K-2
Role of Math Games in Building Computational Fluency

As you come in, sit at the table that corresponds to the grade your child is in.

Kindergarten

1st Grade

2nd Grade

K-2
Role of Math Games in Building Computational Fluency

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Big Ideas in Mathematics

- A ***Big Idea*** is a statement of an idea that is central to the learning of mathematics, one that links numerous mathematical understandings into a coherent whole.

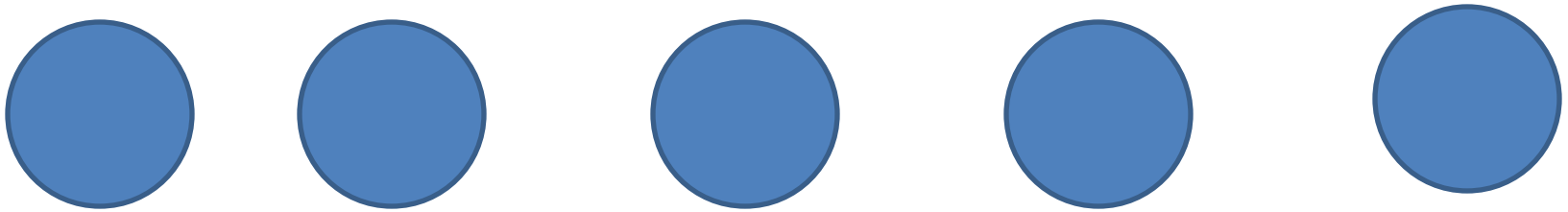
- Our math games are designed to develop skills reinforcing the big ideas in mathematics.

Essential Big Ideas in K-2

- **One to One Correspondence**
- **Cardinality**
- **Conservation**
- **Commutativity**
- **Part-Whole Relations**
- **Hierarchical Inclusion**
- **Magnitude**
- **Equivalence**
- **Compensation**
- **Unitizing**
- **Place Determines Value**
- **Place Value Patterns**
- **Associativity**

One to One Correspondence

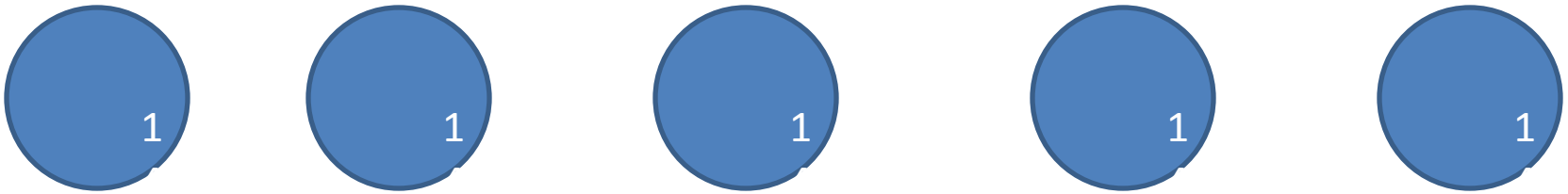
- When counting objects, pairing each object with one and only one number name.



1 2 3 4 5

Cardinality

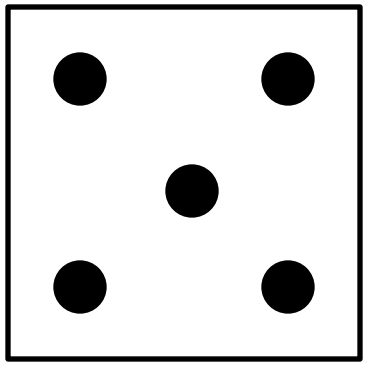
- Understanding that when counting, the last number name said tells the number of objects counted.

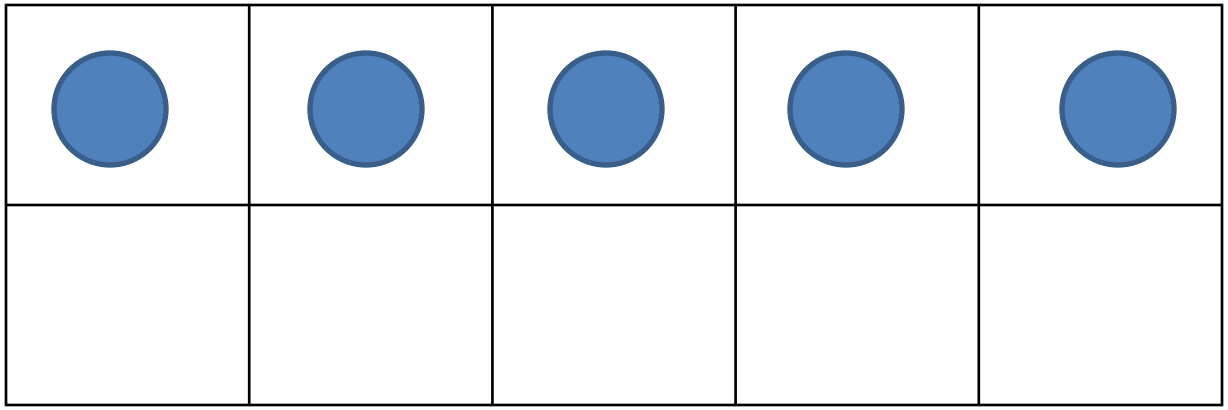


"There are **five** dots."

Conservation

- Understanding that the number of objects remains the same regardless of their arrangement or the order in which they are counted.





Commutativity

- Numbers can be added in any order and the sum will stay the same.

$$5 + 3 = 3 + 5$$

Part-Whole Relations

- Understanding of how the parts are related to the whole. This includes how addition and subtraction are related.

If 5 + 3 = 8 then 8 -3 must be 5.

Hierarchical Inclusion

- Understanding that smaller numbers nest inside larger numbers and each number grows by one and only one each time.

Six includes five; plus one.

Five includes four, plus one.

Etc.

Magnitude

- Comparing amounts and knowing which is more or less.

3 **5**

“Three is less than five.”
“Five is more than three.”

Equivalence

- Understanding that amounts can be rearranged and decomposed and still be equivalent.

2 groups of ten plus 3 ones = 1 group of ten plus 13 ones

Compensation

- Understanding that if you lose one (or any amount) from one number, but gain it in the other number, the total stays the same.

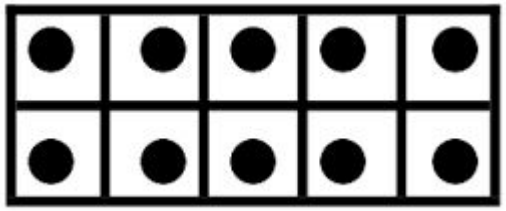
$$5 + 3 = (5 - 1) + (3 + 1)$$

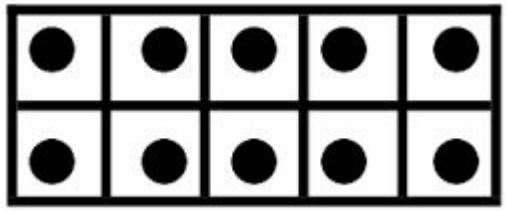
$$5 + 3 = 4 + 4$$

Unitizing

- Understanding that a group of objects can be seen as a unit.

= 10 cents





= 20 dots

Place Determines Value

- The idea that a numeral can represent ones or tens or hundreds, etc. depending on where it is placed.

$$28+21 = (20 + 8) + (20 + 1)$$

Place Value Patterns

- Place value patterns exist when adding or subtracting ten to or from a number.
- Place value patterns exist when dealing with numbers in the tens, hundreds, thousands, etc.
- The understanding of place value patterns will support students in understanding why the standard algorithm (aka stacking) for addition and subtraction work when introduced in 4th grade.

Associativity

- When working with addition, numbers can be grouped in a variety of ways and the sum stays the same.

$$5 + (3 + 2) = (5 + 3) + 2$$

Now, let's play some games with a partner!

- Use the big ideas sheet to play some games on your child's grade level.
- Write down games that fall under specific big ideas.
- Some games may cross over to more than one big idea and more than one game will support each big idea.

What is computational fluency?

The three main components of computational fluency are:

- Efficiency
- Accuracy
- Flexibility

-Ann Dowker Research

What is efficiency?

In efficient strategy use, the student…

- Does not get bogged down in too many steps or lose track of the logic of the strategy
- Uses a strategy that can be easily carried out
- Is able to keep track of sub-problems
- Makes use of intermediate results to solve the problem

What is accuracy?

Accuracy depends on many aspects of the problem-solving process:

- Careful recording
- Knowledge of number facts
- Knowledge of other important number relationships
- Double-checking results

What is flexibility?

- Requires the knowledge of more than one approach to solving a particular kind of problem
- Enables the student to choose an appropriate strategy for the problem at hand
- Enables the student to shift strategies in the problem-solving situation if a more efficient strategy becomes apparent
- Allows the student to use one method to solve a problem and another method to double-check the results.