NELSON MATHS: AUSTRALIAN CURRICULUM BUILDING MENTAL STRATEGIES SKILL BOOK 4

TEACHER SUPPORT NOTES

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Multiplication Strategies

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Unit 1
Counting with Whole Numbers

Teacher Support Notes

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

Teaching Focus: ***to be able to determine if a counting pattern is by 6s, 7s, 8s or 9s and to continue the pattern by determining the repeating number pattern.***

You will need: calculators

- Write the following counting pattern on the board.
  18, 24, 30, 36, 42, 48

Ask students, 'How can you determine what this pattern is counting by?' Discuss the need for finding the difference between each consecutive number in the sequence. Select a student to work out the difference between 18 and 24, another student for 24 and 30, and another for 30 and 36. Students should have worked out that the difference is always 6 and, therefore, the pattern is counting by 6s.

- Select individual students to come out to the board and write the next number in the sequence.
- Invite students to look carefully at the final digits of each number in the counting sequence. Discuss that a repeating sequence has occurred – 8, 4, 0, 6, 2, 8. Ask students to predict what the final digit for the next number in the sequence will be, and the next, and so on.
- Present students with patterns counting by 7s, 8s and 9s. Ask them to determine what the counting sequence is counting by, and then the final-digit patterns.
- Demonstrate to the class how to play 'Guess My Pattern'. Using a large or overhead calculator, key in a beginning number such as 21 and show it to the students. Then without the students seeing, add on a single-digit number such as 7. Show them the next number in the sequence, 28. Using the constant function present them with the next number in the sequence, 35, and the next, 42. Ask students if they can predict what the next number will be. Select a student to make a prediction and then check on the calculator for the next number in the sequence. To assist students the numbers in the sequence can be recorded. Have students work in pairs with a calculator. One student can set up the pattern on the calculator while the other tries to predict the term.

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

Assessment Task/s

- Have students look carefully at the patterns below and determine which patterns are **not** correct.

  24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 104, 112, 120, 128
  24, 30, 36, 42, 48, 54, 60, 66, 70, 76, 82, 88, 94, 100, 106
  27, 36, 45, 54, 63, 72, 80, 89, 98, 107, 116, 125, 134, 143
  28, 35, 42, 49, 56, 63, 70, 77, 84, 91, 98, 105, 112, 119, 126

Recommendations

- For further practice with counting patterns, give students a starting number and tell them what they will be counting by. Then give students one minute to record the counting sequence. Students can check one another's work by using the constant function on a calculator. The student who counted correctly to the highest number wins. This activity can be matched to students' ability levels giving higher starting points to more able students and simple patterns for less able students.
- Students who are experiencing difficulty can use a 100 chart and use simpler counting patterns.
- More able students can use more difficult starting points such as 3-digit numbers and explore more difficult counting patterns such as 11s or 12s.

Unit 2

Counting with Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 6–7

Teaching Focus: ***to use an understanding of fraction knowledge, including equivalent fractions, to identify and continue counting patterns.***

You will need: circles traced onto paper

- Have each student cut out a circle and then cut it into halves. Invite a student to stick one of their halves to the board and begin to record the counting sequence with '1/2'. Have them join on their next half and ask students what they can see. Discuss that while there are two halves there is one whole circle so record '1'. Continue with each student adding their halves and invite them to keep recording the counting sequence.
- Repeat the activity above but ask students to cut their circles into quarters. Recording the counting sequence should raise the concept of equivalent fractions, therefore, as students place the second quarter discuss how the counting sequence can be recorded.
- Invite students to look at the first counting sequence involving halves and ask them if they can see a pattern. Students should be able to see that the pattern is half, whole number, half, whole number and continues in that manner. Invite them to predict what the next number in the counting sequence would be. Explore the counting sequence involving quarters and discuss with students what the repeating pattern is, and how this can help predict the next number in the sequence.
- Repeat the above activities for thirds and fifths.
- Present students with the following counting sequence.
  1/3, 2/3, 1, 1 1/3, 1 2/3, 2, 2 1/3, 2 2/3, 3, 3 1/3, 3 2/3, 4

Discuss with students what the counting sequence is counting by and how they know. Ask them to predict the next four numbers in the sequence. Repeat for other counting sequences that involve quarters and fifths

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 6–7.

Assessment Task/s

- Observe students as they complete the above activities.
- Collect samples of the counting patterns that students have written in one minute, looking at any common errors and the ease with which they were able to record the pattern in one minute.
- Ask students to write the next five numbers in the counting sequences below:
  4 2/ 3, 5, 5 1/3, 5 2/ 3, 6, 6 1/3,
  4/5, 1, 1 1/5, 1 2/5, 1 3/5, 1 4/5,
  2 1/2, 2 3/4, 3, 3 1/4, 3 1/2, 3 3/4,

Recommendations

- For students having difficulty see *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, Unit 2 Counting with Fractions, pp. 6–7.
- For students needing a challenge have them complete counting sequences using sixths, sevenths, eighths, ninths and tenths.
- For further practice, give students a starting point such as 3 and ask them to count by thirds, quarters or fifths. See how far they can count in one minute.

Unit 3
Counting with Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 8–9

Teaching Focus: ***to use knowledge of whole-number counting to complete decimal counting patterns.***

You will need: metre rulers, orange Cuisenaire rods or MAB tens, post-it notes

- Put the following counting sequence on the board.
  0.1, 0.2, 0.3, 0.4, 0.5

Invite a student to write the next number in the sequence. Invite them to explain how they knew what the counting sequence was and what the next number in the sequence would be. Continue inviting students to add the next number in the sequence. Discuss with students the use of a whole number after 0.9. To further revise counting by tenths ask students to stand in a circle. Select a student to begin counting from 0.1. Ask the student standing next to them to say the next number in the counting sequence. Continue, and if a student says an incorrect number, they sit down.

- Give out metre rulers to each pair or small group of students. Invite students to line up orange Cuisenaire rods or MAB tens next to the metre rule. Establish with students that each rod is 0.1 or a metre. Ask students to label each rod '0.1 m', '0.2 m', '0.3 m', and so on. Now draw students attention to each of the centimetres marked. Pose the problem, 'If there are 100 centimetres in a metre, how can one centimetre be represented as part of a metre?' Discuss that each centimetre is 0.01 of a metre and record this on the board. Point to each centimetre and ask students to count aloud 0.01, 0.02, 0.03, 0.04, 0.05, and so on. Make sure that when students reach one tenth they call it 0.1. Continue counting using the ruler to help.
- Invite students to join their ruler with another pair and choose different starting points such as 0.23, 0.44, 0.67, 0.87, 0.98 and 1.04.
- Using the rulers for support, give students a different starting point such as 0.83, and ask them to count backwards by 0.01.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 8–9.

Assessment Task/s

- Have students continue the following patterns orally.
  0.01, 0.02, 0.03, 0.04, 0.05
  0.14, 0.15, 0.16, 0.17, 0.18
  0.55, 0.56, 0.57, 0.58, 0.59
  0.27, 0.26, 0.25, 0.24, 0.23
- Give students a starting number such as 0.21 and give them one minute to continue the counting sequence. Collect their work samples. Different starting points can be given to different students depending on their ability level.

Recommendations

- Have students explore counting by decimals by keying a number into a calculator and using the constant function to count by hundredths. Students can record these counting patterns on long strips of paper. Display in the room.
- Students having difficulty might need more practice counting by tenths. See *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, Unit 3 Counting with Decimals, pp. 8–9 and the corresponding Teacher Support Notes.
- Students needing more of a challenge can explore counting patterns that increase or decrease by 0.02, 0.03 or 0.04.

Unit 4

Ordering Whole Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 10–11

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

You will need: 4-digit cards, MAB, dice

- Select a 4-digit card such as 2817 and invite a student to read out the number. Invite a student to use MAB to model the number. Select another number such as 2783. Invite a student to read it out and then model it with MAB. Ask students to decide which number is the largest and to explain how they know. Discuss the fact that both numbers have 2 thousands, however the larger number has 8 hundreds while the other number has only 7 hundreds.
- Give out the remainder of the cards to students. Have them hold these at the front of the class. Make sure that the cards can be seen by the whole class. Ask, 'Are the numbers in order from largest to smallest?' Ask students to offer suggestions of who needs to change places and why. Explanations should focus on place-value understanding.
- Invite students to work with a partner or small group. Each group will need four dice. One student rolls the dice. Students then need to work out all the possible 4-digit numbers. If a 3, 4, 6 or 2 are rolled then there are 24 possible numbers. Once students have made all the possible numbers they can then order the numbers from smallest to largest. This activity can be tailored to suit students' varying ability levels. Some students might need to work with three dice for 3-digit numbers while others might be capable of using five or six dice.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 10–11.

Assessment Task/s

- Have students order the following numbers.
  934, 9034, 3094, 4903, 4309, 943

Recommendations

- Students having difficulty should model numbers with MAB to help them determine the largest numbers.
- Students needing a challenge can work with 5- and 6-digit numbers.
- For further practice encourage students to find the postcodes of 10 different places. Use http://www1.auspost.com.au/postcodes to find postcodes for different locations. Then ask students to order the postcodes from largest to smallest.

Unit 5
Renaming Numbers

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 12–13

Teaching Focus: ***to use an understanding of the number system as a base-10 system, students can interchange place-value units of thousands, hundreds, tens and ones, and maintain the same value.***

You will need: 5-digit number expander, MAB, dice

- Write the following number on the board.
  2143

Ask students to model it with MAB. Then pose the problem to students, 'Could you still model the number if there were no thousands?' Students should realise that they can use 10 hundreds in place of the 1 thousand and still represent the number 2143. Explore other ways of modelling the number using MAB. Record the different ways of renaming the number.

- Organise students in pairs and have each pair explore a different number. Students having difficulty can work with 3-digit numbers.
- Use a 5-digit number expander and cut off the tens of thousands section. Record the number 4328 on the number expander. Fold the number expander so that only the digits are visible, then model how the expander can be used to rename the place-value components.
- Use the number expander with students and explore the different ways that 6734, 5013, 6203 and 4970 can be renamed.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 12–13.***

Assessment Task/s

- Have students list three different ways of making or modelling the following number.
  5672
- Have students explain how 6743 can be made without any hundreds.

Recommendations

- For students having difficulty working with 4-digit numbers see *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, Unit 7, pp. 16–17 and the Teacher Support Notes where they can complete activities renaming 3-digit numbers.
- Give each student a 5-digit number expander. Have them cut out the number expanders, cutting off the tens of thousands column. Have students then roll a die four times and fill in the number on the first number expander. Invite students to record the different ways that they can rename their number. Students can repeat the same activity using the other two number expanders on the sheet. Students can complete the activity according to ability level. More able students can use the tens of thousands column while those who experience difficulty might like to only work with hundreds, tens and ones.
- Students needing a challenge can rename larger numbers.

Unit 6

Rounding

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 14–15

Teaching Focus: ***to understand the conventions used to round numbers to nearest place-value units of 10 and 100.***

You will need: playing cards

- Explain to students that they are going to practise rounding the following numbers to the nearest 10.

  78, 32, 56, 34, 93, 27, 51, 65.

Before they begin ask if students remember the rules for rounding numbers. Record the rules on the board as a reminder for students: round up numbers that end with 5, 6, 7, 8 and 9 to the next 10 and round down numbers that end in 1, 2, 3 and 4 to the next 10.

- Explain that sometimes it might be necessary to round numbers to the nearest 100. So when rounding to the nearest 100 students need to look at how many tens there are. If there are 5, 6, 7, 8 or 9 tens, then the number is rounded up to the nearest 100. If the number has 1, 2, 3 or 4 tens, then it is rounded down to the nearest 100. Write 471 on the board and ask if the number needs to be rounded down to 400 or up to 500. Students should agree that the number needs to be rounded up to 500. Ask students for examples of other numbers that might be rounded up to 500.
- Write 738 on the board. Ask students which number they need to check to round the number to the nearest 100. They should agree that they look at the tens and as there are only 3 tens the number should be rounded down to 700. Ask students for some other numbers that would also be rounded down to 700.
- Write the numbers 274 and 634 on the board. Ask students to round each of the numbers to the nearest 100 and then the nearest 10. Discuss with students what their answers were and how they got their answer.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 14–15.***

Assessment Task/s

- Have students determine which of the following numbers could be rounded to 500.

  556, 456, 324, 519, 492, 508, 444
- Have students list four numbers that could be rounded to 70.

Recommendations

- Students experiencing difficulty might need further experience rounding numbers to the nearest 10 (see *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, Unit 5, pp. 12–13 and the corresponding Teacher Support Notes).

- Have students play ‘Round Up’. Students play with a partner or in a small group. Using a deck of playing cards with the picture cards and 10s removed, students select three cards which they place down on the table in front of them. The first card is a hundred, the second card is a ten and the third card is a one. If the 3-digit number made by the cards can be rounded up such as 367, then the student keeps the three cards. If the number cannot be rounded up such as 952, then the cards are placed on the bottom of the deck. The game continues until all the cards have been used. The student with the most cards wins. The game can be played where the student keeps the cards if the number made can be rounded up to the nearest ten. Students having difficulty can play with two cards.
- Students needing a challenge can work with 4-digit numbers that can be rounded to nearest 10, 100 or 1000.

Unit 7

Locating Fractions on a Number Line

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 16–17

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

You will need: long strips of paper all the same length, post-it notes

- Give a strip of paper to each pair of students and ask them to carefully fold their strip into thirds making sure that each section is the same size. Select one pair of students to lay their strip of paper on the floor. Point to the first fold and ask, 'What fraction of the whole strip is shown by the fold?' Give students a Post-it Note to make a label of 1/3, point to the next fold and ask what fraction it is and have them make a label of 2/3. Point to the end of the strip and ask what label they can place to show that it is one whole.
- Invite another pair of students to join their whole strip onto the previously labelled strip at 1. Point to the next fold and ask students what label they will need to put here. Remind students that they already have a whole as well as this next fractional part. Invite them to make the label of 1 1/3 and to continue labelling their strip.
- Continue asking students to add their strip of paper and place the labels. This large number line could be displayed around the room or in the corridor.
- Ask students to look carefully at the number line and answer questions such as, 'What is a number that comes before 4 2/3 on the number line?', 'What comes after 6 1/3 on the number line?' and 'What would the next three numbers be if the number line was extended?'
- Invite students to locate specific numbers on the number line such as 11 2/3, 4 and 9 1/3. Ask students how they know where to find the numbers. During the discussion students should be able to explain the idea that as the number line increases the numbers increase, so smaller numbers will be at the beginning and larger numbers at the end.
- Ask students to shut their eyes and remove some of the post-it notes. Then ask students to look carefully and see if they are able to work out the missing numbers. Ask students to explain how they were able to work out the missing numbers. Students should be aware that they are able to use their understanding of counting with fractions to help work out the missing numbers.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 16–17.

Assessment Task/s

- On a class list note responses that individual students make to questions and their contribution to discussions.
- Ask students to construct a number line showing fractions of their choice.

Recommendations

- For more experience with number lines use paper strips to construct number lines with fifths.
- Students experiencing difficulty might need more practice with counting patterns with fractions (see *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, Unit 2 Counting with Fractions, pp. 6–7 and the corresponding Teacher Support Notes).
- Students needing more of a challenge can construct a number line using understanding of equivalent fractions for quarters.

Unit 8

Ordering Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 18–19

Teaching Focus: ***to understand that the position on a number line can help determine if a fraction is bigger or smaller than another.***

You will need: fraction wall, fraction cards

- Enlarge a fraction wall and adhere it to the wall. Explain to students that the first row is a whole and label it as such. Point to the halfway mark in the next row and ask students what fraction is represented (label it '1/2'). Point to the right-hand end of the same row and ask, 'How many halves do we have up to here?' Students should realise that they have two halves and can represent them as 2/2 or 1. Continue working with students and labelling the fractional parts of the next three rows.
- Underneath the fraction wall draw a line. Use a ruler or piece of string to line up the end of 1/2 to the line below it. On the line write 1/3. Then using the ruler or string work out where 2/2 will go on the line. Continue to label the thirds, quarters and fifths.
- Ask students to look at the number line that you have made. Ask them where zero would go and label it. Ask students to compare the size of 1/4 and 1/2 by looking at the fraction wall. Then ask students to look at the position on the number line. Ask students to compare other fractions looking first at their size on the fraction wall and then their position on the number line. Students should begin to realise that any fraction to the right on the number line is larger and those to the left are smaller.
- Invite students to name fractions that are larger than 1/3 or smaller than 3/4.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 18–19.***

Assessment Task/s

- On a class list, make a note of students who can name fractions larger than 1/3 and smaller than 3/4.
- Have students complete the following number sentences.

  2/3 < ____ 1 = ____ 1 1/4 >_____

  2 2/5____1 4/4 4 1/4 ____ 6 3/4 2 2/4___2 1/2

Recommendations

Give students two strips of paper the same length. Folding each strip into quarters ask them to make their own number line marking in 1/4, 2/4 or 1/2, 3/4, 1, 1 11/4, 1 2/4 or 1 1/2, 1 3/4, 2. Ask students to complete number sentences such as the following. Invite students to make their own numerical sentences.

1 > ___ 3/4 < ____ 1/2 = ____

- Students experiencing difficulty can use simpler fractions such as halves to construct number lines and make numerical sentences.
- More able students can construct number lines using eighths and their equivalent fractions.

Unit 9

Locating Decimals on a Number Line

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 20–21.

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

You will need: post-it notes

- Students need to be able to count by hundredths. To revise counting see Unit 3, Counting with Decimals, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 8–9. Practise counting patterns by asking students to form a circle and select a student to begin the counting practice with various starting points such as 1.26, 3.71, 14.56 and 27.82.
- Draw an empty number line. Select a non-zero starting point such as 2.14 and invite students to come to the board and write the next number in the number line (2.15), then the next (2.16) and so on (2.17, 2.18, 2.19, 2.2, 2.21, 2.22 and 2.23). Discuss with students that after a number with nine hundredths, the next number will only have tenths as ten hundredths is a tenth.
- Repeat, drawing number lines on the board that begin at numbers such as 4.95, 9.91 and 16.37. Ask students what happens to the numbers the number line progresses. Students should be able to see that the numbers become bigger as you move across the number line from left to right, and if you are moving from right to left the numbers become smaller.
- Ask students to name the next four numbers to continue each of the number lines. Ask students to think about the numbers that would come before the beginning number of each number line.
- Cover some of the number lines with post-it notes while students are not looking. Invite students to predict what the covered numbers are. Have them explain how they were able to work it out.
- Draw a number line on the board and in the middle of the number line write the number 5.63. Ask students what number would come after and what number would come before 5.63.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 20–21.***

Assessment Task/s

- Observe students as they work on the above activities and identify those who are having difficulty and those who are finding the work easy.
- Collect work samples of the number lines that students have created. These will give a good indication of the numbers that students are comfortable working with.

Recommendations

- Invite students to create their own number lines with missing numbers for their friends to find the missing number.
- Students experiencing difficulty might need to work on number lines with tenths. See Unit 8 from *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 18–19 and the corresponding Teacher Support Notes.
- Students who need more of a challenge can create number lines beginning at numbers such as 431.14 or 652.78.

Unit 10
Ordering Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 22–23.

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

You will need: decimal cards

- Pose the question, 'Which number out of 2.21 and 2.12 is the largest?' Discuss with students possible ways of working out the correct answer. Discuss that drawing a number line and seeing where the numbers are can help. This is because students know that the numbers on the right are bigger than the numbers on the left. Draw a number line on the board including the numbers 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17, 2.18, 2.19, 2.2, 2.21, 2.2 and 2.23. Draw a circle around 2.21 and 2.12 so students can clearly see where they are located on the number line. Ask students to name the largest number. Discuss with students that because 2.21 is to the right of 2.12 then it is a larger number. Ask students to name a number that is less than 2.17 or larger than 2.2.
- Give students pairs of numbers and ask then to identify the largest numbers.
  3.32, 3.37 3.23, 3.03 3.32, 3.23 3.73, 3.37 3.3, 3.29

To check answers discuss with students a possible number line that would help them see where the numbers are located on the number line and, therefore, which number is the largest.

- Give students pairs of numbers and invite them to identify the smallest numbers of the pairs. Remind students that drawing a number line might help them if they are having difficulty.
  7.46, 7.4 7.74, 7.74 7.04, 7.4 7.17, 7.21 7, 7.07
- Present students with a set of numbers to order such as the following.
  5.65, 5.6, 5.16, 5.53, 5.56, 5.06

Ask students to think about where the numbers might be on a number line and put them in order from smallest to largest.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 22–23.

Assessment Task/s

- Collect samples of student responses to ordering the following numbers.
  5.65, 5.6, 5.16, 5.53, 5.56, 5.06

Look for common errors that students might make in ordering (for example, they might think that the more numbers after the decimal point the larger the number so they might put 5.6 as the smallest number). Another common mistake happens when students disregard the zeros and might see 5.06 as 5.6.

- Have students put the following numbers on a number line in the correct order.
  0.9, 0.25, 0.12, 0.51

0_____1

Recommendations

- Have students work in pairs. Give each pair of students decimal cards and have them order the numbers from largest to smallest.
- Students experiencing difficulty might need to work with number lines locating the position of numbers being compared and ordered.
- Students needing more of a challenge can work with more complex numbers such as 404.44, 444.04, 404.04, 404.4 and 444.4.

Unit 11

Using Known Strategies

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 24–25

Teaching Focus: ***to quickly and accurately find the total by selecting the most appropriate strategy from a range of addition strategies.***

You will need: playing cards

- Explain to students that they are going to practise adding 2-digit numbers using mental strategies. Invite them to brainstorm the mental strategies they know for addition. These should include doubles, near doubles, compatible numbers, bridging to the next 10 and counting on in place-value units from the largest number. These can be made into a chart and displayed in the classroom for students to refer to.
- Ask students to brainstorm some addition problems that they would be able to solve using their known doubles facts. Then investigate possible near doubles facts that they would be able to solve from the known doubles facts.
- Discuss what compatible numbers are and give students two minutes to list as many pairs of numbers as possible that give a total of 100.
- Discuss with students how they could use the 'bridging to the next 10' strategy to solve 67 + 8.
- Present the following problem.
  36 + 57

Invite students to solve the problem mentally and then discuss the various methods that students used.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 24–25.

Assessment Task/s

- Ask students to look carefully at the following problems and identify the addition strategies they would use to solve them.

34 + 58	75 + 7	18 + 18	34 + 66
56 + 25	19 + 18	49 + 51	37 + 62

- Ask students to solve the above problems using the appropriate strategy.

Recommendations

- To practise using known strategies, play the game 'How Close Can You Get?' Give each pair or small group of students a deck of playing cards with the picture cards and 10s removed. Students select two cards from the deck and make the largest possible 2-digit number to be the 'target'. Each student selects four cards. Using the four cards students make two 2-digit numbers that they add together to get as close to the 'target' as they can. The winner is the student closest to the 'target'.
- Students having difficulty can revisit relevant units in *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*that deal with addition strategies they need extra work in.
- Students needing a challenge can try finding the total of three 2-digit numbers, which should involve using a range of strategies.

Unit 12
Adding Place-value Units

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 26–27

Teaching Focus: ***to visualise and mentally add multiples of the place-value units of 10s, 100s and 1000s.***

You will need: MAB, calculator, dice, multiplication and division Cards

- Write 238 on the board and ask students to model it with MAB. Invite students to imagine that there is another ten and ask them what number it would make. Check by using the MAB to show 248. Record the new number on the board and ask students to see how the number is different. Students should notice that the 3 in the tens place has changed to 4. Discuss that this is because the number has increased by 1 ten. Tell students that they are going to add another ten and ask them how the number 248 will change. Ask them to check their prediction with MAB to show 258. This time, tell students that they are going to add 2 tens and to think about what number will change to. Ask them to check with MAB to show 278.
- Write the following numbers on the board.
  214, 567, 308, 169, 843, 456, 622

Ask students to mentally add 10 to each of the numbers. Have students check each other's answers using a calculator. Ask students to mentally add 30 or 3 tens to the numbers above again checking responses with a calculator.

- Next write the number 342 on the board and ask students to make it with MAB. Ask them to imagine the number if one more hundred was added. Ask students what number it would be and record their answer on the board. Ask students if they can see what is happening, i.e. that the number 3 in the hundreds place has increased by one to 4. Ask students what the number would be if 2 more hundreds were added. What would happen to the '4' in the hundreds place and what number would that make? Students should be able to predict that the number would now become 642.
- Practise mentally adding 100, 200 or 300 to the following numbers.
  569, 197, 376, 671, 428, 280
- Next write the number 567 on the board and ask students to make it with MAB. Ask them to add one thousand to the number and record the new number (1567) on the board. Ask them to look carefully at how the number has changed. Discussion should focus on the fact that there is now a 1 in the thousands place. Students will need to realise that in the number 567 there is zero in the thousands column and so zero has increased by one. Practise adding 1000, 2000 or 3000 to other numbers, asking students to visualise, predict and then check their answers on a calculator.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 26–27.

Assessment Task/s

- Make a set of multiplication and division cards and write 3-digit numbers on them. Ask students to add 20 to each card, then 300 and finally 1000 to see how proficient they are.
- Observe students as they play the game explained below.

Recommendations

- To practise adding multiples of place-value units, students can play a game where they select three cards from a deck of playing cards with the picture cards and 10s removed. Students need to make this into the largest possible number. Students then roll a die and add on as many hundreds as the number rolled (i.e. if they rolled a 3, they would add on 300). The student with the largest number wins. Students can play with a partner or in small groups. Students can play the game adding on thousands instead of hundreds. The game can be varied to match the varying ability level of students. Those having difficulty can play making 2-digit numbers from the cards and then adding on tens. Those needing a challenge can roll the die twice. The first roll denotes the number of hundreds and the second roll denotes the number of tens to be added on.

Unit 13

Using Open Number Lines for Addition

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 28–29

Teaching Focus: ***to develop mental imagery to help students mentally add place-value components of 3-digit numbers.***

You will need: playing cards with 10s and picture cards removed

- Explain to students that in this lesson they are going to be using open number lines to add numbers together. Discuss what an open number line is and what students need to be able to do to add the numbers together. Discussion should include understanding that students need to add on to the largest number and then be able to add on the place-value components of the other number. Write up any important facts that students need to remember.
- Present the following problem to students, with an open number line drawn beneath it.

  37+ 154

Ask students to identify which is the largest number that they will add on to. Model for students that they will need to put 154 on the left end of the number line and then add on the components of 3 tens (164, 174, 184) and then 7 ones (185, 186, 187, 188, 189, 190, 191).

- Invite students to complete the following problems using open number lines.

  214 + 56 24 + 147 328 + 44 65 + 516

- Once students are comfortable adding 2-digit numbers to 3-digit numbers they can try adding 3-digit numbers to 3-digit numbers. Write the following problem on the board

  135 + 156

Ask students which is the largest number and write it on the left end of the open number line. Then ask students what to add on first (from 135). Students should be able to break the number into its parts (100, 30 and 5) and know that they add on the largest place-value component first (in this case 100) to give 256. Then students add on the 30 or 3 tens 266, 276 and 286. Finally students add on the 6 ones 287, 289, 289, 290 and 291 to give the answer 291

- Model the following examples, working with the students.

  452 + 122 131 + 356 216 + 234 356 + 163

***Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp.* 28–29.**

Assessment Task/s

- Have students solve the following problems using open number lines.

  43 + 128

  _____

  156 + 137

  _____

- Observe students as they play the game ‘Highest Total’ (see Recommendations) noting the ease or difficulty with which they find the total.

Recommendations

- Students experiencing difficulty might need further practice adding multiples of 10 and 100 to various numbers.
- For further practice, have students work in pairs with a deck of cards (with the 10s and picture cards removed) to play the game ‘Highest Total’. Each student draws three cards from the deck. The first card drawn is the hundred and the next card is the ten and the third card is the one. Students repeat the process making another number, which they then add together using the open number line strategy. The student with the highest total wins. This game can be varied for students’ differing abilities. Less able students can make a 2-digit number from two cards and more able students can add on a third 2-digit addend by drawing out two more cards.
- Students having difficulty working with 3-digit numbers can complete Unit 18, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 38–39.

Unit 14

Compatible Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 30–31

*Teaching Focus**: to develop mental images that will encourage students to quickly recall compatible fractions for 1.***

You will need: strips of paper or paper streamer cut to the same length, fraction wall, Fraction Cards

- Hold up a strip of paper and explain to students that this is one whole. Carefully fold and cut the strip in half. Stick one half onto the board and ask, 'How much more do I need to make 1?' When students have given the answer 1/2, stick the second half next to the first half and record 1/2 + 1/2 = 1 underneath.
- Organise students into pairs. Give each pair of students a strip of paper and ask them to carefully fold each strip into thirds. Ask students to cut off 1/3 and hold up 1/3 and ask, 'How much more do we need to make 1?' Students should realise that because they have a piece that represents 1/3 the other piece represents 2/3 and that together these make 1. Write 1/3 + 2/3 = 1. Then hold up the piece that is 2/3 and ask 'How much more do I need to make 1?' Record on the board: 2/3 + 1/3 = 1.
- Give each pair of students another strip of paper and invite them to fold it into quarters. Ask students to explore how many quarters added to how many quarters will make 1. Discuss students' findings and record them on the board, e.g. 1/4 + 3/4 = 1, 2/4 + 2/4 = 1 and 3/4 + 1/4 = 1.
- Show students a strip of paper folded into quarters and ask, 'How many more quarters do I need to add to this to make 1?' Discussion should reveal that 4/4 + 0 = 1 and, therefore, 0 + 4/4 = 1. These can be written with the other quarters facts.
- Give students another strip and ask them to explore fifths. Once students have found 1/5 + 4/5 = 1, 2/5 + 3/5 = 1, 3/5 + 2/5 = 1, 0 + 5/5 = 1 and 5/5 + 0 = 1 ask them to look carefully at the combinations that are equivalent to 1 and discuss with students if they can see any pattern. Discussion should reveal that the two numerators added together are the same as the denominator.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 30–31.

Assessment Task/s

- Make a set of Fraction Cards discarding any fraction cards that involve eighths, sixteenths and tenths. Hold up a card for a student and ask them to name the compatible fraction to make 1. Any difficulties can be noted to plan further work to address the problem.
- Have students complete the following number sentences.

3/4 + _____ = 1	2/5 + _____ = 1	1/3 + _____ = 1
_____ + 1/2 = 1	3/3 + _____ = 1	4/5 + _____ = 1

Recommendations

- Students having difficulty can use copies of the first five rows of a fraction wall. Have students cut out each row, colour one of the fractional parts and then see how many more are needed to make one. They can continue by colouring in the next fractional part and how many more to make one. They can explore this for thirds, quarters and fifths.
- Once students know the compatible fractions that make 1 they can then explore combinations that make 2.
- More able students can explore compatible fractions for sixths, sevenths, eighths, ninths and tenths.

Unit 15
Adding Simple Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 32–33

Teaching Focus: ***to add simple fractions by using an open number line to count on fractions with like denominators.***

You will need:

- For students to be successful at adding simple fractions on open number lines they need to be able to count different fraction patterns. Practise counting by halves, thirds, quarters, fifths and eighths. Begin counting from zero and then choose different non-zero starting points. Record counted sequences involving halves, thirds, quarters, fifths and eighths and display them around the room to help support students during this unit. If students are having difficulty counting by fractions, they might need to revisit Unit 2, Counting with Fractions, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 6–7 and the activities from the corresponding Teacher Support Notes.
- When students are proficient at counting fraction sequences explain that they are going to use the open number line strategy to count on fractions. First they need to be able to identify the larger fraction to count on from. Ask students to name the largest out of the following pairs of numbers. Note that there is no larger fraction in the pair 1/2, 1/2 because they are the same.

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

- When students have identified the largest number explain that they are going to add them together. On the left end of a number line mark 3/4 then count on the two quarters (4/4 or 1 and 1 1/4) to give the answer of 1 1/4.
- Continue working with students through the first five pairs of numbers. Then ask them to look carefully at the pair of numbers 1 4/5, 2 3/5. They know that 2 3/5 is the largest number and so is to be written on the left end of the number line. Explain that first the whole number or 1 needs to be counted on so the next number written on the number line would be 3 3/5. Then add the remaining four fifths to give 3 4/5, 4, 4 1/5 and 4 2/5 to give the answer of 4 2/5.
- Continue to work adding the remaining pairs of numbers using open number lines.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 32–33.

Assessment Task/s

- Have students explain how to solve the following problems using an open number line.

2/8 + 5/8

_____

1/2 + 2 1/2

_____

1 3/5 + 3 2/5

_____

2 2/3 + 5 2/3

_____

Recommendations

- Students experiencing difficulty should work with simple fractions on prepared number lines where they can count using the visual support.
- Students could make a ‘Help List’ for other students to avoid possible mistakes such as being careful when counting on and getting to a whole number.
- Students needing more of a challenge can add together fractions with different denominators using their understanding of equivalent fractions.

Unit 16

Compatible Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 34–35

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

You will need: fraction wall, playing cards with the 10s and picture cards removed, round counters

- Use a piece of paper divided into tenths. Ask students to colour in one tenth and ask them how many more tenths are needed to make 1. Record their findings as 0.1 + 0.9 = 1. Colour the next tenth so that two tenths are coloured in and ask them how many more tenths are needed to make 1 and record this as 0.2 + 0.8 = 1. Continue until all combinations have been explored.
- Revise students' understanding of compatible tenths by playing a game where students write down four decimals less than 1 such as 0.3, 0.9, 0.7 and 0.5. Roll a 10-sided die. If for instance a 1 is rolled, this denotes one tenth or 0.1. If a student has the compatible decimal that will go with 0.1 to make 1, then they can cross it off. The first student to cross off all their numbers is the winner.
- Write on the board a few of the compatible decimals that involve hundredths such as the following.

0.36 + 0.64	0.18 + 0.82	0.45 + 0.55	0.91 + 0.09
0.58 + 0.42	0.05 + 0.95	0.61 + 0.39	0.27 +0.73
0.87 + 0.13	0.79 + 0.21	0.25 + 0.72	0.38 + 0.62

Give each pair of students a calculator to work out the answer. Discuss what students have found. Ask students, 'If the answer equals 1 each time, what are all these pair of numbers?' Once students have established that they are compatible decimals ask them if they are able to explain what they are. Some students might see the connection to whole numbers that are compatible to 100. Others might see that the digits in the hundredths place always add to 1 and the digits in the tenths place always add to 9.

- Ask students to make a list of other compatible decimals.
- Ask students to look carefully at the list of problems below and identify the problems that involve compatible decimals.

0.94 + 0.06	0.28 + 0.53	0.76 + 0.39	0.19 + 0.81
0.24 + 0.76	0.87 + 0.13	0.69 + 0.39	0.51 +0.46
0.33+ 0.73	0.27 + 0.73	0.55 + 0.55	0.38 + 0.62

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 34–35.***

Assessment Task/s

- Ask students to make a list of ten compatible decimals that make 1.
- Ask students to name those which are **not** compatible decimals from the pairs of numbers below.

0.45, 0.65	0.78, 0.22	0.92, 0.08
0.65, 0.35	0.16, 0.94	0.32, 0.64
0.27, 0.75	0.58, 0.42	0.36, 0.68
0.37, 0.63	0.24, 0.72	0.96, 0.4

Recommendations

- Students having difficulty might need more time working on compatible tenths. Once they have a good understanding of compatible tenths give them a 10 by 10 grid and explain that the grid is 1 whole and each of the small squares is one hundredth or 0.01. Ask students to colour different decimals such as 0.32 and work out how many more to make 1.
- Students can practise recall of compatible decimals by using a round counter and then selecting two cards from a deck where the 10s and picture cards have been removed. They can read the decimals and then name the compatible decimal.
- Students who are able to quickly recognise compatible decimals can work on problems involving near compatible decimals such as 0.75 + 0.26. Students know that 0.75 + 0.25 = 1 and as 0.26 is one hundredths or 0.01 they can use this to answer the problem 0.75 + 0.26 = 1.01.

Unit 17

Adding Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 36–37

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

You will need: multiplication and division cards

- To be successful in using open number lines to add decimals students need to be able to count by decimals. Invite students to practise counting by standing them in a circle and giving them a starting point such as 0.34. Have students take turns to say the next number in the counting sequence. Practise using various starting points such as 2.12, 6.72, 3.88 and 5.02. If students are having difficulty counting by fractions, they might need to revisit Unit 3, Counting with Decimals, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 8–9 and the corresponding activities from the Teacher Support Notes.
- Explain that students are going to be adding decimal numbers together using the 'count on' strategy. Discuss what the 'count on' strategy is and the importance of being able to recognise the largest number to start counting on from. Write the following two numbers on the board.

  0.24, 0.67

Ask students which number is the largest and how they know. Invite students to identify the largest number from the following pairs of numbers.

0.56, 0.32	0.45, 0.76	0.01, 0.11	0.34, 0.45	0.89, 0.98
0.39, 0.38	0.75, 0.63	0.84, 0.38	0.91, 0.19	0.26, 0.56

- Present the following problem to students.

  0.7 + 0.6

Ask students which is the largest number and explain that 0.7 is to be placed on the left end of the open number line. Then count on six tenths 0.8, 0.9, 1, 1.1, 1.2, 1.3 to give the answer 1.3.

Keep modelling a few more problems involving tenths.

- Once students are familiar with adding tenths they are ready to tackle adding numbers with hundredths. Write the following problem in the board.

  0.32 + 0.53

Invite students to identify the larger number and write 0.53 on the left end of an open number line. Explain to students that just as with whole numbers they need to add the place-value parts starting with the largest first. The largest numbers in this example are the tenths. So they need to 'count on' the 0.3 or three tenths (0.63, 0.73, 0.83). Then they need to add on the 2 hundredths (0.84, 0.85) to give the answer of 0.85. Model a few more examples such as the following.

0.45 + 0.38	0.74 + 0.08	0.27 + 0.36	0.6 + 0.18

- Have students work with a partner to try a few examples such as the following.

0.36 + 0.57	0.61 + 0.24	0.27 + 0.54

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 36–37.

Assessment Task/s

- Collect samples of students' completed work.
- Have students complete the following problems using open number lines and the 'count on' strategy.

0.6 + 0.9

_____

0.45 + 0.31

_____

0.38 + 0.5

_____

Recommendations

- Students having difficulty might need to establish a better understanding of adding tenths before adding numbers involving hundredths as well.
- Invite students to make a set of decimal cards where they can write any numbers from 0.01 to 0.5. Have students work in groups of three where two students race one another to add two numbers selected from the cards and the third student checks the answer on a calculator. The first student with the correct answer wins. Students should change roles making sure that everyone has a chance to compete and check answers on the calculator.
- Students who need a challenge can try completing problems where there are three addends such as the following.

0.32 + 0.28 + 0.15

Unit 18
Subtracting Place-Value Units

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 38–39

Teaching Focus: ***to use knowledge of place value to subtract multiples of place-value units of 10s, 100s and 100s.***

You will need: MAB

- Invite students to work with a partner and model 278 with MAB. Write 278 on the board. Tell students that they are going to take away 10 and ask them to try imaging what the number would look like made out of MAB. Ask students to describe what it would look like – e.g. 2 hundreds, 6 tens and 8 ones. Ask students to take away ten and check their prediction. Record 268 on the board and ask students how the numbers are different. Students should be able to see that the digit in the tens place has decreased by 1. Have students model 345 and then visualise what the number would look like with 20 less, predict the number and check with the MAB. Invite students to look at the difference between 345 and 325 and note that the digit in the tens place has decreased by 2. Explain that this is because 2 tens have been taken away. Present students with other 3-digit numbers and have them name the number that is 30 less or 50 less.
- Ask students to make a model of 786 with the MAB and to visualise what it would look like with 200 less and predict the number. Compare the numbers 786 and 586 and discuss what has happened. They should be able to see that 5 is two less than 7 and so the digit in the hundreds place has decreased by 2. Have students name 300 less than 569, 941, 706, 850, 672 and 348. They can check their responses using MAB. Discuss how easy it is for students to take away place-value units from numbers mentally.
- Ask students to make a model of 1725 and then tell students to take away 400. Look at the numbers and note that the digit in the hundreds column has decreased by 4 to give 1325. Ask students to name the number 400 less than the following numbers: 2864, 1502, 1498, 2576 and 2430. Have them check responses using MAB.
- Next ask students to model 2463 with MAB and ask them what the number would be if they took away 1000. Students should be able to predict that the number would be 1463 and they can check their prediction with MAB. Ask students to name 100 less than numbers such as 4650, 3212, 1987, 2489 and 1043.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 38–39.***

Assessment Task/s
- Observe students as they complete the activities above.
- Have students take away 300 from other large numbers.

Recommendations

- Students having difficulty might need to work at taking away multiples of 10 and then when they can do that successfully work on taking away multiples of 100.
- Students needing a challenge can take away multiples of 100 and 10 where they need to think about renaming numbers. For example, taking 800 away from 1573 (which they need to mentally rename as 15 hundreds, 7 tens and 3 ones) will leave 7 hundreds, 7 tens and 3 ones (773).

Unit 19
Counting Back

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 40–41

Teaching Focus: to develop mental imagery to help students mentally subtract the place-value components of 3-digit numbers.

You will need: 10-sided dice (0–9)

- Students need to be competent in counting sequences that count back in place-value units from various starting points. Students should be able to begin at a number such as 475 and count back by 10 to give the counting sequence 465, 455, 445, 435, 425, 415, 405, 395 385, 375 and so on. Practise counting back by 10 from various starting points such as 246, 394, 782, 531 and 648. Students should also be able to count back by a 100 from various starting points such as 856 to give the sequence 756, 656, 556, 456, 356, 256, 156 and 56. Have students practise counting back by 100 from starting points such as 911, 784, 637, 892 and 948.
- As well as being able to count back by 10 and 100 from various starting points students need to be able to break numbers into their place-value parts. That is, they should see that 456 is made up of 4 hundreds, 5 tens and 6 ones. Students should practise breaking the following numbers into their place-value parts.
  672, 938, 459, 263, 585, 794, 107, 341
- Write the following problem on the board.
  64 – 27

Draw an open number line and on the right end put the number 64. Explain to students that to take away 27 they need to count back by place-value units starting with the largest which in this case is the tens. Demonstrate counting back 2 tens 54, 44 and then counting back 7 ones 43, 42, 41, 40, 39, 38, 37 to find the answer 37.
Encourage students to complete some more examples with 2-digit numbers such as those below.

84 – 36 54 – 28 73 – 35 61 – 37

- Present students with the following problem.
  152 – 94

Model for students that they need to put 152 on the right end of the number line, then count back 9 tens (142, 132, 122, 112, 102, 92, 82, 72, 62) and then count back the 4 ones (61, 60, 59, 58) to give the answer of 58.
Invite students to practise some more examples such as those below.

163–45 245–67 194–85 345–79

- Students should now be ready to take 3-digit numbers from 3-digit numbers.

Write the following problem on the board.

344–176

Draw an open number line with 344 at the right end of the line. Remind students that they need to count back in place-value units and that the largest unit this time is a hundred. So first they need to count back 1 hundred to get 244. Then count back 7 tens (234, 224, 214, 204, 194, 184, 174) and then count back 6 ones (173, 172, 171, 170, 169, 168) to get the answer 168.
Invite students to work with a partner to solve the following problems.

276–153 327–138 432–167 541–238

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 40–41.***

Assessment Task/s

- Collect samples of student work from the activities above.

Recommendations

- Students needing extra support might need to practise taking away 2-digit numbers (see Unit 26, Open Number Lines for Subtraction, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 54–55 and corresponding Teacher Support Notes).
- For further practice, students can play a game where they roll three dice and make the largest number possible. They then make the smallest number possible and calculate the difference between the two numbers. The student with the biggest difference is the winner. This game can be played with a partner or in small groups
- Students needing a challenge can work with examples where they subtract three subtrahends.

Unit 20

Counting Up To

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 42–43

Teaching Focus: ***to use the count up strategy to solve subtraction problems when numbers are close to each other and where it reduces the number of steps.***

- Explain to students that as well as being able to count back to find the answer to subtraction problems they can also solve subtraction problems by 'counting up to'. Write the following problem on the board.

  463–385

On an open number line put 385 on the left end and 463 on the right end. Explain to students that now they are going to count up from 385 to 463 and the difference will be the amount they have 'counted up'. Ask them to look carefully at the two numbers and ask, 'If I was to count up 1 hundred, what would I get?' Students should be able to calculate that they would get 485. Explain that 485 is more than 463 and so that would be 'counting up' too far. Explain that you are now going to 'count up' in tens to get near to 463. So you would count 395, 405, 415, 425, 435, 445 and 455. Discuss that if you counted another 10 you would get to 465 which is more than 463 and that you need to be careful so that you do not count past the number. Explain that you have 'counted up' 7 tens. Show that from 455 you count by ones (456, 457, 458, 459, 460, 461, 462 and 463). Explain that you have now 'counted up' 7 tens and 8 ones so the answer is 78.

- Model a few more examples for students such as those below.

  163–97 243–181 312–256 405–387

- Explain to students that 'counting up' is a useful strategy to use when they need to find the difference between numbers that might be close to one another. Ask students to find the difference between the following pairs of numbers.

  124, 86 164, 218 215, 263 344, 294

Remind students to start 'counting up' from the smaller number to the larger number.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 42–43.***

Assessment Task/s

- Collect samples of work from the above activity where students found the difference between the pairs of numbers.
- Have students use an open number line and the 'count up to' strategy to solve the following problem.

  243 – 189

Recommendations

- For students experiencing difficulty see Unit 23 Difference, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 48–49 and the corresponding Teacher Support Notes.
- Students needing more of a challenge can try this method using 4-digit number problems such as 2134 – 1873.
- As a class discuss the different strategies of 'counting back' and 'counting up to' using an open number line and ask which strategy students prefer and why.

Unit 21

Subtracting Fractions

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 44–45

Teaching Focus: ***to subtract simple fractions by using an understanding of counting patterns to count back fractions with like denominators.***

- To be able to use the counting back strategy to solve subtraction problems involving simple fractions students need to be competent at recalling the needed counting pattern. Practise counting by halves from various starting points such as 1 1/2, 3, 51/2, 9 and 11 1/2. Invite students to practise counting back from larger numbers such as 5 1/2, 8, 91/2, and 12. Have students practise counting by thirds both forwards and backwards from various staring points. Students can practise counting patterns for quarter, fifths and eighths. Remember to give different starting points and count forwards and backwards. See how far students can count by standing them in a circle and giving a starting number such as 2 1/5 and asking each student to add the next number and see how far they can count as a class. See if they can get to zero by giving a starting point such as 12 2/3 and having them count backwards.
- On the board write the following number sequence.

  1/2, 1, 1 1/2, 2, 2 1/2,

Invite students to continue the pattern until they have reached 7. Pose the following problem for students 4 1/2–1/2. Explain to students that they are able to solve a problem by 'counting back'. Find 4 1/2 in the counting sequence and count back 1/2 to get the answer 4. Invite students to solve the following problems.

  6 – 1/2 3 1/2 – 1/2 2 – 1/2 5 1/2 – 1/2

- Have students continue the following counting sequence, recording on the board.

  1/3, 2/3, 1, 1 1/3, 1 2/3, 2, 2 1/3,

Pose the following problem.

  5 – 2/3

Demonstrate finding 5 in the counting sequence and 'counting back' two thirds to get the answer (4 1/3). Invite students to complete the following problems.

  3 1/3 – 2/3 2 – 1/3 3 2/3 – 1/3 1 – 1/3

- Invite students to record and continue the following counting sequence in their books.

  1/4, 2/4, 3/4, 1, 1 1/4, 1 2/4,

Encourage students to use the count back strategy to solve the following.

  3 1/4 – 3/4 2 – 2/4 1 3/4 – 2/4 4 – 1/4

- Continue with students, asking them to record the counting sequence for fifths and eighths and posing some simple problems for them to solve.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 44–45.

Assessment Task/s

- Observe students as they complete problems from the above activities.

Recommendations

- For students experiencing difficulty, record and display the counting sequences that they might need to refer to them when solving simple problems.
- Students need to be able to look at a problem and think of the counting sequence that will help them solve the problem. Ask them to write the counting sequence that will help them solve the following problems.

  4 3/8 – 5/8 6 1/3 – 2/3 9 – 4/5 8 – 3/4
- Have students needing more of a challenge use their knowledge of equivalent fractions to continue the following counting sequence.

  1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1,

Invite students to solve the following problems.

2 1/4 – 5/8 1 1/4 – 3/8 2 1/8 – 1/4 1 1/2 – 7/8

Unit 22
Subtracting Decimals

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 46–47

Teaching Focus: ***to use the 'count back' strategy and open number lines to visually represent the subtraction of decimal numbers.***

- Record the following counting sequence on the board.
  4.3, 4.2, 4.1, 4, 3.9, 3.8, 3.7, 3.6, 3.5, 3.4, 3.3, 3.2, 3.1, 3, 2.9, 2.8, 2.7, 2.6

Ask students to look carefully and explain the counting sequence. Students should be able to determine that it is a pattern decreasing by one tenth each time. Present the following problem to students.

3.4 – 0.7

Explain to students that they can solve this problem by using the 'count back' strategy. Draw an open number line on the board and on the right hand end write the number 3.4 and then count back 7 tenths (3.3, 3.2, 3.1, 3, 2.9, 2.8, 2.7) to get the answer 2.7.
As a class work through a few more problems such as those below.

4.1 – 0.6 3.9 – 0.5 3.3 – 0.8 3.5 – 0.9 4.3 – 1.5

In the last problem make sure that students understand that they need to take away in place-value units, so first they would count back 1 to get 3.3 and then count back 5 tenths (3.2, 3.1, 3, 2.9, 2.8) to give the answer 2.8.

- Invite students to solve the following problems using open number lines and the 'count back' strategy.
- Once students are able to count back in tenths they are ready to use the 'count back' strategy for numbers involving hundredths as well. Invite students to continue the following number sequence.

0.05, 0.06, 0.07, 0.08, 0.09, 0.1, 0.11, 0.12, 0.13, 0.14,

- Present the following problem to students.
  0.23 – 0.14
- Draw a number line on the board with the 0.23 on the right end. Then explain to students that they need to count back in place-value units so the need to count back 1 tenth to give them 0.13 and then 4 hundredths (0.12, 0.11, 0.1, 0.09) giving the answer of 0.09.
- Work through a number of examples with students, including the need to 'count back' ones, tenths and hundredths such as:

1.32 – 0.19 1.82 – 0.64 2.34 – 0.83 2.45 – 0.58 2.52 – 1.37 4.63 – 2.28

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 46–47.

Assessment Task/s

- Have students solve the following problems using open number lines and the 'counting back' strategy.
  1.45 – 0.7 2.38 – 0.56 3.45 – 1.37

Recommendations

- To be successful students need to be proficient at counting back by tens and hundredths. For practice, see Unit 3, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 8–9 and the corresponding Teacher Support Notes.
- Have students experiencing difficulty record counting sequences for tenths and solve simple problems with tenths. When they are able to do that they can work with whole numbers and tenths.
- Students needing a challenge could try to work out the problems mentally without recording their workings on an open number line.

Unit 23

Commutative Property of Multiplication

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 48–49

Teaching Focus: ***to use the commutative property of multiplication of known facts to help recall more multiplication facts.***

You will need: square counters, centimetre grid

- In pairs, have students make a 3 by 4 array with square counters. Ask students to represent their array with a number sentence.

  $3 \times 4 = 12$

Ask students to carefully rotate their array a quarter turn and represent this with the number sentence.

  $4 \times 3 = 12$

Discuss with students that although the array has been rotated a quarter turn it still remains the same. Explain that this because multiplication is commutative. That is, for $3 \times 4 = 4 \times 3$.

- Invite students to test the commutative nature of multiplication by giving them a centimetre grid and colouring the arrays to solve the following problems.

$8 \times 2 =$	$2 \times 8 =$	$6 \times 4 =$	$4 \times 6 =$
$7 \times 1 =$	$1 \times 7 =$	$4 \times 10 =$	$10 \times 4 =$
$6 \times 5 =$	$5 \times 6 =$	$9 \times 0 =$	$0 \times 9 =$

Some students might need to work through more examples before they believe that multiplication is commutative.

- Ask students to make a list of the 2s multiplication facts and name the other fact that this helps them to solve.

$0 \times 2 = 0$	$2 \times 0 = 0$
$1 \times 2 = 2$	$2 \times 1 = 2$
$2 \times 2 = 4$	$2 \times 2 = 4$
$3 \times 2 = 6$	$2 \times 3 = 6$
$4 \times 2 = 8$	$2 \times 4 = 8$
$5 \times 2 = 10$	$2 \times 5 = 10$
$6 \times 2 = 12$	$2 \times 6 = 12$
$7 \times 2 = 14$	$2 \times 7 = 14$
$8 \times 2 = 16$	$2 \times 8 = 16$
$9 \times 2 = 18$	$2 \times 9 = 18$
$10 \times 2 = 20$	$2 \times 10 = 20$

- Ask students to work through other multiplication facts they know such as 1s, 4s, 5s and 10s.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 48–49.

Assessment Task/s

- Give students two minutes to see how quickly and accurately they are able to answer the following problems.

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

- Observe students as they play 'Around the World' (see Recommendations) taking note of any facts they are not able to recall.

Recommendations

- Students having difficulty might need to revise multiplication strategies from *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*.
- For students to be able to use the commutative property of multiplication they should be able to quickly and accurately recall the multiplication facts of 0s, 1s, 2s, 4s, 5s and 10s. To revise quick and accurate recall of number facts, play games such as 'Around the World'. Students form a circle. The teacher selects two students next to one another to begin. The teacher calls out a multiplication fact such as 6 × 2 and the first student to call out the correct answer wins. The winning student then plays the next student in the circle and this continues until all students have had a chance to challenge.
- Students needing more of a challenge might like to revise multiplication facts of 0s, 1s, 2s, 4s, 5s and 10s with larger numbers.

Unit 24

Multiplying by 8

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 50–51

Teaching Focus: ***to be able to multiply any number by 8 quickly and accurately by doubling, doubling and doubling again.***

You will need: multiplication and division cards, calculators, 10-sided dice (0–9)

- To enable students to be successful they need to be able to quickly and accurately recall doubles facts. Make some number cards such as 11 through to 25. Play games such as 'Maths Relay' where students are divided into teams, the teacher holds up a card and the first student from the front of the teams to name the correct double scores a point for their team. The front students then go to the back of their teams and the teacher continues hold up a card and the first to name the double correctly wins a point for their team. The game continues so that all players have at least one turn to compete. The team with the most points wins. More cards can be made to make the task easier or more difficult.
- Once students are confident revise strategies for multiplying by 2 and 4. See Units 29 and 32 from *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 3*, pp. 60–61 and pp. 66–67.
- Write the following on the board.

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 =

Remind students that to multiply any number by 2 they need to double the number and to multiply any number by 4 they need to double and double again. Ask students to complete the multiplication tables above. Ask the students to look closely at the answers and to look for any pattern they can see between the 2s and 4s multiplication facts. Hopefully they can see that the answers for the 4s are double that of the 2s.

- Next to the 2 and 4 times tables list the 8 times tables. Encourage students to use a calculator to work out the answer.

1 × 2 = 2	1 × 4 = 4	1 × 8 =
2 × 2 = 4	2 × 4 = 8	2 × 8 =
3 × 2 = 6	3 × 4 = 12	3 × 8 =
4 × 2 = 8	4 × 4 = 16	4 × 8 =
5 × 2 = 10	5 × 4 = 20	5 × 8 =
6 × 2 = 12	6 × 4 = 24	6 × 8 =
7 × 2 = 14	7 × 4 = 28	7 × 8 =
8 × 2 = 16	8 × 4 = 32	8 × 8 =
9 × 2 = 18	9 × 4 = 36	9 × 8 =
10 × 2 = 20	10 × 4 = 40	10 × 8 =

Then draw students attention to the fact the answers for the 8 times table are double that of the 4 times table and that to work out any number multiplied by 8 all they have to do is to double, double again and double again.

- Ask students to check that the strategy is correct by rolling a die and then asking them to double, double again and double again and then to check on a calculator to see if the strategy works.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 50–51.***

Assessment Task/s

- Have students complete the following problems.

3 × 8 =	5 × 8 =	8 × 8 =	3 × 8 =	0 × 8 =	9 × 8 =
6 × 8 =	10 × 8 =	2 × 8 =	4 × 8 =	11 × 8 =	1 × 8 =

- Call out the following numbers and ask students to mentally multiply them by 8 using the double, double again and double again strategy.

  8, 2, 4, 10, 5, 3, 12, 15

Recommendations

- Students experiencing difficulty might need more practice with automatically recalling doubles facts. Invite them to play games such as ‘Around the World’ were students form a circle and two students next to one another compete. The teacher calls out a number and the first student to name the correct double wins the challenge. The next student in the circle becomes the challenger. All students have a chance to compete and the student who has won the final challenge is the winner.
- For practice, students can play ‘Beat the Calculator’. One student has a calculator and the other student uses the double, double again and double again strategy to multiply the number by 8. A die is rolled and that number is multiplied by 8. The student using the mental strategy tries to ‘beat’ the calculator by answering before it is calculated on the calculator.
- Students needing more of a challenge can try using the strategy to multiply larger numbers by 8.

Unit 25

Multiplying by 3

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 52–53

Teaching Focus: ***to use doubling and adding on the number being multiplied to be able to multiply any number by 3 quickly and accurately.***

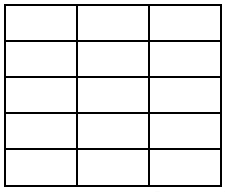
You will need: square counters, calculators

- On a multiplication grid ask students to fill in the facts they are able to recall using various mental strategies and the commutative property of multiplication.

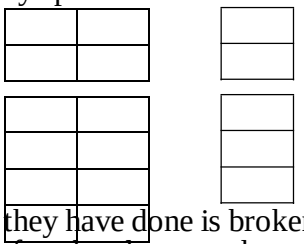
X	0	1	2	3	4	5	6	7	8	9	10
0											
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Discuss with students that they already know many of the 3 times tables multiplication facts. Ask students to make a list of them.

- Ask students to use square counters to make arrays of 5 × 3 and find that it is 15.



Ask students to break the array apart so that it looks like this.



Discuss with students that all they have done is broken the array apart and its value is still 15. Draw their attention to the fact that they now have 5 × 2 and 5 × 1. They are easily able to work out the first section from their doubles fact (10) and they know that any number multiplied by 1 is the same, so it will be 5 and 10 and 5 is 15.

- Repeat for other examples such as 7 × 3, 4 × 3, 10 × 3, 3 × 3 asking students to make the array and then breaking into the two parts so they can then see 7 × 2 and 7 × 1 and so on.

- Discuss a possible strategy that to multiply any number by 3 is to double the number and then add on one set of the number. Ask students to try out the strategy for 8×3, 10×3, 15×3, 50×3, 100×3 and 200×3.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 52-53.***

Assessment Task/s

- Observe students as they complete the activities above.

Recommendations

- For this to be a successful strategy, students need to know their doubles facts and be able to add numbers mentally. Students having difficulty need to practise these skills first.
- For practice, play 'Maths Chasey' where students find a spot in the room. The teacher calls out a number such as 'eight' and the child who knows what the number is multiplied by is put up their hand. The teacher selects the first student who puts up their hand to answer. If the student is correct they may take one step in any direction. If they can tag another student the student is then out of the game. If they answer incorrectly they are out of the game. The last student left in the game wins.
- For students needing a challenge try the strategy with larger numbers. They can try to 'Beat the Calculator' (see Unit 24).

Unit 26

Multiplying by 6

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 54–55

Teaching Focus: ***to use recall of 3 times tables and doubling to be able to quickly and accurately multiply any number by 6.***

You will need: calculator

- Students need to be able to quickly and accurately be able to recall 3s multiplication facts. If students cannot multiply numbers by 3 then see Unit 25, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 52–53.
- To practise recall of 3s facts, play 'Around the World' (Unit 24) or 'Maths Relay' (Unit 24).
- Write on the board the 3 times tables for students to complete.

  1 × 3 =
  2 × 3 =
  3 × 3 =
  4 × 3 =
  5 × 3 =
  6 × 3 =
  7 × 3 =
  8 × 3 =
  9 × 3 =
  10 × 3 =
- Then next to the three times table write the six times table.

1 × 3 = 3	1 × 6 =
2 × 3 = 6	2 × 6 =
3 × 3 = 9	3 × 6 =
4 × 3 = 12	4 × 6 =
5 × 3 = 15	5 × 6 =
6 × 3 = 18	6 × 6 =
7 × 3 = 21	7 × 6 =
8 × 3 = 24	8 × 6 =
9 × 3 = 27	9 × 6 =
10 × 3 = 30	10 × 6 =

Encourage students to use a calculator to complete the 6 times table. Ask students to compare the answers from the 3 times table to those of the 6 times table. Discuss with them how the answers of the 6 times tables are double those of the 3 times tables. Ask them to think of a possible mental strategy that they might be able to use. Students should be able to see that if they multiply and number by 3 and then double it, it is the same as multiplying by 6.

- Have students test the strategy in pairs with one student working on the mental strategy and the other checking answers with a calculator.
- Ask students to try the mental strategy to answer the following.

4 × 6 =	6 × 6 =	9 × 6 =	1 × 6 =	3 × 6 =	11 × 6 =
7 × 6 =	2 × 6 =	8 × 6 =	5x 6 =	10 × 6 =	0 × 6 =

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 54–55.***

Assessment Task/s

- Ask students to mentally multiply the following numbers by 6.
  5, 7, 2, 3, 10, 100, 30, 15, 11
- Observe students as they play the 'Grid Game' (see Recommendations).

Recommendations

- Students experiencing difficulty might need more practice to quickly and accurately multiply numbers by 3 and remember their doubles facts.
- For practice recalling the 6 times table, encourage students to work in pairs and play the 'Grid Game'. Students draw a 6 × 6 grid and roll a die to get a number. They then multiply that number by 6 and record the answer on the grid. Students continue rolling the die and multiplying the number by 6 and writing on the grid until the grid is complete. Students then take turns rolling the die and if they can find the number rolled on the grid, they can put their counter on it. Each student has different coloured counter. Students take turns to roll the die and place their counter. They can only place one counter for each roll of the die. The first student to place five counters in a row vertically, horizontally or diagonally wins the game. This game can be varied by changing the numbers on the die to match their ability level.
- Students needing more of a challenge can use the mental strategy to multiply larger numbers. They can play 'Beat the Calculator' (see Unit 24) with a partner.

Unit 27

Multiplying by 9

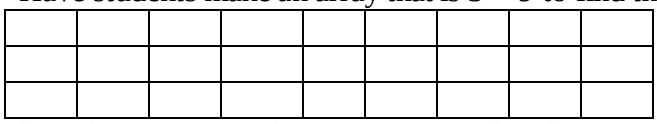
Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 56–57

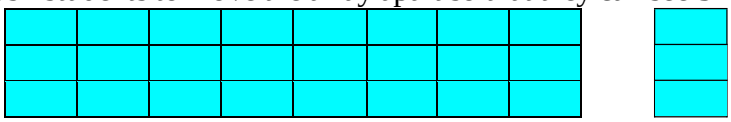
Teaching Focus: ***to be able to multiply any number by 9 quickly and accurately by multiplying by 10 and taking away the number being multiplied or by doubling, doubling, doubling and adding the number being multiplied.***

You will need: square counters, calculators

- Have students make an array that is 3 × 9 to find the answer 27.



Then ask students to move the array apart so that they can see 3 × 8 and 3 × 1.



Ask students to check that they still have the same number of counters. Discuss with students that if they multiply a number by 8 and then add on one more set of that number, it is the same as multiplying a number by 9.

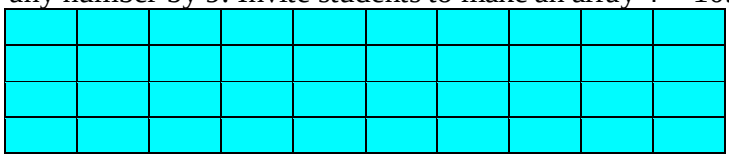
- Discuss how students already know a mental strategy that helps them to multiply any number by 8 (see Unit 24) and that is double, double again and double again. Revise mentally multiplying numbers by 8 by playing 'Maths Relay' (Unit 24), 'Around the World' (Unit 24) or 'Maths Chasey' (Unit 25).
- When students can quickly and accurately multiply a number by 8 they are ready to use the mental strategy of multiplying by 8 and adding one set of the number, which will enable them to multiply any number by 9. Ask students to try the strategy to find the answers to the following problems.

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

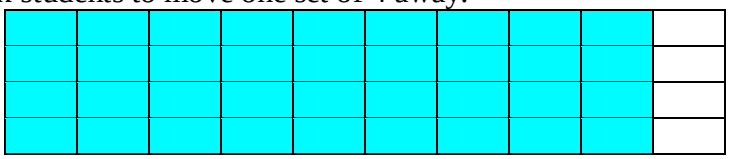
See if students are able to use the strategy to multiply larger numbers by 9 such as the following.

12, 20, 100, 15, 50

- Explain to students that there is another strategy that they can also use to multiply any number by 9. Invite students to make an array 4 × 10.



Then ask students to move one set of 4 away.



Explain that they made a 4 × 10 array and took one set of 4 away to give them a 4 × 9 array. So if they multiply a number by 10 then take one set of that number away it will be the same as multiplying by 9. So, to solve 5 × 9 ask students to multiply 5 by 10 to get 50 and then to take away 5 to give the answer of 45. As a class solve the following problems using the mental strategy of multiplying by 10 and then taking one set away. Then invite students to check the strategy with a calculator.

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

- Have students solve the following problems using whatever strategy they wish.

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

Ask students to look at the answers for each of the problems. Discuss with students that if they add the digits in the answer they get 9. This can be useful in checking as they will know that the answer is correct if the digits total 9.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 56-57*.**

Assessment Task/s

- Observe students as they play 'Beat the Calculator' (see Unit 24) and see how quickly and accurately they can multiply numbers by 9. Ask students to work in pairs. One student uses a calculator to solve the problem while the other tries to mentally find the answer faster. Students can use a 10-sided die to roll a number that is multiplied by 9.
- Ask students to explain which mental strategy they prefer to use and why. This should demonstrate students' understanding of the mental strategy.

Recommendations

- Discuss with students which strategy they prefer to use. If students are very good at doubling they can double, double again, double again and add one set of the number. If students find it easy to multiply the numbers by 10, then they might prefer the strategy that involves multiplying by 10 and taking one set of the number away.
- Some students might have difficulty if they are not proficient at multiplying by 10 or doubling and could need further practice with these strategies.
- Students who find multiplying single digits by 9 easy can try mentally multiplying 2-digit numbers by 9.

Unit 28

Multiplying by 7

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 58–59

Teaching Focus: ***to investigate multiplication tables to understand that only one fact needs to be learned to know the 7 times tables.***

You will need: 10-sided dice (0–9) or spinners

- Present students with a multiplication grid.

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

As a class discuss the mental strategies students already know to multiply numbers. As students name strategies colour the appropriate column and row on the grid. Discuss with students that they know all of the multiplication facts except 7 × 7.

- Ask students to make a 7 × 7 array to find the answer 49.

- Discuss with students the shape of the array. Ask them to make other square arrays and record the problems and answers. Explain to students that the answers are what are known as ‘square numbers’.
- As students now have strategies that enable them to quickly and accurately recall multiplication facts ask them to see how many of the following problems they can answer in one minute.

4 × 9 =	3 × 6 =	8 × 2=	5 × 10 =	7 × 0 =	1 × 13 =
5 × 2 =	9 × 5=	1 × 8 =	7 × 0 =	2 × 4 =	6 × 6 =
0 × 15 =	7 × 10 =	4 × 1 =	2 × 3 =	8 × 7 =	10 × 2=
8 × 10 =	7 × 7 =	2 × 11 =	9 × 6 =	6 × 2=	4 × 10 =

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 58–59.

Assessment Task/s

- Collect samples of students work from the above activity.

Recommendations

- Students having difficulty might need to revisit the units for Multiplication Strategies in *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 58–69 and *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 48–59.
- To practise recall of multiplication facts, have students play in groups of 3. One student is the judge who decides which student has answered correctly in the quickest time. The other two students compete by each rolling a die and finding the product of the two numbers multiplied.

Unit 29

Multiplying by Multiples of 10

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 60–61

Teaching Focus: ***to use the understanding of how to multiply numbers by 10 and the additional steps to multiply any number by 20, 30 and 40.***

You will need: calculators, multiplication and division cards

- Students need to be able to quickly and accurately multiply numbers by 10. Discuss the mental strategy of moving a place-value column to multiply any number by 10. Then ask students to practise multiplying numbers by 10 by playing 'Around the World' (Unit 24), 'Maths Relays' (Unit 24) and 'Maths Chasey' (Unit 25).
- Ask students to complete the following problems on the board.

  $1 \times 10 =$
  $2 \times 10 =$
  $3 \times 10 =$
  $4 \times 10 =$
  $5 \times 10 =$
  $6 \times 10 =$
  $7 \times 10 =$
  $8 \times 10 =$
  $9 \times 10 =$
  $10 \times 10 =$
- Once students have quickly answered the problems above write the following problems next to them so that they will be able to easily compare answers. Students can use a calculator to answer the problems.

$1 \times 10 = 10$	$1 \times 20 =$
$2 \times 10 = 20$	$2 \times 20 =$
$3 \times 10 = 30$	$3 \times 20 =$
$4 \times 10 = 40$	$4 \times 20 =$
$5 \times 10 = 50$	$5 \times 20 =$
$6 \times 10 = 60$	$6 \times 20 =$
$7 \times 10 = 70$	$7 \times 20 =$
$8 \times 10 = 80$	$8 \times 20 =$
$9 \times 10 = 90$	$9 \times 20 =$
$10 \times 10 = 100$	$10 \times 20 =$

When the answers have been recorded ask students to look at the answers and see if they can see any pattern occurring between what happens when a number is multiplied by 10 and 20. Students should realise that when a number is multiplied by 20 the answer is double that of when it is multiplied by 10. Suggest to students that to multiply a number by 20 you can multiply it by 10 and then double it.

- In pairs, have students test the strategy. One student uses a calculator and the other uses the strategy of multiplying by 10 and then doubling. Ask students to multiply the following numbers by 20.

  3, 9, 10, 12, 15, 100, 40
- Ask students to think about multiplying numbers by other multiplies of 10 such as 30 and 40. Have them devise a mental strategy and then test it by using the strategy and checking on a calculator.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 60-61*.**

Assessment Task/s

- Ask students to explain what mental strategy they would use to solve the following problems.

  9x 20 = 7 × 30 = 5 × 40 =

- Ask students to solve the following problems.

  4 × 20 = 6 × 30= 8 × 20= 2 × 40=

  8 × 30 = 2 × 20 = 0 × 40 = 5 × 30 =

Recommendations

- Students experiencing difficulty might need to practise multiplying numbers by 10 see Unit 30, *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 62– 63.
- Students needing more of a challenge can try using the strategy to multiply 2-digit numbers and decimals by multiples of 10.
- For further practice, students can play 'Beat the Calculator' (see Unit 24). Students can make cards with problems such as 3 × 40, 8 × 20, 6 × 30 and so on. Students then compete against one another, where one uses a calculator to solve the problem and the other uses the appropriate mental strategy. The student who finds the correct solution the quickest keeps the card. The student with the most cards wins.

Unit 30

Multiplying by 100

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 62–63

Teaching Focus: ***to use place-value understanding to quickly and accurately multiply numbers by 100.***

You will need: calculator, place-value chart

- Revise with students their strategy for multiplying a number by 10. Discuss that rather than 'adding a zero' it is best to move the number across two place-value columns. So 346 can be set out as follows:

Thousands	Hundreds	Tens	Ones
	3	4	6

And when it is multiplied by ten it becomes:

Thousands	Hundreds	Tens	Ones
3	4	6	0

Practise multiplying the following numbers by 10.

8, 3, 16, 78, 142

- Ask students to use a calculator to multiply the following numbers by 100.

1	11	21
2	12	22
3	13	23
4	14	24
5	15	25
6	16	26
7	17	27
8	18	28
9	19	29
10	20	30

Record the answer next to the numbers being multiplied by 100.

- 1 – 100, 2 – 200, 3 – 300, 4 – 400, 5 – 500, 6 – 600, 7 – 700, 8 – 800, 9 – 900, 10 – 100
- 11 – 1100, 12 – 1200, 13 – 1300, 14 – 1400, 15 – 1500, 16 – 1600, 17 – 1700, 18 – 1800, 19 – 1900, 20 – 2000
- 21 – 2100, 22 – 2200, 23 – 2300, 24 – 2400, 25 – 2500, 26 – 2600, 27 – 2700, 28 – 2800, 29 – 2900, 30 – 3000

Ask students to look at what happened to the number when it was multiplied by 100. Devise with students a useful strategy for multiplying a number by 100. Rather than 'adding two zeros' ask students to realise that the number moves across two place-value columns. So, even if they were to multiply a decimal by 100 such as 2.45 rather than adding two zeros (2.4500) – which does not change the value of the number – they should move it across two place-value columns to get 245.

- Have students multiply the following numbers by 100.

45, 7, 21, 16, 50, 9, 54

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 62–63.***

Assessment Task/s

- Ask students to multiply the following numbers by 10 and 100.
  13, 8, 3, 45, 0, 9, 15
- Ask students to explain the mental strategy that they used to:
  a) multiply by 10
  b) multiply by 100.

Recommendations

- Students experiencing difficulty might need to work with MAB to model the process and develop visual images of what happens when a number is multiplied by 10 and 100.
- Once students are familiar and confident to multiply whole numbers by 10 and 100 they can try to multiply decimals numbers by 10 and 100. Using a place-value chart ask students to write in the number (such as 4.3) and then move across one place-value column to multiply by 10 (to get 43). Then ask them to move across two place-value columns to multiply by 100 (to get 430). Students can practise using the place-value chart for numbers such as 9.3, 7.1, 12.7, 10.6, 27.4 and 123.8.

Unit 31

Halving

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 64–65

Teaching Focus: ***to use recall of halves facts to quickly and accurately solve problems where the numbers are divided by 2 and 4.***

You will need: calculators

- Invite students to halve the following numbers.
  8
  14
  20
  12
  6
  2
  18
  4
  16
  10
- Then ask students to complete the problems that have been written next to the numbers that were halved.

8	4	8 ÷ 2 =
14	7	14 ÷ 2 =
20	10	20 ÷ 2 =
12	6	12 ÷ 2 =
6	3	6 ÷ 2 =
2	1	2 ÷ 2 =
18	9	18 ÷ 2 =
4	2	4 ÷ 2 =
16	8	16 ÷ 2 =
10	5	10 ÷ 2 =

- When students complete the problems ask them to compare the answers so that they can see that to halve a number is the same as dividing it by 2.

8	4	8 ÷ 2 = 4
14	7	14 ÷ 2 = 7
20	10	20 ÷ 2 = 10
12	6	12 ÷ 2 = 6
6	3	6 ÷ 2 = 3
2	1	2 ÷ 2 = 1
18	9	18 ÷ 2 = 9
4	2	4 ÷ 2 = 2
16	8	16 ÷ 2 = 8
10	5	10 ÷ 2 = 5

- To be successful dividing by 2, students need to be able to halve numbers. Practise halving by playing games such as ‘Around the World’ and ‘Maths Relay’ see (Unit 24). For any student who appears to be having difficulty see Unit 33 *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 68–69 and the accompanying Teacher Support Notes for revision of halving.

- Ask students to use a calculator to solve 16 ÷ 4. Then tell students to halve and halve again. Ask students what they notice. Repeat for 44 ÷ 4, 100 ÷ 4, 40 ÷ 4 and 24 ÷ 4. Ask students to work out the problem with a calculator and then by halving and halving again. Discuss with students that to halve and halve again is the same as dividing a number by 4.
- Have students write a mental strategy for dividing any number by 4. Ask them to work with a partner and test their strategy – one student using a calculator and the other using the mental strategy. Have students complete problems such as the following.

  16 ÷ 4 =
  28÷ 4 =
  4 ÷ 4 =
  20 ÷ 4 =
  12 ÷ 4 =
  32 ÷ 4 =
  8 ÷ 4 =
  40 ÷ 4 =
  24 ÷ 4 =
  36 ÷ 4 =
- Discuss with students why they think the strategy works.

Have students complete **Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 64–65.***

Assessment Task/s

- Collect samples of students' workings of the above problems.
- Have students solve the following problems.

28 ÷ 4 =	16 ÷ 2 =	36 ÷ 4 =	44 ÷ 4 =
40 ÷ 2 =	16 ÷ 4 =	24 ÷ 2 =	32 ÷ 2 =

  Have students explain their strategy for:
  a) dividing by 2
  b) dividing by 4.

Recommendations

- Students having difficulty might need more practice halving numbers. They can work with counters making groups and halving.
- Students needing more of a challenge can try using the strategy with larger numbers such as the following.

120 ÷ 4 =	92 ÷ 4 =	180 ÷ 4 =	64 ÷ 4 =	128 ÷ 4 =
76÷ 4 =	104÷ 4 =	144 ÷ 4 =	84 ÷ 4 =	100 ÷ 4 =

Unit 32

Multiplication Facts to Solve Division

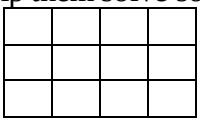
Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 66–67

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

You will need: square counters

- Present students with the division sign ÷ and ask them what it means. Brainstorm possible terms such as 'is divided by', 'how many groups of', 'shared between'. Discuss that when students are dividing they are sharing into equal size groups. Students can make posters about what the division sign means – perhaps giving a story and a picture to explain a particular equation such as 16 ÷ 8, 15 ÷ 3, 28 ÷ 7, 36 ÷ 6 and so on, with each student explaining a different equation.
- Explain to students that they are going to use their knowledge of multiplication facts to help them solve some division facts. Ask them to make a 4 × 3 array.



Students can see that 4 × 3 = 12. Pose the following problem: 'If I wanted to solve 12 ÷ 3, how can the array we have made help us?' During discussion students should be able to say that as the array shows that 4 groups of 3 makes 12 then they know that when 12 is shared into 3 equal groups there are 4 in each group.
- Continue asking students to make arrays such as 4 × 5 and solve 20 ÷ 5.
- When students are familiar with the idea ask them to list known multiplication facts and then write the corresponding division facts that they can solve. So, for the 2 times table they will have:

1 × 2 = 2	2 ÷ 2 = 1
2 × 2 = 4	4 ÷ 2 = 2
3 × 2 = 6	6 ÷ 2 = 3
4 × 2 = 8	8 ÷ 2 = 4
5 × 2 = 10	10 ÷ 2 = 5
6 × 2 = 12	12 ÷ 2 = 6
7 × 2 = 14	14 ÷ 2 = 7
8 × 2 = 16	16 ÷ 2 = 8
9 × 2 = 18	18 ÷ 2 = 9
10 × 2 = 20	20 ÷ 2 = 10

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 66–67.

Assessment Task/s

- Ask students to list five multiplication facts that they know and the division problems that they can solve using the multiplication fact.

Recommendations

- Students having difficulty can work making arrays to explore division problems that they can solve.
- Ask students to work with a partner and write out the multiplication facts they know and the division problems that they can solve. These lists can be displayed around the room.
- More able students can solve problems that match the difficulty of multiplication problems that they are able to solve.

Unit 33

Factors

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4,* pp. 68–69

Teaching Focus: ***to use understanding of multiplication to generate related division facts that will help identify factors.***

You will need: centimetre grid, square counters

- Give each student a centimetre grid. Ask them to make as many arrays as they can that make 4. Students should be able to make a 1 × 4 array, a 2 × 2 array and a 4 × 1 array.
- Ask students for the multiplication facts that they have shown with their arrays and record them on the board.

  1 × 4 = 4
  2 × 2 = 4
  4 × 1 = 4

Explain to students that the numbers 1, 2 and 4 are factors of 4 as they are the numbers that will make 4 when multiplied.

- Ask students to name the division facts that they know about 4 and record these on the board.

  4 ÷ 1 = 4
  4 ÷ 4 = 1
  4 ÷ 2 = 4

- On a centimetre grid ask students to make as many arrays as they can for 15. Again record the multiplication facts that they have found for 15.

  1 × 15 = 15
  3 × 5 = 15
  5 × 3 = 15
  15 × 1 = 15

Ask students to list the factors for 15 and then the division facts that they know.

- Ask students to make as many arrays as they can for 12 and list the factors.

Ask students what number is always a factor? Students should begin to realise that 1 and the number itself are always factors.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 68–69.

Assessment Task/s

- Ask students to list the factors for:

  12
  8
  16
  9

Recommendations

- Students having difficulty might need time to explore the different arrays. Making the arrays first with square tiles could help them work out all the possible arrays. Students can then record the arrays onto a centimetre grid.
- Students can work individually or with a partner and explore different numbers by making the arrays, finding the factor and listing the related division problems.
- Students needing more of a challenge could work with larger numbers such as 64.

Unit 34

Remainders

Teacher Support Notes

Recommended introductory lesson to *Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4*, pp. 70–71

Teaching Focus: ***to use an understanding of multiplication to solve division problems where there will be remainders in the answer.***

You will need: counters, multiplication and division cards

- Ask students what strategies they know for solving division problems. Make a list of them on the board. These should include halving and an understanding of multiplication facts. Present students with the following problem.

  8 ÷ 3

Ask students how they could go about solving this problem. Go through the strategies and discuss how they cannot use halving and that the 3 times tables cannot help them.

  0 × 3 = 0
  1 × 3 = 3
  2 × 3 = 6
  3 × 3 = 9

As 3 is not a factor of 8 then there is not a related multiplication fact to help. Ask a student to read the problem as '8 shared between 3'. Give students some counters to try to solve the problem.

- Remind students that they must be shared into equal groups. Many students will be able to work out that when they share 8 into 3 groups the groups they will have 2 in each group with 2 left over. Record the answer on the board.

  8 ÷ 3 = 2 r 2

Explain that this means that 8 has been shared between 3 and that there are 2 left over. Explain that the 2 left over are the remainders.

- Present students with another example.

  5 ÷ 2

Ask students, 'If 2 is not a factor of 5, then will there be a remainder in this problem?' Ask students to think about their 2 times table.

  0 × 2 = 0
  1 × 2 = 2
  2 × 2 = 4
  3 × 2 = 6

Explain to students that as 3 × 2 = 6, which is more than 5, they need to go back to 2 × 2 = 4. This will tell them that there will be 2 shared between 2, and as 5 is 1 more than 4 there will be 1 remaining.

- As a class work through a few more examples.

  9 ÷ 4 13 ÷ 6 15 ÷ 4 10 ÷ 3 11 ÷ 5

- Explain that we know when we look at a division problem that there will be a remainder if the divisor is not a factor. Ask students to identify which of the following problems will have a remainder.

  24÷ 8 25 ÷ 6 28 ÷ 5 27 ÷ 3 30 ÷ 6 27 ÷ 2

Then have students solve the problems.

Have students complete* Nelson Maths: Australian Curriculum Building Mental Strategies Skill Book 4, *pp. 70–71.

Assessment Task/s

- Collect samples of students work from above activity.
- Ask students to solve the following problems.
  25 ÷ 5 28 ÷ 3 20 ÷ 6 24 ÷ 7 22 ÷ 4 21 ÷ 7
- Ask students to explain what a remainder is.

Recommendations

- Students experiencing difficulty will need more experience working with concrete aides such as counters to help the solve division problems.
- For practice, ask students to play a game called ‘Remainders’. Give each pair of students multiplication and division cards and ask them to write the numbers 11 to 25 on the cards. Students take it in turns to select a card, roll a die and divide it by the number on the die. For example, a player may select a card with 18, roll a 4 on the die and then solve 18 ÷ 4 to give the answer 4 r 2. The player then collects two counters as the remainder was 2. Each student has five turns and the student with the most counters at the end is the winner.

