

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Topic:** Change the Order (Understanding) and More than one way

**Learning Area:** Number

**Date** 17<sup>th</sup> July and 18<sup>th</sup> of July

**Year Level:** Grade 1/2

**Duration:** 55 minutes x 2

**Learning Purpose:**

Revision point:s

- That we can change the order in which we add numbers/ collections to aid calculation.
- That there is always more than one strategy or set of strategies for adding numbers, however some approaches are more efficient than others.

**Australian Curriculum references:**

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as commutativity for addition, building to 10, 10 facts, doubles and adding 10.

	<b>Group set up</b>	<b>Materials</b>
<p><b>LESSON 1 – change the order; dice (to 6)</b></p> <p><b>Review:</b> Review the SURF board; discuss the four goals and an example of a teaching point to support each goal.</p> <p><b>Engagement (whole group):</b> Roll 4 dice on the EWB (6-sided). Discuss the different ways we can add these numbers together (change the order). Debate what might be the best (i.e., most efficient) approach. Record the chosen number sentence on the whiteboard. The idea is that students can use strategies and fast facts learnt during SURF to support their thinking. 15 mins</p> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>• Working in pairs, students will receive 4 dice (either 6-sided or 10-sided, depending on their level). Students roll the dice, and together decide the best way to add the 4 numbers together. The</li> </ul>	<p>Pair students up based on ability.</p>	<p>Whiteboards Markers Dice Cards</p>

idea is that they are looking for strategies and fast facts which will support their addition (e.g., doubles, rainbow facts, near doubles, bridging through ten). Students can use an abacus to support their thinking. Students can record their number sentences on a whiteboard.

20 mins

**Pulling it together:**

- Come back together as a class, and get different students to share their approaches for adding numbers. Focus on students who managed to use some of their known strategies/ fast facts to support their thinking.

10 mins

- Time permitting, play a game of GOTYA with the class having to add three numbers together in the most efficient way possible. Always give students a pair of rainbow numbers amongst the 3 numbers (e.g., 8, 5 and 2).

10 mins

**LESSON 2 – change the order; cards (to 10)**

**Review:** Discuss yesterday's lesson. Spend time reviewing the various strategies, understandings and fast facts which supported our thinking when adding the dice together.

5 minutes

**Engagement (whole group):**

Pull 4 cards from a deck. Discuss the different ways we can add these numbers together (change the order). Debate what might be the best (i.e., most efficient) approach. Record the chosen number sentence on the whiteboard. The idea is that students can use strategies and fast facts learnt during SURF to support their thinking.

10 minutes

**Procedure:**

- Working in pairs, students will receive 4 cards or 6 cards, depending on their level. Students pull cards, and together decide the best way to add the 4 or 6 numbers together. The idea is that they are looking for strategies and fast facts which will support their addition (e.g., doubles, rainbow facts, near doubles, bridging through ten). Students can use an abacus to support their thinking. Students can keep the cards as a set in

the order they added them together (rather than record the number sentences on the whiteboards).  
20 minutes

**Pulling it together:**

- Come back together as a class, and get different students to share their approaches for adding numbers. Focus on students who managed to use some of their known strategies/ fast facts to support their thinking.
- Time permitting, play a game of GOTYA with the class having to add three numbers together in the most efficient way possible. Always give students a pair of rainbow numbers amongst the 3 numbers (e.g., 8, 5 and 2).

10 minutes

**Observations of students' learning:** Observations of whether students can change the order, and add the cards more than one way to determine efficient strategies. The particular focus is whether students can look for known patterns, and opportunities to utilise known strategies.

**Teacher's Resources:** Large cards; EWB.

**Catering for inclusion:**

LESSON 1 and 2:

Enabling prompts:

- Students roll 3 dice, or select 3 cards. What is the best order to add these cards in? Is there another way of adding these numbers together?

Extending prompts:

- Students could initially play with a range of dice (e.g., 2 x 20 sided and 2 x 10 sided)
- In relation to the cards, students could increase the number of cards they added beyond 6 (e.g., 10). This will allow them opportunities to look for adding patterns.

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Date** 24<sup>th</sup> July and 25<sup>th</sup> of July

**Topic:** Greater than and less than (Reading)

**Year Level:** Grade 1/2

**Learning Area:** Number

**Duration:** 55 minutes x 2

#### Learning Purpose:

Introduce

- That when two numbers are not the same we use the greater than/ less than sign and not the equals sign
- That when two parts of a number sentence are not the same we used the greater than/ less than sign and not the equals sign

#### Australian Curriculum references:

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as commutativity for addition, building to 10, 10 facts, doubles and adding 10.

	Group set up	Materials
<p><b>LESSON 1 – introducing inequalities</b></p> <p><b>Review:</b> Review the SURF board; Focus on reading.</p> <p><b>Engagement (whole group):</b> Discuss the meaning of the equal sign. Provide examples of two halves of number sentences where it would be appropriate to use the equal sign. Then provide some addition examples where it is no longer appropriate, because one side is larger than the other.</p> <p><b>Procedure:</b> Working in pairs, play double dice versus cards. However, this time, write down the number sentence using the appropriate sign (equals or greater than/ less than) to finish the sentence. The student with the larger number can record the number sentence in their book. If both numbers are the same, both students should record the number sentence in their book. The first student to</p>	<p>Pair students up based on ability.</p>	<p>Whiteboards Markers Dice Cards Books</p>

record 10 number sentences wins.

20 mins

**Pulling it together:**

- Come back together as a class, and get different students to share some of their number sentences.

10 mins

- Time permitting, play a game of guess that number. Use X as the mystery number, and write up student questions using the greater than or less than notation (e.g., is it greater than 50 means I can write  $x > 50$ ; is it between 20 and 60 means I can write  $20 < x < 60$ ).

10 mins

**LESSON 2 – more on inequalities**

**Review:** Discuss yesterday's lesson. Spend time reviewing the equals sign and the greater than/ less than sign.

5 minutes

**Engagement (whole group):**

Using the panbalance scales (through the illumination website, if the link works), discuss examples where the scales balance (and thus the equals sign is appropriate), and where the scales do not balance (and thus we need to use the greater than/ less than sign).

10 minutes

**Procedure:**

- Working in pairs, play 3 little pigs versus the big bad wolf. One player is the big bad wolf (the 20 sided dice) and the other play is the three little pigs (three six sided dice). On the count of the three, both players roll their dice. If the big bad wolf's total is greater than the three little pigs' total, the house is blown down, he/ she gets to write the number sentence in their book; vice versa, if the three little pigs' total is greater than the big bad wolf, the house is saved, and he/ she gets to write the number sentence in their book. If both totals are the same, it's a draw, and both players roll again. First to 10 number sentences (10 houses blown down, 10 houses saved) wins. 20 minutes

<p><b>Pulling it together:</b></p> <ul style="list-style-type: none"> <li>• Come back together as a class, and get different students to share some of their number sentences. 10 mins</li> <li>• Time permitting, play a game of guess that number. Use X as the mystery number, and write up student questions using the greater than or less than notation (e.g., is it greater than 50 means I can write <math>x &gt; 50</math>; is it between 20 and 60 means I can write <math>20 &lt; x &lt; 60</math>). 10 mins</li> </ul> <p>10 minutes</p>		
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<p><b>Observations of students' learning:</b> Observations of whether students can apply the correct sign in the correct circumstance. Observations as to whether students can verbalise how to interpret the greater than or less than sign.</p>
<p><b>Teacher's Resources:</b> Large cards; EWB.</p>
<p><b>Catering for inclusion:</b>  <b>LESSON 1 and 2:</b>  <b>Enabling prompts:</b></p> <ul style="list-style-type: none"> <li>• Students can each roll one dice, decide which is the larger number, and then write the expression accordingly (e.g., <math>2 &lt; 3</math>).</li> <li>• Students can each roll two dice, decide which is the large sum, and then write the expression accordingly (e.g., <math>3 + 4 &gt; 2 + 3</math>)</li> </ul> <p><b>Extending prompts:</b></p> <ul style="list-style-type: none"> <li>• Students can play with 2 dice and 2 cards (or perhaps, 3 dice and 3 cards).</li> <li>• Students can play with 1 dragon (dice counts by 10 to 100) versus 10 little vikings (10-sided dice), or 12 little Vikings (8-sided dice). Whoever has the higher number, either burns the town or saves the town.</li> </ul>

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Date:** 31<sup>st</sup> of July and 1<sup>st</sup> of August

**Topic:** Friendly Numbers (Fast Fact) and decomposition

**Year Level:** Grade 1/2

**Learning Area:** Number

**Duration:** 55 minutes

**Learning Purpose:** To consolidate students understanding of friendly numbers, and decomposition; as a precursor to two digit addition.

Friendly Numbers and Decomposition: Numbers can be broken up into ones, tens, hundred, thousands etc. This is decomposition. Putting decomposed numbers back together again is what is meant by friendly numbers.

Developing an appreciation of place value is one of the biggest challenges for many children in relation to their mathematical development. It is critical that students come to understand that 37, for example, is not comprised of a 3 and a 7, but of 3 tens and 7. In addition, students need to learn to automatically connect the concept of 3 tens with the number 30. We introduced this concept when discussing sensible and 'crazy numbers', and how English is full of 'crazy numbers' (which would make the concept of place value much clearer). The Friendly Number strategy aims to further scaffold this development.

Fluency with the Friendly Numbers strategy is an important prerequisite before more sophisticated strategies, such as Number Splitting, can be introduced. It is particularly important that students are very comfortable and competent with Friendly Numbers and decomposition before any attempt is made to teach the addition (or subtraction) algorithm.

At more advanced levels, this strategy also allows explicit focus on the idea that the rank order of a particular digit when counting from right to left determines its value. For example, the 3 in the number 12,735 is the second digit in this number when counting from the right, and consequently, it corresponds to 3 tens or 30.

#### **Australian Curriculum references:**

Year 1: Count collections to 100 by partitioning numbers using place value, including understanding partitioning of numbers and the importance of grouping in tens and understanding two-digit numbers as comprised of tens and ones/units

Year 2: Group, partition and rearrange collections up to 1000 in hundreds, tens and ones to facilitate more efficient counting, included •using an abacus to model and represent numbers; •understanding three-digit numbers as comprised of hundreds, tens and ones/units; •demonstrating and using models such as linking blocks, sticks in bundles, place-value blocks and Aboriginal bead strings and explaining reasoning.

	Group set up	Materials
<p><b>Lesson 1: Introduction to Friendly numbers and decomposition:</b></p> <p><b>Review</b>  Discuss what was covered in last week's SURF lesson. Get students to model when to use the greater than/ less than sign, how it works, and when to use the equals sign.  5 mins</p> <p><b>Engagement – the first part of the lesson is essentially a review, so I will go through it quickly and move on to the electronic resource fairly early in, before introducing the game.</b></p> <ol style="list-style-type: none"> <li>1) Begin by getting students to decompose 2-digit numbers into multiples of tens and ones. This can be done by asking students the simple question 'What lives inside this number?'. For example 'What lives inside the number 37'. Encourage the student to initially respond 3 tens and 7.</li> <li>2) Then ask a question such as: 'What is another way of saying three tens?' or 'What number does three tens equal?' or 'What is three tens the same as?'. If the student cannot easily equate three tens with thirty, get some unifix blocks or popsticks and bundle them up into three groups of ten. Then encourage the student to count by tens '10, 20, 30'. If a student finds this too challenging, you might be better off getting students to fill up three tens frames with counters.</li> <li>3) Ask the student again 'So, what lives inside this number?', now encouraging them to respond 30 and 7. The above is a basic introduction to decomposition and sets a foundation for introducing the friendly number strategy.</li> <li>4) Then ask the student, 'So what happens if we add 30 and 7 together'. Hopefully the student is able to see the answer immediately. If not, you should model making the number 37 using ten frames or bundles of ten and state 'I have 30 and 7 more. This equals 37'.</li> <li>5) Provide students with a range of other examples 'So what happens if we add 50 and 6 together'. Again, if the student finds this difficult, you can model the process using concrete materials.</li> <li>6) Finally, sum up the learning by explaining that any multiple of ten ('any number ending in a zero') can easily be added to a number between 1 and 9, and get students to restate several examples (30 and 7 equals 37; 50 and 6 equals 56). Introducing this strategy also provides a good opportunity to explore some mathematical vocabulary, specifically that the word 'and' simply implies that two numbers can be added together.</li> </ol> <p>Note: Use an abacus to reinforce this thinking (I still see the primary benefit of using an abacus at this stage as a 'counter', rather than a 'real abacus').</p> <p>Some websites to support this mini-lesson.</p> <p><a href="http://www.topmarks.co.uk/Flash.aspx?f=pvchartmoving">http://www.topmarks.co.uk/Flash.aspx?f=pvchartmoving</a></p>	<p>Mixed ability groupings based on student choice for Lesson 1.</p>	<p>Lesson 1:  Cards  Dice  100's Charts  EWB</p> <p>Lesson 2:  Speedy math sheets  Abacus  EWB</p>

15 mins

### Procedure

Play 3 in a row friendly numbers.

This game is the same as 3 in a row, with a small twist. In 3 in a row, you roll a 6 sided dice, you double the number you roll, and then the player gets to choose whether or not they take a card. If they don't get a card, they get the doubles fact, if they get a black card, they have to add 1 to their number, if they get a red card, they have to take 1 from their number. The goal is to get 3 in a row (horizontally – because the highest score is 13).

With 3 in a row friendly numbers, players play with a 10-sided 10's dice (10 to 100) and a 10-sided 1's dice (0 to 9). Players take turn of rolling these two dice. They can add their score together, and then either take that score or take a card. If they take a card, the same rule applies (i.e., they can take 1 away if it is red, and add one if it is black). The goal is to get three in a row, however this three in a row can be made horizontally, vertically or diagonally.

To make the game more challenging, another element of strategic choice could be added in. Students could choose to either subtract or add (depending on the card they get) from either the 10's dice (i.e., plus/ minus 10) OR the 1's dice (i.e., plus/ minus 1). However, this challenge may confuse students, and should only be introduced once they have demonstrated some mastery over the basic game.

### Bringing it together:

1) Focus on this resource:

[http://www.hbschool.com/activity/numbers\\_to\\_1000/](http://www.hbschool.com/activity/numbers_to_1000/)

10 mins

## Lesson 2: Further focus on decomposition

### Review

Discuss what was covered in the previous SURF lesson. Get students to model how to use friendly numbers and how to answer the question 'What lives inside this number?' Go over in some depth ideas introduced in previous session.

10 mins

### Engagement

- The following resources can be used to support student understanding and to engage students.

<http://www.topmarks.co.uk/Flash.aspx?f=PVChartv8>

<p>10 mins</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1) Get students to have a go at the friendly numbers fast fact sheet.</li> <li>2) Once students have completed the sheet, get them to correct it together in groups (or, if this is difficult to coordinate, correct as a class). 20 mins</li> </ol> <p>20 mins</p> <p><b>Bringing it together:</b></p> <ol style="list-style-type: none"> <li>1) Play a game of 3 in a row friendly numbers, Mr Russo vs the class.</li> </ol>		
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**Observations of students' learning:** Performance on fast fact sheet. Observations during independent game activity. Whether students choose/ appear to need to access either an enabling prompt or an extending prompt. Whether students are confident and capable of demonstrating their learning in front of the class.

**Teacher's Resources:** EWB, Whiteboard, Large Cards

**Catering for inclusion:**

Lesson 1, Enabling Prompt: This game can be simplified by removing the card element. Students must try and get 3 in a row just rolling the 2 dice.

Lesson 1, Extending Prompt: To make the game more challenging, another element of strategic choice could be added in. Students could choose to either subtract or add (depending on the card they get) from either the 10's dice (i.e., plus/ minus 10) OR the 1's dice (i.e., plus/ minus 1). However, this challenge may confuse students, and should only be introduced once they have demonstrated some mastery over the basic game.

Lesson 2, Enabling Prompt: Encourage students to use an abacus to model numbers during the fast fact sheet.

Lesson 2, Extending Prompt: Back of speedy maths sheet has some extension questions.

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students

- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Date:** 14<sup>th</sup> and 15<sup>th</sup> of August

**Topic:** Super Rainbow Facts (or complements to 100)

**Year Level:** Grade 1/2 (Group 2)

**Learning Area:** Fast Facts

**Duration:** 55 minutes

**Learning Purpose:** For students to understand why super rainbow facts (complements to 100) work through connecting the concept of the equals sign as meaning 'the same as' to their hundreds facts. This is an extension of a similar lesson for rainbow fact, although considerably more challenging. Students also may need to learn the strategy for generating Super Rainbow Facts (i.e., count by 1's to the next 10; count by 10's to the 100), however the aim is to move students towards fluency with complements to 100.

**Australian Curriculum references:**

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as ten facts.

	Group set up	Materials
<p><b>LESSON 1: Introduction to super rainbow buddies</b></p> <p><b>Review:</b> Rainbow Fact review – game of ping pong.</p> <p><b>Engagement (whole group):</b> Use EWB and interactive 100's board. Discuss how we can use the 100's board to work out 'Super Rainbow Buddies' (instead of rainbow buddies). We count 1's to the next 10. Then we count 10's to the next 100. The total amount is the numbers rainbow buddy.</p> <p>You can also demonstrate this concept using a number line, using the 'frog hopping' method for working out 'how many more' to 100.</p> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>• Play 3 in a row: Super Rainbow Buddies. Demonstrate game.</li> <li>• Essentially works the same as 3 in a row (Friendly Numbers), however has an additional component. The objective is to get the most 3 in a rows on the board. One player rolls the 10's</li> </ul>	Mixed ability pairs	Counters/ Teddies 100's Charts

dice and the 1's dice. Whatever number they land on, they get. However, they also get to put a counter on this numbers super rainbow buddy. For example, if you rolled a 60 and a 2, you would put a counter on 62, and also place a counter on 38, which is 62's super rainbow buddy.

- Initially, the element of strategic choice (i.e., introducing the cards) will be removed from the game because it will add unnecessary complexity. However, once players are confident with Super Rainbow Buddies, this element of strategic choice can be reintroduced.
- Students can use a whiteboard and draw number lines to support their thinking. Encourage students to use both the number chart and the whiteboard to 'check' whether they have found the correct Super Rainbow Buddy. This could be made systematic. The non-rolling player could be using the number line and the rolling player could be using the 100's chart.
- Consider the option of making this game 'non-competitive'. As a team, students need to try and obtain as many 3 in a rows as possible. One student can be the 'roller' (using the number chart to support their thinking) and the other student can be the 'checker', using the whiteboard and the number line to check responses.
- One option would be to make the game non-competitive the first time students play it, and competitive the second time they play it.

**Pulling it together:**

Whole group: Discuss the results of student games. What patterns do students notice? Play a game of 3 in a row Super Friendly Numbers, Mr Russo versus The Class using the extending prompt (to add the element of strategic choice).

Alternatively, consider playing a game of gotcha where players have to mentally calculate Super Rainbow Buddies.

**LESSON 2: Consolidation of super rainbow buddies**

**NOTE:** Given the game is quite challenging, and the concept is new to most students, it is suggested that the same core activity be used for both sessions.

**Observations of students' learning:** Student ability at the end of the session to generate Super Rainbow Facts. Student ability to participate in game with/ without enabling prompts. Students embracing extending prompt.

**Teacher's Resources:** EWB.

**Catering for inclusion:**

Enabling Prompt:

- Initially, have players only use the 10's dice, rather than use the 10's and the 1's dice. Once they are confident with the process, the 1's dice can also be introduced.
- Grab nine MAB 10's and ten MAB 1's. You and your partner need to create as many addition number sentences as you can using this total of MAB. Record the number sentences in your book as you go. Allow students to discover that they are in fact exploring complements to 100 through physical modelling.

Extending Prompt:

- Introduce the component of strategic choice by allowing players to choose to take a card. If the card is black, they need to move their number forward 1 (and the numbers Super Rainbow Buddy back by 1); if the number is red, they need to move their number back 1 (and the numbers Super Rainbow Buddy forward 1).
- An alternative extension activity would involve one player thinking of a 3-digit number, and the other player having to think of the complement to 1000 of that number.

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Date:** 21<sup>st</sup> and 22<sup>nd</sup> of August

**Topic:** Adding two-digit numbers (number splitting)

**Year Level:** Grade 1/2 (Group 2)

**Learning Area:** Strategies

**Duration:** 55 minutes

**Learning Purpose:** For students to understand how adding 2-digit numbers can be achieved through adding the 10's and adding the 1's. For students to achieve fluency in this process through first partitioning numbers, then adding and then recombining numbers.

**Australian Curriculum references:**

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as ten facts.

	<b>Group set up</b>	<b>Materials</b>
<p><b>LESSON 1: Introduction to number splitting to support addition</b></p> <p><b>Review:</b> Friendly number review – game of ping pong. Revisit the language 'what lives inside' this number.</p> <p><b>Engagement (whole group):</b> Introduce students to the number splitting method for adding 2-digit numbers.            What lives inside the first number?            What lives inside the second number?            How many tens do we have altogether?            How many ones do we have altogether?            How much do we have altogether?</p> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>Give students a series of 2-digit additions which they can work on in their workbooks using the number splitting method.</li> </ul> <p><b>Pulling it together:</b>            Mark the work together.</p> <p>Play a game of gotcha require students to undertake 2-</p>	<p>Mixed ability pairs</p>	<p>Workbooks            Cards</p>

digit addition mentally.

## LESSON 2: More on number splitting

**Review:** Number splitting method for adding 2-digit numbers.

### Engagement (whole group):

Introduce activity, outlined below.

### Procedure:

- Get students to remove the 10's and picture cards from a pack and flip over 4 cards. One student constructs the largest 2-digit number they can by treating one of the cards as the 10's column and one of the cards as the 1's column; the other student constructs the smallest 2-digit number they can using the remaining two cards.
- In their books, students need to solve the addition fact using the number splitting technique.

### Pulling it together:

Get students to come back together and share their work.

Play a game of gotcha require students to undertake 2-digit addition mentally.

**Observations of students' learning:** Student ability at the end of the session to describe the number splitting technique. Student ability to demonstrate such skills in their workbook.

**Teacher's Resources:** EWB.

### Catering for inclusion:

#### Enabling Prompt:

- Encourage students to use concrete materials to aid their addition (in particular, materials which can easily be organised into 10's and 1's, such as MAB or popsticks).

#### Extending Prompt:

- Encourage students to add 3-digit numbers or to add the numbers using a different strategy (more than one way).

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Topic:** Adding two-digit numbers (hop on)

**Learning Area:** Strategies

**Date:** 28<sup>th</sup> and 29<sup>th</sup> of August

**Year Level:** Grade 1/2 (Group 2)

**Duration:** 55 minutes

**Learning Purpose:** For students to understand how adding 2-digit numbers can be achieved through using an open number line. For students to achieve fluency in this process through first 'hopping on' by 10's, and then 'hopping on' by ones.

**Australian Curriculum references:**

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as ten facts.

	Group set up	Materials
<p><b>LESSON 1: Introduction to 'hop on' to support addition</b></p> <p><b>Review:</b> Review 2-digit addition using the number splitting strategy.</p> <p>RECALL: Introduce students to the number splitting method for adding 2-digit numbers.</p> <ol style="list-style-type: none"> <li>1. What lives inside the first number?</li> <li>2. What lives inside the second number?</li> <li>3. How many tens do we have altogether?</li> <li>4. How many ones do we have altogether?</li> <li>5. How much do we have altogether?</li> </ol> <p><b>Engagement (whole group):</b> Introduce the 'hop on' technique as an alternative. The hop on technique essentially mirrors count on. For example <b>39 + 23</b>.</p> <ol style="list-style-type: none"> <li>1. Students begin at the larger number (<b>39</b>) and record it on an open number line.</li> <li>2. Students work out how many 10's are inside the smaller number (<b>2 10's or 20</b>), and how many 1's are</li> </ol>	Mixed ability pairs	Workbooks Dice

inside the smaller number (**3**).

3. Students move along the number line in multiples of 10's corresponding to the number of 10's in the smaller number. In our example, **39, 49, 59**.

4. Students then move along the number line in 1's corresponding to the number of 1's in the smaller number. In our example, **59, 60, 61, 62**.

5. Students have 'hopped on' to the answer (**62**).

Note that students do not necessarily have to 'hop on' in 10's and 1's once they understand the concept. Instead, they could hop on in multiples of 10's and 1's. The most important idea is the use of the open number line to support addition.

**Procedure:**

- Give students a series of 2-digit additions which they can work on in their workbooks using the hop on method.

**Pulling it together:**

Mark the work together.

Play a game of gotcha require students to undertake 2-digit addition mentally.

**LESSON 2: More on 'hopping on'**

**Review:** 'Hop on' method for adding 2-digit numbers.

**Engagement (whole group):**

Introduce activity, outlined below.

**Procedure:**

- Get students to roll 4 10-sided dice. One student constructs the largest 2-digit number they can by treating one of the dice as the 10's column and one of the dice as the 1's column; the other student constructs the smallest 2-digit number they can using the remaining two dice.
- In their books, students need to solve the addition fact using the hop on technique.

**Pulling it together:**

Get students to come back together and share their work.

Play a game of gotcha require students to undertake 2-

digit addition mentally.		
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**Observations of students' learning:** Student ability at the end of the session to describe the hop on technique. Student ability to demonstrate such skills in their workbook.

**Teacher's Resources:** EWB.

**Catering for inclusion:**

Enabling Prompt:

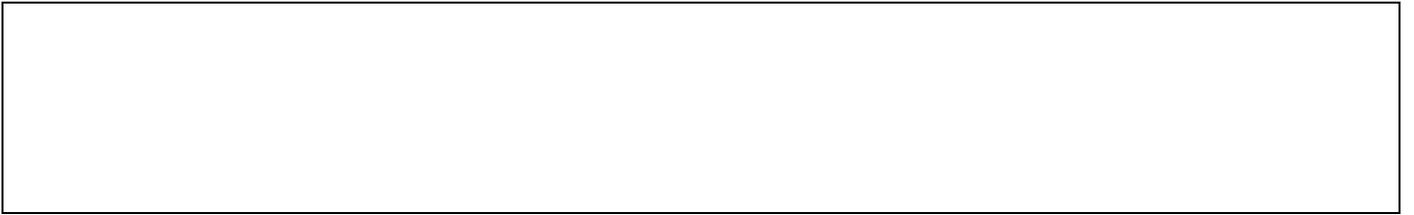
- Encourage students to use concrete materials to aid their addition (in particular, materials which can easily be organised into 10's and 1's, such as MAB or popsticks).

Extending Prompt:

- Encourage students to add 3-digit numbers or to add the numbers using a different strategy (more than one way).

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt



# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

<b>Name:</b> James Russo	
<b>School:</b> Belgrave South Primary	<b>Date:</b> 4 <sup>th</sup> and 5 <sup>th</sup> of September
<b>Topic:</b> Subtracting two-digit numbers (hop back)	<b>Year Level:</b> Grade 1/2 (Group 2)
<b>Learning Area:</b> Strategies	<b>Duration:</b> 55 minutes

<p><b>Learning Purpose:</b> For students to understand how subtracting 2-digit numbers can be achieved through using an open number line. For students to achieve fluency in this process through first 'hopping back' by 10's, and then 'hopping back' by ones.</p> <p><b>Australian Curriculum references:</b></p> <p>Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.</p> <p>Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as ten facts.</p>
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	Group set up	Materials
<p><b>LESSON 1: Introduction to 'hop back' to support addition</b></p> <p><b>Review:</b> Review 2-digit addition using the 'hop on' strategy.</p> <p>RECALL</p> <ol style="list-style-type: none"> <li>1. Students begin at the larger number and record it on an open number line.</li> <li>2. Students work out how many 10's are inside the smaller number, and how many 1's are inside the smaller number.</li> <li>3. Students move along the number line in multiples of 10's corresponding to the number of 10's in the smaller number.</li> <li>4. Students then move along the number line in 1's corresponding to the number of 1's in the smaller number.</li> <li>5. Students have 'hopped on' to the answer.</li> </ol> <p>Note that students do not necessarily have to 'hop on' in 10's and 1's once they understand the concept. Instead, they could hop on in multiples of 10's and 1's. The most important idea is the use of the open number line to support addition.</p>	<p>Mixed ability pairs</p>	<p>Workbooks Dice</p>

**Engagement (whole group):**

Introduce students to the 'hop family'. The hop family is similar to the count cousins. There are 3 members (Hop On – who we met last week; Hop Back – who we will meet today; and Hop Up – who we will meet later this term). There are two older sisters (Hop On and Hop Back) and one younger sister. Hop On (like Count On) is the greedy older sister always wanting more; Hopping Back (like Count Back) is the generous older sister, always giving things away. Hop Up (like Count Up) is the younger sister always trying to catch up to her big sisters. We use hop on for addition, and hop back, and hop up for subtraction.

Model the 'hop back' process.

For example, **69 – 24**.

1. Students begin at the larger number (the first number) and record it on an open number line (**69**).
2. Students work out how many 10's are inside the smaller number (the second number; in our example, **2 10's or 20**), and how many 1's are inside the smaller number (in our example, **4**).
3. Students move back along the number line in multiples of 10's corresponding to the number of 10's in the smaller number (**69, 59, 49**).
4. Students then move back along the number line in 1's corresponding to the number of 1's in the smaller number (**49, 48, 47, 46, 45**).
5. Students have 'hopped back' to the answer.

Note that students do not necessarily have to 'hop back' in 10's and 1's once they understand the concept. Instead, they could hop back in multiples of 10's and 1's. The most important idea is the use of the open number line to support subtraction.

**Procedure:**

- Give students a series of 2-digit subtraction which they can work on in their workbooks using the hop back method.

**Pulling it together:**

Mark the work together.

Play a game of gotcha require students to undertake 2-digit subtraction mentally.

<p><b>LESSON 2: More on 'hopping back'</b></p> <p><b>Review:</b> 'Hop back' method for subtracting 2-digit numbers.</p> <p><b>Engagement (whole group):</b> Introduce activity, outlined below.</p> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>• Get each student to roll a 10's dice and a 10-sided 1's dice. Students have to subtract the smaller number rolled from the larger number.</li> <li>• In their books, students need to solve the subtraction fact using the hop back technique.</li> </ul> <p><b>Pulling it together:</b> Get students to come back together and share their work.</p> <p>Play a game of gotcha require students to undertake 2-digit subtraction mentally.</p>		
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**Observations of students' learning:** Student ability at the end of the session to describe the hop back technique. Student ability to demonstrate such skills in their workbook.

**Teacher's Resources:** EWB.

**Catering for inclusion:**

Enabling Prompt:

- Encourage students to use concrete materials to aid their subtraction (in particular, materials which can easily be organised into 10's and 1's, such as MAB or popsticks).

Extending Prompt:

- Encourage students to subtract 3-digit numbers or to subtract the numbers using a different strategy (more than one way).

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and

- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Topic:** Change the Order (Understanding) and More than one way (Understanding)

**Learning Area:** Number

**Date** 11<sup>th</sup> September and 12<sup>th</sup> of September

**Year Level:** Grade 1/2 (whole group)

**Duration:** 55 minutes x 2

#### Learning Purpose:

Revision points

- That we can change the order in which we add numbers/ collections to aid calculation.
- That there is always more than one strategy or set of strategies for adding numbers, however some approaches are more efficient than others.

#### Australian Curriculum references:

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as commutativity for addition, building to 10, 10 facts, doubles and adding 10.

	Group set up	Materials
<p><b>LESSON 1 – change the order and more than one way; dice</b></p> <p><b>Review:</b> Review the SURF board; discuss the four goals and an example of a teaching point to support each goal.</p> <p><b>Engagement (whole group):</b> Roll 4 dice on the EWB (6-sided). Discuss the different ways we can add these numbers together (change the order). Debate what might be the best (i.e., most efficient) approach. Record the chosen number sentence on the whiteboard. The idea is that students can use strategies and fast facts learnt during SURF to support their thinking. 15 mins</p> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>• Working in pairs, students will receive 3 dice (either 6-sided or 10-sided, depending on their level). Students roll the dice, and together decide</li> </ul>	<p>Pair students up based on ability.</p>	<p>Whiteboards Markers Dice Cards</p>

the best way to add the 4 numbers together. The idea is that they are looking for strategies and fast facts which will support their addition (e.g., doubles, rainbow facts, near doubles, bridging through ten). Students can use an abacus to support their thinking. Students can record their number sentences on a whiteboard.

- Encourage students to explore 'more than one way' of adding the numbers, and to decide which approach they prefer/ feel is most efficient.

20 mins

**Pulling it together:**

- Come back together as a class, and get different students to share their approaches for adding numbers. Focus on students who managed to use some of their known strategies/ fast facts to support their thinking. Emphasise how there are multiple methods for solving these addition facts, however that some methods are more efficient than others.

10 mins

- Time permitting, play a game of GOTYA with the class having to add three numbers together in the most efficient way possible. Always give students a pair of rainbow numbers amongst the 3 numbers (e.g., 8, 5 and 2) or a doubles fact.

10 mins

**LESSON 2 – change the order and more than one way; cards**

**Review:** Discuss yesterday's lesson. Spend time reviewing the various strategies, understandings and fast facts which supported our thinking when adding the dice together.

5 minutes

**Engagement (whole group):**

Pull 4 cards from a deck. Discuss the different ways we can add these numbers together (change the order). Debate what might be the best (i.e., most efficient) approach. Record the chosen number sentence on the whiteboard. The idea is that students can use strategies and fast facts learnt during SURF to support their thinking.

10 minutes

**Procedure:**

- Working in pairs, students will receive 3 cards or

4 cards, depending on their level. Students pull cards, and together decide the best way to add the 3 or 4 numbers together. The idea is that they are looking for strategies and fast facts which will support their addition (e.g., doubles, rainbow facts, near doubles, bridging through ten). Students can use an abacus to support their thinking. Students can keep the cards as a set in the order they added them together (rather than record the number sentences on the whiteboards). Again, encourage students to pursue 'more than one way', and determine which method they feel is most efficient (and why).

20 minutes

**Pulling it together:**

- Come back together as a class, and get different students to share their approaches for adding numbers. Focus on students who managed to use some of their known strategies/ fast facts to support their thinking.
- Time permitting, play a game of GOTYA with the class having to add three numbers together in the most efficient way possible. Always give students a pair of rainbow numbers amongst the 3 numbers (e.g., 8, 5 and 2) or a doubles fact.

10 minutes

**Observations of students' learning:** Observations of whether students can change the order, and add the cards more than one way to determine efficient strategies. The particular focus is whether students can look for known patterns, and opportunities to utilise known strategies.

**Teacher's Resources:** Large cards; EWB.

**Catering for inclusion:**

LESSON 1 and 2:

Enabling prompts:

- Students roll 3 dice (6-sided), or select 3 cards. Use concrete materials (e.g., abacus, counters) and prompting questions such as 'What is the best order to add these cards in? Is there another way of adding these numbers together?'

Extending prompts:

- Students could initially play with an additional dice (4<sup>th</sup> dice).
- In relation to the cards, students could increase the number of cards they added beyond 4 (e.g., 5 or 6 cards). This will allow them additional opportunities to utilise multiple strategies, and consider which approach is the most efficient.

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Topic:** Subtracting two-digit numbers (hop up)

**Learning Area:** Strategies

**Date:** 18<sup>th</sup> and 19<sup>th</sup> of September

**Year Level:** Grade 1/2 (Group 2)

**Duration:** 55 minutes

**Learning Purpose:** For students to understand how subtracting 2-digit numbers can be achieved through using an open number line. Note that this technique involves viewing subtraction as the 'difference between' two numbers. For students to achieve fluency in this process through beginning at the smaller number and 'hopping up' to the larger number.

**Australian Curriculum references:**

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as ten facts.

	Group set up	Materials
<p><b>LESSON 1: Introduction to 'hop up' to support addition</b></p> <p><b>Review:</b> Review 2-digit subtraction using the 'hop back' strategy.</p> <p>RECALL</p> <ol style="list-style-type: none"> <li>1. Students begin at the larger number (the first number) and record it on an open number line.</li> <li>2. Students work out how many 10's are inside the smaller number (the second number), and how many 1's are inside the smaller number.</li> <li>3. Students move back along the number line in multiples of 10's corresponding to the number of 10's in the smaller number.</li> <li>4. Students then move back along the number line in 1's corresponding to the number of 1's in the smaller number.</li> <li>5. Students have 'hopped back' to the answer.</li> </ol> <p>Note that students do not necessarily have to 'hop back' in 10's and 1's once they understand the concept. Instead, they could hop back in multiples of 10's and 1's. The most important idea is the use of the open number</p>	Mixed ability pairs	Workbooks Dice

line to support subtraction.

**Engagement (whole group):**

(Re)Introduce students to the ‘hop family’. The hop family is similar to the count cousins. There are 3 members (Hop On – who we met a few weeks ago; Hop Back – who we met two weeks ago; and Hop Up – who we will meet today). There are two older sisters (Hop On and Hop Back) and one younger sister. Hop On (like Count On) is the greedy older sister always wanting more; Hopping Back (like Count Back) is the generous older sister, always giving things away. Hop Up (like Count Up) is the younger sister always trying to catch up to her big sisters. We use hop on for addition, and hop back, and hop up for subtraction.

Model the ‘hop up’ process for subtraction (e.g.,  $66 - 38$ ).

1. Students record the smaller number (38) and the larger number (66) at opposite ends of the number line. Their task is to work out the difference between the two numbers.
2. Beginning at the smaller number, students ‘hop up’ to the next friendly number (i.e., multiple of 10). In our example, students will hop up **2** to 40. They can either achieve this in a single step, or by moving up the number line in 1’s.
3. Students then hop up to the last friendly number on the number line (i.e., the last multiple of 10). In our example, students would hop up **20** to 60. Students can either achieve this in a single step, or by moving up the number line in 10’s.
4. Students then finish hopping up to the larger number. In our example, students will hop up **2** more to land on 62. Again, this can either be achieved in a single step, or in multiple steps.
5. Students need to work out how far they have hopped up altogether. This will be the difference between the two numbers. In our example, we have hopped up **24** (i.e.,  $2 + 20 + 2$ ).

**Procedure:**

- Give students a series of 2-digit subtraction which they can work on in their workbooks using the hop up method.

**Pulling it together:**

Mark the work together.

<p>Play a game of gotcha require students to undertake 2-digit subtraction mentally.</p> <p><b>LESSON 2: More on ‘hopping up’</b></p> <p><b>Review:</b> ‘Hop up’ method for subtracting 2-digit numbers.</p> <p><b>Engagement (whole group):</b> Introduce activity, outlined below.</p> <p><b>Procedure:</b></p> <ul style="list-style-type: none"> <li>• Get each student to roll a 10’s dice and a 10-sided 1’s dice. Students have to subtract the smaller number rolled from the larger number.</li> <li>• In their books, students need to solve the subtraction fact using the hop up technique.</li> </ul> <p><b>Pulling it together:</b> Get students to come back together and share their work.</p> <p>Play a game of gotcha require students to undertake 2-digit subtraction mentally.</p>		
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**Observations of students’ learning:** Student ability at the end of the session to describe the hop up technique. Student ability to demonstrate such skills in their workbook.

**Teacher’s Resources:** EWB.

**Catering for inclusion:**

Enabling Prompt:

- Encourage students to use concrete materials to aid their subtraction (in particular, materials which can easily be organised into 10’s and 1’s, such as MAB or popsticks).

Extending Prompt:

- Encourage students to subtract 3-digit numbers or to subtract the numbers using a different strategy (more than one way).

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt

# SURF

## Mental Maths and Problem Solving Program

### LESSON PLAN FORMAT

**Name:** James Russo

**School:** Belgrave South Primary

**Topic:** Translations and Representations  
(Reading)

**Learning Area:** Number

**Date** 16<sup>th</sup> October and 17<sup>th</sup> of October

**Year Level:** Grade 1/2 (whole group)

**Duration:** 55 minutes x 2

**Learning Purpose:** For students to be able to translate number sentences (e.g.,  $6 + 4 =$ ) into number stories (e.g., I had 6 fish and caught 4 more. How many fish do I have?). For students to be able to represent number stories as number sentences.

**Australian Curriculum references:**

Year 1: Represent and solve simple addition and subtraction problems using a range of strategies including counting on, partitioning and rearranging parts.

Year 2: Solve simple addition and subtraction problems using a range of efficient mental and written strategies, such as commutativity for addition, building to 10, 10 facts, doubles and adding 10.

Solve problems by using number sentences for addition or subtraction, including representing a word problem as a number sentence and writing a word problem to represent a number sentence

	<b>Group set up</b>	<b>Materials</b>
<p><b>LESSON 1 and 2 – Sentences into stories</b></p> <p><b>Review:</b> Review the SURF board; focus on reading and the associated symbols. Discuss English language words which can be substituted for some of these mathematical symbols.</p> <p><b>Engagement (whole group):</b> Remind students that mathematics is a language, just like English is a language. We need to be able to move between the language of maths and the English language to be good mathematicians and problem solvers.</p> <p>Record some simple addition and subtraction number sentences on the board. Create a number story around each of these number sentences. Get students to try and generate their own examples.</p> <p>Move on to more sophisticated examples (e.g., missing addends) as appropriate.</p> <p>15 mins</p>	<p>Pair students up based on ability.</p>	<p>Problem cards</p>

**Procedure:**

- This activity will likely require a demonstration to students.
- Working in pairs, each student will receive 3 number sentence cards, which they cannot show to their partner. Students A's job is to think of a number story which reflects each of their number sentences. Student B's job is to translate this number story back into a number sentence on a whiteboard. Students can then compare number sentences to see whether their 'translation' was accurate. After 3 cards, get students to switch roles.
- If students finish early, allow them to choose an additional three cards each.
- Encourage students to generate imaginative/interesting number stories.
- During the second lesson, encourage students to pursue more challenging problems.

25 mins

**Pulling it together:**

- Get students to share their experiences with the activity. The teacher can ask questions such as:
- What did you find more challenging: thinking of the stories or working out the number sentences?
- What clues did you notice when you were the 'detective' and had to work out what the number sentence was? What clues did you give your partner when it was your turn to think of the number story?
- How did you know whether you had to add or subtract (or multiply/ divide) (or what other processes are relevant)?
- Can you ever have an example where the same number story can be represented by more than one number sentence (the answer is yes – the most obvious example is perhaps repeated addition, such as  $4 + 4 + 4$ , and multiplication  $4 \times 3$ ). This again hints at the idea that there is **more than one way**.
- Time permitting, play a game of GOTYA. Think of a number story and get students to translate it into a number sentence.

15 mins

**Observations of students' learning:** Observations of whether students can translate between number sentences and number stories and vice versa. This can only really be achieved by listening to students.

**Teacher's Resources:** Whiteboard

**Catering for inclusion:**

LESSON 1 and 2:

Enabling prompts:

- Encourage students who are finding it difficult to translate a number story back into a number sentence to focus on what the operation is (i.e., is it addition or subtraction).
- Encourage students who are finding it difficult to think of number stories to create a story from objects around the room.

Extending prompts:

- Students could be encouraged to try and think of 2 different ways they could represent the number story as a number sentence.
- Students could be asked to generate additional number sentences for the activity, involving more complex operations and processes.

**Your reflection:** Identify the pedagogical stance you took during the lesson and reflect on:

- what went well and why
- what was difficult and why
- how engaged the students were and
- what you did to encourage this
- what else you could have done to improve the students' learning
- how responsive you were able to be to the students
- what you learnt