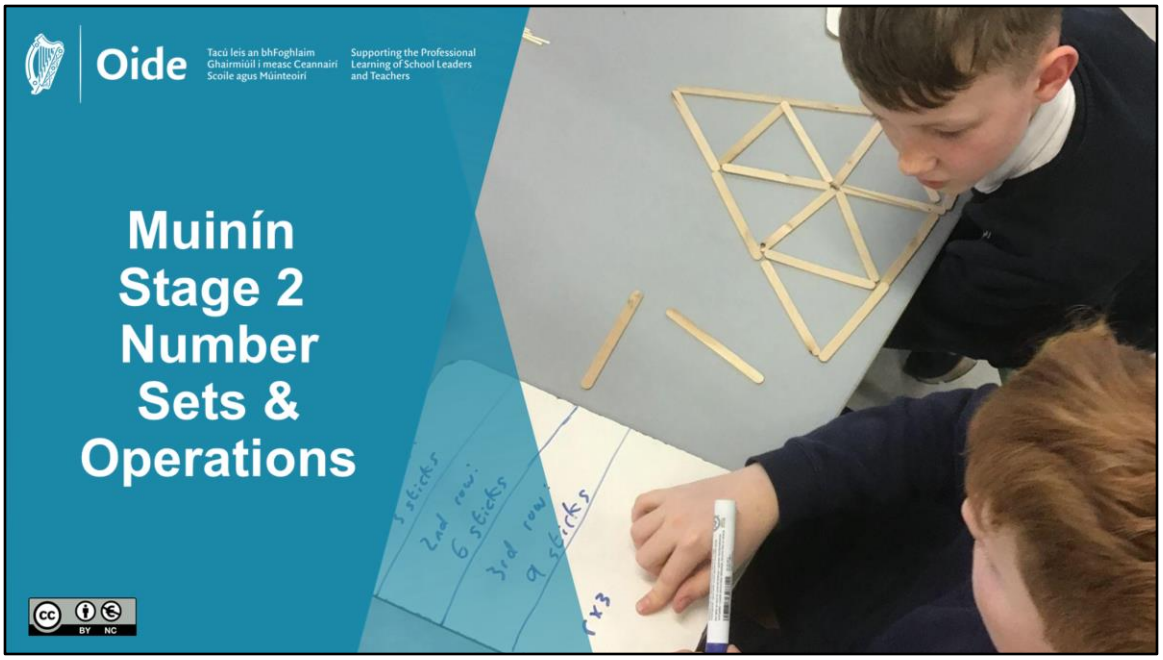
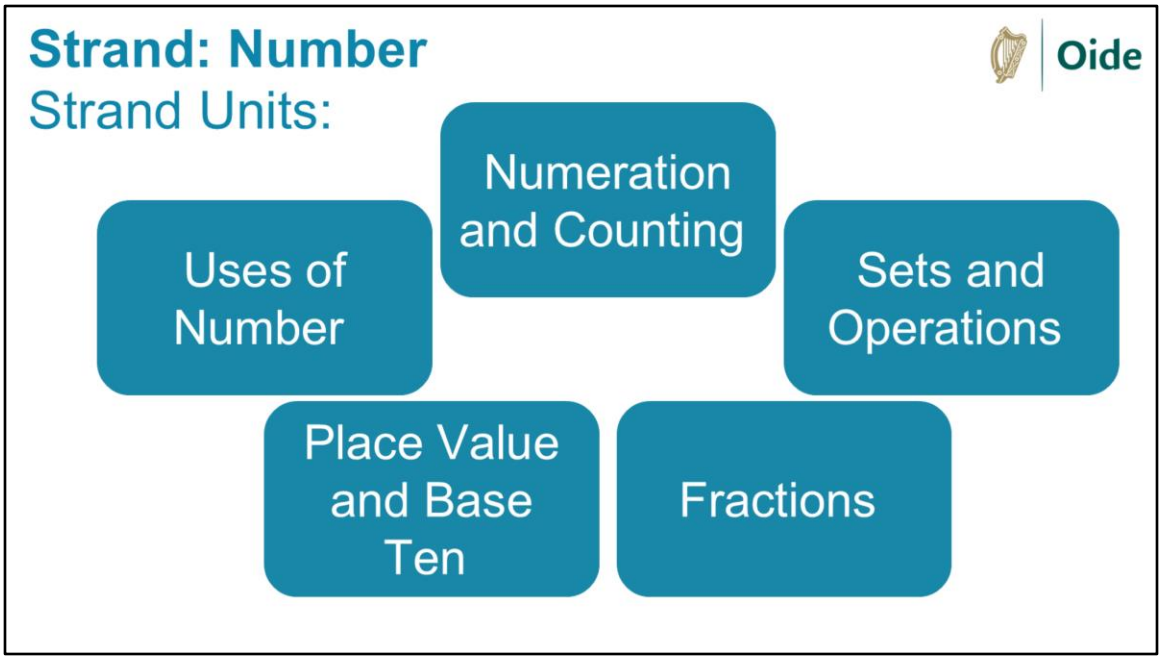


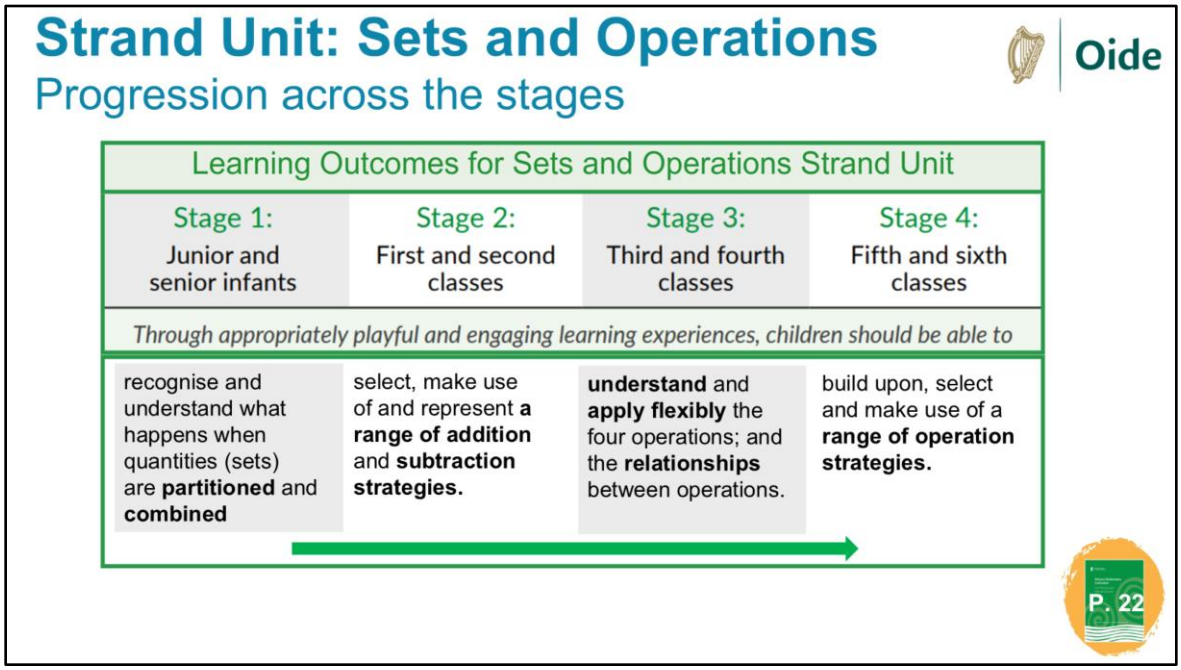
Purpose of slide:
Introductory slide for presentation of Stage 2 Number- Sets and Operations.



Purpose of slide:
To provide teachers with an overview of the Number Strand.

Notes for teachers:

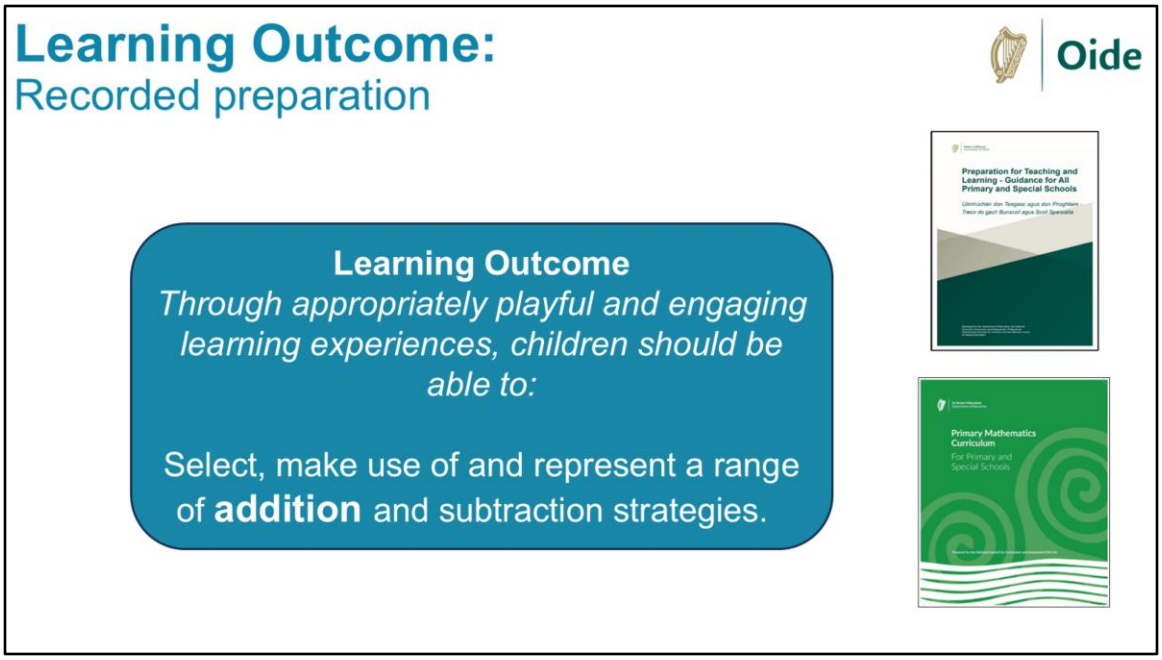
- Go to page 22 of the Primary Mathematics Curriculum.
- There are 5 strand units within the strand of Number in the primary mathematics curriculum. There are uses of number, numeration and counting, place value and base ten, sets and operations and fractions.
- Notice:
    - uses of number is in stage 1 only.
    - numeration and counting is stage 1 and 2 only.
    - place value and base ten, sets and operations and fractions are there for all stages.



Purpose of slide:
To explore the progression across the stages in the strand unit Sets and Operations

Notes for teachers:

- Notice the progression along the stages.
- Note how language, knowledge and skills are developed from stages 1 to 4.
- Knowledge of progression is necessary so that we can adapt and extend our teaching based on the knowledge we have of the children in front of us.
- Looking at the learning outcomes we can see how each stage builds upon the last, fostering a rich understanding of sets and operations and its mathematical significance.
- The TIMSS 2019 report highlights that a pupil's ability to perform well in number-related tasks often correlates with their understanding of sets and operations, as these foundational concepts are essential for grasping more complex mathematical ideas.

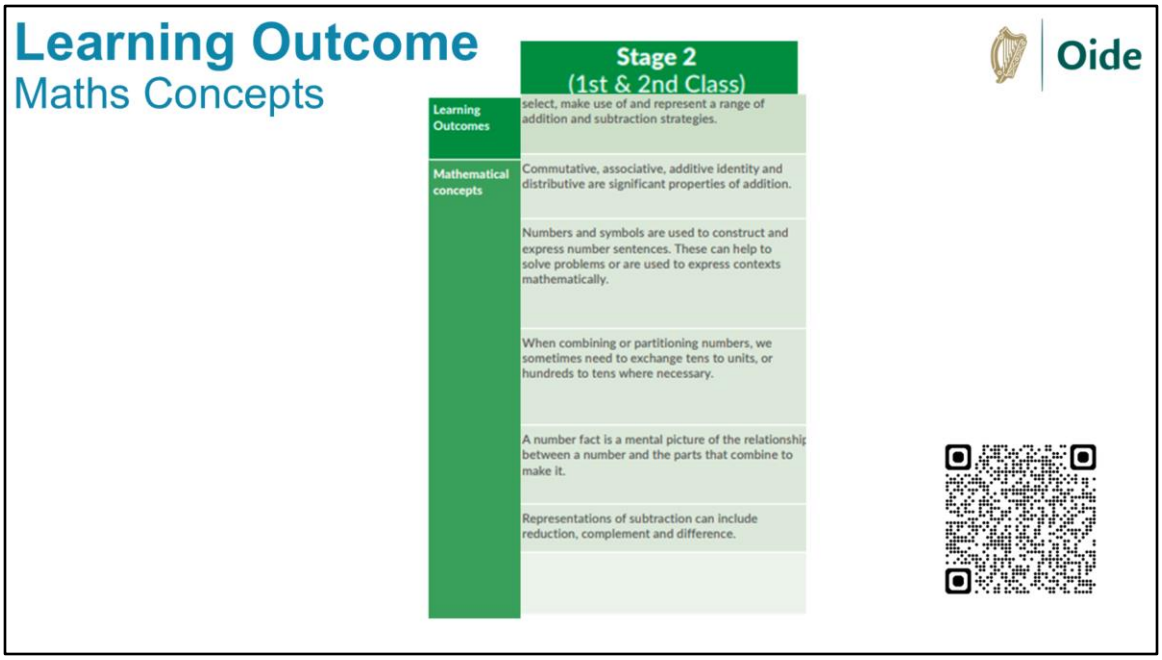


Purpose of slide:
To highlight the learning outcome as the starting point for preparation.

Notes for teachers:

- This is the learning outcome for Stage 2 Strand – Number, Strand Unit - Sets and Operations (p.22 PMC).
- Learning outcomes are broad in nature. When working with learning outcomes it is useful to break down the learning outcome into areas of focus.
- The Stage 2 learning outcome refers to **making use of and representing a range of addition and subtraction strategies.**
- A strategy is letting the numbers/structure influence how you solve a problem. The same method is not used for every problem. Only the moves you need are used.
- An algorithm is a series of steps to solve any problem of that type. The same method for every problem, regardless of the numbers/structure. All the steps, all the time.
- Algorithms provide a standardized, reliable way to solve problems, while strategies offer a flexible, understanding-based approach. Both are

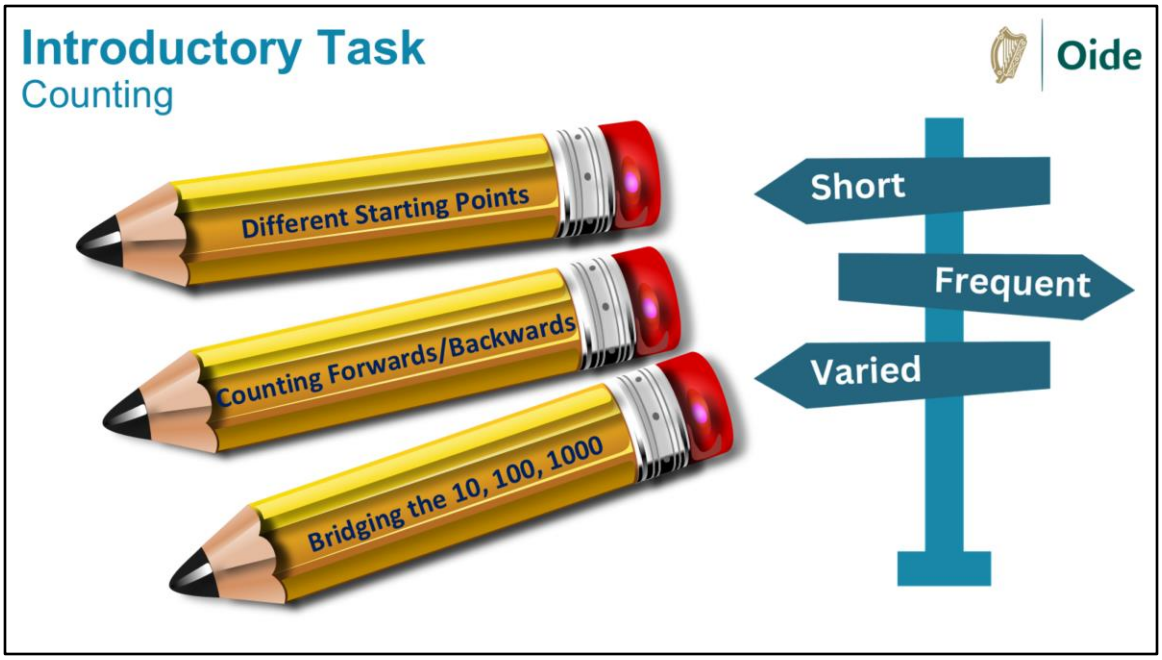
valuable tools in mathematics, but strategies encourage deeper thinking and problem-solving skills.



Purpose of slide:
To highlight the Maths concepts for Stage 2 Number- Sets and Operations

Notes for teachers:

- The maths concepts are the key mathematical ideas that underpin each learning outcome.
- Maths concepts may be useful as an entry point/ reference when preparing for teaching and learning.
- Go to the NCCA Maths Toolkit via this link: https://www.curriculumonline.ie/primary/curriculum-areas/mathematics/number/ or via the QR code to look at the Maths Concepts for Number – Sets & Operations.



Purpose of slide:

To highlight counting as the first step in mental calculations.

Notes for teachers:

- Counting is the foundation of the development of number sense. It is the first step in mental calculation.
- It is important to develop pupils' flexibility with counting. All pupils will benefit greatly from simple counting activities. Many children who struggle with Maths don’t have a full grasp of number sequences and can gain in confidence from daily or regular number work. The three key pillars include:
    - Different starting points
    - Counting forwards and backwards (more robust understanding of number relationships needed) Number before and after included in this.
    - Bridging 5s and 10s. For example, crossing the 10 can be challenging because the word pattern that precedes it is

different. (e.g. 17 to 23 - seventeen to twenty-three requires pupils to change from a teen pattern to a different format)

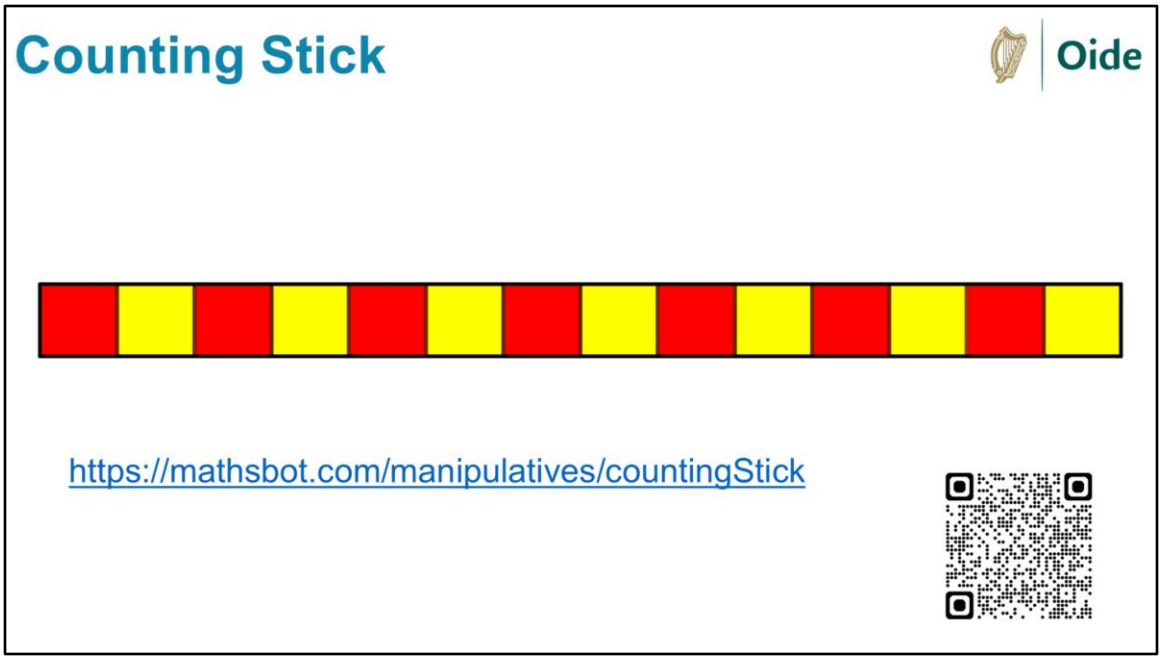
- Children may have difficulty counting, for example, pronouncing the 'thirteen', 'fourteen', ….. 'nineteen' and might confuse these with decuple numbers (thirty and so on),
- Children may not know numbers after 9, e.g. 29, 49 etc. and likewise may struggle to produce the number before a decuple number (tens number)
- Crossing(hurdling) 109 commonly children may say 200. After 999, children may say ten hundred.
- We need children to understand the magnitude of number and see the patterns and relationship within the number sequence.
- As students come to know the basic facts in any operation, they progress through three phases (Baroody, 2006)

    1. Counting
    2. Deriving (reasoning strategies on known facts)
    3. Mastery (efficiently produces answers)
- Children cannot move on to more complex phases unless they are able to count
- A counting session should have:
    - A lively pace.
    - Enthusiastic participation.
    - 2 or 3 short focused activities.
    - Physical activity.
    - Choral response.
    - Individual response.
- <u>Sample counting activities</u> :
    - Counting choir – start with choral counting, move onto parts of the choir.
    - Count around
    - Bridging unusual ranges of numbers (forwards and backwards) e.g. 73 – 65
    - Counting Can (1s, 5s, 10s etc.)
    - Bucket count on – live counting: Similar to counting can – teacher shows children a numeral card and place it in a container. This is the starting number, teacher drops a 10, then

another ten into the bucket and the children count along. Teacher asks how many now? E.g. 36 +20 = 56. Other examples following this order - tens + tens(30 + 40), tens and ones + tens(36 + 20), tens and ones + tens and ones without regrouping(32 + 33), tens and ones + tens and ones with regrouping (29 + 33) When adding tens and ones – add them to the bucket in their place value parts.

    - Counting stick - https://mathsbot.com/manipulatives/countingStick or https://bossmaths.com/countingstick/ or Amplify Polypad - Use number line for skip counting.

- As well as counting, another important aspect is learning about numerals - identify, recognise, sequence, order, locate and write numerals.
- Learning experiences that help to develop counting can be found here Counting Stage 1 and 2 https://pmc.oide.ie/resources/supportmaterialsforschools/
- Counting is for all stages and should be done daily.



Purpose of slide:
To introduce the digital counting stick on the maths bot website.

Notes for teachers:

- Count in 1's and 2's.
- Could also use for patterns and colours.
- Can you think of other activities using the counting stick?
- Virtual counting sticks are available online and also via the QR code on the screen.
- Counting stick - https://mathsbot.com/manipulatives/countingStick or https://bossmaths.com/countingstick/

Maths Strategies
Counting

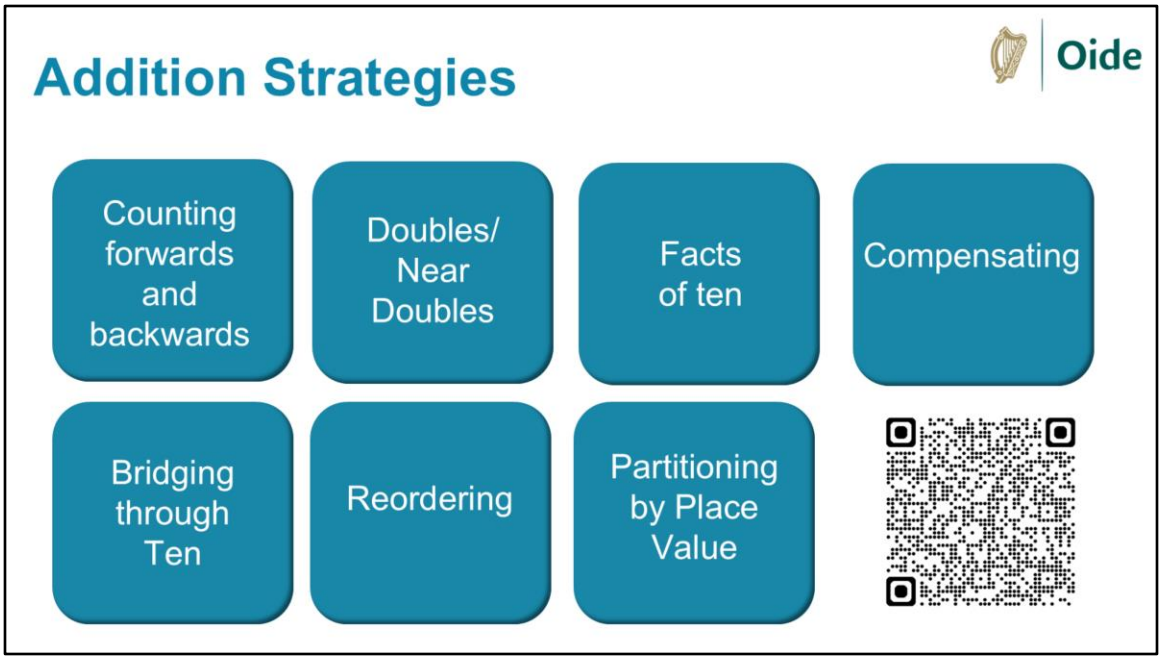
Oide

Every Child, Every Class, Every Day

Purpose of slide:
To highlight supports for counting activities.

Notes for teachers:

- Counting activities for stages 1 and 2 are available on www.pmc.oide.ie in the Support Materials for Schools section or via the QR code.



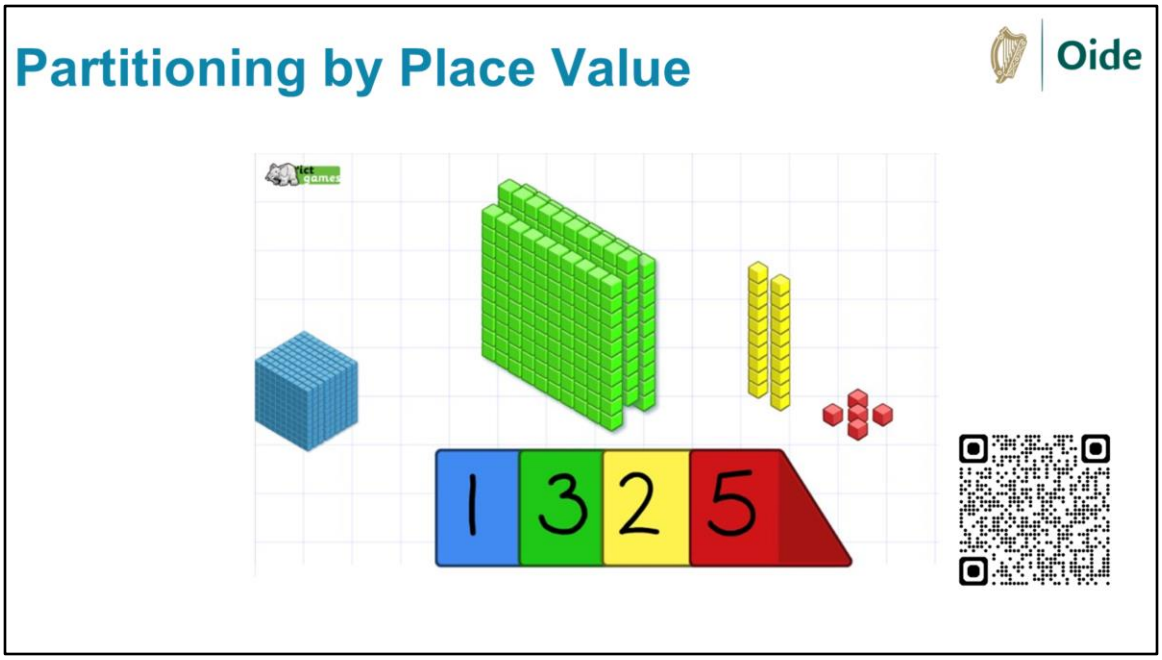
Purpose of slide:
To provide an overview of some addition strategies.

Notes for teachers:

- These are some examples of addition strategies children could use.
- This presentation will focus on three of these strategies - counting, partitioning by place value and bridging through ten.
- Partitioning by place value - Splitting each addend by place-value, adding those place value parts together, and then pulling everything together.
- Bridging ten(s) - Keeping one addend whole, students decompose the other addend in order to add to a friendly number. Then students continue to add the rest of that addend. This is a bit sequential in nature - get to the friendly number, take stock, add the rest. (children decompose one addend and add to get them to a tens number . .. ..)
- Counting Forwards and Backwards
- Note: Writing problems in a horizontal format encourages pupils to develop and use strategies.

Resources:

- Activities that explore the development of number properties such as commutative property of addition and the associative property of addition can be found in the PDST addition and subtraction manual. These are pre-requisites for the development of mental maths strategies. See PDST Manuals link on https://pmc.oide.ie/resources/useful-links/.
- Additionally explore the Exploring Operations Strategies document: https://pmc.oide.ie/resources/supportmaterialsforschools/



Purpose of slide:
To introduce the partitioning by place value strategies and activities to develop it.

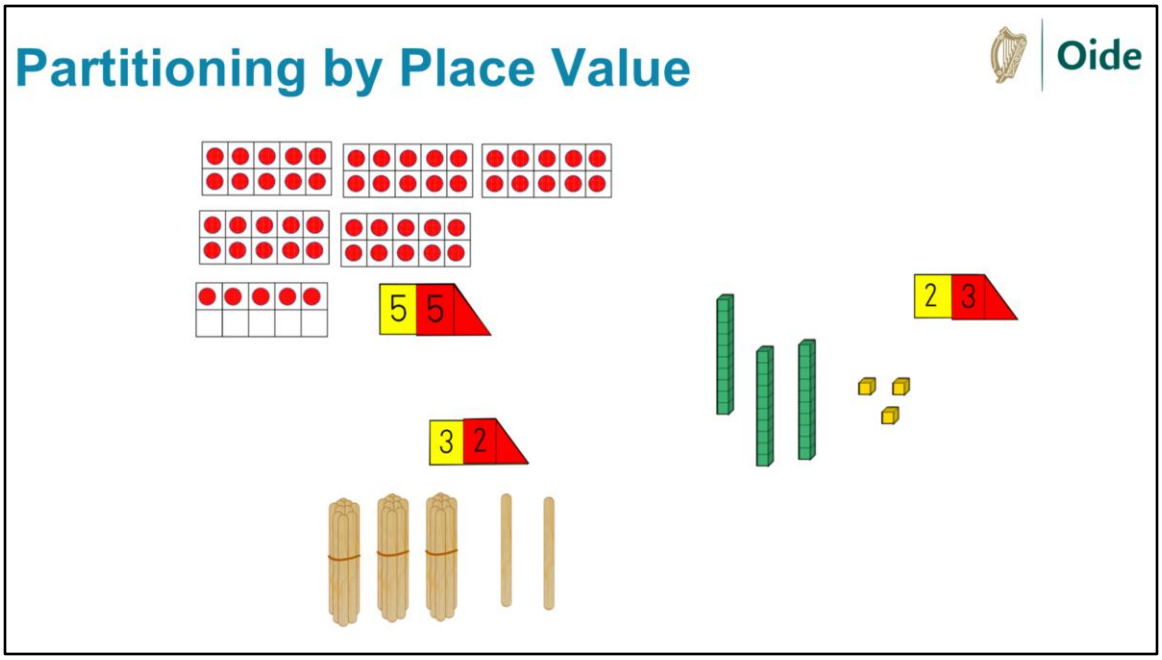
Notes for teachers:

- Partitioning by place value: This strategy involves splitting each addend by place-value, adding those place value parts together, and then pulling everything together. This is a necessary starting point, but then students need to develop other strategies.
- Activity to build place value partitioning - Grouping in tens:
- Find a collection of items that pupils might be interested in counting, for example, sweets in a jar, crayons in the class, etc. Ensure that the collection is countable and is somewhere between 50 and 200.
- Through demonstrating counting in ones, twos, and threes you then pose a question to prompt a faster way of counting. Hopefully, a pupil will suggest grouping in tens, if not you could suggest tens.

- For example: Estimate how many straws are in a box. Discuss with your partner ways in which you can count the straws. Is there an easier way than counting by ones? Did anyone do it another way? What is the fastest way to count these straws?
- Allow children to try this strategy counting other objects of interest.
- Look at the Elements on page 25 of the primary mathematics curriculum. Can they see opportunities for the elements in this task. What pedagogical practices do you think a teacher may use during this task?
- <u>Background Knowledge for teachers:</u>
- Group-able models: Models that most clearly reflect the relationship of ones, tens, and hundreds are those for which the tens can be made or grouped from the single pieces. As pupils become more familiar with these models, collections of tens can be made by pupils and kept as ready-made tens, for example, lollipop sticks pre-bundled.
- Pre-grouped models: These are models that are pre-grouped and cannot be taken apart. They should be introduced after pupils have worked with group-able models. Pre-grouped models are an efficient way to model large numbers. Base ten blocks and dienes blocks are examples of pre-grouped models.

Resources:

- Dienes blocks - https://mathsbot.com/manipulatives/blocks
- QR Code links to ICT Games Arrow Cards



Purpose of slide:

To explain that arrow cards are an important resource to aid a child's understanding and confidence with the concept of place value.

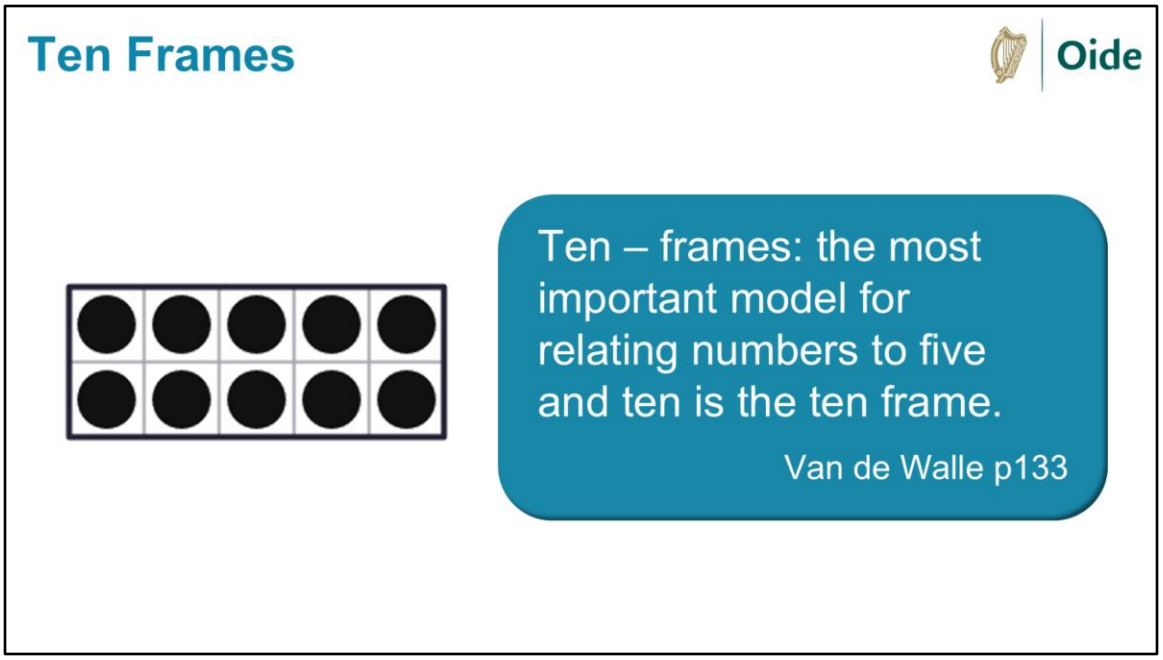
Notes for teachers:

- Arrow cards are an important resource to aid a child's understanding and confidence with the concept of place value. These can be bought or printed.
- Arrow Card activities:
- Build the number: Place all tens and ones arrow cards face down. Children choses a ten and a one. Children build the number and say the number. Afterwards they expand the number to check the numeral identifications.
- I read, you write, we check, we build: Children work in pairs/threes. The

first child chooses a numeral card and reads it to the other child who writes the number. Together the children check the number using the arrow cards and finally build the number with base ten material.

Resources:

- Free printable arrow cards https://www.kentuckymathematics.org/math_tools.php
- Kentucky Maths Arrow card activities which would allow pupils to explore Arrow cards in relation to other concrete materials online at https://www.kentuckymathematics.org/vr_placevalue.php#pv-7



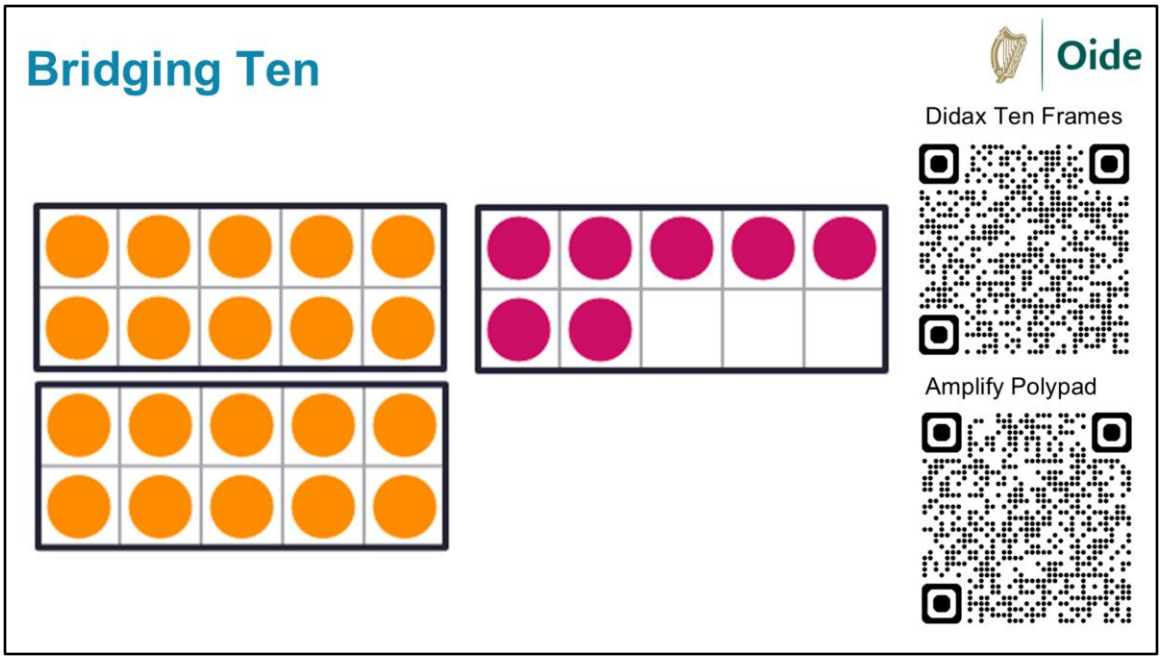
Purpose of slide:
To give an overview of the ten frame and the key concepts to develop.

Notes for teachers:

- Ten Frame Overview:
  - Ten frames have 2 rows of 5 squares.
  - They help pupils visualize numbers and connect them to quantities.
  - Ten frames group numbers into 5s and 10s, matching the base-ten system.
  - Pupils create and read patterns on 10-frames.
  - Teachers can quickly flash number patterns for practice.
- Strategies to that we want children to develop through exploration and investigation:
  1. Facts of Ten:
     - Teach the *Make Ten* strategy using two coloured counters (e.g. blue and red)
     - Ask: “How many blue? How many white? How many altogether?”
     - Write number sentences (e.g. 7 + 3 = 10)

- Extend to multiple ten frames (e.g. 30, 50)

2. Ten Plus Patterns:
    - Use a full ten-frame and one with dots (e.g.10 + 6).
    - Ask: “How many on each frame? How many altogether?”
    - Extend to larger numbers (e.g. 80 + 3).
3. Bridging Through Ten:
    - Use two ten-frames, starting with 9 and 4 counters.
    - Ask “How many? What if you move one to fill the top row?”
    - Extend to larger numbers (e.g. 78 + 5)



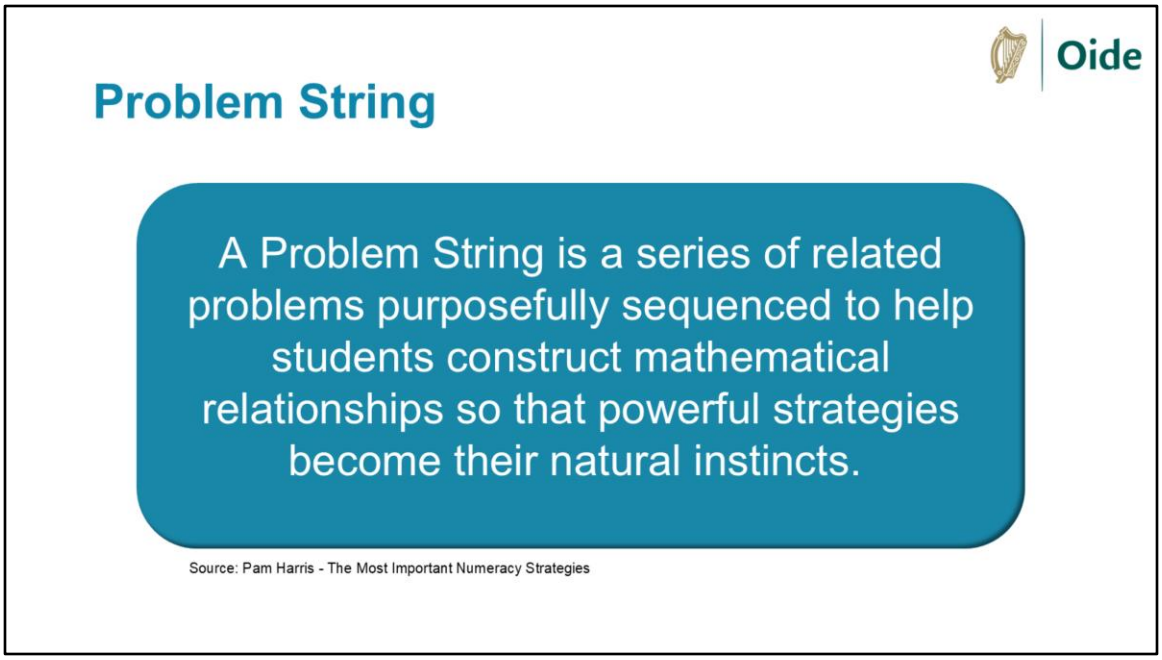
Purpose of slide:
To demonstrate bridging through ten using the ten frame.

Notes for teachers:

- For all patterns, children will:
    1. Create patterns on their 10-frames.
    2. Read and interpret patterns from the 10-frames.
    3. You can then begin to flash patterns quickly to build fluency.
    - Example:
        - Show the number 26 on the 10-frame.
        - Ask: "Can you tell me how many without counting", "Can you explain how you worked this out? How did you know?" and "How many more to make the next ten?" Repeat this process with different numbers.
    - Extension activity:
        - Start at 56 and count on in tens. (Counting strategies).
        - Start at 75 and count backwards.

Resources:

- QR code will take you to Amplify Polypad Ten Frames and Didax Ten Frames virtual manipulatives.



Purpose of slide:
To introduce "Problem Strings".

Notes for teachers:

- A Problem String is a series of related problems purposefully sequenced to help students construct mathematical relationships so that powerful strategies become their natural instincts.
- It is effective because:
    - It creates a meaningful conversation as students solve one problem at a time.
    - The teacher's role is to make student thinking visible and highlight important connections.
- How to use it:
    - A teacher introduces each problem, gives students time to think, and asks probing questions to help them see patterns and relationships.
- The following demonstrates how a problem string gradually builds complexity:
    1. Start with simple problems:

- What is 8 + 2?
- Give students time to think.
- Show the answer on a number line.
- What is 8 + 3?
- Ask students if they used the previous problem (8 + 2) to help them figure it out.
- Represent the connection between 8 + 2 and 8 + 3 on the number line.

2. Gradually build complexity:
- What is 8 + 5?
- Again, ask if students used the earlier problem (8 + 2) to solve it.
- What is 9 + 1?
- Show this on a number line, and ask if the previous problem (8 + 5) helped.
- What is 9 + 6?
- Explore how previous problems (9 + 1) could be useful.

3. Introduce larger numbers:
- What is 36 + 4? (Show on number line).
- What is 36 + 15?
- Did anyone use 36 + 4 to help them solve this?
- What is 55 + 5?
- Build on previous problems.
- What is 55 + 18?
- Did 55 + 5 help solve it?

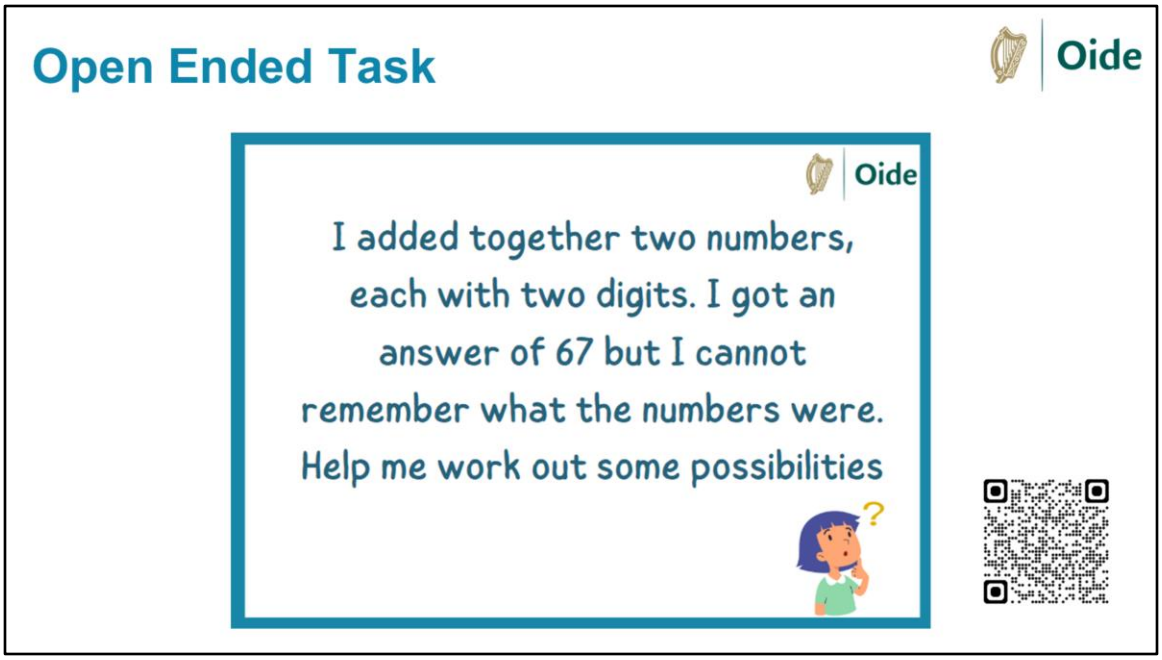
4. Continue exploring more complex problems:
- What is 47 + 3?
- What is 47 + 24?
- Explore how these problems connect and represent the relationships visually.
- What is 64 + 18?
- If needed, break it down further with useful questions (e.g. 64 + 6) bridge through ten

- This approach ensures the Problem String engages students in mathematical reasoning and helps them see how one problem can inform another.

Resources:
- For further information about Problem Strings you might like to visit https://www.mathisfigureoutable.com/blog/what-is-the-difference-

between-a-problem-talk-and-a-problem-string

- Pam Harris' Podcast - Math is Figureoutable Episode 71: "What are Problem Strings Anyway?" provides more insights on this method.



Purpose of slide:
To demonstrate an open-ended task where the children can use different addition strategies.

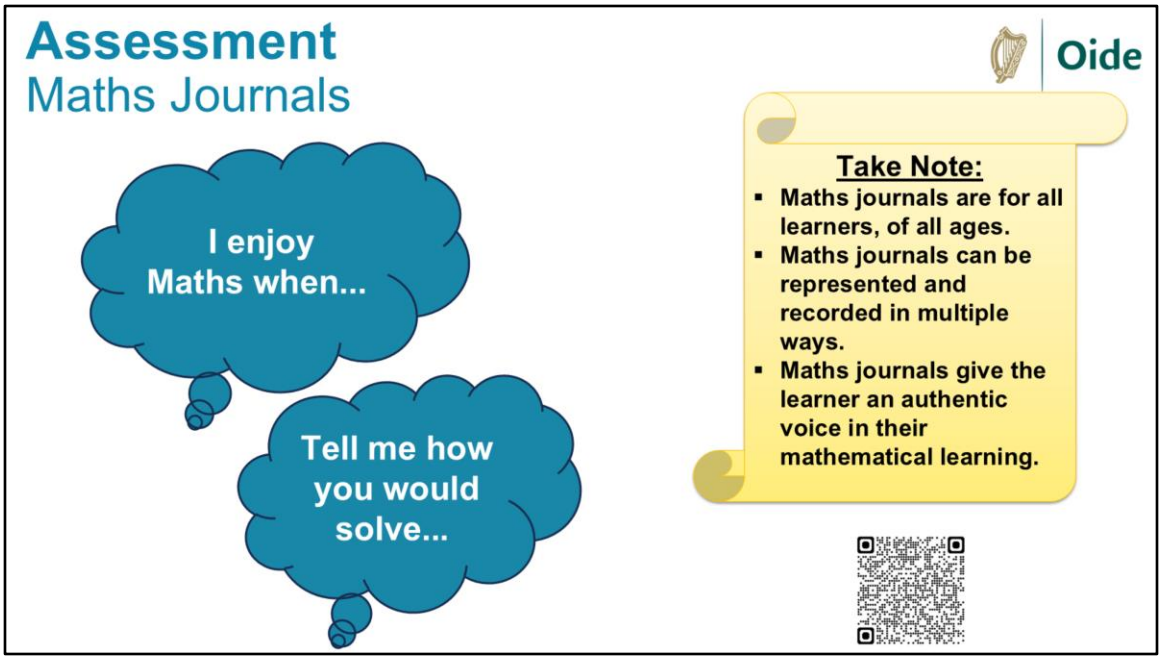
Notes for teachers:

- An open-ended task is one where there is a range of 'correct' solutions and/or a range of ways to achieve one or more solutions.
- Using open-ended tasks is one way to encourage playfulness in mathematics and foster a productive disposition to mathematics.
- Open-ended tasks, like this task, provide opportunities for exploration, investigation, challenge, creativity, choice and independence.
- A key aspect of children engaging in open-ended tasks is the follow-up discussions that take place either in a small group or a whole class setting.
- If the emphasis is placed on the generation of different ideas, all children feel that they have something to contribute, and, moreover, learn from the ideas and strategies of their peers.
- Open-ended tasks are also one way of providing for cognitively challenging tasks in maths.

- When selecting an open-ended task, as with selecting any task, it is important to keep in mind the mathematical point.
- Ask pupils for a solution. Model talk moves during the follow up discussion e.g. tell me more, can you repeat what …. said etc..
- Look at the Elements on page 25 of the Primary Maths Curriculum. Can they see opportunities for the elements in this task. What pedagogical practices do you think a teacher may use during this task?

Resources:

- Other Open-Ended tasks are available on https://pmc.oide.ie/resources/micro-maths/ or via the QR code



Purpose of slide:
To provide reflective prompts for use in class.

Notes for teachers:

- Journals are useful for both teachers and learners to assess attitudes, knowledge and skills.
- Children can keep track of their thinking and understanding in the journal.
- Journals can contain general observations about Maths or can be more specific and focus on a particular concept.
- On the slide are two journal prompts which can be used in class. The first one focuses on the child's disposition and can be used across all stand units.
- Journal prompts -
    - I enjoy Maths when .... general prompt to get the children to express their feelings towards maths.
    - Tell me how you would solve .... e.g. 8 + 6 =, 49 + 8 =, 27 + 22 teacher can choose their own problem so that children can demonstrate different addition strategies.

- A Maths Journal encourages a child to:
    - Reflect on what they have learned and put it in their own words.
    - Discuss maths with others (pupil and teacher).
    - Identify areas of strength and weakness.
    - Evaluate what they have learned.
    - If journal writing is done on a regular basis it will help promote mathematical understanding.
    - Writing about Maths can have a positive effect that on reducing pupil's Maths anxiety.

Resource:

- Further information about Maths Journals available via: https://pmc.oide.ie/resources/supportmaterialsforschools/