NELSON MATHS: AUSTRALIAN CURRICULUM BUILDING MENTAL STRATEGIES SKILL BOOK 3

TEACHER SUPPORT NOTES

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Unit 1

Counting With Larger Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 4–5

Teaching Focus: ***to use counting skills and an understanding of repeating final-digit patterns to extend mental counting ability to larger numbers beyond 100.***

You will need: 100 chart, transparent counters

- Display the 100 chart and ask students to count by 5s from zero to 100 (0, 5, 10, 15 … 100). Ask students to keep going beyond 100 (105, 110, 115 …). Discuss with students how they know if they are correct. Draw students' attention to the repeating final-digit pattern of 0 and 5.
- Repeat, counting by other patterns such as by 3s and 4s. Invite students to check their accuracy by looking at the repeating final-digit pattern. Encourage this way of self checking.
- Provide students with the opportunity to start counting with numbers other than zero, e.g. for 5s, begin counting from 35 or 60 or 115.
- For further practice, play 'Counting Knock Out'. Invite students to stand in a circle and decide on which counting pattern to practise, e.g. 4s. Select a student to begin by saying aloud '4'. The next student will need to continue the pattern by saying '8' and the next '12'. If a student gives an incorrect answer, they sit down. Continue until the last student is standing. When students sit down they could use the constant function key on a calculator to check the accuracy of other students' counting.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 4–5.

Assessment Task/s

- Invite students to fill in the next five numbers in the following patterns and explain how they know that they are correct.

  104, 108, 112, 116, 120,

  111, 116, 121, 126, 131,

  101, 104, 107, 110, 113,

Recommendations

- If students are having difficulties, have them work in a teacher focus group using a 100 chart as support when practising the numbers up to 100. Students can place transparent counters on the 100 chart to show the counting pattern.
- To extend the activity for more able students, work with a range of different starting points and larger numbers.
- For further practice that will enable students to quickly and accurately count with large numbers, give students a starting point, e.g. 95. Have students record the number in a book or on paper. Give students two minutes to continue counting by 5s. Check answers using the constant function of a calculator. Ask all students to stand and when they find a mistake or the counting pattern goes beyond their numbers, they sit down. The last student standing is the winner.

Unit 2

Counting with Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 6–7

Teaching Focus: ***to use the understanding of fractions to identify and continue counting patterns using common fractions.***

You will need: number lines

- On the number line begin writing the number sequence 0, 1/2, 1, 1 1/2, 2. Ask students to identify the counting sequence. With the assistance of the students, complete the sequence. Discuss the pattern that is made.
- Repeat using a number line to demonstrate the counting sequence when counting by quarters, thirds and fifths.
- Continue to work with counting patterns using fractions; however, try starting with different starting points, e.g. begin counting by halves beginning at 5 1/2 or 8 1/2 or 11.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,** ***pp. 6–7.***

Assessment Task/s

- During 'Counting Knock Out' (see Recommendations) observe student performance, taking note of where students experience difficulty.
- Have students complete the following patterns by putting the next five numbers in the sequence.

  4, 4 1/2, 5, 5 1/2, 6
  3 2/3, 4, 4 1/3, 4 2/3, 5
  2 4/5, 3, 3 1/5, 3 2/5, 3 3/5

Recommendations

- Scaffold the task for students continuing to have difficulty with fractions by providing them with number lines to work on rather than relying solely on mental counting.
- For further practice, play 'Counting Knock Out' (as in Unit 1) using counting patterns with fractions. To cater for the varying ability levels, group students according to ability to play 'Counting Knock Out'. Match the starting point and the difficulty of the counting pattern to the groups. For students who are experiencing difficulty, count by halves starting at 0, 1/2 or 1/2, 1. Invite students needing a challenge to count by fifths from 7 3/5. Other students can count by thirds or quarters from 0 or 1. As students improve vary the starting points.

Unit 3
Counting with Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 8–9

Teaching Focus: ***to use an understanding of decimal numbers to identify and continue counting patterns using tenths.***

You will need: number lines

- On the first empty number line write in the counting sequence 0, 0.1, 0.2, 0.3. Ask students what the counting sequence is increasing by. When students have identified that the pattern is counting by decimal fractions (tenths), select students to come out and continue the pattern.
- Repeat a few more times on other number lines beginning at a different starting point such as 1.7, 2.2, 3.8.
- Continue practising counting sequences by standing students in a circle and beginning at various starting points. In turn, students say the next number in the sequence.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 8–9.***

Assessment Task/s

- Collect samples of work from 'How Far Can You Go' (see Recommendations). The samples should indicate students' level of proficiency by how many correct numbers of the counting sequence they have written in the time.
- Ask students to write the next five terms in the counting patterns below.
  3.75, 3.76, 3.77, 3.78, 3.79, 3.8
  7.03, 7.04, 7.05, 7.06, 7.07, 7.08
  15.89, 15.9, 15.91, 15.92, 15.93, 15.94

Recommendations

- Some students might have difficulty when a counting pattern reaches a whole number such as 0.9, 1, 1.1. Students need to be reminded that ten tenths makes the next whole number, and therefore the counting sequence will also include whole numbers.
- Further counting practice can be given by playing 'How Far Can You Go?' where students are given a starting point such as 1.3 and write down the pattern counting on by tenths. Using a timer or clock, students have one minute to continue as far as they can. Invite students to stand up. Using the constant function on a calculator the teacher or a student can call out the number sequence. Students need to sit down if they are not correct or if the counting has continued beyond what they have recorded. The last student standing can read out their remaining numbers.
- 'How Far Can You Go?' can be varied for differing abilities – where more able students can play against one another by beginning at starting points such as 231.4 or count on by 0.2 or 0.3.

Unit 4

Place-value Units

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 10–11

Teaching Focus: ***to understand that numbers in our number system are made up of combinations of place-value units such as ones, tens, hundreds and beyond.***

You will need: a set of digit cards or MAB

- Select a student to hold a card with a single digit on it such as 4. Ask the class to read out the number (4) and ask how this could be represented using MAB (modelled with 4 ones). Select a second student to stand on the left of the first student also holding a card with a single digit such as 3. Have the class read the number (43). Ask what the '4' now represents (tens) and select a student to represent the number using MAB. Select another student to stand to the left with another card such as 6. Invite students to say the number (436) and ask what does the '4' now represent (100s). Select a student to model with MAB.
- Repeat a few more times using a different set of digit cards each time. Make sure to include a zero. Discuss how zero lets us know that there are none of those place-value units. It also holds the other digits in their place-value columns. Students should understand that each digit tells them how many of each place-value unit is needed to model the number.
- Ask students to make a model of a 3-digit numbers, e.g. with a 7 in the tens place, a 4 in the hundreds and a 2 in the ones place.

***Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 10–11*.**

Assessment Task/s

- Ask students to place the numbers 345, 462, 174, 954, 648, 486, 864, 941 into the correct columns. For example:

4 hundreds	4 tens	4 ones

Recommendations

- Have students experiencing difficulty to work with 2-digit numbers.
- Have more able students work with higher place-value units.
- For further practice, play a game called 'Traffic Lights'. Select a mystery 3-digit number such as 356. Select a student to guess the number and record their guess, e.g. 453. When a guessed digit is the correct digit in the correct column, put a green dot above it. When it is the correct digit but in the wrong place-value column, put an amber dot above it. When it is not the correct digit, put a red dot above it. So for the guess of 453 there would be a red dot above the 4, a green dot above the 5 and an amber dot above the 3. Continue until the mystery number has been correctly identified.

Unit 5
Rounding Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 12–13

Teaching Focus: ***to understand the conventions used to round numbers to the nearest place-value unit of 10.***

You will need: number lines, dice, MAB with only tens and hundreds

- Enlarge a sheet of number lines. Using the first number line, begin numbering from 10 and counting by ones to 30. When writing in the numbers emphasise 10, 20 and 30 so that they stand out from the other numbers. Put a circle around the number 17. Explain to students that sometimes it is necessary to round numbers to the nearest 'ten'. Ask students to look at where the 17 is and which 'ten' it is nearest to: 10, 20 or 30?
- Put a circle around 23 and ask which 'ten' it is closest to. Put a circle around 25 and explain that as it is half way, and the convention for rounding is that it would be rounded up to 30.
- Have students look carefully at the number line and ask them to name the numbers that need to be rounded down and those that need to be rounded up. Ask students to devise a 'rule' for rounding numbers to the nearest 'ten'.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,** ***pp. 12–13.***

Assessment Task/s

- Have students sort the list of numbers below into those that need to be rounded up and those that need to be rounded down.
  47, 31, 29, 74, 38, 55, 16, 82, 63
- Have students round the following numbers to the closest 'ten'.
  94, 27, 61, 45, 32, 89, 56, 74, 13

Recommendations

- For students having difficulty, use the other number lines and vary the range of numbers for them to work with.
- Encourage more able students to work with higher numbers.
- For further practice play a game called 'Round It'. Students play with a partner. In turn, students throw two dice and make the largest 2-digit number that they can. If their number is the largest, they can round to the nearest 'ten' and select the appropriate MAB. For example, if they threw a 5 and a 6, they would make the number 65 and then round it up to 70 and collect seven tens. The student with the most tens or highest score after five turns wins the game. More able students can use three dice making 3-digit numbers and round to either the nearest '10' or '100'.

Unit 6
Ordering Whole Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 14–15

Teaching Focus: ***to use understanding of place-value to order numbers from smallest to largest and largest to smallest.***

You will need: MAB materials, 3-digit cards, playing cards

- Randomly hand out ten 3-digit cards to ten students. Ask these students to stand out the front of the class.
- Explain to the remaining students that they need to put their classmates with cards in order. The cards need to be ordered from largest to smallest. Ask, 'Should [Mary] be standing in the first position?' If the answer is 'yes', move on to the next student in the line and ask the same question. If the answer is 'no', ask which student she needs to change position with, and ask them to explain how they knew. Students should be able to explain their reasoning in terms of '[Jack] has a number that has 6 hundreds and as [Mary's] number had 4 hundreds, [Jack's] number is larger.'
- Repeat for the next student, and so on until all the cards are in the correct order from largest to smallest.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 14–15.***

Assessment Task/s
- Observe students as they play 'Card Switch' (see Recommendations) and note their level of understanding on a grade list.

Recommendations
- Students having difficulty might need more practice ordering numbers. Use numbers that match their range of understanding.
- Students needing a challenge could work with a selection of cards using 4-digit numbers.
- For practice, students can play a game called 'Card Switch'. Students play in small groups. After the picture cards and ten cards have been removed and the cards shuffled, place the cards in a pile so that the numbers cannot be seen. In turn students select a card from the pile and place it on the table in front of them. This becomes their hundreds card. In turn, have students select their next card, which is placed in the tens position and then a third card, which is placed in the ones position. Students **cannot** change the order of the cards. They can select another card from the deck and switch it for any one of their cards, which will help them to make a larger number. Each student will have two more turns at selecting and switching cards. The student with the largest number is the winner. The game can be varied by aiming to make the smallest number or the closest number to a target number such as 296.

Unit 7

Renaming Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 16–17

Teaching Focus: ***Using understanding of number system as a base 10 system, students can interchange place-value units and maintain the same value.***

You will need: MAB materials, 3-digit cards

- Provide pairs of students with MAB hundreds, tens and ones. Give each pair a 3-digit card to model with the MAB. Invite students to explain how they know that they have modelled correctly.
- Then only give students MAB with tens and ones and ask them to model the same numbers. Look at the models and ask students to explain how they were able to make the number without using hundreds. Repeat, swapping with other 3-digit number cards.
- Ask how a 3-digit number like 128 could be modelled with only ones.
- Look at the number expander below.

	HUNDREDS		TENS		ONES

This can be a useful device to explore how 3-digit numbers can be renamed. For example, 437 can be represented as:

4	HUNDREDS	3	TENS	7	ONES

or

4	3	TENS	7	ONES

or

4	3	7	ONES

Give students a copy of the blank number expander and ask them to explore how different 3-digit numbers can be expanded.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,** ***pp. 16–17.***

Assessment Task/s

- Observe students as they play 'Renaming Bingo' (see Recommendations) noting their level of understanding as they cross out numbers.
- Ask students to model 456 in at least three different ways.

Recommendations

- Students having difficulty might need more practice renaming numbers using numbers that match their range of understanding.
- Students needing a challenge could work with a selection of 4-digit numbers.
- For further practice, play ‘Renaming Bingo’. Ask students to list six 3-digit numbers, which they can mark off if they match the clue such as ‘a number that has 34 tens’ or ‘23 ones’ or ‘9 hundreds’. The first student to cross off their six numbers wins the game.

Unit 8

Locating Fractions on a Number Line

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 18–19

Teaching Focus: ***to understand that there is a given order to where fractions are on a number line and this can help when ordering and comparing value.***

You will need: strips of paper or paper streamers cut to the same length, post-it notes, a number line

- Provide five or six students with a strip of paper that is the same length. Invite students to carefully fold it in half. Discuss how the fold is the halfway mark and divides the whole into two equal parts – halves. Invite one student to hold up their strip of paper, and have them label 0, 1/2 and 1. Ask another student to hold their strip of paper next to it and note that their strip will join at one end. Ask, 'What will the fold in the centre of the paper be?' Students should see that it can be labelled 1 1/2 and the end will be labelled 2. Continue joining strips of paper, labelling and recording onto an enlarged number line.
- Repeat the process above but ask students to fold their strips of paper in half and half again. Ask them what fractions they are showing by folding their strip of paper into four equal parts. Label the folds and keep adding strips of paper to make a large number line or record on an enlarged number line.
- Continue for other fraction patterns, making large number lines that can be displayed around the room to support students in their work on fractions.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 18–19.

Assessment Task/s

- Ask students to make the next section of the various number lines that have already been made and displayed around the room.
- Give students a sheet of number lines and invite them to make some number lines showing fractions. The complexity of the number lines that students make should indicate their level of understanding. Check that they are using the correct notation and correct sequence.

Recommendations

- Students experiencing difficulty might need more experience making and completing number lines with simple fractions.
- Some students might suggest using equivalent fractions on their number lines, e.g. instead of labelling 2/4 they substitute 1/2.
- Students can use a sheet of blank number lines to make their own number lines to assist with future work on fractions.

Unit 9

Ordering Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 20–21

Teaching Focus: ***use an understanding of where fractions are located on a number line to compare and order them.***

You will need: strips of paper or paper streamers cut to the same length

- Using strips of paper or paper streamers fold to make a fraction model. Have students work in small groups and give each group five strips of the same length. Ask students to label the first strip '1 whole'.
- Then have students carefully fold the second strip in half and mark '1/2' on the fold in the middle and '2/2' at the end. Place this under the first strip.
- Tell students that they are going to fold the next strip into three equal parts to make thirds. When students have folded the strip into thirds ask them to label each fold '1/3', '2/3' and '3/3', and place under the halves. It might take some students a while to fold a strip of paper into thirds. Generally, there are a few students that manage the task quite well and they can help the other groups.
- Students take another strip and fold it into half and then half again. Ask students to count the number of parts in the whole and what fraction they have folded. Label each of the folds in order '1/4', '2/4', '3/4' and '4/4'. Place under the thirds. Draw students' attention to the size of each of the fractional parts and that as the whole is being folded into more parts each individual part is getting smaller.
- With the final strip of paper ask students to fold it into fifths. This might take some time because it is quite a difficult task. When students have folded it correctly, ask them to label '1/5', '2/5', '3/5', '4/5', '5/5', and place it under the quarters to finish the fraction wall.
- When students have finished, their fraction wall should look like this:

<table>
<tr><td colspan="10">1 whole</td></tr>
<tr><td colspan="5">1/2</td><td colspan="5">2/2</td></tr>
<tr><td colspan="3">1/3</td><td colspan="4">2/3</td><td colspan="3">3/3</td></tr>
<tr><td colspan="2">1/4</td><td colspan="3">2/4</td><td colspan="3">3/4</td><td colspan="2">4/4</td></tr>
<tr><td colspan="2">1/5</td><td colspan="2">2/5</td><td colspan="2">3/5</td><td colspan="2">4/5</td><td colspan="2">5/5</td></tr>
</table>

- Ask students to name the fractions that are smaller than 1/2, equivalent to 1/2 and more than 1/2.
- Students can construct their own number line by using a piece of string or draw a line underneath their fraction wall. Then, using a ruler, students can draw lines from the fraction names down to the line and label. Depending on ability level they might construct a number line with a few simple fractions such as 1/4, 1/3, 1/2, 3/4 and 1. Using the information from their fraction walls and number lines, students can write some number sentences using the symbols =, < and >.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 20–21*.**

Assessment Task/s

- Collect samples of the number sentences that students have written.

Recommendations

- Students experiencing difficulty need to have more experiences making models of fractions, e.g. folding paper and cutting up shapes made from play dough.
- Students needing a challenge can extend their fraction walls to include sixths, eighths, ninths and tenths.

Unit 10

Locating Decimals on a Number Line

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 22–23

Teaching Focus: ***to understand that there is a given order to where decimal fractions are on a number line and this can help when ordering and comparing values.***

You will need: MAB tens and metre rulers (or pieces of strapping tape cut to metre lengths), Decimal Snap, decimal cards

- Hold up a metre ruler and explain that it is 1 metre long. Give each student a metre ruler and some MAB tens to see how many MAB tens make up a metre.
- Ask students, 'If 10 MAB tens are equivalent to a metre, how then can 1 MAB ten be written as a metre?' Promote discussion that encourages students to see that each MAB ten is one tenth of a metre and, therefore, can be written as 1/10 or 0.1 m. Discuss how the number after the decimal point signifies that it is tenths, just as the number before the decimal point signifies that it is in the ones column.
- Label each of the MAB tens '0.1 m', '0.2 m', '0.3 m', '0.4 m', … '1 m'.
- Add one more MAB ten and select students to come and label it. Discuss that because there are already 10 tenths, if we add one more tenth, we will have 1 metre and 0.1 of a metre – giving a total of 1.1 metres.
- Invite students to combine their 0.1 m (or MAB tens) making sure that each time they place a MAB ten they also record a label. Make sure that students are writing the correct notation by stopping them and asking, 'Who has made theirs more than 2 metres but less than 3 metres? What must their labels begin with? (2)' See how far they can make their 'number lines' in two minutes.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 22–23.

Assessment Task/s

- Observe students as they make their number lines, taking note of any students who are having difficulty correctly labelling their number lines.
- Give students a sheet of number lines and ask them to make some number lines starting from 0, 1.4, 3.7, 4.8 and 28.9.

Recommendations

- Provide students who are having difficulty with more time and give them prepared labels to put on their number lines.
- For further practice give students a sheet of number lines. Have them complete number lines using Decimal Snap and decimal cards as a starting point, depending on their level of ability.

Unit 11
Ordering Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 24–25

Teaching Focus: ***to use an understanding of where decimal fractions are located on a number line to compare and order.***

You will need: a piece of rope or string approximately 2 metres long, pegs, Decimal Snap, decimal cards, number lines

- Use a long piece of rope or string and make some decimal number cards that have been enlarged. Peg a label of '0' at one end of the rope and at about three quarters of the way along peg the label '1'. Randomly select a decimal card and ask a student to place it where they think it should go on the rope. Ask students to explain and justify their choice. Encourage students to estimate half way between 0 and 1 and to place numbers that are less than 0.5 or more than 0.5 but less than 1.
- Repeat the process, selecting different students to peg on their cards and explain and justify their choice.
- When all of the number cards have been pegged onto the rope ask students to name a decimal number that is more than 0.3, less than 0.7, more than 1.1, less than 0.4 and so on. Invite students to explain how they know that they are correct.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 24–25.***

Assessment Task/s
- Ask students to order the following numbers from smallest to largest and to explain how they were able to order the numbers.
  7.4, 1.6, 0.4, 0.1, 1, 11.2

Recommendations
- For students experiencing difficulty, begin by working with only the decimal numbers from 0.1 to 0.9 and provide opportunities for them to put them in order from smallest to largest. This can be done by giving individual students a set of cards with the numbers from 0.1 to 0.9 to see how quickly and accurately they can order them. This could take the form of a race. When students have become proficient, repeat the race adding more decimal numbers. When students have become more proficient still, randomly take some of the cards away and ask students to order them from smallest to largest and largest to smallest.
- Make cards showing a range of decimal numbers and ask students to hold the cards and order them. The range of decimal numbers can be changed to suit ability levels.
- Make a set of cards showing decimal numbers. Play 'Around the World' where students stand in a circle and the teacher selects two students standing next to one another. Two cards are turned over and the student who can name the highest (or lowest) decimal number wins. The winner then plays against the next student in the circle. Continue until every student has had a chance to challenge.

Unit 12
Bridging to 10

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 26–27

Teaching Focus: ***to use knowledge of facts to 10 and part/part whole to quickly and accurately add 1-digit numbers to 2-digit numbers.***

You will need: MAB materials, dice (0–9) or a spinner

- To begin, explain that students need to know their 10s counting pattern and ask them to count by 10s. Record students' answers as they are counting (to at least 100). Randomly say some 2-digit numbers such as 26, 35, 94, 17, 76, 52, 63, 48, 81 and ask students to name the next '10'. For example 26 – 30, 35 – 40, 94 – 100, 17 – 20, 76 – 80, 52 – 60, 63 – 70, 48 – 50, 81 – 90.
- When students have become quick and accurate at naming the next '10' ask them to also state how many more they would need to get to the next '10'. For instance, if you say '36' they should be able to tell you that the next '10' is 40 and that they need 4 more to '**bridge**' to the next '10' of (40). Repeat for other 2-digit numbers until students can respond quickly and accurately.
- Present students with the problem 27 + 8. Select a student to model 27 with MAB. Ask students, 'Which is the next "10" after 27?' and 'How many more do we need to "bridge" to the next "10" (30)?' Explain that knowing 3 more are needed to 'bridge' to 30 and that 3 and 5 make 8 makes it easy (add 27 and 3 and then add 30 and 5 to give the answer 35). This can be modelled using the MAB.
- Repeat a few times with the support of MAB and draw students' attention to how many more they will need to 'bridge' to the next ten.
- When students understand the idea of 'bridging', ask them to solve problems without using MAB focusing on the mental steps.
- Invite students to use and practise the strategy by playing a game called 'The Highest Score'. Teams of three or so roll a die three times to make the highest score. First, the class needs a starting number and this can be decided by rolling a die twice such as if a 4 and 6 are thrown, the starting number could be 46 or 64. The first student in the team takes a turn to roll the die and add on to the starting number. The next student rolls the die again and adds to the previous total. This is repeated until each team member has had a turn. The team with the highest score wins. This will help students revise a range of mental strategies including 'bridging to the next "10"'.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 26–27.

Assessment Task/s
- Observe students as they are playing 'The Highest Score' (see above).
- Ask students to explain how they can use the strategy of 'bridging to the next 10' to solve 67 + 8.

Recommendations

- The game ‘The Highest Score’ can be played in small groups where students are grouped by ability and play individually to reach the highest score to win. The number of times the students roll the die can vary according to the speed at which they can find the total.
- Students experiencing difficulty can begin with a single-digit starting number and use a die or spinner with a smaller range of numbers.
- More able students can begin with 3-digit starting numbers, e.g. 136, and try to reach a target number, e.g. 275.

Unit 13

Adding Place-value Units

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 28–29

Teaching Focus: ***to visualise and mentally add on 10s and 100s.***

You will need: number cards from 11 to 99, MAB, blank spinner labelled with '10 more', '20 more', '30 more', '100 more', '200 more' and '300 more'

- Select a card, e.g. 36, and ask a student to model the number with MAB. Ask students to think about what the number that is ten more than 36 would look like. Have students describe how this could be modelled with MAB. Ask students to name the number that is 10 more than 36 and model to check that 46 is correct.
- Ask students to select another number from the cards, e.g. 59, and ask one student to model it. Ask students to think about what the number would look like if it was 100 more and what the number would be. Ask students to think about what the number would look like if it was 300 more and what the number would be. Check answers by modelling.
- Invite each student in turn to select a number card, spin the spinner and calculate the number that is 10, 20, 30, 100, 200 or 300 more. Check responses by modelling with MAB.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 28–29.

Assessment Task/s

- Observe students as they calculate the numbers in the activities listed above.
- Have students complete the table below.

	10 more	100 more	30 more	200 more
61				
26				
97				
45				
73				
19				
52				
84				
38				

Recommendations

- For more practice, students can play a game by selecting a number card and spinning the spinner. The winner could be the person to get the highest number, lowest number or closest number to a target like 99 or 145.
- For students demonstrating difficulty adding on 10s or 100s, model a number with MAB and have students predict what 10 more or 100 more would be. Use MAB to check students' predictions.
- For students who find the task easy, increase the numbers to amounts such as 600, 700 and 800 or extend to 1000s.

Unit 14

Counting on from 2-digit Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 30–31

Teaching Focus: ***to solve addition problems by counting on place-value units of tens and ones and using a 100 chart to assist.***

You will need: MAB materials, 100 chart, calculator

- Enlarge a 100 chart so that students can view it clearly. Explain that students will be using their understanding of a 100 chart to help them to add two numbers together. Have students discuss how the 100 chart is organised, making sure that they understand that as you move across a row the numbers increase by 1 and as you move down a column the numbers increase by 10.
- Use a set of cards from 1 to 50 made from cutting up a 100 chart (e.g. 36). Select a student to locate the number on the enlarged 100 chart. Ask students, 'How can the 100 chart help me to add 10 or 1?' and 'How can it help me to add 20 or 30 or 4 or 5?'
- Continue to randomly select cards and pose questions such as 'What is 20 more than this number? How do you know?' Make sure that students can justify their answer by demonstrating moving two rows down on the 100 chart.
- When students are able to confidently add multiples of 1 and 10, select two cards such as 43 and 25. Explain to students that they are going to use the 100 chart to count on so they must be able to identify the largest number. As 43 is the largest, students find it on the 100 chart. To add on 25 they move down two rows to add on 20 and then move across 5 to add on 5 to get the answer of 68.
- Continue by randomly selecting two cards and asking students to use the 100 chart to find the total.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 30–31*.**

Assessment Task/s

- Observe students as they find the total when they have randomly selected two 2-digit numbers.
- Have students complete the following problems.

  27 + 38, 63 + 14, 33 + 47, 42 + 59

Recommendations

- For students experiencing difficulty, continue to work on adding 1, 2, 3, 4 … 9 to numbers on the 100 chart. When students are able to add on single digits to any number by 'counting on' on the 100 chart, invite them to practise adding multiples of 10.
- Invite students needing more of a challenge to create their own number chart from 101 to 200 and ask them to practise 'counting on' 2-digit numbers.

- For further practice, have pairs work with a calculator and a set of cards made by cutting up a 100 chart. Have students place the cards face down so that they cannot see the numbers. One student selects two cards and finds the total and the other student checks that the answer is correct using the calculator. If the first student is correct, they can keep the cards; if not, they put the cards back down. In turn, have students find the total and check it with the calculator. The student who finishes with the most cards is the winner.

Unit 15

Near Doubles to 20

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 32–33

Teaching Focus: ***to quickly identify and solve addition problems that have similar addends to known doubles facts.***

You will need: MAB materials

- Make some cards that have the numbers from 0 to 20 on them. Invite students to practise their doubles facts by quickly showing them a card and asking them to name its double. Play 'Around the World' as per Unit 11 except naming the double.
- Make a list of equations on the board such as 14 + 14, 8 + 8, 5 + 7, 13 + 6, 15 + 15, and so on. Ask students to identify which problems they would be able to solve using their doubles facts.
- Write the problem 12 + 13 on the board. Explain that while this is not a doubles fact there is a fact that could help them solve it. Ask students if they know a doubles fact that could help them solve the problem and to explain why it could help. Make sure students understand that either 12 + 12 or 13 + 13 will help them because 12 is one less than 13 and 13 is one more than 12 and so the answer will be one more than 12 + 12 or one less than 13 + 13.
- Invite students to practise a few more examples such as 16 + 15, 11 + 12, 17 + 18 and 19 + 20.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 32–33.

Assessment Task/s

- Observe students as they answer the problems below.
  16 + 15, 11 + 12, 17 + 18, 19 + 20
- Invite students to explain how they would use the 'near doubles' strategy to find the solution to the following problem.
  14 + 13

Recommendations

- Students having difficulty might need more practice with doubles facts.
- Students who need more of a challenge might like to try some problems using doubles facts to 30.
- Write a doubles fact on the board such as 15 + 15. Ask students to make a list of the problems that this fact might help them to solve such as 14 + 15 and 15 + 16. Continue with more examples.

Unit 16

Adding Near Multiples of 10

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 34–35

Teaching Focus: ***to quickly and accurately add near multiples of 10 by using knowledge of adding multiples of 10.***

You will need: an enlarged 100 chart, a 100 chart cut up to make individual number cards

- Discuss with students how the 100 chart is organised, i.e. it increases by 1 as you move across a row and it increases by 10 as you move down a column. Draw students' attention to how the final digit of every number in the column is the same.
- Practise adding 10 to numbers by randomly calling out numbers such as 24, 67, 45, 73, 11, 82, 36 and 58. Use the 100 chart to check if responses are correct.
- Point to a number on the 100 chart such as 56. Explain that to add on 9 you can add on 10, which will give you 66 and then move back 1 space to 65 (because 9 is one less than 10). Repeat this strategy, demonstrating on the 100 chart with other numbers such as 28, 72, 49 and 83.
- Repeat the activity, asking students to add 9 to any given numbers without the use of the 100 chart and to remember to add 10 and take away 1.
- Record the starting number and the number with 9 added. Ask students to make up a rule for what happens; for example, 'The ones digit decreases by one and the tens digit increases by one except when the number is a multiple of 10'.
- When students have mastered adding 9 to any 2-digit number try adding 11 by adding 10 and then 1 more. Make a set of cards by cutting up a 100 chart. Place cards 1 to 89 in a bag or container and randomly select a card, asking students to add 11 to the number shown on the card. This can be done as game of 'Around the World' where students stand in a circle and the teacher selects two students standing next to one another. One card is selected and the student who can add on 11 the quickest and get the correct answer wins. The winner then plays against the next student in the circle. Continue until every student has had a chance to challenge.
- For students who are able to quickly and accurately add 9 and 11 to any 2-digit number try to ask them to add 19 or 21 by adding 20 and taking away 1 for 19 or adding 1 for 21. Randomly select numbers such as 62, 28, 46, 73, 34, 57 and 84 for students to add on 19 or 21.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 34–35.

Assessment Task/s

- Observe students as they complete the above activities noting the level of ease at which they are able to use the mental strategy.
- Read out the following problems to students and collect and correct their responses.

9 + 34	45 + 11	27 + 11	76 + 9
42 + 19	24 + 21	72 + 19	37 + 11

Note any common mistakes students make.

Recommendations

- Draw students' attention to the position of the number that is 9 more. It is always the number diagonally below the number that you are adding to. For example, with 35:

23	24	25	26	27
33	34	**35**	36	37
43	**44**	45	46	47

- Invite students to shut their eyes and visualise the 100 chart. Ask students to think of the number that is diagonally below 27, 68, 87, 39, 52 and 46. This strategy works well with visual learners if they are familiar with the 100 chart. This strategy can be used to add on 11 or 19 or 21 also.
- Make spinners with 6 sections and make them to suit the ability levels of students. For those still to master the strategy make spinners with 9, 9, 10, 10, 11 and 11 and for competent students make spinners with 9, 11, 19, 21, 29 and 31. Invite students to spin the spinner using a paper clip. Then select a number from cards made by cutting up a 100 chart and adding on what was designated by the spinner. If they are correct they keep the card and at the end the person with the most cards win. To check that answers are correct look at a 100 chart.
- Have more able students try adding on 99 or 101 by adding on 100 and taking 1 away for 99 or adding 1 for 101.

Unit 17

Compatible Numbers to 100

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 36–37

Teaching Focus: ***to extend students' understanding of facts to 10, to rapidly and accurately recall number combinations that are equivalent to 100.***

You will need: MAB materials, a 100 chart

- Using MAB present students with 10 tens (longs) and ask, 'How many does this make?' Group the tens into two groups, e.g. 3 tens and 7 tens. Ask, 'What other combinations could we make to make 100?' Record responses, e.g. 10 + 90 = 100, 20 + 80 = 100 … 90 + 10 = 100.
- Demonstrate one example with MAB, e.g. 30 + 70 = 100. Exchange 1 ten for 10 ones. Group 3 tens with 1 one leaving 6 tens and 9 ones. Select a student to record the equation: 31 + 69. Explore and record other options: 32 + 68, 33 + 67, and so on. Draw students' attention to final-digit combinations, tens facts, and how the combination of the tens always equals 9 (9 tens). Have students list other combinations that make 100.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 36–37.***

Assessment Task/s

- Invite students to list the compatible numbers for each of the numbers below.
  63, 27, 82, 56, 14, 38, 91, 75, 49
- Invite students to identify which of the pair of numbers listed below are **not** compatible numbers.

27 and 63	35 and 75	19 and 81	94 and 16
38 and 63	51 and 59	26 and 74	54 and 46

Recommendations

- For students experiencing difficulty, have them work in a teacher focus group using MAB and list compatible numbers.
- For students who have a sound understanding of compatible numbers to 100 extend their knowledge by encouraging them to solve problems where the number combinations are close to the compatible numbers, e.g. 46 + 55.
- To practise quick and accurate recall of compatible numbers, cut up a 100 chart into individual number cards. Place the cards in a box. Have students select a number and then work out the compatible number to make 100. This could be used as a 'speed test' where one student selects a designated amount of number cards for a given amount of time and must quickly work out the compatible numbers, while a partner checks their calculations with a calculator.

Unit 18
Open Number Lines for Addition

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 38–39

Teaching Focus: ***to develop imagery to help students mentally add the place-value units of 2-digit numbers.***

You will need: tape measure, calculator, 100 chart

- Present students with the problem 24 + 37. Explain to students that they are going to use a number line to help them add the numbers together. Show them the tape measure that can be used as a number line. Display the number line by adhering it to the board so that it is visible to all students.
- Ask students which number they would choose to add to or count on from. By this stage students should know that they always start from the largest number. Select a student to locate 37 on the tape. Ask them to use their understanding of place-value units to demonstrate how easy it is to add on 20 by adding on 10 to get 47 then another 10 to get 57. Use chalk to show this on the number line. Then count on 4 more (58, 59, 60, 61) to get the answer of 61.
- Model this strategy for a few more examples such as 53 + 32, 21 + 64, 38 + 13 and 37 + 49.
- Select students to come to the board and solve other examples such as 28 + 33, 67 + 25, 73 + 21, 54 + 42 and 29 + 65.
- In pairs or small groups, give students a tape measure to use to solve more problems such as 72 + 19, 56 + 38, 35 + 56 and 27 + 66.
- Once students understand and they can comfortably select the largest numbers and add on the tens then ones, they are ready to solve problems without the use of the tape measure. Draw a line on the board and present the problem 35 + 56. Invite students to identify the largest number (56) and write 56 onto the left end of the line. Then, in steps, add on the three tens (66, 76, 86) and then the five ones (87, 88, 89, 90, 91) to get the answer of 91.
- Model the strategy solving 54 + 27, 29 + 63 and 18 + 26 using the open number line technique.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 38–39.

Assessment Task/s

- Observe students as they play 'Find the Total' (see Recommendations).
- Ask students to solve the following problems.

  68 + 14 43 + 57 26 + 43 37 + 56

Recommendations

- Support students experiencing difficulty by providing them with MAB and tape measures so that when they model the number they are adding and placing on the tape measure. For a problem such as 32 + 16 students can locate 32 on the tape measure and then make 16 with MAB and place it onto the tape measure to show that 32 and 1 ten is 42 and then 6 ones is 38.
- Students needing more of a challenge can add three numbers together such as 38+ 14 + 49.

- To practise the skill further, invite students to play ‘Find the Total’. Students work in groups of three and race one another to get the correct total. Two of the students race each other. The remaining student selects two numbers from cards made from the 100 chart and checks the answer on a calculator. The first of the competing students with the correct answer wins. Students compete in turn for the points. The game can be varied to suit ability levels by limiting or increasing the range of cards.

Unit 19
Estimating for Addition

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 40–41

Teaching Focus: ***to use the skill of rounding numbers to the nearest 10 to check the reasonableness of answers for addition problems.***

- To be successful in estimating, students need to be able to quickly round numbers. See Teacher Support Notes for Unit 5 and activities in *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 12–13.
- Explain to students that to estimate the answer for a problem the numbers can be rounded to help. Invite students to explain the rules for rounding numbers and record them on the board or a chart so that students can refer to them when needed.
- Present the problem 63 + 28 to students and explain that all they need to do to estimate the answer is to round the numbers to the nearest 10 and quickly work out the answer. Ask students to round 63 and 28 to the nearest ten, 60 and 30, and then to add the tens together to get 90. So the answer is near to 90.
- Repeat for a few more examples such as 24 + 35, 82 +19, 33 + 47, 56 + 13 and 11 + 76.
- Present students with some examples of work that have been completed such as 29 + 34 = 53, 43 + 56 = 99, 77 + 19 = 86 and 37 + 44 = 71. Ask them to decide if the problems have been correctly answered or not by estimating. Encourage students to give a 'thumbs up' sign if they think the problem is correct or a 'thumbs down' if they think it is wrong. Select students to explain why.

***Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 40–41*.**

Assessment Task/s

- Have students estimate the answer to the following problem.
  24 + 78
- Have students use estimating to decide if the answers to the following problems are correct.

58 + 23 = 81	47 + 54 = 91	32 + 47 = 79
62 + 21 = 93	19 + 52 = 71	28 + 54 = 92

Recommendations

- Provide students experiencing difficulty with more practice rounding numbers and then adding multiples of ten together.
- When the opportunity presents, invite students to estimate answers as a way of checking their own work before asking the teacher to correct.
- Students who need more of a challenge can work with more than two addends or 3-digit numbers.

Unit 20

Compatible Decimals

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 42–43

Teaching Focus: ***to extend understanding of facts to 10 to rapidly and accurately recall number combinations of decimal numbers that are equivalent to 1.***

You will need: a sheet showing blocks in groups of 10

- Give students a sheet showing blocks in groups of 10and ask them to make models of 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1.
- Ask students to look at what is coloured in and what is not coloured in and to name the combinations that make 1 such as 0.1 and 0.9.
- Explain to students that these combinations that make 1 are called compatible decimals and, like tens facts, can be useful when adding and subtracting decimal numbers. Ask students to make a list of the compatible decimals.
- Call out decimal numbers and ask students to name the compatible decimals. For example, call out ‘0.6’ and students should respond with ‘0.4’.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 42–43.

Assessment Task/s

- Have students name the compatible decimal for each of the numbers listed below.

  0.6, 0.4, 0.9, 0.1, 0.7, 0.3, 0.5
- Have students find which of the following pairs of decimals are **not** compatible decimals:

  0.2 and 0.8, 0.6 and 0.5, 0.7 and 0.3, 0.9 and 0.2, 0.5 and 0.5, 0.4 and 0.6

Recommendations

- Have students experiencing difficulty continue to make models and record the decimals that make 1.
- For practice, students can play ‘Compatible Decimal Bingo’ by choosing four decimals to place in a 2 by 2 grid such as:

0.6	0.3
0.5	0.2

The teacher rolls a 10-sided die and if a 3 is rolled, call out ‘If you have the compatible decimal for three tenths, cross it off ’. The first student to cross off their four numbers calls out ‘Compatible decimals!’ is the winner.

- Students needing more of a challenge can work out compatible decimals for 2 such as 0.1 and 1.9, 0.2 and 1.8 and so on. They can work on more compatible decimals for 3, 4 or more.

Unit 21
Adding Decimals

Teacher Support Notes

Introductory lesson to Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, pp. 44–45

Teaching Focus: ***to use the 'count on' strategy and to visualise the strategy with open number lines to find the total of two decimal numbers.***

You will need: number lines, a sheet showing blocks in groups of 10, Decimal Snap, paper bag

- Practise counting by 0.1 by standing students in a circle and asking them to begin at zero and count by 0.1 to see how far they can get in one minute. Practise beginning at different starting points such as 0.4, 1.3, and 2.8 and so on.
- Give each student a number lines and ask them to complete the number lines starting at different starting points such as 0, 0.3, 0.5, 0.7, 0.9, 1.4 and 4.7 and counting on by 0.1.
- Ask students to use the number lines to 'count on' 0.1 more than 0.5. Repeat for numbers such as 0.9, 1.3, 2.6, 3.1, 4.8 and 5.6.
- Ask students to use their number lines to 'count on' 0.2 more than 0.2, 0.8, 1.6, 2.7 and 5.1.
- Explain to students that they can use the 'count on' strategy to add decimal numbers together just as they can for whole numbers. Present students with a problem such as 0.3 + 0.4. Remind students to always start 'counting on' from the largest number. They should begin with 0.4 and count on 0.5, 0.6, 0.7 to get the answer of 0.7. Demonstrate how this can be represented on an open number line.
- Provide students with more examples such as 0.2 + 0.5, 0.6 + 0.7, 1.2 + 0.4, 1.6 + 0.9. Ask students to demonstrate on the board how they would use open number lines to help them solve the problem.
- Present students with the problem 1.4 + 2.3 and discuss with them how this could be solved. Make sure students understand that first they 'count on' the whole numbers and then they count on the tenths. So to solve 1.4 + 2.3, students would begin with the largest number (2.3) and 'count on' 1 to get 3.3, and then 'count on' the tenths 3.4, 3.5, 3.6 and 3.7.
- Have students solve other problems such as 3.6 + 1.3, 2.8 + 1.1, 1.5 + 2.7 and 3.3 + 2.8.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 44–45.***

Assessment Task/s

- Collect samples of students' work as they solve the problems above.
- Have students demonstrate how they would use an open number line to solve the following.

  0.5 + 0.9 1.6 + 3.5

Recommendations

- Revisit Unit 3 to make sure students can count by tenths and Unit 11 to make sure students can identify the largest decimal.
- Give students who are having difficulty a sheet showing blocks in groups of 10 so that they can solve problems by colouring a model of the largest number and then colouring the second addend to find the answer. So to solve 0.6 + 0.3 students identify 0.6 as the largest number and colour it in. Then students colour the next three tenths to add on the 0.3 to get the answer 0.9.
- For practice, give pairs of students a copy of Decimal Snap with the cards cut up and placed in a paper bag. In turn, have students select two cards and add the numbers together. The student with the highest total wins. The game can be matched to students' ability levels by varying the decimal number cards.
- Students needing more of a challenge can use larger numbers such as 15.6 + 18.7.

Unit 22
Counting Back

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 46–47

Teaching Focus: ***to solve subtraction problems by 'counting back' in place-value units of tens and ones while using a 100 chart to assist.***

You will need: 100 chart

- Provide each student with a 100 chart. Students can work individually or with a partner. Explain that students will be using their understanding of the 100 chart to help them to add two numbers together. Invite students to discuss how the 100 chart is organised. Make sure students understand that as you move backwards along the row the numbers decrease by 1 and as you move back up a column the numbers decrease by 10.
- Use a set of cards made from cutting up a 100 chart. Randomly select a card, e.g. 56. Select a student to locate the number on the 100 chart. Ask students, 'How can the 100 chart help me to subtract 10 or 1?' Discuss so that all students are aware that to subtract 10 they move up one row and to subtract 1 they move back one space in the row. Pose further questions for discussion such as, 'How can I subtract 20 or 30 or 4 or 5?'
- Continue to randomly select cards and pose questions such as 'What is 20 less than this number? How do you know?' Make sure that students can justify their answer by demonstrating moving back up two rows on the 100 chart.
- When students can confidently subtract multiples of 1 and 10, select two cards such as 67 and 23. Explain that students are going to use the 100 chart to 'count back' so they must be able to identify the largest number. So as 67 is the largest, ask students to find it on the 100 chart and then subtract or count back 23 (they move back two rows to subtract 20 and then back three spaces to subtract 3 to get the answer of 44).
- Continue by randomly selecting two cards and asking students to use the 100 chart to subtract the smaller number from the larger number (find the difference).
- Make sure you include examples where students can count back up two rows for the two tens such as 53 – 25. Then when counting back five ones (32, 31, 30, 29, 28) they will need to move to 30 at the opposite end of the row above and then count back two more to get the answer of 28.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 46–47.

Assessment Task/s

- Ask students to explain how they are able to solve the following using the 100 chart.

  63 – 45

Recommendations

- Have students who are experiencing difficulty continue to work on subtracting 1, 2, 3, 4 … 9 from numbers on the 100 chart. Once students are able to accurately subtract single digits from any number by 'counting back' on the 100 chart, have them practise subtracting multiples of 10 by 'counting back' a row for each 10.
- Students needing more of a challenge can create their own number chart of 101 to 200 and practise 'counting back' 2-digit numbers.
- For further practice, have pairs work with a calculator and a set of cards made by cutting up a 100 chart. Have students place the cards face down so that they cannot see the numbers. One student selects two cards and subtracts the smaller number from the larger number. The other student checks that the answer is correct using the calculator. If the first student is correct, they keep the cards; if not, they put the cards back down. In turn, have students subtract the numbers and check with the calculator. The student with the most cards is the winner.

Unit 23
Difference

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 48–49

Teaching Focus: ***to solve problems involving difference by visualising the 100 chart and use the 'count up to' strategy.***

You will need: transparent counters, a 100 chart

- Write the word 'difference' on the board. Ask students what they think this term might mean in mathematics. If a maths dictionary is handy, ask students to look up the meaning of the word. Discuss that when you find the answer to the problem 11 – 5 you find the difference between the two numbers, which is 6.
- Explain that you are going to use the 'count up to' strategy to find the difference between pairs of numbers. Use an enlarged copy or an overhead transparency of a 100 chart. Locate the numbers 78 and 63. Explain that to find the difference you will be 'counting up' from the smaller number to the larger number. Ask students which is the smaller number. As a class, count up from 63 by moving up a row (one ten) to 73 and then across 74, 75, 76, 77 and 78 (five ones) to find the difference of one ten and five ones (15).
- In pairs, give students a 100 chart so that they can work together to solve the problems. Have students locate the numbers 27 and 39 and place a transparent counter on each number. Invite students to point to the smallest number and then to 'count up' to the larger number to find the difference of 12. Give students a few more problems such as 'Find the difference between 45 and 69, 32 and 54, 28 and 49'.
- Write 45 – 63 on the board and encourage students to solve it. When solving this problem students need to count up from 45 to 55 and then count up by ones. Note that they cannot count past 63 to 65. Have a student demonstrate his or her solution.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 48–49.

Assessment Task/s

- Ask students to imagine that there is a new student who has not used the 'count up to' strategy to solve a subtraction problem before. Ask them to write an explanation of how to solve 85 – 63 for the new student.
- Have students solve the following problems using the 'count up' strategy.

  94 – 81 62 – 47 45 – 29 36 – 24

Recommendations

- Students experiencing difficulty can work with problems that 'count up' by ones such as 27 and 21, 12 and 18, 78 and 73, 54 and 58. When students are familiar with 'counting up' by ones, give them problems that require them to 'count up' in multiples of 10 such as 32 and 52, 75 and 45, 98 and 68.
- Once students are competent using the 'counting up' strategy invite them to try it without the aid of the 100 chart. That is, ask them to visualise the chart in their mind and solve problems such as 67 – 32, 54 – 21, 84 – 53 and 98 – 74.

Unit 24

Subtracting Near Multiples of 10

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 50–51

Teaching Focus: ***to quickly and accurately subtract near multiples of 10 by building on the skill of subtracting multiples of 10.***

You will need: an enlarged 100 chart, spinners and a 100 chart cut up to make individual number cards

- Discuss with students how the 100 chart is organised – i.e. decreasing by 1 as you move back across the row and decreasing by 10 as you move back up the column. Draw students' attention to how the final digit of every number in a column is the same.
- Practise subtracting 10 from numbers by randomly calling out numbers such as 29, 62, 48, 71, 15, 83, 36, 54 and using the 100 chart to check.
- Point to a number on the 100 chart such as 76 and explain that to subtract 9 you can subtract 10, which will give you 66, and then you move across 1 space to 67. Explain that because you took away 10, you took one too many, and so you need to 'give one back', or add on 1. Check the strategy by 'counting back' 9 ones. Repeat demonstrating on the 100 chart for numbers such as 37, 84, 43 and 92.
- Repeat the activity asking students to subtract from any given number without the use of the 100 chart. Remind them to remember to subtract 10 and then add on 1.
- Record a given number and the number with 9 subtracted. Ask students to make up a rule for what happens such as 'The final digit increases by one and the tens digit decreases by one except when the number is a multiple of 10'.
- Once students have mastered subtracting 9 from any 2-digit number try subtracting 11 by subtracting 10 and then 1 more. Make a set of cards from a 100 chart and cut them up. Place cards 10 to 99 in a bag or container and randomly select a card. Ask a student to subtract 11 from the number selected. This can be done as game of 'Around the World' (Unit 11) where students stand in a circle and the teacher selects two students standing next to each other. One card is selected and the student who can subtract 11 the quickest and get the correct answer wins. The winner then plays against the next student in the circle. Continue until every student has had a chance to challenge.
- If students are able to quickly and accurately subtract 9 and 11 from any 2-digit number, encourage them to subtract 19 or 21 by taking away 20 and adding 1 (for 19) or subtracting another 1 (for 21). Randomly select numbers such as 58, 62, 27, 84, 35, 73 and 46 for students to subtract 19 or 21 from.

***Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 50–51*.**

Assessment Task/s

- Note students' performances when they play 'Around the World' (see above activity).
- Give students two minutes to solve the following problems and see how many they can answer correctly.

64 – 9 =	87 – 9 =	36 – 9 =	27 – 9 =	53 – 9 =
35 – 11 =	74 – 11 =	33 – 11 =	66 – 11 =	81 – 11 =
47 – 9 =	61 – 11 =	45 – 11 =	98 – 9 =	24 – 11 =
87 – 9 =	67 – 11 =	73 – 19 =	99 – 19 =	62 – 21 =

Recommendations

- Draw students' attention to the position of the number that is 9 less – it is always the number diagonally above the number that you are subtracting from. For example, with 57:

35	36	37	38	39
45	46	47	**48**	49
55	56	**57**	58	59

Invite students to shut their eyes and visualise the 100 chart and ask them to think of the number that is diagonally above 27, 68, 87, 39, 52 and 46. This strategy works well with visual learners if they are familiar with the 100 chart. This can be used to subtract 11 or 19 or 21 also.

- Make a spinner with 6 sections that suits the ability level of students. For those still to master the strategy, make a spinner with 9, 9, 10, 10, 11 and 11. For competent students, make spinners with 9, 11, 19, 21, 29, 31. Invite students to spin the spinner using a paper clip and then select a number from cards 40 to 99 (made by cutting up a 100 chart) and subtracting what was designated by the spinner. If the student is correct, they keep the card. The person with the most cards at the end wins. To check answers use a calculator.
- More able students can make cards 120 to 199 and try subtracting 99 or 101 by subtracting 100 and adding on 1 for 99 or taking a further 1 for 101.

Unit 25

Subtracting Numbers with Same Final Digits

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 52–53

Teaching Focus: ***to use the understanding of how a 100 chart is organised to subtract numbers with the same last digit.***

You will need: a 100 chart

- Provide each student with a copy of a 100 chart. Discuss with students how the numbers are arranged so they know that as you move across a row from left to right the numbers increase by one and as you move down a column the numbers increase by 10. Ask students to close their eyes and ask them what number is below 27, to the right of 54, above 63 to the left of 86. Students can check to see if they are correct by looking at the 100 chart.
- Present students with the problem 54 – 24. Invite students to solve it and explain the strategy they used. Ask students what they notice about where the numbers 54 and 24 are located.
- Present students with the following problems to solve: 49 – 29, 78 – 38, 52 – 32, 97 – 47 and 86 – 26.
- Discuss with students what they notice about the answers. They should notice that all the answers are multiples of 10. Ask students to explain why all the answers are multiples of 10. Students should realise that as the numbers are in the same column on the 100 chart then by using the 'count up to' strategy they are just moving up the column and therefore answers will always be multiples of 10.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 52–53.

Assessment Task/s

- Invite students to explain why they know that the answer to the following problem is not correct.

  83 – 63 = 23
- Ask students to solve the following problems.

  63 – 23 = 49 – 19 = 97 – 47= 78 – 38= 51 – 31=

Recommendations

- When students are able to answer problems quickly and accurately invite them to solve the following problems without using a 100 chart.

  73 – 13, 82 – 62, 37 – 7, 94 – 24, 86 – 56, 66 – 16
- For more able students present the problem 106 – 46 and ask if they know how to solve it. Encourage them to explain how they would solve it. Have students write some problems involving some numbers greater than 100 and to give them to their friends to solve.

Unit 26

Open Number Lines for Subtraction

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 54–55

Teaching Focus: ***to develop visual imagery to help students mentally subtract the place-value parts of 2-digit numbers.***

You will need: a 1–100 number line, a tape measure, a calculator, 100 chart

- Present students with the problem 43 – 26. Tell them that they are going to use a number line to help them solve the problem.
Display the number line by adhering it to the board so that it is visible to all students.
- Select a student to come out to the board and locate 43 on the number line. Explain that they are going to use their understanding of place-value units to help them subtract 26. Ask how many tens there are in 26 and to use the number line to count back the two tens (33, 23). Then they need to count back six ones (22, 21, 20, 19, 18, 17) to get the answer of 17.
- Model for a few more examples such as 53 – 32, 64 – 25, 38 – 13 and 49 – 37.
- In pairs or small groups, give students a tape measure to use in place of a number line to solve more problems such as 72 –19, 56 – 38, 94 – 56 and 66 – 27.
- Once students understand and can quickly and accurately solve problems, they are ready to start solving problems without the use of the tape measure. Draw a line on the board and present the problem 63 – 45. Write 63 on the right-hand side of the line and then ask how many tens are in 45. Then take away the four tens (53, 33, 23, 13). Ask how many ones now need to be taken away (12, 11, 10, 9, 8) to give the answer of 8 (5 ones).
- Model solving a few more problems such as 54 – 27, 63 – 29 and 26 – 18 using the open number line technique.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 54–55.***

Assessment Task/s

- Ask students to demonstrate using an open number line to solve the following problem.
  73 – 46
- Observe students as they play ‘Subtraction Race’ (see Recommendations).

Recommendations

- Students having difficulty might still need to use the tape measure to practise counting back numbers less than 10. When students are competent at taking away 1-digit numbers they can count back multiples of 10. When they are ready they can move on to counting back simple amounts such as 12, 41 and 32.
- Students needing more of a challenge can try taking away more than one subtrahend such as 76 – 34 – 16, 85 – 16 – 38, 92 – 54 – 22.

- To practise the skill further, students can work in groups of three and play 'Subtraction Race'. Students race one another to find the correct answer. Two of the students will race one another while the remaining student selects two numbers from cards made from the 100 chart and the competing students try to quickly and accurately find the difference. The third student checks the answer on a calculator. The student with the correct answer wins. In turn, have students compete for the points.

Unit 27

Estimating for Subtraction

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 56–57

Teaching Focus: ***to use the skill of rounding to the nearest 10 to check the reasonableness of answers to subtraction problems.***

- To be successful in estimating students need to be able to quickly round numbers. See Teacher Support Notes for Unit 5 and activities in *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 12–13.
- Explain to students that to estimate the answer for a problem the numbers can be rounded to help. Invite students to explain the rules for rounding numbers and record on the board or a chart so that students can refer to them when rounding numbers.
- Present the problem 73 – 38 to students and explain that all they need to do to estimate the answer is to round to the nearest 10 to quickly work it out. Ask students to round 73 and 38 to the nearest ten, 70 and 40, and then subtract 40 from 70 to get the answer 30. So the answer is near 30.
- Present students with a few more problems to work through such as 59 – 32, 83 – 64, 97 – 51 and 78 – 51. Ask for students to demonstrate for the class.
- Have students work independently and estimate the answers for the following problems: 92 – 58, 69 – 32, 58 – 21 and 88 – 37.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 56–57.***

Assessment Task/s

- Ask students to estimate the answer to the following problem.
  78 – 52
- Present students with some examples of work that has been completed such as: 71 – 38 = 43, 49 – 21 =28, 77 – 19 = 58 and 68 – 41 = 37. Ask students to decide if the problems have been correctly answered by estimating.

Recommendations

- Students having difficulty might need more practice rounding numbers and finding the difference between multiples of ten.
- When the opportunity presents, ask students to estimate answers as a way of checking their own work before asking the teacher to correct it.
- Students who need more of a challenge can work with larger numbers such as 168 – 43 or 259 – 122.

Unit 28
Multiplying by Zero and 1

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 58–59

Teaching Focus: ***to develop an understanding of multiplication and what happens when a number is multiplied by 1 or zero.***

You will need: counters

- Present students with the multiplication sign and ask them to explain what it means. Brainstorm and list terms such as ‘groups of’, ‘piles of’, ‘sets of’, ‘rows of’, ‘multiplied by’ and so on. This list can be used to make a display for students to refer to in the classroom.
- Ask a student to come and write a multiplication problem on the board or write one such as 4 × 3. Explain the problem using the terms from the brainstormed list such as 4 groups of 3, 4 piles of 3, 4 sets of 3, 4 rows of 3, 4 multiplied by 3. Ask students to use counters to model this problem and then solve it. Repeat for a few more examples so that students have an understanding of multiplication. Using square counters, encourage students to make arrays. This can help them better visualise multiplication problems.
- Invite students to solve the following problems using calculators: 5 × 0, 7 × 0, 8 × 0, 2 × 0, 0 × 0, 9 × 0, 4 × 0, 17 × 0, 200 × 0. Ask students to explain what they found. Pose the problem ‘Is the answer always zero when a number is multiplied by zero?’ Have students justify their thoughts. Ask the class to write a rule for multiplying by zero.
- Invite students to solve the following problems using counters: 9 × 1, 2 × 1, 10 × 1, 5 × 1, 3 × 1, 7 × 1, 1 × 1, 6 × 1 and 4 × 1. Ask students if they can see a pattern to what happens when a number is multiplied by 1. As a class write a rule for multiplying a number by 1.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 58–59.

Assessment Task/s
- Ask students to write the strategies they use when multiplying any number by 0 and 1.
- Ask students to solve the following problems.

4 × 1 =	1 × 0 =	3 × 0 =	8 × 0 =	10 × 1 =	5 × 0 =
6 × 0 =	7 × 1 =	2 × 0 =	5 × 1 =	7 × 0 =	8 × 1 =
9 × 1 =	2 × 1 =	6 × 1 =	4 × 0 =	3 × 1 =	1 × 1 =

Recommendations
- Have students experiencing difficulty use counters and hoops to model problems. Using the hoops should reinforce what happens when a number is multiplied by zero. So 3 × 0 can be modelled by three hoops with no counters in each hoop.
- Invite students to see how quickly they can answer a series of problems involving a mixture of problems multiplied by 1 and 0.

Unit 29
Doubles

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 60–61

Teaching Focus: ***to use recall of doubles facts to quickly and accurately solve problems where numbers are multiplied by 2.***

You will need: blocks, paper, paint, set of single-digit cards

- Students who might be unfamiliar with doubles facts can 'make' doubles by building with blocks. So for double 4 they can join 4 blocks together and then join another 4 to show that they have 8 blocks altogether. Another way to model doubles is to use a sheet of paper, put 3 dots of paint on one side and then fold it in half making an imprint of another three dots to show that double 3 is 6. These can be displayed around the room to remind students of their doubles facts.
- Students can practise recalling doubles facts by playing 'Maths Chasey'. Students find a spot in the room and the teacher calls out a number. When a student recalls the double they put up their hand. The teacher chooses the first student to put up their hand and if they are correct they can take one step in any direction and 'tag' another student who is then out of the game. If the student answers incorrectly, they are out of the game. The last student left in the game wins.
- Make a list on the board of the doubles facts that students know. Then list on the board the following problems: 1 × 2 =, 2 × 2 =, 3 × 2 =, 4 × 2 =, 5 × 2 =, 6 × 2 =, 7 × 2 =, 8 × 2 =, 9 × 2 =, and 10 × 2 =. Select students to answer the problems. Ask students to look closely at the answer to the multiplication problems and the doubles facts. Students should be able to see that the answer for the problem is the same as double the number. Ask students to explain their findings and why they think that it happens that way. Ask if it will be the case for all numbers. Invite students to offer more doubles facts that they know and use a calculator to check that when the number is multiplied by 2 the answer is the same. Ask students to make a rule about multiplying numbers by 2.

***Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 60–61*.**

Assessment Task/s

- Ask students to multiply the following numbers by 2 and collect their responses.

  7, 1, 4, 8, 3, 5, 0, 9, 6, 2
- Observe students as they play 'Around the World' (see Recommendations).

Recommendations

- To be successful, students must be able to quickly and accurately recall their doubles facts. For further practice, students can play 'Around the World' (see Unit 11) varied so that when the teacher shows a single-digit card.
- Students needing more of a challenge can work with larger numbers to be multiplied by 2.

Unit 30
Multiplying by 10

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 62–63

Teaching Focus: ***to use place-value understanding to quickly and accurately multiply numbers by 10.***

You will need: MAB

- Invite students to make 1 with MAB. Ask students to show what 1 × 10 would look like. Many students will get out 10 ones. Some students might automatically get out 1 ten, but if they don't, ask if there is a quicker way of showing 1 × 10 and suggest substituting a ten. Ask students to show 4 ones and then ask them to show 4 × 10. Repeat with more examples such as 9 × 10, 3 × 10, 8 × 10, 6 × 10, 5 × 10, 2 × 10, and 7 × 10.
- When students have completed representing all the single digits multiplied by 10 they should be automatically representing the answer by using tens. Discuss with students what happens to the single digit when it is multiplied by 10. Students should be able to understand that when single digits or ones are multiplied by 10 they become tens.
- Ask students to show 10 with the MAB and then to show 10 × 10. Ask them to get out 30 and then to show what 30 × 10 looks like. Repeat for other multiples of 10. Discuss with students what happens to 10s when they are multiplied by 10s.
- Ask students to make 12 with the MAB and then invite them to show what 12 × 10 looks like. Ask students to predict what 14 × 10, 17 × 10, 11 × 10 and 15 × 10 would look like. Discuss what happens to a number when it is multiplied by ten. Have students make up a rule for multiplying by 10. Often students will come up with a rule that to multiply a number by 10 you add a zero. This type of rule can be confusing because when you actually add zero to any number the number remains the same. Students might be thinking of adding a zero to the end of the number, but this does not work with decimal numbers. A rule that involves the idea of moving across place-value columns will work better for decimals and whole numbers.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3, *pp. 62–63.

Assessment Task/s
- Ask students to multiply the following numbers by 10.

  4, 9, 3, 6, 12, 25, 17, 33, 100
- Observe students as they play 'Maths Relay' (see Recommendations) noting any students who are having problems answering quickly and accurately.

Recommendations
- Students encountering difficulties can keep working with MAB to help them build up a visual image of how the place-value units change.

- For practice students can play games such as ‘Maths Relay’. Students are divided into teams and line up. The teacher calls out a problem such as 7 × 10 and the first student at the front of each team to give the correct answer scores a point for their team. The front students then go to the back of their team and the teacher continues to call out a problems and the first to answer correctly wins a point for their team. The team with the most points at the end of a set time wins. Students can be organised into teams so that they are competing against students of like ability.
- Students needing a challenge can work on multiplying decimal numbers by 10.

Unit 31
Multiplying by 5

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 64–65

Teaching Focus: ***to use the strategy of multiplying any number by 10 and then halving when a number is multiplied by 5.***

You will need: counters, 10-sided die

- To be successful using this strategy for multiplying numbers by 5 students need to be able to quickly and accurately multiply numbers by 10. See Unit 30 for ideas to develop and practise the strategy. Students can play games such as 'Maths Chasey' (Unit 29), 'Around the World' (Unit 11) and 'Maths Relays' (Unit 30) to practise quick recall of facts multiplying numbers by 10.
- List following problems on the board.

  1 x10 =
  2 x10 =
  3 x10 =
  4 x10 =
  5 x10 =
  6 x10 =
  7 x10 =
  8 x10 =
  9 x10 =
  10 x10 =

Select students to answer the problems. Next, list the same numbers multiplied by 5 next to them.

1 × 10 = 10	1 × 5 =
2 x10 = 20	2 × 5 =
3 × 10 = 30	3 × 5 =
4 × 10 = 40	4 × 5 =
5 × 10 = 50	5 × 5 =
6 × 10 = 50	6 × 5 =
7 × 10 = 70	7 × 5 =
8 × 10 = 80	8 × 5 =
9 × 10 = 90	9 × 5 =
10 × 10 = 100	10 × 5 =

Have students answer the problems. Ask students to look at the answers and see if they can see any pattern between a number multiplied by 10 and 5. If no students see a pattern, list the answer numbers together: i.e. 10 and 5, 20 and 10, 30 and 15, 40 and 20 and so on. Students should be able to recognise that the answers to multiplying a number by 5 are half of when they multiplied by 10.

- Pose the question to students, 'So if I multiply any number by 10 and halve it, is it the same as multiplying a number by 5?' Some students might recognise that because 5 is half of 10 then this strategy will work every time. Invite students to work in pairs to try out the strategy where one student uses the strategy and the second student uses a calculator multiplying by 5. Try other examples such as 7, 12, 20 and 100.
- Invite students to make a rule for multiplying numbers by 5.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 64–65.***

Assessment Task/s

- Have students complete the following problems as quickly as they can.

3 × 5	9 × 5	1 × 5	7 × 5	10 × 5
6 × 5	4 × 5	2 × 5	8 × 5	5 × 5

- Observe students as they play 'Multiplication Bingo' (see Recommendations) noting those that are able to quickly and accurately recall the facts.

Recommendations

- Some students might have difficulty with the strategy because they do not have quick and accurate recall of halving numbers. These students can use counters to work out half of various even numbers.
- For practice, play 'Multiplication Bingo'. In pairs, have students complete a 6 × 6 grid.

Students roll a 10-sided die and multiply the number on the die by 5 and write the answer on the first cell in the grid. Students continue to work together to roll the die and complete the grid. Then, taking turns students roll the die and multiply the number rolled by 5 and put a × or O (or use different colour counters) on a grid number that matches the answer. Students can only put one mark each time they roll the die. If there is no number that matches their answer, they cannot put down a mark and it is their partner's turn. The first player to place 5 marks (or counters) in a row is the winner.

- Students needing a challenge can try using the strategy with larger numbers.

Unit 32
Multiplying by 4

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 66–67

Teaching Focus: ***to mentally multiply any number by 4 by using the strategy of doubling and doubling again.***

You will need: counter, 10-sided die, spinners

- Students will need accurate recall of doubles facts or multiplying numbers by 2. Refer to Unit 29 Doubles for ideas to develop and practise the strategy. For further practice recalling doubles facts play 'Around the World' (Unit 11), 'Maths Chasey' (Unit 29) and 'Maths Relays' (Unit 30).
- To explore the link between multiplying numbers by 2 and 4 have students answer the problems.

1 × 2 =	1 × 4 =
2 × 2 =	2 × 4 =
3 × 2 =	3 × 4 =
4 × 2 =	4 × 4 =
5 × 2 =	5 × 4 =
6 × 2 =	6 × 4 =
7 × 2 =	7 × 4 =
8 × 2 =	8 × 4 =
9 × 2 =	9 × 4 =
10 × 2 =	10 × 4 =

Students can use a calculator to answer the problems where numbers are multiplied by 4. When the answers have be recorded so that all the students can see them. Ask students if they can find any pattern between the answers for when a number is multiplied by 2 and 4. Students should be able to recognise that the answer to when a number is multiplied by 4 is twice or double the answer of when it is multiplied by 2.

- Ask students if they can devise a rule or strategy to help them mentally multiply any number by 4. Record students' ideas and display them for future reference.
- Ask students to prove their rule or strategy by trying it out on lots of numbers. They can use a calculator to check that they are correct.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 66–67.

Assessment Task/s

- Ask students to double the following numbers.
  5, 9, 2, 11, 7, 3, 8, 6, 4, 10
- Ask students to solve the following problems.
  5 × 4 9 × 4 2 × 4 11 × 4 7 × 4 3 × 4 8 × 4 6 × 4 4 × 4 10 × 4

Recommendations

- Students' success will depend on the ease with which they can quickly and accurately recall their doubles facts. Those having difficulty might need further work on doubling.
- Students wanting more of a challenge can use the strategy with larger numbers.
- For practice, students can play 'Climb the Ladder'. Using a drawing of a ladder, students place their marker at the base of the ladder. In turn, have students roll the dice and if they can correctly multiply the number on the dice by 4 they move up to the next rung. The student who reaches the top of the ladder first wins. Using spinners with numbers varied to suit students' ability levels will tailor the game for the different groups in the class.

Unit 33
Halving

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 68–69

Teaching Focus: ***to use recall of halves facts to quickly and accurately solve problems where the numbers are divided by 2.***

You will need: counters, spinners

- Write the division sign (÷) on the board and ask students what it means. During discussion make sure that students have the idea of sharing equally. Brainstorm different ways of expressing division such as 'shared between', 'how many groups of', 'divided by', 'cut into' and so on. These can be made into a chart to display in the room.
- Explain to students that they are going to be finding half of some numbers. Discuss with students what 'a half' means. From the discussion students should be able to explain that a half is when something is divided into two equal parts or groups. In pairs, have students get out 16 counters. Ask pairs to find a half of 16. Select students to explain how they were able to find a half. Repeat for other numbers such as 24, 18, 14, 28, 12 and 30. Record answers on the board.

  Half of 16 is 8
  Half of 24 is 12
  Half of 18 is 9
  Half of 14 is 7
  Half of 28 is 14
  Half of 12 is 6
  Half of 30 is 15

- Invite students to work out the doubles for 8, 12, 9, 7, 14, 6 and 15 and record these next to the 'half' facts.

Half of 16 is 8	Double 8 is 16
Half of 24 is 12	Double 12 is 24
Half of 18 is 9	Double 9 is 18
Half of 14 is 7	Double 14 is 7
Half of 28 is 14	Double 14 is 28
Half of 12 is 6	Double 6 is 12
Half of 30 is 15	Double 15 is 30

Have students look closely to see if they can determine the inverse relation between doubling and halving. That is, if they know a doubles fact such as double 8 is 16 then it will help them know that half of 16 is 8.

- Ask students for more doubles facts and then write the related halves facts such as double 10 is 20 so half of 20 is 10.
- Write the problem 16 ÷ 2 on the board. Ask students how they might be able to solve the problem. Some students might be able to connect the problem to 'halving'. If not, remind students that they were able to find half of 16, which they did by dividing the 16 into two equal groups (or they shared 16 into two equal groups) and found the answer 8. Write some other familiar problems for students to solve such as 24 ÷ 2, 18 ÷ 2, 14 ÷ 2, 28 ÷ 2, 12 ÷ 2 and 30 ÷ 2.
- Discuss with students how easy it was for them to complete the problems because they knew how to halve the number and this is a useful strategy when dividing any number by 2.

- In pairs, have students solve other problems such as 10 ÷ 2, 22 ÷ 2, 8 ÷ 2, 26 ÷ 2, 4 ÷ 2, 6 ÷ 2 and 2 ÷ 1. One student can use the halving strategy and the other can check using a calculator.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 68–69.***

Assessment Task/s

- Have students explain how they can use halving to solve some division problems.
- Have students solve the following problems.

  14 ÷ 2 22 ÷ 2 16 ÷ 2 24 ÷ 2 10 ÷ 2 18 ÷ 2

Recommendations

- Students experiencing difficulty might need to practise their doubles fact and then name the related halves fact.
- Students needing more of a challenge could work with bigger numbers, naming known doubles facts and the related division problems they would be able to solve.
- For further practice, students can play 'Division Bingo' (similar to 'Multiplication Bingo') where they use spinners and include numbers 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20. Students fill in the 6 × 6 grid by dividing the number spun by 2. Players take turns and the first player to fill in five in a row wins.

Unit 34

Multiplication Facts to Solve Division

Teacher Support Notes

Introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,* pp. 70–71

Teaching Focus: ***to understand the relationship between multiplication and division and use known multiplication facts to solve division problems.***

You will need: counters

- Write the problem 24 ÷ 4 on the board and read it aloud to students as '24 shared between 4' or '24 shared into 4 groups'. Provide students with counters and ask them to solve the problem. List some other problems and have students complete.

  9 ÷ 1 =
  15 ÷ 5 =
  16 ÷ 4 =
  60 ÷ 10 =
  35 ÷ 5 =

- Next to the division problems write some related multiplication problems.

9 ÷ 1 = 9	1 × 9 =
15 ÷ 5 = 3	5 × 3 =
16 ÷ 4 = 4	4 × 4 =
60 ÷ 10 = 6	10 × 6 =
35 ÷ 5 = 7	5 × 7 =

Ask students to look at the two lists of problems. Ask them if they can see that while each example uses different operations the numbers are the same. Explain that in the first example if we know that 1 group of 9 is 9 then it can help us to work out that 9 shared into 1 group would mean that there would be 9 in the group. Knowing that 5 groups of 3 is 15 means that you can know that 15 shared into 5 groups means that there are 3 in each group.

- Encourage students to name some multiplication facts and then to write the related division fact.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3,** ***pp. 70–71.***

Assessment Task/s

- Collect samples of students' work where they have listed known multiplication facts and the related division facts.

Recommendations

- It can be difficult for some students to see the connection between multiplication and division. Have these students use square counters to make arrays such as 6 × 2 to find the answer of 12. Then ask 'How many groups of 2 are there in 12?' Work with students to make other arrays and find out how many groups are in each array.
- Have students list multiplication facts and related division facts.
- Students needing a challenge can work with more difficult multiplication problems and their related division facts.

