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### TEACH BY CONCEPT
- **TEACH BY CONCEPT**
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- Teaching Plan
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- Investigations and Reflections
- Problem Solving
- Problem Solving PowerPoint
- Videos

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1. Select Teaching Resources.

2. Select Teach by Grade.

3. Select a grade, for example, Year 2.
4. Select a term, for example, Term 1.

5. Select and Download the Grade Scope and Sequence.

6. The first page of the grade scope and sequence provides a year overview, with orange arrows showing essential prior and next concepts, and green arrows showing essential related concepts.
7. The next 4 pages of the grade scope and sequence provide a term by term sequence of understanding. Once a concept has been taught, it should be revisited frequently to ensure understanding deepens.

**YEAR 2 CONCEPT SCOPE AND SEQUENCE – TERM 1**

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
<th>Week 7</th>
<th>Week 8</th>
<th>Week 9</th>
<th>Week 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Value 12</td>
<td>Count forwards, backwards by 10s on and off the decade from two-digit numbers</td>
<td>Describe patterns that increase and decrease by adding and subtracting 10</td>
<td>Addition and Subtraction 13, 14</td>
<td>Add and subtract two tens numbers, counting forwards and backwards by 10s on the decade</td>
<td>Add 2 tens numbers, subtract a tens number from a tens number in 100s, partitioning tens number</td>
<td>Measurement and Geometry 21</td>
<td>Make and use a tape measure to measure length using informal units, including making and using a place value tape measure of 16 units of measurement</td>
<td>Recognize the need for a formal unit</td>
<td>Make and use a ruler using centimetres</td>
</tr>
<tr>
<td>Place Value 15, 16</td>
<td>Patterns and Algebra 12</td>
<td>Count forwards, backwards by 100s, 10s and 1s on and off hundred, decade, from three-digit numbers</td>
<td>Describe patterns, increase, decrease add and subtract 100s, 10s and 1s, on, off hundred and decade</td>
<td>Explain standard, non-standard place value of three-digit numbers grouping in hundreds, tens, ones</td>
<td>Read and order three-digit numbers on a number line and hundred charts</td>
<td>Partition three-digit numbers, standard, non-standard place value, non-place value</td>
<td>Place Value 14</td>
<td>Friends of any 100, through addition and commutativity, and through subtraction</td>
<td>Place Value 13</td>
</tr>
</tbody>
</table>

8. On the website, select a concept level, for example, Place Value 12.
TEACH BY GRADE and TEACH BY CONCEPT are the same from here!

9. Select 'Teaching Plan'.

PLACE VALUE 12 - COUNT BY 10S ON AND OFF THE DECADE

Children investigate counting forwards and backwards by 10s, on and off the decade, explaining which digit changes and why, and which digit doesn’t change and why. They then begin to investigate adding and subtracting 10s numbers, using their understanding of counting by 10s (Addition and Subtraction 13, 15).

Place Value 12 and Patterns and Algebra 11 are the same concept, thus the resources are the same. Counting forwards and backwards by 10s involves understanding of place value and patterns, and algebraic thinking.

10. The first page of the Teaching Plans for Number and Algebra concepts include information about essential prior, related and next learning. Each segment of the Teaching Plan has its own video, investigation and problem solving. (Current teaching resources for Measurement and Geometry, and Statistics and Probability don’t yet have this page, nor are the videos, investigations and problem solving explicitly linked yet. They are being adapted during Term 1 and new versions will be uploaded as they become available.)

PLACE VALUE 12, PATTERNS AND ALGEBRA II - TEACHING COUNTING BY 10s

ESSENTIAL PRIOR, RELATED AND NEXT LEARNING

Identify students’ current levels of understanding using tracking data, and formative embedded or separate assessment for this concept, and for the essential prior learning.

<table>
<thead>
<tr>
<th>Essential Prior Learning</th>
<th>Essential Related Learning</th>
<th>Essential Next Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Value 11 – Place value of two-digit numbers</td>
<td>Addition and Subtraction 13 and 15 – Add and subtract 2 tens numbers, counting forwards and backwards by 10s on the decade</td>
<td>Place Value 13 – Partition tens numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Place Value 14 – Friends of 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Place Value 15 – Place value of three-digit numbers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Addition and Subtraction 14 and 16 – Add and subtract tens numbers to and from two-digit numbers, bridging to 100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Addition and Subtraction 17 – Add and subtract two-digit numbers, bridging to 100</td>
</tr>
</tbody>
</table>

Use assessment data to select the level of this concept, or essential related concepts, and the segments of each explicit teaching plan, to teach.

TEACHING VIDEOS, EXPLICIT TEACHING PLAN, INVESTIGATION, REFLECTION, PROBLEM SOLVING

The videos and the explicit teaching plan are divided into the same segments of the concept.

TEACHING SEGMENT 1: Count forwards by 10s on the decade less than 100.
TEACHING SEGMENT 2: Count backwards by 10s on the decade less than 100.
TEACHING SEGMENT 3: Count forwards by 10s on the decade over 100.
TEACHING SEGMENT 4: Count backwards by 10s on the decade over 100.
TEACHING SEGMENT 5: Count forwards by 10s off the decade less than 100.
TEACHING SEGMENT 6: Count backwards by 10s off the decade less than 100.
TEACHING SEGMENT 7: Count forwards by 10s off the decade over 100.
TEACHING SEGMENT 8: Count backwards by 10s off the decade over 100.

VIEW the videos before teaching, to develop YOUR understanding and meta-language, then teach the concept using YOUR understanding and meta-language and the Explicit Teaching PowerPoint, and/or SHOW the video to the whole class / groups of children / individual children to develop THEIR understanding and meta-language.
II. The second page of the Teaching Plans for Number and Algebra concepts, and current first page of the Teaching Plans for Measurement and Geometry, and Statistics and Probability, provides an overview of the teaching plan.

11. The second page of the Teaching Plans for Number and Algebra concepts, and current first page of the Teaching Plans for Measurement and Geometry, and Statistics and Probability, provides an overview of the teaching plan.

12. The remaining pages of the Teaching Plans provide detailed a teaching sequence, including the meta-language that could be used to explain and ask questions.

II. The second page of the Teaching Plans for Number and Algebra concepts, and current first page of the Teaching Plans for Measurement and Geometry, and Statistics and Probability, provides an overview of the teaching plan.
13. At the end of every segment of the Teaching Plan for Number and Algebra, there is a summary of the investigation and problem solving that children could engage in to deepen their understanding. (Current teaching resources for Measurement and Geometry, and Statistics and Probability don’t yet have this page, nor are the investigations and problem solving explicitly linked yet. They are being adapted during Term 1 and new versions will be uploaded as they become available.)

14. On the website, select Teaching Plan PowerPoint.
15. The first slide in the Teaching Plan PowerPoint explains that each Teaching Plan segment has its own segment of the PowerPoint, which includes its Investigations, Reflections and Problems. It contains advice about using segments of different Teaching Plan PowerPoints to differentiate Explicit Teaching.

16. The remaining slides in the Teaching Plan PowerPoint contain
   a) each segment of the Teaching Plan,
   b) the Investigations, Reflections and Problems that link explicitly to a segment on the Teaching Plan.
   c) more Investigations and Reflections that do not link explicitly to a segment on the Teaching Plan.
   These Investigations provide more ways that students may investigate the concept to deepen their understanding.
17. On the website, select Investigation.

PLACe VALUE 12 - COUNT BY 10S ON AND OFF THE DECADE

Children investigate counting forwards and backwards by 10s, on and off the decade, explaining which digit changes and why, and which digit doesn’t change and why. They then begin to investigate adding and subtracting 10s numbers, using their understanding of counting by 10s (Addition and Subtraction 13, 15).

Place Value 12 and Patterns and Algebra 11 are the same concept, thus the resources are the same. Counting forwards and backwards by 10s involves understanding of place value and patterns, and algebraic thinking.

TEACHING RESOURCES

<table>
<thead>
<tr>
<th>Investigation</th>
<th>Teaching Plan</th>
<th>Teaching Plan Powerpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) forwards, on the decade less than 100</td>
<td>(c) forwards, on the decade over 100</td>
<td></td>
</tr>
<tr>
<td>(b) backwards, on the decade less than 100</td>
<td>(d) backwards, off the decade less than 100</td>
<td></td>
</tr>
<tr>
<td>(c) forwards, on the decade over 100</td>
<td>(e) forwards, off the decade over 100</td>
<td></td>
</tr>
<tr>
<td>(d) backwards, off the decade over 100</td>
<td>(f) backwards, off the decade less than 100</td>
<td></td>
</tr>
</tbody>
</table>

18. The first page of the Investigation and Reflection explains how to guide students through the investigation process, then allow them to investigate independently, and to reflect often on their understanding. Investigations and Reflections that link explicitly to a segment on the Teaching Plan are listed first.

PLACE VALUE 12, PATTERNS AND ALGEBRA 11, INVESTIGATION AND REFLECTION (Year 2) ACMMNA026, ACMMNA035, NSW MA1-4NA

Count forwards and backwards by 10s on the decade, and forwards and backwards by 10s off the decade from two-digit numbers, explaining which changes and why, while describing patterns that increase and decrease by adding and subtracting 10.

GUIDED AND INDEPENDENT INVESTIGATIONS AND REFLECTION

These investigations allow children to investigate and explain the concept in new and varied situations, providing formative assessment data for both the child and the teacher. "Doing" mathematics is not enough and it is not a good indication of understanding.

Children investigate and explain independently many concepts at just beyond their current level of understanding, intervening themselves and the teacher’s current level of understanding. It is during independent investigation that deep understanding and problem solving develop.

As they investigate, allow children to experience confusion (problematic knowledge) and to make mistakes to develop resilience and deep understanding, if children knew what it was they were doing, it wouldn’t be called learning.

GUIDE children through the INVESTIGATION process until they are ready to investigate INDEPENDENTLY.

Children DISCUSS then RECORD their response to the REFLECTION question.

<table>
<thead>
<tr>
<th>Teaching Segment and Video</th>
<th>Count forwards by 10s on the decade less than 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>In pairs, children select a card to make a tens number as a start number. They record the count forwards by 10s from their number on a number line. They explain the pattern of repeatedly adding 10. They explain which digit changes and why and which digit does not change and why. Reflection: Why does the ones digit stay the same and the tens digit change when we count forwards by 10s?</td>
<td></td>
</tr>
</tbody>
</table>

Website: http://www.alearningplace.com.au  
Email: info@alearningplace.com.au  
Twitter: @learn4teach  
YouTube: A Learning Place A Teaching Place  
Facebook: A Learning Place
19. The next pages list more Investigations and Reflections that do not link explicitly to a segment on the Teaching Plan. These Investigations provide more ways that students may investigate the concept to deepen their understanding.

- In pairs, children select an Ace and 2 more cards to make a number in the one hundreds as a start number. They record the count backwards by 10s from their number on a number line. They explain the pattern of repeatedly subtracting 10. They explain which digit changes and why and which digit does not change and why. Reflection: Why does the ones digit stay the same and the tens digit change when we count backwards by 10s? When does the hundreds digit change?

- Children count forwards and backwards by tens on and off the decade on a hundred chart, identifying the pattern of going down or up columns. They check how many they added or subtracted each time by counting by ones between numbers. They identify which digit changes and which digit stays the same and why.

- In pairs, children have a calculator. They enter a number and then + 10. They repeatedly select the equals sign, recording each number. They identify that they have been repeatedly adding 10.

- In pairs, children have a calculator. They enter a number and then - 10. They repeatedly select the equals sign, recording each number. They identify that they have been repeatedly subtracting 10.

- In pairs, each child records a two-digit number with the same ones digit. They work out the number of tens they need to add or subtract to get to one another’s number. For example, children record 27 and 57. One child works out they need to add 3 tens to 27 while the other child works out they need to subtract 3 tens from 57.

- In pairs, children have a calculator. One child enters a two-digit number. Their friend ‘wipes out’ the tens digit by subtracting the number of tens.

- Children count 10 cents coins by 10s. (see Money and Financial Mathematics 4, 5, 6, 7)

- Children count units of measurement by 10s using the ruler they create using informal units. (see Measurement and Geometry 21)

- Children count forwards and backwards by 10s along a metre ruler. (see Measurement and Geometry 21)

20. The next pages of Investigations and Reflections list Problems that link explicitly to a segment on the Teaching Plan. Each Problem has its answer.

**PROBLEM SOLVING** linked to videos, explicit teaching, investigations and reflections

Problems allow children to investigate concepts in new and varied situations. Any problem worth solving takes time and effort.

Problems are designed to develop and use higher order thinking. Allowing children to grapple with problems, providing minimal support by asking strategic questions, is key. Differentiating problems allows children to solve simpler problems, before solving more complex problems on a concept.

Problems may not always be solved the first time. They are presented – or at all. The issue of problem solving is the development of problem solving understanding and capacity – not mastery! Returning to a problem after further learning, develops both resilience and increased confidence as children take the necessary time and input the necessary effort. After solving problems, children also create their own problems.

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**Teaching Segment and Video 1:**

**Count forwards by 10s on decade under 100**

**Teaching Segment and Video 2:**

**Count backwards by 10s on decade under 100**

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These problems are directly linked to Explicit Teaching, are emphasised in the Explicit Teaching Plan, and appear on the Explicit Teaching PowerPoint. These, and more problems, appear as blackline master on the Problem Solving PDF and are differentiated on the Problem Solving PowerPoint.
21. The remaining pages of Investigations and Reflections provide blackline masters of:
   a) the Investigations, Reflections and Problems that link explicitly to a segment on the Teaching Plan.
   Each problem has a hint for creating new problems.
   b) the Investigations and Reflections that do not link explicitly to a segment on the Teaching Plan.

22. On the website, select Problem Solving.

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**PLACE VALUE 12 - COUNT BY 10S ON AND OFF THE DECADE**

Children investigate counting forwards and backwards by 10s, on and off the decade, explaining which digit changes and why, and which digit doesn’t change and why. They then begin to investigate adding and subtracting 10s numbers, using their understanding of counting by 10s (Addition and Subtraction 13, 15).

Place Value 12 and Patterns and Algebra 11 are the same concept, thus the resources are the same. Counting forwards and backwards by 10s involves understanding of place value and patterns, and algebraic thinking.
23. The first page of Problem Solving explains the purpose of problem solving is to develop understanding of problem solving, and capacity to solve problems – not to solve a specific problem today. It provides information about differentiating problems by creating different levels of the same problem to suit the different problem solving understandings and capacities of the students in the class. It provides information about creating 3 levels of a problem, and guiding students through solution following the problem solving steps, allowing them to attempt to solve the final level independently. It suggests that students then create their own problem. (For further information and a video explaining this problem solving process, see the ‘Problem Solving’ banner on the home page of the website.)

a) Problems that link explicitly to a segment on the Teaching Plan are listed first.

b) Problems that do not link explicitly to a segment on the Teaching Plan are listed next.

Each Problem has its answer.

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### PLACE VALUE 12, PATTERNS AND ALGEBRA 11_PROBLEM SOLVING

**Place Value (Year 2) ACMNA026, ACMNA035, NSW MA1-4NA**

Problems allow children to investigate concepts in new and varied situations. Any problem worth solving takes time and effort – that’s why they’re called problems.

Problems are designed to develop and use higher order thinking. Allowing children to grapple with problems, providing minimal support by solving similar questions, is key. Differentiating problems allows children to solve simpler problems, before solving more complex problems on a concept.

Problems may not always be solved the first time they are presented – or all. The focus of problem solving is the development of problem solving understandings and capacity – not necessarily returning to a problem after further learning, develops both resilience and increased confidence in children to make necessary time and input the necessary effort.

After solving problems, children are asked to create their own problem.

GUIDE children through the first level using the problem solving steps. Allow children to investigate the second level with friends, with minimal guidance. Allow children to investigate the third level by themselves. Children create their own problems.

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**Teaching Segment and Video 1:** Count forwards by 10s on the decade over 100

<table>
<thead>
<tr>
<th>Teaching Segment and Video 1: Count forwards by 10s on the decade over 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>What number is missing from this number line? (80, 5 here)</td>
</tr>
<tr>
<td>+10</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

---

**Teaching Segment and Video 7:** Count forwards by 10s off the decade over 100

<table>
<thead>
<tr>
<th>Teaching Segment and Video 7: Count forwards by 10s off the decade over 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>What number is missing from this number line? (204, 10 tens and 4 ones)</td>
</tr>
<tr>
<td>+10</td>
</tr>
<tr>
<td>74</td>
</tr>
</tbody>
</table>

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**Teaching Segment and Video 8:** Count backwards by 10s off the decade over 100

<table>
<thead>
<tr>
<th>Teaching Segment and Video 8: Count backwards by 10s off the decade over 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>What number is missing from this number line? (203, 10 tens and 3 ones)</td>
</tr>
<tr>
<td>-10</td>
</tr>
<tr>
<td>73</td>
</tr>
</tbody>
</table>

---

**a) Problems that link explicitly to a segment on the Teaching Plan are listed first.**

b) Problems that do not link explicitly to a segment on the Teaching Plan are listed next.

### More problems

**Calculator and 10**

<table>
<thead>
<tr>
<th>Calculator and 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Betty showed this number on her calculator. 36 She changed it so it became this number. 46 What did Betty do to change 36 to 46? (10, tens)</td>
</tr>
<tr>
<td>Betty showed this number on her calculator. 45 She changed it so it became this number. 75 What did Betty do to change 45 to 75? (30, 30, 10 tens)</td>
</tr>
<tr>
<td>Betty showed this number on her calculator. 56 She changed it so it became this number. 86 What number did Betty think of? (40, 1 ten)</td>
</tr>
<tr>
<td>Johny thought of a number. He subtracted 10. His answer was 56. What number did Johny think of? (66, 10 more)</td>
</tr>
<tr>
<td>There are 10 more boys than girls in the grade. There are 43 girls. How many boys are there? (53, 10 more)</td>
</tr>
</tbody>
</table>
24. The remaining pages of Problem Solving provide blackline masters of all Problems - those that link explicitly to a segment on the Teaching Plan as well as those that don’t. Each problem has a hint for creating new problems. Each problem recommends students create their own problem.

25. The final pages of Problem Solving provide the Problem Solving steps.

![Problem Solving steps diagram](image-url)

27. The first slide of the Problem Solving PowerPoint explains the problem solving steps. It provides information about creating 3 levels of a problem, and guiding students through solution following the problem solving steps, allowing them to attempt to solve the final level independently. It suggests that students then create their own problem. (For further information and a video explaining this problem solving process, see the ‘Problem Solving’ banner on the home page of the website.)
28. The remaining slides provide 3 levels of each Problem from Problem Solving. They also contain the problem solving steps. (For further information and a video explaining this problem solving process, see the ‘Problem Solving’ banner on the home page of the site.)

a) The rectangle covers everything except for the part of the problem that is asking us to find something out.

b) The rectangles may be removed during the lessons to reveal the information we need to find it out.

29. On the website, select a Teaching Video.
30. Each segment of the Number and Algebra concepts Teaching Plans has its own Video. (Current Videos for Measurement and Geometry, and Statistics and Probability don’t yet explicitly link to each segment of the Teaching Plans. They are being adapted during Term I and new versions will be uploaded as they become available.)

31. At the end of the Number and Algebra concepts Videos the Investigations and Reflections are described.
TEACH BY CONCEPT

1. On the site, select Teach by Concept.

2. Select a concept group, for example, Number and Algebra.

3. Select a concept, for example, Place Value.
4. Select and download the Concept Sequence.

NUMBER AND ALGEBRA TEACHING RESOURCES

PLACE VALUE TEACHING RESOURCES

PLACE VALUE CONCEPT SEQUENCE

In the first 3 years of school, children investigate Place Value additively as they add the values of the digits to get the value of the number. They investigate both standard and non-standard additive place value, describing numbers in place values flexibly. They use their understanding to add and subtract single-digit, tens, and two-digit numbers using place value.

From Year 3 onwards, they continue to investigate standard and non-standard place value of larger numbers and decimals. They begin to investigate Place Value multiplicatively, as they explain that we are multiplying and dividing by 10 (and powers of 10) to get the values of the places to the left and the right. They use their understanding to add, subtract, multiply, and divide, larger whole numbers and decimals using standard and non-standard additive place value and multiplicative place value.

Place Value 1: Partition single-digit numbers informal recording
Place Value 2: Friends of 10 informal recording
Place Value 3: Partition ten numbers informal recording
Place Value 4: Ten Numbers are 10 and... informal recording
Place Value 5: Friends of 20 informal recording
Place Value 6: Friends of 10 through addition, commutativity and subtraction.

5. The Concept Sequence lists the concept in order of understanding. It also provides information regarding relationships to other concepts.

PLACE VALUE CONCEPT SEQUENCE

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>YEAR 2</th>
<th>YEAR 3</th>
<th>YEAR 4</th>
<th>YEAR 5</th>
<th>YEAR 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
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<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
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<td></td>
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<tr>
<td>28</td>
<td>29</td>
<td>30</td>
<td>31</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Essential related concepts are Addition and Subtraction 6 and 7. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Essential related concepts are Addition and Subtraction 13, 14, 15, 16, 17. Patterns and Algebra 11. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Measurement and Geometry 23. Essential related concepts are Addition and Subtraction, 13, 14, 15, 16, 17. Patterns and Algebra 12. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Essential related concepts are Addition and Subtraction 14, 21, 23, 24, Patterns and Algebra 36. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Essential related concepts are Addition and Subtraction 29, Fractions and Decimals 32, Measurement and Geometry 61.

Essential related concepts are Addition and Subtraction 6 and 7. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Measurement and Geometry 23. Essential related concepts are Addition and Subtraction, 13, 14, 15, 16, 17. Patterns and Algebra 12. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Essential related concepts are Addition and Subtraction, 13, 14, 15, 16, 17. Patterns and Algebra 12. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Essential related concepts are Addition and Subtraction 14, 21, 23, 24, Patterns and Algebra 36. Multiplication and Division 9, 10, 11, 12, 13, 14, 15, 16, 17. Essential related concepts are Addition and Subtraction 29, Fractions and Decimals 32, Measurement and Geometry 61.

4. Select and download the Concept Sequence.

5. The Concept Sequence lists the concept in order of understanding. It also provides information regarding relationships to other concepts.
6. On the website, each concept is divided into sequential levels of understanding.

| Place Value 1 - Partition single-digit numbers informal recording |
| Place Value 2 - Friends of 10 informal recording |
| Place Value 3 - Partition teen numbers informal recording |
| Place Value 4 - Teen Numbers are "10 and ...," informal |
| Place Value 5 - Friends of 20, Informal Recording |
| Place Value 6 - Friends of 10, through addition, commutativity and subtraction. |
| Place Value 7 - Place Value of Teen Numbers, Formal Recording |
| Place Value 8 - Partition single-digit numbers and teen numbers in place value and non-place value. |

Use these concepts now to add and subtract single-digit numbers bridging 10 using place value. (ADDITION AND SUBTRACTION 6 AND 7)

| Place Value 9 - Friends of 20, through addition and subtraction |
| Place Value 10 - Friends of Any Decade |
| Place Value 11 - Place Value of Two-digit Numbers |

Use these concepts now to add and subtract single-digit numbers to and from teen numbers bridging 20 using place value. (ADDITION AND SUBTRACTION 8)

Then use these concepts to add and subtract single-digit numbers to and from teen numbers bridging any decade using place value. (ADDITION AND SUBTRACTION 9)

| Place Value 12 - Count by 10s On and Off the Decade |

Use this concept now to add and subtract tens numbers, counting by 10 on the decade. (ADDITION AND SUBTRACTION 13)

Use this concept now to measure lengths using informal units grouped in tens, and using centimetres. (MEASUREMENT AND GEOMETRY 21)

| Place Value 13 - Partition Teen Numbers |

7. After students develop understanding of one concept to a specific level, they apply their understanding to investigate related concepts.

| Place Value 1 - Partition single-digit numbers informal recording |
| Place Value 2 - Friends of 10 informal recording |
| Place Value 3 - Partition teen numbers informal recording |
| Place Value 4 - Teen Numbers are "10 and ...," informal |
| Place Value 5 - Friends of 20, Informal Recording |
| Place Value 6 - Friends of 10, through addition, commutativity and subtraction. |
| Place Value 7 - Place Value of Teen Numbers, Formal Recording |
| Place Value 8 - Partition single-digit numbers and teen numbers in place value and non-place value. |

Use these concepts now to add and subtract single-digit numbers bridging 10 using place value. (ADDITION AND SUBTRACTION 6 AND 7)

| Place Value 9 - Friends of 20, through addition and subtraction |
| Place Value 10 - Friends of Any Decade |
| Place Value 11 - Place Value of Two-digit Numbers |

Use these concepts now to add and subtract single-digit numbers to and from teen numbers bridging 20 using place value. (ADDITION AND SUBTRACTION 8)

Then use these concepts to add and subtract single-digit numbers to and from teen numbers bridging any decade using place value. (ADDITION AND SUBTRACTION 9)

| Place Value 12 - Count by 10s On and Off the Decade |

Use this concept now to add and subtract tens numbers, counting by 10 on the decade. (ADDITION AND SUBTRACTION 13)

Use this concept now to measure lengths using informal units grouped in tens, and using centimetres. (MEASUREMENT AND GEOMETRY 21)

| Place Value 13 - Partition Teen Numbers |
8. Select a concept level, for example, Place Value 12.

<table>
<thead>
<tr>
<th>Place Value 2</th>
<th>Friends of 10 Informal recording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Value 3</td>
<td>Partition teen numbers informal recording</td>
</tr>
<tr>
<td>Place Value 4</td>
<td>Teen Numbers are &quot;10 and .&quot; informal</td>
</tr>
<tr>
<td>Place Value 5</td>
<td>Friends of 20, Informal Recording</td>
</tr>
<tr>
<td>Place Value 6</td>
<td>Friends of 10, through addition, commutativity and subtraction.</td>
</tr>
<tr>
<td>Place Value 7</td>
<td>Place Value of Teen Numbers, Formal Recording</td>
</tr>
<tr>
<td>Place Value 8</td>
<td>Partition single-digit numbers and teen numbers in place value and non-place value.</td>
</tr>
</tbody>
</table>

Use these concepts now to add and subtract single-digit numbers bridging 10 using place value. (ADDITION AND SUBTRACTION 6 AND 7)

<table>
<thead>
<tr>
<th>Place Value 9</th>
<th>Friends of 20, through addition and subtraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Value 10</td>
<td>Friends of Any Decade</td>
</tr>
<tr>
<td>Place Value 11</td>
<td>Place value of Two-digit Numbers</td>
</tr>
</tbody>
</table>

Use these concepts now to add and subtract single-digit numbers to and from teen numbers bridging 20 using place value. (ADDITION AND SUBTRACTION 8)

Then use these concepts to add and subtract single digit numbers to and from teen numbers bridging any decade using place values. (ADDITION AND SUBTRACTION 9)

| Place Value 12 | Count by 10s On and Off the Decade |

Use this concept now to add and subtract tens numbers, counting by 10 on the decade. (ADDITION AND SUBTRACTION 10)

Use this concept now to measure lengths using informal units grouped in tens, and using centimeters. (MEASUREMENT AND GEOMETRY 21)

| Place Value 13 | Partition Tens Numbers |

10. The first page of the Teaching Plans for Number and Algebra concepts include information about essential prior, related and next learning. Each segment of the Teaching Plan has its own video, investigation and problem solving. (Current teaching resources for Measurement and Geometry, and Statistics and Probability don’t yet have this page, nor are the videos, investigations and problem solving explicitly linked yet. They are being adapted during Term 1 and new versions will be uploaded as they become available.)
II. The second page of the Teaching Plans for Number and Algebra concepts, and current first page of the Teaching Plans for Measurement and Geometry, and Statistics and Probability, provides an overview of the teaching plan.

11. The second page of the Teaching Plans for Number and Algebra concepts, and current first page of the Teaching Plans for Measurement and Geometry, and Statistics and Probability, provides an overview of the teaching plan.

PLACE VALUE 12, PATTERNS AND ALGEBRA 11_ OVERVIEW OF EXPLICIT TEACHING PLAN
(Year 2) ACMNA026, ACMNA035, NSW MA1-4NA

Count forwards and backwards by 10s on the decade, and forwards and backwards by 10s off the decade from two-digit numbers, explaining which digit changes and why, while describing patterns that increase and decrease by adding and subtracting 10.

This is a summary of the explicit teaching plan, describing the sequence which will occur over multiple lessons. The complete explicit teaching plan starts on page 3.

| Segments 1 and 2: Count forwards and backwards by 10s on the decade under 100. |
| Segments 3 and 4: Count forwards and backwards by 10s on the decade over 100. |
| Segments 5 and 6: Count forwards and backwards by 10s off the decade under 100. |
| Segments 7 and 8: Count forwards and backwards by 10s off the decade over 100. |

Children:
- count forwards and backwards by 10s, on the decade identifying that they are adding or subtracting 10 each time, for example,
- count forwards and backwards by 10s off the decade identifying that they are adding or subtracting 10 each time, for example,
- explain that the tens digit doesn’t change because we are adding / subtracting zero ones
- explain the tens digit goes up / down by 1 each time because we are adding / subtracting 1 ten each time

Children:
- ask one another questions about counting forwards and backwards by 10s, on and off the decade, for example,
- how could we count forwards / backwards by 10s?
- how many are we adding / subtracting each time?
- how could we record this on a number line?
- what happens to the ones digit when we counting forwards / backwards by 10s?
- why doesn’t the ones digit change?
- what happens to the tens digit when we counting forwards / backwards by 10s?
- why does the tens digit go up / down by 1 ten each time?

12. The remaining pages of the of the Teaching Plans provide detailed a teaching sequence, including the meta-language that could be used to explain and ask questions.

PLACE VALUE 12, PATTERNS AND ALGEBRA 11_ EXPLICIT TEACHING PLAN
(Year 2) ACMNA026, ACMNA035, NSW MA1-4NA

FULL EXPLICIT TEACHING PLAN, EMBEDDING THE INVESTIGATIONS, REFLECTIONS AND PROBLEMS THAT MAY BE USED TO DEVELOP DEEP UNDERSTANDING OVER MULTIPLE LESSONS

Resources: playing cards as number generators, children or pictures of children showing 10 fingers and 4 fingers, pencil, paper

Focus children’s thoughts on the concept, exposing current understanding and any misconceptions.

Teaching Segment and Video 1: Introduces counting by 10s on the decade less than 100.

What could we do?

Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.

Stand five children, or display a picture of 5 children, in a row, each displaying 10 fingers, for example.

Point to each child from the left as children count their fingers, 0, 10, 20, 30, 40, 50.

What language could we use to explain and ask questions?

- Today brings an investigation about counting by 10s.
- What do you know about counting by 10s?
- Talk about counting by 10s with a friend.
- Is anyone ready to share what they are thinking about counting by 10s?
- Let’s investigate counting forwards by 10s on the decade
- Here we have 1 child.
- How many fingers is the child showing?
- Is the child showing 10 fingers?
- Let’s count the fingers, as each child stands up
- 0, 10, 20, 30, 40, 50
- Who could come out and show us 20?
13. At the end of every segment of the Teaching Plan for Number and Algebra, there is a summary of the investigation and problem solving that children could engage in to deepen their understanding. (Current teaching resources for Measurement and Geometry, and Statistics and Probability don’t yet have this page, nor are the investigations and problem solving explicitly linked yet. They are being adapted during Term 1 and new versions will be uploaded as they become available.)

14. On the website, select Teaching Plan PowerPoint.
15. The first slide in the Teaching Plan PowerPoint explains that each Teaching Plan segment has its own segment of the PowerPoint, which includes its Investigations, Reflections and Problems. It contains advice about using segments of different Teaching Plan PowerPoints to differentiate Explicit Teaching.

16. The remaining slides in the Teaching Plan PowerPoint contain:
   a) each segment of the Teaching Plan,
   b) the Investigations, Reflections and Problems that link explicitly to a segment on the Teaching Plan.
   c) more Investigations and Reflections that do not link explicitly to a segment on the Teaching Plan.

These Investigations provide more ways that students may investigate the concept to deepen their understanding.
17. On the website, select Investigation.

PLACE VALUE 12 - COUNT BY 10S ON AND OFF THE DECADE

Children investigate counting forwards and backwards by 10s, on and off the decade, explaining which digit changes and why, and which digit doesn’t change and why. They then begin to investigate adding and subtracting 10s numbers, using their understanding of counting by 10s (Addition and Subtraction 13, 15).

Place Value 12 and Patterns and Algebra 11 are the same concept, thus the resources are the same. Counting forwards and backwards by 10s involves understanding of place value and patterns, and algebraic thinking.

TEACHING RESOURCES

18. The first page of the Investigation and Reflection explains how to guide students through the investigation process, then allow them to investigate independently, and to reflect often on their understanding. Investigations and Reflections that link explicitly to a segment on the Teaching Plan are listed first.

PLACE VALUE 12, PATTERNS AND ALGEBRA 11 INVESTIGATION and REFLECTION

(Year 2) ACMMN026, ACMMN035, NSW MA1-4NA

Count forwards and backwards by 10s on the decade, and forwards and backwards by 10s off the decade from two-digit numbers, explaining which changes and why, while describing patterns that increase and decrease by adding and subtracting 10.

GUIDED AND INDEPENDENT INVESTIGATIONS and REFLECTION

These investigations allow children to investigate and explain the concept in new and varied situations, providing formative assessment data for both the child and the teacher. "Doing" mathematics is not enough and its not a good indicator of understanding.

Children investigate and explain independently over many lessons at just beyond their current level of understanding, allowing both themselves and the teacher to their current level of understanding. It is during Independent Investigation that deep understanding and understanding develops.

As they investigate, allow children to experience confusion (problematic knowledge) and to make mistakes to develop resilience and deep understanding. If children know what it was they were doing, it wouldn’t be called learning!

GUIDE children through the INVESTIGATION process until they are ready to investigate INDEPENDENTLY.

Children DISCUSS then RECORD their response to the REFLECTION question.

Teaching Segment and Video 1

Count forwards by 10s on the decade less than 100.

- In pairs, children select a card to make a tens number as a start number. They record the count forwards by 10s from their number on a number line. They explain the pattern of repeatedly adding 10. They explain which digit changes and why and which digit does not change and why. Reflection: Why does the ones digit stay the same and the tens digit change when we count forwards by 10s?
19. The next pages list more Investigations and Reflections that do not link explicitly to a segment on the Teaching Plan. These Investigations provide more ways that students may investigate the concept to deepen their understanding.

- In pairs, children select an Ace and 2 more cards to make a number in the one hundreds as a start number. They record the count backwards by 10s from their number on a number line. They explain the pattern of repeatedly subtracting 10. They explain which digit changes and why and which digit does not change and why. Reflection: Why does the ones digit stay the same and the tens digit change when we count backwards by 10s? When does the hundreds digit change?

- These Investigations are not directly linked to Explicit Teaching. Instructions for students appear here and on the Explicit Teaching PowerPoint.

- Children count forwards and backwards by tens on and off the decade on a hundred chart, identifying the pattern of going down or up columns. They check how many they added or subtracted each time by counting by ones between numbers. They identify which digit changes and which digit stays the same and why.

- In pairs, children have a calculator. They enter a number and then +10. They repeatedly select the equals sign, recording each number. They identify that they have been repeatedly adding 10.

- In pairs, children have a calculator. They enter a number and then -10. They repeatedly select the equals sign, recording each number. They identify that they have been repeatedly subtracting 10.

- In pairs, each child records a two-digit number with the same ones digit. They work out the number of tens they need to add or subtract to get to one another’s number. For example, children record 27 and 57. One child works out they need to add 3 tens to 27 while the other child works out they need to subtract 3 tens from 57.

- In pairs, children have a calculator. One child enters a two-digit number. Their friend ‘wipes out’ the tens digit by subtracting the number of tens.

- Children count 10 cents coins by 10s. (see Money and Financial Mathematics 4, 6, 7)

- Children count units of measurement by 10s using the ruler they create using informal units. (see Measurement and Geometry 21)

- Children count forwards and backwards by 10s along a metre ruler. (see Measurement and Geometry 21)

20. The next pages of Investigations and Reflections list Problems that link explicitly to a segment on the Teaching Plan. Each Problem has its answer.

**PROBLEM SOLVING** linked to videos, explicit teaching, investigations and reflections

Problems allow children to investigate concepts in new and varied situations. Any problem worth solving takes time and effort.

Problems are designed to develop and use higher order thinking. Allowing children to grapple with problems, providing minimal support by asking strategic questions, is key. Differentiating problems allows children to solve simpler problems, before solving more complex problems on a concept.

Problems may not always be solved the first time they are presented – or at all. The issue of problem solving is the development of problem solving understanding and capacity – not mastery! Returning to a problem after further learning, develops both resilience and increased confidence as children take the necessary time and input the necessary effort.

After solving problems, children also create their own problems.

Create 3 levels of a problem. GUIDE children through the first level using the problem solving steps. Allow children to investigate the second level with friends, with minimal guidance. Allow children to investigate the third level INDEPENDENTLY. Children create their own problem.

**Teaching Segment and Video 1:** Count forwards by 10s on decade under 100

**Teaching Segment and Video 2:** Count backwards by 10s under 100

These problems are directly linked to Explicit Teaching, are embedded in the Explicit Teaching Plan, and appear on the Explicit Teaching PowerPoint. These, and more problems, appear as blackline masters on the Problem Solving PDF and are differentiated on the Problem Solving PowerPoint.
21. The remaining pages of Investigations and Reflections provide blackline masters of:

a) the Investigations, Reflections and Problems that link explicitly to a segment on the Teaching Plan. Each problem has a hint for creating new problems.

b) the Investigations and Reflections that do not link explicitly to a segment on the Teaching Plan.

22. On the website, select Problem Solving.
23. The first page of Problem Solving explains the purpose of problem solving is to develop understanding of problem solving, and capacity to solve problems - not to solve a specific problem today. It provides information about differentiating problems by creating different levels of the same problem to suit the different problem solving understandings and capacities of the students in the class. It provides information about creating 3 levels of a problem, and guiding students through solution following the problem solving steps, allowing them to attempt to solve the final level independently. It suggests that students then create their own problem. (For further information and a video explaining this problem solving process, see the 'Problem Solving' banner on the home page of the website.)

a) Problems that link explicitly to a segment on the Teaching Plan are listed first.

b) Problems that do not link explicitly to a segment on the Teaching Plan are listed next.

Each Problem has an answer.

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### PLACE VALUE 12, PATTERNS AND ALGEBRA 11_PROBLEM SOLVING

(Year 2) ACMA926, ACMNA935, NSW MA1-4NA

**Problem Solving**

Problems allow children to investigate concepts in real and varied situations. Any problem worth solving takes time and effort – that's why they're called problems.

Problems are designed to develop and use higher order thinking. Allowing children to grapple with problems provides minimal support by solving structured equations, see key. Differentiating problems allows children to solve similar problems, before solving more complex problems as a concept.

Problems may not always be solved the first time they are presented – or at all. The focus of problem solving is the development of problem solving understanding and capacity - not merely to arrive at a solution which may be merely a matter of mathematical or experimental skills.

The formulation of a problem is far more important than its solution, which may be merely a matter of mathematical or experimental skills.

It's not that I'm so smart, it's just that I stay with problems longer.

Create 3 levels of a problem. 

**GUIDE** children through the first level using the problem solving stages. Allow children to investigate the second level with guidance. Allow children to investigate the third level independently. Children create their own problems.

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**Teaching Segment and Video 1:**

**Count forwards by 10s on decade chart 100**

**Teaching Segment and Video 2:**

**Count backwards by 10s off decade over 100**

**Teaching Segment and Video 3:**

**Count backwards by 10s off decade over 100**

**Teaching Segment and Video 4:**

**More problems**

- Calculator and ID
- Calculator and ID
- Think, and ID
- Think, subtract 10
- All more

---

**a)**

What number is missing from this number line? (60, 5 more)

20 30 40 50 60 70

**b)**

What number is missing from this number line? (60, 5 more)

74 84 94 114 114

What number is missing from this number line? (60, 5 more)

78 83 93 113 123

---

**Teaching Segment and Video 5:**

**Count forwards by 10s off decade over 100**

**Teaching Segment and Video 6:**

**Count backwards by 10s off decade over 100**

**Teaching Segment and Video 7:**

**Count forwards by 10s off decade over 100**

**Teaching Segment and Video 8:**

**Count backwards by 10s off decade over 100**

---

**b)**

- Betty showed this number on her calculator. 36. She changed it so it became this number. 46. What did Betty do to change 36 to 46? (10, 10 more)
- Betty showed this number on her calculator. 45. She changed it so it became this number. 75. What did Betty do to change 45 to 75? (30, 100, 100 more)
- Jerry thought of a number. She added 10. Her answer was 56. What number did Jerry think of? (46, 10 more)
- Johnny thought of a number. He subtracted 10. His answer was 56. What number did Johnny think of? (66, 100 more)

There are 10 more boys than girls in the grade. There are 43 girls. How many boys are there? (53, 10 more)
24. The remaining pages of Problem Solving provide blackline masters of all Problems - those that link explicitly to a segment on the Teaching Plan as well as those that don’t. Each problem has a hint for creating new problems. Each problem recommends students create their own problem.

<table>
<thead>
<tr>
<th>Problem Solving</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLACE VALUE II. PATTERNS AND ALGEBRA II Count forwards and backwards by 100 on the decade, and forwards and backwards by 100 off the decade from two-digit numbers, describing patterns that increase and decrease by adding and subtracting 10, explaining which digit changes and why.</td>
</tr>
</tbody>
</table>

What number is missing from this number line?

-10 -10 -10 -10 -10

20 30 40 50 60 70

It’s not that I’m so smart. It’s just that I stay with problems longer.

Blink Change the tens numbers on the number line, and allow children to solve again!

The formulation of a problem is far more essential than its solution, which may merely be a matter of Mathematical or experimental skill.

Make up your own problem!

25. The final pages of Problem Solving provide the Problem Solving steps.

Read the part of the problem that is asking you to find something out.

April had 12 biscuits.
She gave 2 to a friend and ate 3.
How many biscuits does April have left?

I think I have to find out...

Understand the information you need to find it out.

April had 12 biscuits.
She gave 2 to a friend and ate 3.
How many biscuits does April have left?

I need to know...

Choose a strategy that you could use to find it out.

April had 12 biscuits.
She gave 2 to a friend and ate 3.
How many biscuits does April have left?

I could...

Use a strategy to find it out.

April had 12 biscuits.
She gave 2 to a friend and ate 3.
How many biscuits does April have left?

I... 

Check that you have found out.

April had 12 biscuits.
She gave 2 to a friend and ate 3.
How many biscuits does April have left?

I have found out...

27. The first slide of the Problem Solving PowerPoint explains the problem solving steps. It provides information about creating 3 levels of a problem, and guiding students through solution following the problem solving steps, allowing them to attempt to solve the final level independently. It suggests that students then create their own problem. (For further information and a video explaining this problem solving process, see the ‘Problem Solving’ banner on the home page of the website.)
28. The remaining slides provide 3 levels of each Problem from Problem Solving. They also contain the problem solving steps. (For further information and a video explaining this problem solving process, see the ‘Problem Solving’ banner on the home page of the site.)

a) The rectangle covers everything except for the part of the problem that is asking us to find something out.

b) The rectangles may be removed during the lessons to reveal the information we need to find it out.

29. On the website, select a Teaching Video.
30. Each segment of the Number and Algebra concepts Teaching Plans has its own Video. (Current Videos for Measurement and Geometry, and Statistics and Probability don’t yet explicitly link to each segment of the Teaching Plans. They are being adapted during Term 1 and new versions will be uploaded as they become available.)

31. At the end of the Number and Algebra concepts Videos the Investigations and Reflections are described.