The Parent Sessions:
Mathematical Methods
Year 6

What is ARE?

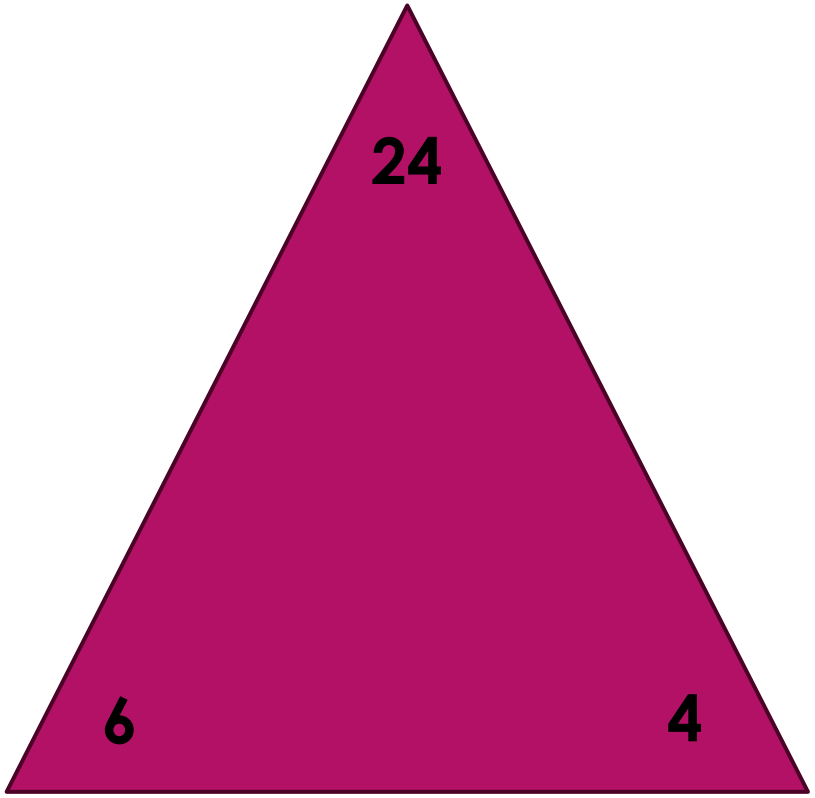
ARE allows the children to consider their calculations actively, enabling them to choose which methods are going to give them the answer the quickest and in the most secure strategy (to them):

Accurate	Reliable	Efficient
How can you check that your answer is correct? Can you use estimation or an inverse operation to verify your calculation? Have you aligned your decimal points or checked your column subtraction carefully?	What method do you know will work well for this type of problem? Is this a strategy you have practiced and feel confident using? Can you double-check your answer to make sure it is correct?	Is this the quickest way to solve the problem while still being accurate? Could a mental strategy like rounding or compensation save you time? Would a written method be better for this calculation or is mental math sufficient?

At Conway, we use this to help develop the mathematical thinking of the children, alongside our questioning, and give them the autonomy over how they achieve an answer. We encourage thinking, calculating and choosing of methods to be ARE - helping them become more reflective and strategic in their problem-solving.

Related facts: using what we already know

- Related facts is one example that allows children to quickly and efficiently recognise connections between numbers.
- **Ask your child: *What connections can you make with this triangle?***
- **For example, if we know: 4 x 6 = 24, what do we also know? *We also know that 6 x 4 = 24***
- By recognizing that multiplication is commutative (order doesn't matter), you only need to remember one fact instead of two. This makes learning faster and more efficient!
- We can make more connections using the inverse operation:
- **24 ÷ 4 = 6. If we know this, then we also know 24 ÷ 6 = 4.**
- These two facts are related and once this relationship is understood, you don't have to memorise everything by rote or calculate everything using written methods as this isn't ARE.



Related facts: using what we already know

- When children reach KS2, they should be making connections between these facts and applying to larger calculations or even decimal calculations.
- **For example: 5400 ÷ 9 = ?**
- Without any written method, the children should connect that 54 is a multiple of 9 (9 x 6 = 54) so they can use jottings to break this down:

  54 ÷ 9 = 6

  540 ÷ 9 = 60

  5400 ÷ 9 = 600

- This is to encourage a range of ways to calculate, as opposed to rote methods.
- Ways to question the children on these facts are by asking, **'Can you prove it?'**(to themselves, to their siblings/parents/carers). This may look like: 9 x 6 = 54, 6 x 9 = 54, 54 ÷ 6 = 9 and 54 ÷ 9 = 6. *They may extend this into explaining how they recognise that 5400 is 100 times bigger than 54 so our answer must be also.*

Practice questions

Starters:

1. 160 ÷ 4 =
2. 2000 ÷ 5 =
3. 810 ÷ 9 =
4. 5600 ÷ 7 =

Expected:

5. 5.6 ÷ 7 =
6. 2800 ÷ 20 =
7. 1.4 x 2 =

Challenging:

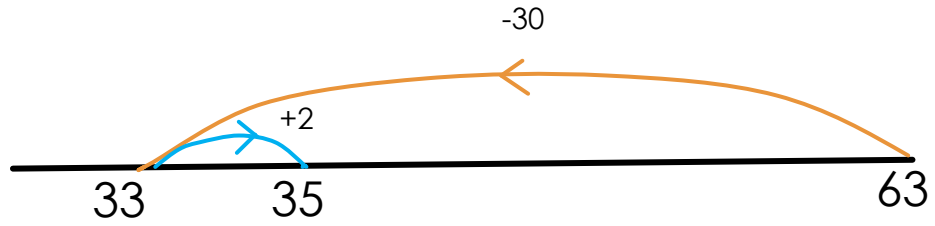
8. 0.28 ÷ 2 =
9. 5600 ÷ ____ = 800
10. _____ x 6 = 3600

Compensation using the number line

- The **compensation strategy** is a mental calculation technique where numbers are adjusted to simplify calculations.
- Using a number line to teach this strategy enhances visual understanding and supports students' ability to adjust numbers effectively which will support their ability to calculate mentally.
- **Visual Representation of Adjustments**
  - A number line provides a clear, visual model for the adjustments made during compensation. For example, solving 63 - 28 can be visualised as:

1. Start at 63 on the number line.
2. Adjust 28 to 30 by rounding up (+2).
3. Subtract 30 from 63 (landing at 33).
4. Compensate by adding back the 2 (landing at 35).

The number line shows the visual process, making the reasoning behind the strategy clear and accessible.



Key Reasons for Using a Number Line to Teach Compensation in Subtraction

- This **visual approach** makes children understand the adjustment process clearly
- **Promotes number sense** - understanding the relationship between numbers and the impact of rounding up or down when subtracting.
- **Builds mental arithmetic skills** – regular use of the number line will enable children to transition from visual aids to efficient mental subtraction.
- **Addresses common errors** - by mapping out each step visually and reduces errors such as forgetting to adjust after rounding or miscalculating the difference.
- **Encourages Mathematical Thinking -** students can explore and discuss alternative subtraction paths on the number line, fostering reasoning and problem-solving skills.
- A number line **connects to key mathematical ideas** like rounding, estimation, and inverse operations.
- **Accessible for All Learners**
  - **Visual learners:** Benefit from seeing the process clearly.
  - **Advanced learners:** Can apply the strategy to more complex numbers or decimals.

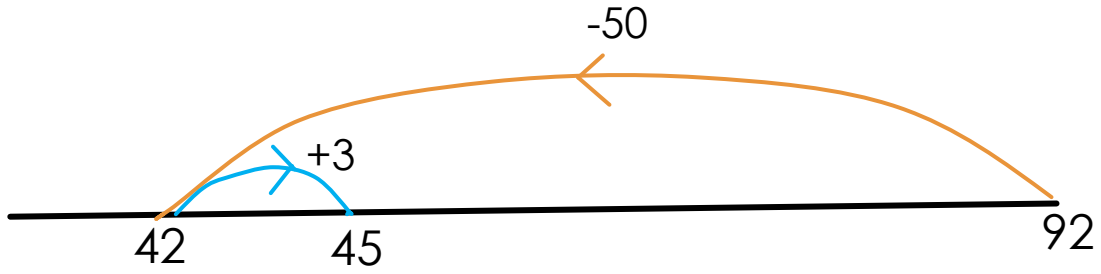
Example 1: Subtraction with a Number Line

Visual learners understand best when they see the process mapped out clearly. Using number lines or diagrams makes the steps explicit.

Problem: 92−47

Steps on a Number Line:

1. Start at 92.
2. Round 47 up to 50 (add 3).
3. Subtract 50 from 92, landing at 42.
4. Compensate by adding the 3 back to account for the rounding, ending at 45.



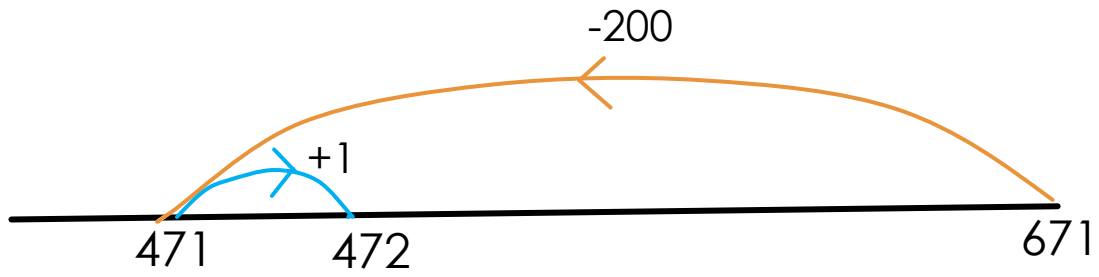
For visual learners, emphasize the diagram by using color-coded steps.

Encourage children to identify rounding to the nearest **multiples of 10** when rounding to compensate.

Example 2a: Subtracting Larger Numbers

Children developing this understanding of using the number line to compensate can move on to larger numbers and continue to apply their skills through the steps.

Problem: 671−199



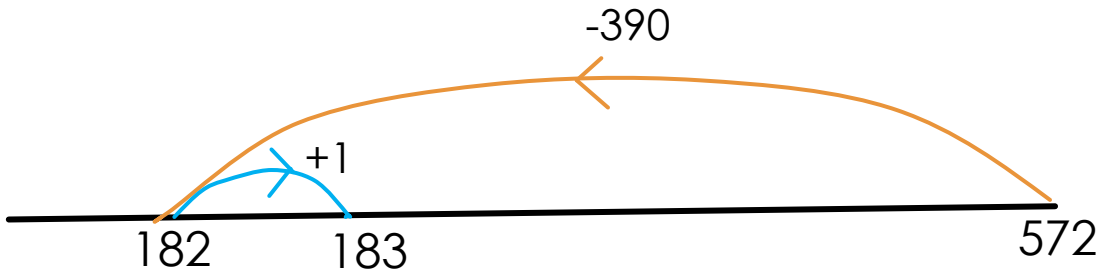
Steps:

1. Round 199 up to 200 (add 1).
2. Subtract 200 from 671: 671−200=471.
3. Compensate by adding 1 back to 471: 471+1=472.

Example 2b: Subtracting Larger Numbers

For advanced learners, encourage tackling more complex calculations, such as those involving larger numbers, decimals, or multiple adjustments.

Problem: 572−389



Steps:

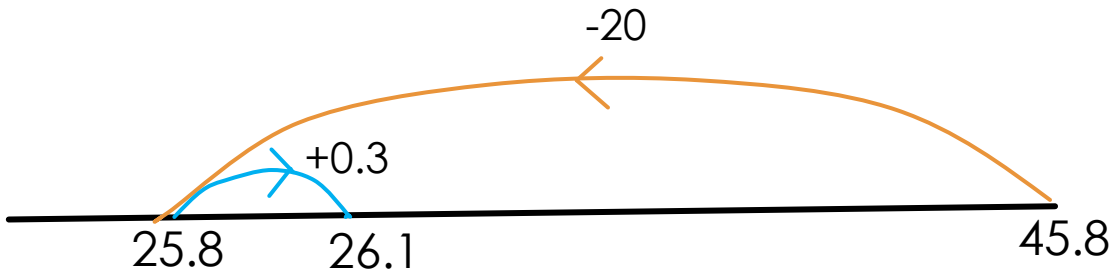
1. Round 389 up to 390 (add 1).
2. Subtract 390 from 572: 572−390=182.
3. Compensate by adding 1 back to 182: 182+1=183.

- **Challenge:** Ask advanced learners to explain why rounding down to 380 and compensating afterward would also work.

Example 3: Subtracting Decimals

For advanced learners, this approach helps students focus on manageable calculations, especially when decimals make subtraction feel more complex.

Problem: 45.8−19.7



Steps:

1. Round 19.7 up to 20 (add 0.3).
2. Subtract 20 from 45.8: 45.8 − 20 = 25.8.
3. Compensate by adding 0.3 back to 25.8: 25.8 + 0.3 = 26.1

- **Extension:** Encourage students to apply the strategy to numbers like 245.93−123.47, emphasizing accuracy and efficiency.

Questions to ask when using a number line to compensate

1. Exploring the Strategy

- **"What makes this subtraction tricky? How could we simplify it?"**
  - Encourages students to identify why adjusting numbers might help.
- **"Which number could we round to make it easier to subtract?"**
  - Guides them to think about rounding the subtracted number (e.g. rounding 28 to 30).
- **"What happens to the total if we round up or down? What do we need to do next?"**
  - Prompts them to consider compensating after adjusting.

2. Using the Number Line

- **"Can you show me where to start on the number line?"**
  - Helps them find the initial number.
- **"If we round 28 to 30, how far do we jump? Where does it take us?"**
  - Encourages them to visualize and calculate the adjustment.
- **"How do we 'undo' the extra we added (or subtracted) earlier?"**
  - Reinforces compensating to return to the correct answer.

3. Checking Understanding

- **"Did you subtract too much or too little? If so, what will you need to do?"**
  - Enables children's thinking process and guides them through the steps to reduce errors
- **"Why do we need to adjust the total after rounding? What would happen if we didn't?"**
  - Encourages reflection on the importance of compensation.
- **"Can you explain each step and why you chose it?"**
  - Promotes reasoning and helps identify misconceptions.

4. Encouraging Reasoning and Flexibility

- **"Could we have adjusted a different number? What would change if we did?"**
  - Explores flexibility in applying the strategy.

5. Practical Application

- **"How could this strategy help you solve problems in real life?"**
  - Links the strategy to everyday situations, such as calculating change.
- **"What types of numbers make this strategy most useful?"**
  - Encourages them to identify when compensation is an efficient choice (e.g., when working with numbers close to multiples of 10).

Practice questions

Starters:

1. 54 – 29 =
2. 73 – 48 =
3. 92 - 37=
4. 125 – 68 =

Expected:

5. 678 – 249 =
6. 725 – 398 =
7. 1,032 – 597 =

Challenging:

8. 7,432 – 3,895=
9. 80.75 – 29.6 =
10. 53.9 – 24.75 =