The Parent Sessions:
Mathematical Methods
Year 3

An explanation of ARE (Appropriate, Reliable, Efficient)

- The ARE framework (Appropriate, Reliable, Efficient) in math helps choose the best problem-solving strategy:

1. **Appropriate:** Select a method suited to the problem (e.g., mental math for simple sums, algorithms for complex ones).
2. **Reliable:** Ensure the method consistently gives correct results (e.g., standard algorithms for accuracy).
3. **Efficient:** Solve the problem quickly without sacrificing accuracy (e.g., using shortcuts like compensation).

- It promotes accuracy, practicality, and flexibility in solving math problems.

Question: 5400 – 79 =

- To use column method to answer this question might not be the most efficient way. A different approach could be to use the compensation strategy (5400 – 80 + 1)

The Rationale Behind:

- Compensation is a mental maths strategy used to simplify calculations. The concept involves adjusting numbers in a way that makes the calculation easier, while ensuring that the total value stays the same. The rationale behind compensation is to break down complex operations into smaller, more manageable steps by "compensating" for the change made to the original numbers.

  For example, in addition, if you're adding **29 + 48**, you might find it easier to **add 30 + 48** first (***by compensating for the 1 you added to 29***). After the calculation, you subtract the 1 you added, thus returning to the correct answer.

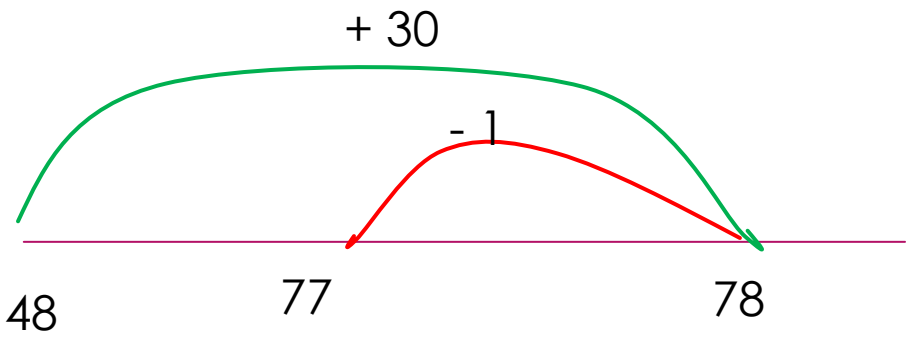
The Rationale Behind:

- Using a number line helps students visualize the adjustments, making the process more concrete. Compensation is particularly useful in addition, subtraction, and sometimes multiplication or division, as it allows students to find easier ways of calculating mentally.

- **Examples of Compensation on a Number Line**

1. **Example 1: Addition (29 + 48)**

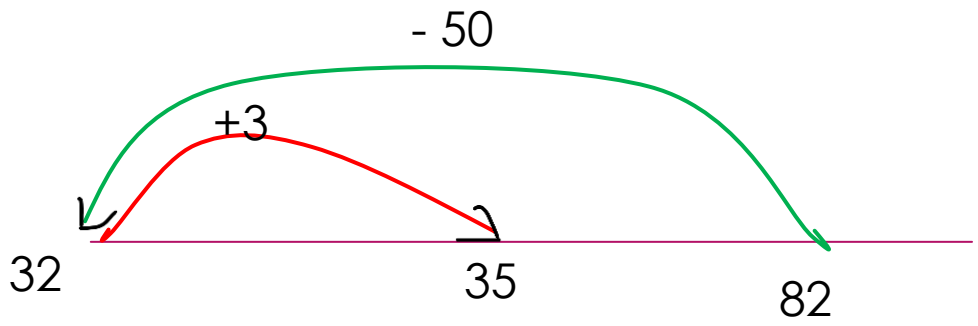
    - **Step 1: Adjust one number**: Start with 29 + 48. We can round 29 to 30 (compensating by adding 1).
    - **Step 2: Perform the calculation**: Now, add 30 + 48, which is easier. 30 + 48 = 78.
    - **Step 3: Compensate**: Since we added 1 earlier, subtract 1 from 78. 78 - 1 = 77.
    - **Result**: 29 + 48 = 77.



Subtraction Example Question: Compensation on a number line

1. **Example 2: Subtraction (82 - 47)**
    - **Step 1: Adjust one number**: **Instead of subtracting 47 directly, you can adjust 47 to 50** (**compensating by adding 3**).
    - **Step 2: Perform the calculation**: Now subtract **82 - 50**, which is easier. **82 - 50 = 32**.
    - **Step 3: Compensate**: Since we subtracted 3 more than necessary, **add 3 back** to the result. ***32 + 3 = 35***.
    - **Result**: **82 - 47 = 35.**

- On the number line, you start at 82, move back by 50, reaching 32, and then move forward by 3 to land at 35.



Practice questions for using compensation on a number line, organized into three levels.

Starter (Basic Questions)

- Focus on simple addition or subtraction within 50, emphasizing small adjustments.

1. **29+8**: Use compensation to simplify the addition.
   (Hint: Adjust 9 to 10 for easier calculation.)
2. **31− 9**: Use compensation to solve.
   (Hint: Adjust 9 to 10, then subtract and adjust back.)
3. **35+7**: Solve using compensation.
   (Hint: Add 5 to make 40, then add 2.)

Expected (Intermediate Questions)

- Involve larger numbers and require more flexible compensation strategies.

4. **52 + 39**: Use compensation to simplify.
   (Hint: Adjust 39 to 40 for easier addition.)
5. **73−18**: Solve using compensation.
   (Hint: Adjust 18 to 20 by adding 2, then compensate.)

Questions to ask during the process – Compensation on a number line

- **What is the easiest way to adjust one of the numbers to make the calculation simpler?**
  (Helps the student think about how to compensate by rounding a number to a more convenient value.)
- **How do you move on the number line to reflect your compensation?**
  (Encourages the student to visualize the adjustments on the number line.)
- **After you adjust, what do you need to do to make sure you haven't changed the original problem?**
  (Prompts the student to remember to compensate back to maintain accuracy.)
- **How can you check that your compensation is correct?**
  (Encourages the student to double-check their work by reversing the compensation step.)
- **Can you think of a different way to compensate that might make the calculation easier?**
  (Encourages flexible thinking and exploring alternative compensation strategies.)

The Rationale Behind:

- The concept of **related number facts** is fundamental in building number sense and understanding the connections between numbers. By recognizing these relationships, students develop a deeper understanding of arithmetic operations and enhance their problem-solving skills.

- Related number facts often refer to pairs or sets of numbers that are linked through operations such as addition, subtraction, multiplication, and division. These facts can help students identify patterns and simplify calculations, making arithmetic more efficient and accessible.

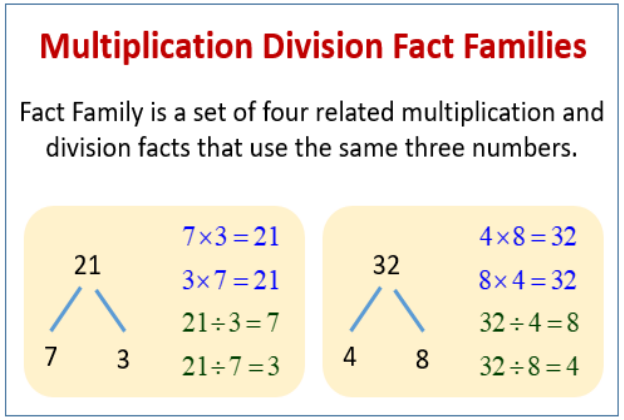
- **Key Rationale:**

1. **Building Fluency:** By knowing related facts, students can quickly recall or derive answers to other calculations, speeding up the process and fostering confidence.

2. **Understanding Relationships:** Students grasp how numbers interact with each other across different operations. For example, if a student knows that 5 + 3 = 8, they can also infer 8 - 3 = 5 or 5 × 3 = 15.

3. **Problem-Solving and Mental Maths:** Related facts help students make connections between different types of problems and apply mental strategies more effectively.

4. **Foundation for Advanced Learning:** Mastering basic related facts sets a solid foundation for more advanced math, such as algebra and fractions, where understanding relationships between numbers is essential.



Example Questions: Related Number Facts

- **Standard:** Knowing that $4 \times 6 = 24$ helps children understand that $24 \div 6 = 4$ and $24 \div 4 = 6$. This illustrates the inverse relationship between multiplication and division.
- **Differentiated Example:**
  - **Simple:** Begin with smaller multiplications such as $2 \times 3 = 6$, reinforcing that division is the inverse ($6 \div 2 = 3$).
  - **Challenge:** Challenge child/children with larger numbers and involve word problems, e.g., if $6 \times 12 = 72$, what is $72 \div 12$?

Example Questions: Related Number Facts

- **Doubling and Halving (e.g., 6 × 2 = 12)**
- **Standard:** Understanding that doubling (multiplying by 2) and halving (dividing by 2) are inverse operations helps child/children see patterns in numbers.
- **Differentiated Example:**
  - **Simple:** Start with simple doubling (e.g., 2 × 2 = 4) and halving (e.g., 4 ÷ 2 = 2) to build basic skills.
  - **Challenge:** Use larger numbers, such as 12 × 2 = 24, and ask child/children to work backward to find half of 24 (i.e., 24 ÷ 2 = 12).

Questions to ask during the process – Related Number Facts

- **What smaller fact do you already know that could help you solve this?**
  (Encourages the student to identify a simpler, related fact.)
- **How does this fact relate to the numbers in the problem?**
  (Prompts them to connect the known fact to the scaled-up or extended problem.)
- **Can you explain how scaling up or down affects the result?**
  (Helps the student think about the impact of place value or multiplication/division.)
- **How can you check if your answer makes sense?**
  (Promotes self-checking by verifying the relationship between the fact and the solution.)
- **What would happen if the numbers were 10 times bigger (or smaller)?**
  (Encourages flexible thinking about scaling and reinforces understanding.)

Key Language to use

Compensation on a number line

- Round
- Compensate
- Inverse
- Prove
- Check
- Friendly number
- Visualisation

Related Number Facts

- Facts
- Inverse
- Number bonds
- Multiplication facts
- Division facts