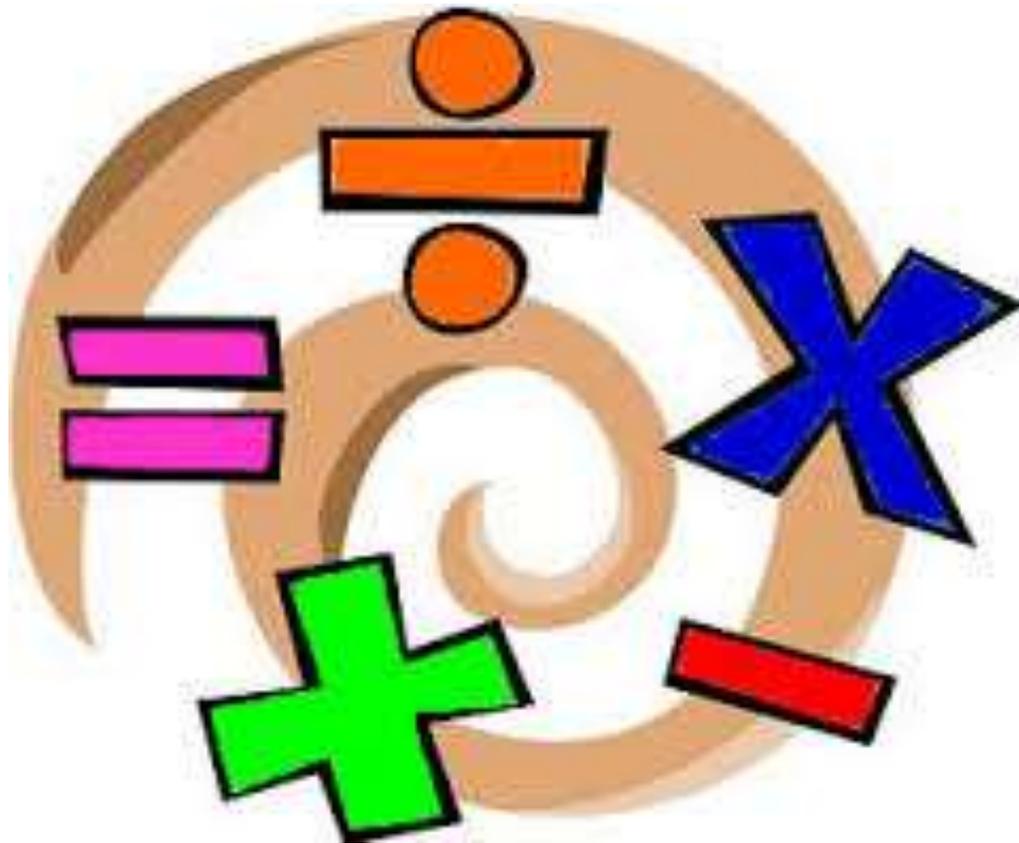


## Mental Maths Strategies

### Workshop 1: Addition and Subtraction



## Uses of Mental Calculation

The following six aspects of mathematics require the use of mental calculation (Crown 2010).

<p><b>Recalling Facts:</b></p> <ul style="list-style-type: none"> <li>• What is 3 add 7?</li> <li>• What is <math>6 \times 9</math>?</li> <li>• How many days are there in a week?... in four weeks?</li> <li>• What fraction is equivalent to 0.25?</li> <li>• How many minutes in an hour? ... in six hours?</li> </ul>	<p><b>Applying Facts:</b></p> <ul style="list-style-type: none"> <li>• Tell me two numbers that have a difference of 12.</li> <li>• If <math>3 \times 8</math> is 24, what is <math>6 \times 0.8</math>?</li> <li>• What is 20% of €30?</li> <li>• What are the factors of 42?</li> <li>• What is the remainder when 31 is divided by 4?</li> </ul>
<p><b>Hypothesising or Predicting:</b></p> <ul style="list-style-type: none"> <li>• The number 6 is <math>1 + 2 + 3</math>, the number 13 is <math>6 + 7</math>. Which numbers to 20 are the sum of consecutive numbers?</li> <li>• Roughly, what is 51 times 47?</li> <li>• On a 1 to 9 keypad, does each row, column and diagonal sum to a number that is a multiple of 3?</li> </ul>	<p><b>Designing and Comparing Procedures:</b></p> <ul style="list-style-type: none"> <li>• How might we count a pile of sticks?</li> <li>• How could you subtract 37 from 82?</li> <li>• How could we test a number to see if is divisible by 6?</li> <li>• How could we find 20% of a quantity?</li> <li>• Are these all equivalent calculations: <math>34 - 19</math>; <math>24 - 9</math>; <math>45 - 30</math>; <math>33 - 20</math>; <math>30 - 15</math>?</li> </ul>
<p><b>Interpreting Results:</b></p> <ul style="list-style-type: none"> <li>• So what does that tell us about numbers that end in 5 or 0?</li> <li>• Double 15 and double again; now divide your answer by 4. What do you notice? Will this always work?</li> <li>• I know 5% of a length is 2 cm. What other percentages can we work out quickly?</li> </ul>	<p><b>Applying Reasoning:</b></p> <ul style="list-style-type: none"> <li>• The seven coins in my purse total 23c. What could they be?</li> <li>• In how many different ways can four children sit at a round table?</li> <li>• Why is the sum of two odd numbers always even?</li> </ul>

## Teaching and Learning

### Suggested Addition and Subtraction Strategies

Counting forwards and backwards	Doubles/near doubles	Facts of 10
Bridging through ten(s)	Reordering	Partitioning by place value
Compensating	Bridging through 60 (time)	<b>Subtraction</b> <ul style="list-style-type: none"> <li>• Think addition</li> <li>• Keeping a constant difference</li> </ul>

### Key Teaching Principles for Mental Maths<sup>1</sup>

- Encourage children to share their mental methods.
- Encourage children to choose efficient strategies.
- Encourage children to use informal jottings to keep track of the information they need when calculating.
- Commit regular time to teaching mental calculation strategies.
- Provide practice time with frequent opportunities for children to use one or more facts that they already know to work out more facts.
- Introduce practical approaches and jottings, with models and images children can use, to carry out calculations as they secure mental strategies.
- Encourage children in discussion when they explain their methods and strategies to you and their peers.

<sup>1</sup> Adapted from Crown (2010)

- Ensure that children can confidently add and subtract any pair of two-digit numbers mentally, using jottings to help them where necessary.
- Teach a mental strategy explicitly but in addition invite children to suggest an approach and to explain their methods of solution to the rest of the class.
- Hands on learning is important
- Provide suitable equipment for children to manipulate and explore how and why a calculation strategy works. That helps them to describe and visualise the method working.
- Encourage children to discuss their mistakes and difficulties in a positive way so that they learn from them and share the ownership of targets to help children to manage and recognise their rate of progress.

### Assessment

- A ‘mental test’ can help children to monitor changes in their own performance over time.  
The traditional mental arithmetic test involves a set of unseen questions. A worthwhile alternative is to give children examples of the type of questions 10 minutes in advance, so that they can think about the most efficient way to answer the questions. The purpose of this preparation time is not to try to commit answers to memory but to sort the questions into those they ‘know’ the answer to, and those that they need to figure out. Pairs of children can talk about their ‘figuring out’ methods and after the test the whole class can spend some time discussing the strategies they used. (Crown 2010)
- Collecting the questions, then giving children the test with the questions in a random order, also encourages attention to strategies. The same test can be used at a different time for children to try to beat their previous score. (Crown 2010)
- Don’t use lengthy timed tests. Pupils get distracted by the pressure and abandon their reasoning strategies. They can lead to pupil anxiety, which does not support mathematical learning. If there is any purpose for a timed test of basic facts it may be for diagnosis – to determine which combinations are mastered and which remain to be learned. Even for diagnostic purposes timed tests should only occur once every couple of weeks. (Van De Walle, p.184)

## Workshop Activities

### Teacher Reflection

#### **Reflection: Beginning of Workshop**

What approach do you take to teaching mental maths?

What resources do you use?

#### **Reflection: End of Workshop**

Do you now need to reconsider your approach to mental maths? If so, how?

What do you now need to plan for in mental maths?

### Instructional Framework Reflection

(based on the Instructional Framework for Supporting and Developing Mathematical Thinking<sup>2</sup>)

**ALWAYS      SOMETIMES      NEVER**

<b>Eliciting</b>	<b>Record here</b>
<b>In my maths teaching, I:</b>	
Elicit many solution methods for one problem from the entire class	
Wait for pupils' descriptions of solution methods and encourages elaboration	
Create a safe environment for mathematical thinking	
Promote collaborative problem solving	
Use pupils explanations for lesson's content	
Identify ideas and methods that need to be shared publicly	
<b>Supporting</b>	
Remind pupils of conceptually similar problem situations	
Direct group help for an individual student through collective group responsibility	
Assist individual pupils in clarifying their own solution methods	
Provide teacher-led instant replays	
Demonstrate teacher-selected solution methods without endorsing the adoption of a particular method	
Record representation of each solution method on the board	
<b>Extending</b>	
Ask all pupils to attempt to solve difficult problems and to try various solution methods	
Facilitate development of mathematical skills as outlined in the PSMC for each class level	
Promote use of learning logs by all pupils	
Push individual pupils to try alternative solution methods for one problem situation	
Encourage pupils to critically analyse and evaluate solution methods	
Encourage pupils to articulate, justify and refine mathematical thinking	
Use pupils' responses, questions, and problems as core lesson including student-generated problems	

<sup>2</sup> This is adapted from Fraivillig, Murphy and Fuson's (1999) Advancing Children's Mathematical Thinking (ACT) framework.

## Take Your Pick

Doubles and near doubles	Bridging through ten
Reordering	Partitioning by place value
Bridging through 60 (time)	Keeping a constant difference
Facts of ten	Compensating
	Think addition

Take a look .....	Name the most efficient strategy
138+69	
2.5 +2.6	
11.45+3Hours +35Min	
108 – 48	
117-112	
270-47	
9.3-2.9	
125-72+25	
973-631	