says something about its value.

In other words,

location is everythıng!!!

Then why is it that teachers say over and over that kids don't know place value?

Thanks to what we will learn as we transition to and implement Common Core, our students will understand our number system and be able to use it to improve their lives.

So, how do we do this?

What place value understanding ~~should~~ **WILL** students have before they arrive in 3rd grade?

Estimation

Without asking anyone his/her name, estimate the total number of letters in all the **MIDDLE** names of the people at your table.

NO TALKING or hints!

Write your estimate

and DON'T CHANGE IT!

Representation

Using the Unifix cubes in your bag, build a train of cubes so that there is one cube for each letter in your MIDDLE name.

The number of cubes in the train should equal the number of letters in our middle name.

Put unused cubes back into the bag.

Group Work

- As a table, discuss how you might use the train cubes to represent the **total** number of letters in the middle names of the people at your table.
- As a table, create a model with your cubes to represent the total for your table.

How accurate was your estimate?

Which person at your table estimated closest to the actual total?

What strategy did this person use to estimate?

Estimation

Without asking anyone the total for a table, estimate the total number of letters in all the MIDDLE names of the people in the room.

NO TALKING or hints!

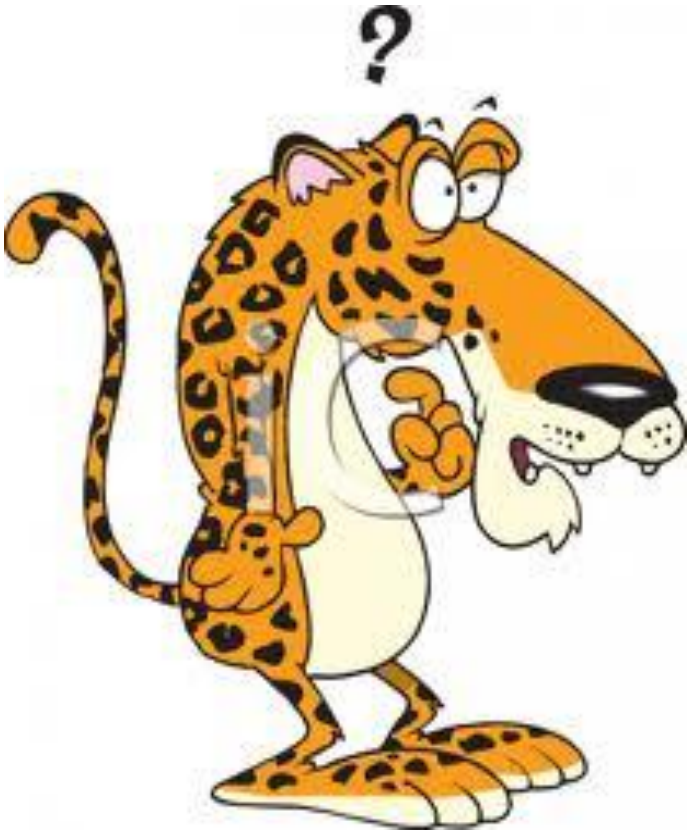
Write your estimate

and DON'T CHANGE IT!

Did anyone choose to build trains of ten as a strategy for determining a total? Why?

- Combine the trains at your table into groups of 10.
- Place the trains of ten in the tens place on the floor chart
- Place the leftover cubes in the ones place.

What's the total?



- Was your estimate <, >, or = the actual total?
- What is the difference between your estimate and the actual?
- How can we determine whose estimate was "best"?

It is important to remember that teaching children the usefulness and logic of grouping objects into tens to make sense of large quantities should not be a lesson objective.

Student Engagement

https://www.teachingchannel.org/videos/making-math-fun-with-place-value-games/embed?format=js

It's your turn!

Let's Celebrate!

Students will leave 2nd grade "knowing" ones, tens, and hundreds!!

The Common Core State Standards for Mathematics

Look at the 8 Standards for Mathematical Practice, and discuss which Practices we have addressed in this one lesson.

Standards for Mathematical Practice

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

Mathematics: 3 Shifts

1. **Focus**: Focus strongly where the standards focus.
2. **Coherence**: Think across grades, and link to major topics.
3. **Rigor**: In major topics, pursue conceptual understanding, procedural skill and fluency, and application.

Coherence

- Carefully connect the learning within and across grades so that students can build new understanding onto foundations built in previous years.
- Begin to count on solid conceptual understanding of core content and build on it. Each standard is not a new event, but an extension of previous learning.

K – 8 Domains

Domains	K	1	2	3	4	5	6	7	8
Counting and Cardinality									
Operations and Algebraic Thinking									
Number and Operations in Base Ten									
Measurement and Data									
Geometry									
Number and Operations - Fractions									
Ratios and Proportional Relationships									
The Number System									
Expressions and Equations									
Statistics and Probability									
Functions									

NBT Content Standards

1st Grade:

Understand 2-digit numbers are "some" tens and "some" ones

Use place value and properties to **add 2-digit and 1-digit**, and **2-digit and multiple of 10**

Subtract **multiple of 10 from multiple of 10** (10-90)

NBT.2

2nd Grade:

- **Understand 3-digit numbers** are "some" hundreds and "some" tens and "some" ones
- Use place value and properties to **add up to four 2-digit numbers**
- Use place value and properties to **add and subtract within 1,000**
- Add and subtract by **multiples of 10 and 100**

Group Work

Make a similar chart for your grade level.

1. Read the NBT Standards from the CCSS document.
2. Make and display your chart.

Time for a 30-minute Lunch!

3 Stages for Developing Mathematical Understanding

1. Concrete
2. Pictorial (semi-abstract)
3. Abstract

How We Usually Teach

Solve using the traditional algorithm.

1. $847 + 635$
2. $472 - 185$
3. 149×6
4. $581 \div 3$

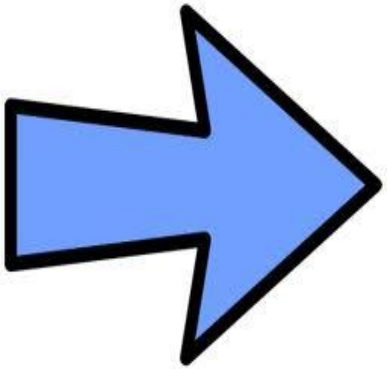
Teaching with the 3 Stages

1. Concrete
2. Pictorial (semi-abstract)
3. Abstract

Using Place Value to +, −, ×, and ÷

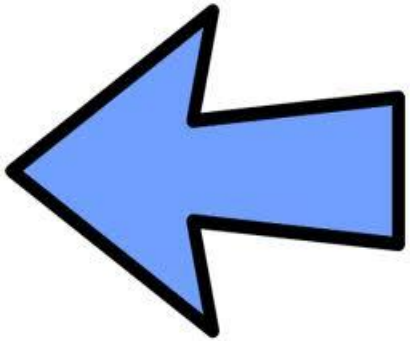
Left to Right

(place value or partial sums/products)



Right to Left

(traditional)



Solve 22 + 36

Traditional Algorithm

2 + 6 = 8

2 + 3 = 5

The sum is 58.

Using Place Value

20 + 30 = 50

2 + 6 = 8

50 + 8 = 58

How We Teach Using Place Value

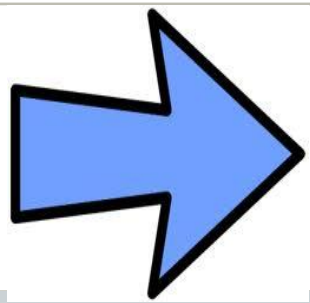
① $847 + 635$

② $472 - 185$

③ 149×6

④ $581 \div 3$

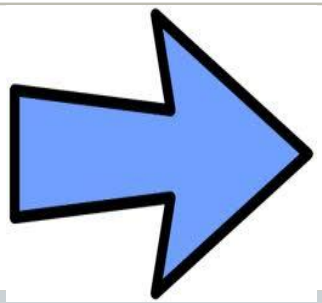
+ Using Place Value



Estimate the sum.
Use place value to add.
Show your work.
Explain your thinking.

259 + 462

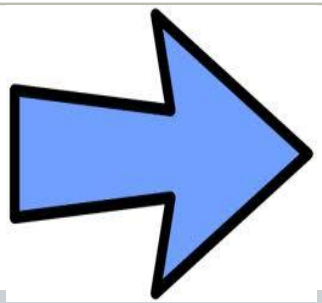
– From the Left



Estimate the difference.
Use place value to subtract.
Show your work.
Explain your thinking.

351 - 284

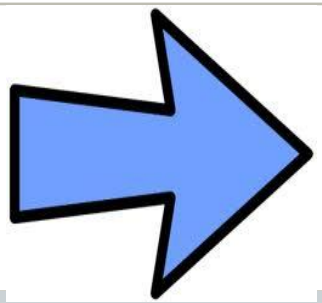
× From the Left



Estimate the product.
Use place value to multiply.
Show your work.
Explain your thinking.

263 × 7

÷ From the Left



Estimate the quotient.
Use place value to divide.
Show your work.
Explain your thinking.

634 ÷ 5

Group Discussion

Should we teach the algorithms?

If no, why not?

If yes, at what point during instruction do we teach them?

"We cannot solve our problems with the same thinking we used when we created them."

Albert Einstein

Handouts and Inventory

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