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Teaching Maths Number Sense School Plan

Introduction: This plan is designed to build number sense across all class levels by focusing on key strategies in addition, subtraction, multiplication, and division. Each strategy is introduced with a specific purpose, encouraging students to develop flexibility, fluency, and confidence in mathematical thinking.

Faughart CNS teachers collaborated with PDST maths advisors in 2018 -2020 on teaching number sense and have created this policy as part of the preparation for teaching the new Primary Maths Curriculum 2024.

Goals:

- To enhance students' mental math fluency.
- To build flexibility in using various strategies for addition, subtraction, multiplication, and division.
- To foster a deeper understanding of number relationships and efficient calculation methods.

General Implementation Guidelines

1. **Counting Activities (All Classes):**
    - Conducted three times per week for 5–15 minutes, reinforcing number patterns and counting skills that support all operations.
2. **Number Talks (All Classes):**
    - Twice per week for 10 minutes, focusing on discussing different approaches to solve problems, promoting mathematical thinking.
3. **Ready Set Go Scheme (Junior and Senior Infants):**
    - Foundational activities designed to develop early number sense, supporting addition and subtraction through hands-on, interactive tasks.
4. **Explicit Teaching of Mental Maths Strategies (1st to 6th Classes):**
    - Following the PDST Mental Maths handbook, teachers will introduce strategies for addition, subtraction, multiplication, and division according to the monthly plan in Appendix A.

Addition and Subtraction Strategies

The following strategies focus on building fluency and flexibility with addition and subtraction. Each strategy is taught using the **Concrete-Pictorial-Abstract (CPA) approach** to ensure that students build a deep understanding of the concepts.

1. **Counting Forwards (using the empty number line):**
    - **Purpose:** To introduce addition as counting forward along a number line.
    - **How it's taught:** Start with a physical or drawn number line where students "jump" forward in steps. Progress to using a mental number line.

2. **Facts of Ten:**
    - **Purpose:** To reinforce number pairs that sum to ten, a key foundation for addition.
    - **How it's taught:** Use manipulatives to demonstrate pairs that add to ten, helping students quickly recall these pairs for mental addition.
3. **Reordering:**
    - **Purpose:** To demonstrate that in addition, the order of numbers doesn't affect the result, allowing easier grouping.
    - **How it's taught:** Show students how reordering can simplify addition (e.g., grouping numbers that make ten).
4. **Doubles:**
    - **Purpose:** To support addition by memorising doubles (e.g., 4+4=8) as quick mental shortcuts.
    - **How it's taught:** Start with concrete examples, encouraging students to memorize doubles for faster mental addition.
5. **Near Doubles:**
    - **Purpose:** To use known doubles to solve problems that are close to doubles (e.g., 6+7 as 6+6+1).
    - **How it's taught:** Teach students to recognize and adjust near doubles for simpler calculations.
6. **Bridging Through Ten:**
    - **Purpose:** To simplify addition by breaking numbers to make a "bridge" through ten.
    - **How it's taught:** Model decomposing numbers (e.g., 8+5 as 8+2+3), building flexibility around ten.
7. **Partitioning by Place Value (for Addition and Subtraction):**
    - **Purpose:** To break down numbers into tens and units, making addition and subtraction easier.
    - **How it's taught:** Demonstrate splitting numbers by place value (e.g., 34+25 as 30+20 and 4+5) for simplified mental calculations.
8. **Rounding with Compensation (for Addition and Subtraction):**
    - **Purpose:** To use rounding to simplify addition or subtraction, adjusting afterward.
    - **How it's taught:** Teach students to round one number, complete the operation, and compensate by adjusting the answer (e.g., rounding 29+8 to 30+8−1).
9. **Think Addition (for Subtraction):**

- **Purpose:** To help students solve subtraction by thinking of the missing number in addition.
- **How it's taught:** Frame subtraction as finding the addend, e.g., solving 15−7 by thinking, "What adds to 7 to make 15?"

10. **Constant Difference (for Subtraction):**
    - **Purpose:** To simplify subtraction by shifting both numbers up or down by the same amount.
    - **How it's taught:** Demonstrate that adjusting both numbers equally maintains the difference (e.g., 53−29 becomes 54−30).
11. **Bridging through 60 (for Subtraction in Time):**
    - **Purpose:** To handle time calculations by bridging through multiples of 60.
    - **How it's taught:** Use real-world examples, such as calculating elapsed time, to reinforce this subtraction skill in time contexts.

Multiplication and Division Strategies

These strategies focus on enhancing students' ability to multiply and divide with efficiency and flexibility. Each strategy is taught with the **Concrete-Pictorial-Abstract (CPA) approach** to support conceptual understanding and fluency.

1. **Partitioning by Place Value (for Multiplication):**
    - **Purpose:** To simplify multiplication by breaking numbers into parts based on place value.
    - **How it's taught:** Show students how to separate numbers (e.g., 23×523 as (20×5)+(3×5)) for easier calculations.
2. **Rounding with Compensation (for Multiplication):**
    - **Purpose:** To simplify multiplication by rounding one factor and adjusting the result.
    - **How it's taught:** Teach students to round a number (e.g., 19×6 as 20×6 −6), then adjust by compensating.
3. **Break Down Factors (for Multiplication):**
    - **Purpose:** To break down larger multiplication problems into smaller, manageable steps.
    - **How it's taught:** Demonstrate decomposing numbers into smaller factors, then multiplying in steps (e.g., 6×15 as 6×5×3).
4. **Doubling and Halving (for Multiplication):**
    - **Purpose:** To simplify multiplication by doubling one factor and halving the other.
    - **How it's taught:** Model how adjusting factors (e.g., 8×25 as 4×50) can make calculations more manageable.

5. **Partial Products:**
    - **Purpose:** To simplify larger multiplication problems by breaking them into partial products.
    - **How it's taught:** Teach students to partition numbers and multiply each part separately (e.g., 23×15 as $(20\times10)+(20\times5)+(3\times10)+(3\times5)$).
6. **Partial Quotients (for Division):**
    - **Purpose:** To approach division as a series of simpler steps, breaking down large numbers.
    - **How it's taught:** Show how to divide by estimating times a divisor fits into parts of the dividend (e.g., $96\div6$ as $60\div6$ and $36\div6$).

Counting Activities by Class Level

Counting activities are designed to strengthen students' understanding of number patterns, sequences, and relationships. These activities are conducted three times per week for 5–15 minutes, tailored to each class level.

1. **Junior Infants:**
    - **Counting Objects:** Students count physical objects like counters, blocks, or toys up to 10.
    - **Number Songs and Rhymes:** Songs like "Five Little Ducks" and "One, Two, Buckle My Shoe" to reinforce counting.
    - **Counting with Fingers:** Practicing counting forward and backward using fingers.
2. **Senior Infants:**
    - **Counting Forward and Backward:** Counting from 0 to 20 and back to 0.
    - **Counting in Pairs:** Practice counting in twos up to 10 using pairs of objects.
    - **Number Line Jumps:** Using a number line to jump forward and backward, reinforcing counting and direction.
3. **1st Class:**
    - **Skip Counting:** Counting by 2s, 5s, and 10s up to 50 using counters or a hundred chart.
    - **Counting with Real-Life Contexts:** Counting items in groups (e.g., pencils, crayons) and creating patterns.
    - **Counting Around the Room:** Taking turns counting objects around the classroom or playground.
4. **2nd Class:**
    - **Counting by 2s, 5s, and 10s up to 100:** Using a hundred chart or counting objects in groups.

- **Counting Forward and Backward from a Given Number:** Practice counting starting from any number within 100.
- **Odd and Even Counting:** Counting only odd or even numbers to build awareness of number properties.

5. **3rd Class:**
   - **Counting by Multiples of 3 and 4:** Practice counting by 3s and 4s up to 100 to support multiplication.
   - **Counting in Reverse:** Start from a given number and count backward by 2s, 5s, or 10s.
   - **Counting with Money:** Using coins to count in 5s, 10s, and 20s, making connections with real-world scenarios.
6. **4th Class:**
   - **Counting in Multiples up to 12:** Practice counting by 6s, 7s, 8s, etc., up to 100 to reinforce multiplication.
   - **Skip Counting with Large Numbers:** Counting by 100s and 1,000s up to 10,000.
   - **Counting Fractions and Decimals:** Count in halves or quarters using fraction strips or visual aids.
7. **5th Class:**
   - **Counting in Larger Multiples:** Practice counting by 25s, 50s, and 100s.
   - **Counting with Decimals:** Count by tenths and hundredths (e.g., 0.1, 0.2, 0.3) to reinforce decimal understanding.
   - **Counting in Patterns:** Identify patterns in counting sequences and extend them (e.g., 2, 4, 8, 16…).
8. **6th Class:**
   - **Counting in Negative Numbers:** Practice counting forward and backward in negative integers.
   - **Counting with Fractions:** Count in fractions like thirds and fifths (e.g., 13,23,1\frac{1}{3}, \frac{2}{3}, 131,32,1).
   - **Counting with Mixed Numbers:** Counting in increments with whole numbers and fractions, e.g., 1, 1 ½, 2, 2 ½.

Number Talks by Class Level

Number Talks encourage students to verbalize their thinking, explore different strategies, and learn from peers. These are conducted twice per week for 10 minutes, adapted to each class level.

1. **Junior Infants:**
    - **Dot Talks:** Show a card with a few dots (up to 5) and ask students how many dots they see and how they saw them.
    - **Finger Patterns:** Show different finger combinations for a number (e.g., 3 fingers on one hand, 2 on the other for 5).
2. **Senior Infants:**
    - **Ten Frame Talks:** Show a ten frame with counters and ask how many there are, discussing different ways to see the total.
    - **Simple Addition Talks:** Show a combination of objects (e.g., 2 apples and 3 apples) and ask how many altogether.
3. **1st Class:**
    - **Addition Facts to 10:** Present addition facts within 10 (e.g., 5 + 3) and ask for different ways to reach the total.
    - **Counting Strategies:** Ask, "How would you count from 7 to 15?" and discuss different counting strategies.
4. **2nd Class:**
    - **Addition and Subtraction within 20:** Pose problems like 12 + 8 or 15 - 7 and ask students to explain their thinking.
    - **Near Doubles:** Use problems like 6 + 7 and ask students how they might solve it by using a known double (6 + 6).
5. **3rd Class:**
    - **Making Ten Strategy:** Ask students how they would solve 8 + 6 by making a ten, discussing different methods.
    - **Basic Multiplication Talks:** Show a multiplication fact like 3 × 4 and ask for different ways to find the product (e.g., repeated addition).
6. **4th Class:**
    - **Two-Digit Addition and Subtraction:** Present problems like 34 + 27 and discuss various strategies, including place value partitioning.
    - **Multiplication by Breaking Apart:** Show 6 × 8 and discuss ways to solve it by breaking it down (e.g., 6 × 4 + 6 × 4).
7. **5th Class:**
    - **Multi-Digit Addition and Subtraction:** Use problems like 125 + 175, encouraging students to discuss strategies like rounding and adjusting.

- **Fraction Talks:** Show a visual of fractions (e.g., two-thirds of a shape shaded) and ask students to describe what they see.

8. **6th Class:**
    - **Decimals and Percentages:** Present problems involving decimals (e.g., 0.75 + 0.25) and discuss strategies for combining decimals.
    - **Division with Remainders:** Pose problems like 37 ÷ 5 and ask how students interpret the remainder, discussing real-world applications.

Teaching Methodologies

Each strategy is reinforced with:

- **Concrete-Pictorial-Abstract Approach**: Start with hands-on practice, move to visual aids, and progress to mental methods.
- **Direct Instruction and Modeling**: Teachers explicitly model each strategy, verbalizing thinking steps.
- **Guided Practice**: Provide scaffolded opportunities for students to apply strategies with teacher support.
- **Collaborative Learning**: Use peer discussions to explore different methods.
- **Fluency and Repetition**: Include regular mental math drills to reinforce strategy use.
- **Application in Problem-Solving**: Integrate strategies into real-world scenarios to reinforce understanding.

Assessment

1. **Formative Assessment**: Observational checklists, exit tickets, and quizzes to gauge understanding and retention.
2. **Summative Assessment**: End-of-term evaluations to assess mastery of multiple strategies.
3. **Self and Peer Assessment**: Reflective activities and peer feedback to encourage metacognitive thinking.

Differentiation

1. **Support for Struggling Learners**: Provide extra practice with concrete materials and visual aids, as well as step-by-step guidance.
2. **Challenges for Advanced Learners**: Extend tasks to explore combinations of strategies and higher-order problem-solving.

Resources

- **Concrete Manipulatives**: Counters, base-ten blocks, number lines.
- **Visual Aids**: Anchor charts and diagrams.

- **Digital Resources**: Online counting games and interactive math tools.
- **Printed Materials**: Worksheets and math journals.

Review and Reflection

This plan will be reviewed regularly to assess its effectiveness. Adjustments will be made based on teacher feedback and student progress, ensuring that the plan aligns with learning goals.

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Teaching Number Sense - Appendix A

Addition and Subtraction All Classes

	Major Strategy	Minor	Minor	Minor
Oct	**Counting forwards** (using the empty number line)	Facts of ten	Reordering	Doubles
Nov	**Facts of ten**	Reordering	Doubles	Near doubles
Dec	**Reordering**	Doubles	Near Doubles	Bridging through ten
Jan	**Doubles**	Near Doubles	Bridging through ten	Partitioning by Place Value
Feb	**Near Doubles**	Bridging through ten	Partitioning by Place Value	Rounding with compensation
Mar	**Bridging through ten**	Partitioning by Place Value	Rounding with compensation	Think Addition
Apr	**Partitioning by Place Value**	Rounding with compensation	Think Addition	Constant difference
May	**Rounding with compensation**	Think Addition	Constant difference	Bridging through 60

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Multiplication and Division

		3rd & 4th		5th & 6th	
		Major Strategy	Minor	Major	Minor
Oct	x	Skip Counting		Skip Counting	Doubles 2s 4s 8s
Nov	x	Doubles 2s 4s	Skip Counting	Repeated addition	Multiplying by 10
Dec	x	Doubles 8s	Doubles 2s 4s	Multiplying by 10	Partitioning by place value
	÷	Skip counting division		Repeated subtraction	Dividing by 10
Jan	x	Repeated addition	Doubles 4s 8s	Partitioning by place value	Rounding with Compensation
	÷	Repeated Subtraction		Dividing by 10	Partitioning by place value
Feb	x	Repeated addition	Partitioning by Place Value	Rounding with compensation	Using known facts
	÷	Dividing by 10		Factorisation	Rounding with compensation
Mar	x	Partitioning by place value	Rounding with compensation	Using known facts	Break down factors
	÷	Factorisation		Think multiplication	
Apr	x	Rounding with compensation	Using known facts	Break down factors	Doubling & Halving
	÷	Using known facts		Proportional Adjustment	
May	x	Using known facts	Break down factors	Doubling & Halving	Partial Products
	÷	Proportional adjustment		Partial Quotients	