DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Number: Fractions

Level 2 (Year 3-4)

Teacher Booklet

Level 2/Year 3-4 teacher booklet: Number: Fractions

Task 1	What are all the different ways you can use the fraction tiles to equal one whole? As you make these record them and be ready to explain and justify how they make one whole. What are all the different ways you can use the fraction tiles to equal a fraction that is less than one whole? As you make these record them and be ready to explain and justify why they are less than one whole. What are all the different ways you can use the fraction tiles to equal a fraction that is more than one whole? As you make these record them and be ready to explain and justify why they are more than one whole.
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols.
Learning Outcomes: Students will be able to:	• Combine and recombine different units of fractions to make one whole. • Identify and recognise equivalent fractions.
Mathematical language	Whole, half, halves, quarters, fourths, fraction, fractional number, whole number, eighths, equal, equivalent.
Sharing back/Connect	Select students to share who made combinations of the whole or other fractions using the same size pieces (halves, quarters, eighths) and recorded the combinations as numbers, equations, or words. Then, select students to share who made combinations of the whole using the unlike fraction pieces (e.g., ½ + ¼ + ¼ = 1) and recorded the combinations as numbers, equations or words. If no students did this, then introduce as an alternative solution that students previously shared. **Connect:** What is 2/2 the same as? What is 4/4 the same as?

	What is 8/8 the same as? What patterns and relationships do you notice? What other fractional numbers are the same as one whole? [Encourage students to record using equals sign 2/2 = 5/5 = 100/100] What is a rule for fractions that equal one whole? [Record conjectures and symbolise as *n*/*n*].
Teacher Notes	• Have fraction pieces for the whole, quarters, halves and introduce eighths at the second task. • Monitor for students using the words fractional numbers (not pieces or bits). • Notice students who make generalisations (e.g., the smaller the denominator the bigger the fraction when the numerator is one). Record these as class conjectures and have students explore and prove at a later date as a warm-up activity. • Expect students to represent materials and use appropriate notation and the equal sign (2/2 = 1). • For the independent task, you will need fraction tile sets.
Independent Tasks	Use the fraction tiles to make different combinations that will equal one whole. Record these using at least three different representations (drawings, equations). Use the fraction tiles to make different combinations that will equal less than one whole. Record these using at least three different representations (drawings, equations). Use the fraction tiles to make different combinations that will equal more than one whole. Record these using at least three different representations (drawings, equations).
Anticipations	

Task 2	What are all the different ways you can use the fraction tiles to equal a fraction that is less than one half? As you make these record them and be ready to explain and justify why they are less than one half. What are all the different ways you can use the fraction tiles to equal a fraction that is more than one half but less than one whole? As you make these record them and be ready to explain and justify why they are more than one half and less than one whole. What are all the different ways you can use the fraction tiles to equal a fraction that is more than one whole but less than two? As you make these record them and be ready to explain and justify why they are more than one whole and less than two.
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols.
Learning Outcomes: Students will be able to:	• Combine and recombine different units of fractions to make one whole.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, fraction, fractional number, whole number, eighths, equal, equivalent, numerator, denominator.
Sharing back/Connect	Select students to share who made combinations of fractions using the same size pieces (halves, thirds, quarters, eighths) and recorded the combinations as numbers, equations, or words. Then, select students to share who made combinations using the unlike fraction pieces (e.g., ½ and 1/3 is more than ½ but less than one whole) and recorded the combinations as numbers, equations or words. If no students did this, then introduce as an alternative solution that students previously shared. **Connect:**

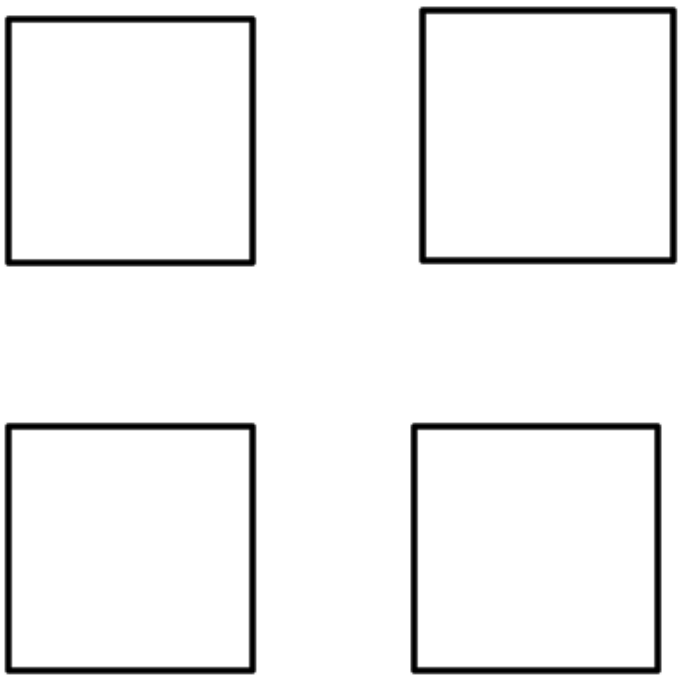
	Use your fraction tiles to find and record fractions that are the same as one half. What other fractions do you know that are the same as one half? What patterns and relationships do you notice? What is a rule for fractions that are equivalent to one half? [e.g., the numerator has to be half of the denominator]
Teacher Notes	• Have fraction pieces for the whole, quarters, halves, eighths and thirds. • Facilitate the students to notice that the numerator names the numbers of pieces of the whole and the denominator names the number of pieces the whole has been divided into. • Monitor for students using the words fractional numbers (not pieces or bits) and justifying their statements using both fraction pieces and notation. • For the independent activity, have fraction tiles for whole, halves, quarters, and thirds available.
Independent Tasks	Identify which number sentences are true or false. 20 + 20 + 70 = 40 + 70 ½ + ½ + ¼ + ¼ = 2/2 + 2/4 18 + 6 = 17 + 7 1 = ¼ + ¼ + ¼ 2 + 2 = 4/4 + 2/2 + 3/3 ¼ + ¼ + ⅓ = 1/3 + ½ Explain and prove why you think the number sentences are true or false
Anticipations	

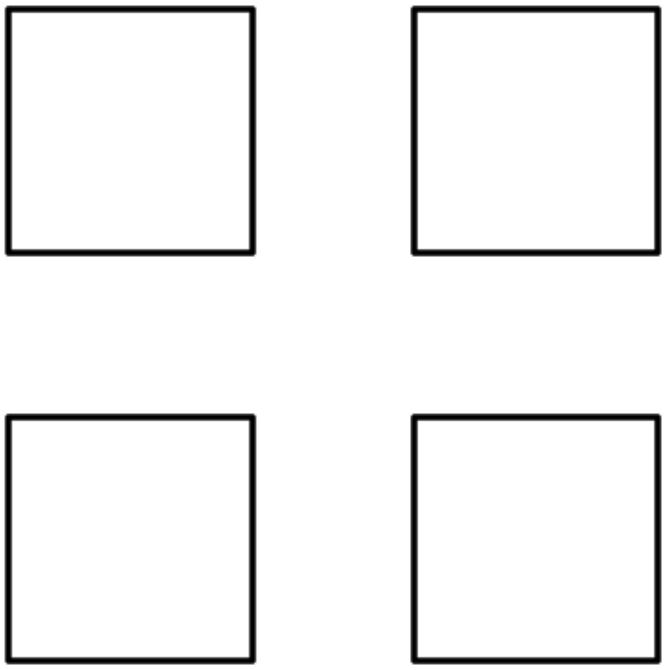
Task 3	What numbers are there between 0 and 1? Be ready to put a marker on the number-line and explain what fractional number is shown. Draw your own number-line and record on it the number you are showing with the marker. Can you show on your number-line four numbers between 1 and 2? Record alongside the mark what number they represent.
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line. Each fraction can be associated with a unique point on a number-line. There are an infinite number of fractions between any two fractions on the number line.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols.
Learning Outcomes: Students will be able to:	• Show fractions on a number-line.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, eighths, counting numbers, mixed numbers.
Sharing back/Connect	Select students to share who are able to show in multiple ways equal parts which represent a range of different fractional numbers on the large number-line and then students who can visualise and draw number-lines and mark the positions of fractions between 0 and 1 and 1 and 2. **Connect:**

	What mathematical statements using mixed numbers can you make using the number-line for numbers between 3 and 4? Use the equals sign (=) or greater than or less than (> and <) signs. I will give you an example to start: 3 ½ is less than 3 ¾ [record as 3 ½ < 3 ¾].
Teacher Notes	• During the launch ask the students whether there are numbers between whole numbers? Lead into a discussion of situations where they have met a half (e.g., a baby before they are one, halfway between their own birthdays, half hour on a clock, half an apple). Extend discussion to other situations using other fractions. • Have an unmarked number line on the whiteboard to use during the lesson. Use this during the launch to estimate where the fraction is that they describe. • Have an unmarked length of paper tape across the floor and large marked fraction cards with whole number words and fraction words and symbols. • Facilitate the students to notice that earlier in the year, the number lines they have used only contained whole numbers (numbers that resulted from counting). The fractions they are talking about now (numbers resulting from equal splitting or partitioning) can be represented on the number line. This shows that fractions may also be thought of as numbers. In the connection, refer to the fractions (e.g., 3½) as mixed numbers. • Monitor for students using vocabulary which emphasises dividing or splitting equally of portioning into equal parts. • Notice students who find the concept of fractions as numbers between numbers counter intuitive. Allow them to struggle and construct reasoning through mathematical talk and using agreeing mathematically and disagreeing mathematically (e.g., I agree because…) • For the independent task, have on A3 a series of number-lines marked with whole numbers from 0 to 10.
Independent Tasks	Mark on the number line where you think the following mixed numbers would be. ½ ¾ 9 1/8 5 2/4 4 1/2 4 3/4 7 2/4 8½ 6/8 3 4/8 9 ½ ¼ Can you mark any other numbers on the number-line?

Anticipations	

Task 4	The bakery is selling banana cakes to families. All the cakes are the same size. Jamie's family has 3 children to share one cake. Daniella's family has 8 children to share one cake. Tiare's family has 2 children to share one cake. Timo's family has 4 children to share one cake. Which children would have more cake? Prove your answer using at least three different representations (numbers, drawings, a number-line)
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line. Each fraction can be associated with a unique point on a numberline.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols.
Learning Outcomes: Students will be able to:	• Divide wholes into equal parts. • Divide a whole number into fractions. • Compare and order unit fractions.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, equal, equivalent, fair share, denominator, numerator.
Sharing back/Connect	Select students to share who have developed multiple representations including numbers, number-line, and drawings and use these to show comparisons between the different fractions.

	Connect: Record the solutions for the task: 1 ÷ 3 = 1/3 1 ÷ 8 = 1/8 1 ÷ 2 = ½ 1 ÷ 4 = ¼ What patterns and relationships do you notice? What do you think would be the solution for? 1 ÷ 6 = 1 ÷ 20 = 1 ÷ A =
Teacher Notes	• During the launch, model the cake as a rectangular representation. • Facilitate the students to notice that the denominator represents the number of pieces the whole has been divided into and the numerator shows the number of pieces that you have of the total. • Expect students to represent using number lines and identical rectangular representations
Independent Tasks	How many different ways can you split these squares into halves?  How many different ways can you split these squares into quarters?

	 How many different designs can you make that are ¾ red and ¼ blue?
Anticipations	

Task 5	Tama, Lelei and Lily want to share five keke pua'a so that each person gets the same amount. The keke pua'a are all the same size. How much do they each get? Tama, Lelei and Lily want to share seven keke pua'a so that each person gets the same amount. The keke pua'a are all the same size. How much do they each get? Tama, Lelei and Lily want to share four keke pua'a so that each person gets the same amount. The keke pua'a are all the same size. How much do they each get?
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages.
Learning Outcomes: Students will be able to:	• Share whole parts equally. • Solve problems that involve dividing a whole number into a fraction.
Mathematical language	Whole, thirds, equal, equivalent.
Sharing back/Connect	Select students to share who develop representations to justify their reasoning and either split all the keke pua'a in thirds or share as a whole and fractional amount. If the second solution is not used, then model as another way the teacher has seen used previously. Connect: Record the matching equations and solutions for each problem.

	4 ÷ 3 = 1 1/3 5 ÷ 3 = 1 2/3 7 ÷ 3 = 2 1/3 Ask students to discuss the pattern that they notice. Ask them to use the pattern to solve: 8 ÷ 3 = 10 ÷ 3 =
Teacher Notes	• Have a picture of a plate of keke pua'a (steamed and fried meat filled buns) for students to see or discuss similar food your students eat. • Facilitate the students to notice the need to coordinate partitioning of the shared item with the number of sharers. This is the basis of students developing understanding of the multiplicative relationship of the numerator and denominator in a fraction. • Monitor for students using vocabulary which relates to equal sharing and thirds. • Notice students who use multiplicative thinking and see the link between five thirds and why.
Independent Tasks	Tama, Sima, Lelei and Lily want to share five keke pua'a so that each person gets the same amount. The keke pua'a are all the same size. How much do they each get? Tama, Sima, Lelei and Lily want to share seven keke pua'a so that each person gets the same amount. The keke pua'a are all the same size. How much do they each get? Tama, Sima, Lelei and Lily want to share nine keke pua'a so that each person gets the same amount. The keke pua'a are all the same size. How much do they each get?
Anticipations	

Task 6	Mireka's Nana has made panikeke and Mireka is wondering who would get more. Eight tama sharing 10 panikeke equally. Two tama sharing 3 panikeke equally. Four tama sharing 9 panikeke equally. Five tama sharing 4 panikeke equally. Make sure that you represent and justify your answer in different ways.
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.
Learning Outcomes: Students will be able to:	• Share whole parts equally. • Solve problems that involve dividing a whole number into a fraction.

Mathematical language	Whole, half, halves, quarters, fourths, thirds, fraction, fractional number, whole number, eighths, equal, equivalent, section, piece, fair share
Sharing back/Connect	Select students to share who develop representations to justify their reasoning and either split all the panikeke into a fractional amount or share as a whole and fractional amount. If the second solution is not used, then model as another way the teacher has seen used previously. **Connect:** Use the student solutions to ask students to record these as equivalent fractions with mixed numbers and improper fractions. Ask the students to represent 10 eighths in a drawing and then record as a fraction and a whole number and a fraction (e.g., 10/8 = 1 2/8). Repeat for the different fractional amounts.
Teacher Notes	• During the launch, model the panikeke as a rectangular representation. • Facilitate the students to notice the need to coordinate partitioning of the shared item with the number of sharers. This is the basis of students developing understanding of the multiplicative relationship of the numerator and denominator in a fraction. • Expect students to represent with drawings and ensure that they use the same whole size for each panikeke when drawing.
Independent Tasks	Papa has baked a banana bread loaf. Who gets to eat more? Six tamariki sharing 10 slices equally. Eight tamariki sharing 12 slices equally. Four tamariki sharing 6 slices equally. Five tamariki sharing 7 slices equally. Make sure you represent and justify your reasoning.
Anticipations	

Task 7	At the Super Striker Soccer competition, these were the results of the goal shooting activity. Ruby scored 5 out of the six goals that she kicked. Daniel scored 2 out of three goals that he kicked. Tasa scored 3 out of the four goals that he kicked. Sesimani scored 7 out of the eight goals that she kicked. Can you put them in order from who was the most accurate to least accurate in shooting the goals?
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages.
Learning Outcomes: Students will be able to:	• Compare and order fractions.
Mathematical language	Whole, quarters, fourths, thirds, sixths, eighths, numerator, denominator.
Sharing back/Connect	Select students to share who either compare the fractions by representing each fraction and comparing or by using the unit fraction left from each and ordering these. If either solution is not used, then model as another way the teacher has seen used previously. **Connect:** Which would be bigger?

	9/10 or 4/5 11/12 or 14/15 6/8 or 4/6
Teacher Notes	• During the launch, support students to understand that they can draw a physical representation with a bar model but the whole needs to be the same size. • Have concrete material available if needed for students to select (e.g., fraction tiles). • Facilitate the students to notice that the denominator represents the number of pieces the whole has been divided into and the numerator represents how many pieces of the whole that there are. • For the independent task, have the fraction tiles available if students would like to use them.
Independent Tasks	Which number is the smallest? Which number is the biggest? ½ or ¼ 1/8 or 1/4 1/3 or ½ ½ or 3/4 ¾ or 2/2 4/4 or 4/3 2/4 or 3/3 3/2 or ¾ 1½ or 1¼ 2¾ or 2 7/8 Record your thinking to justify your ideas.
Anticipations	

Task 8	Miri wants to share her chocolate bars with her five friends. The six of them all have one fourth of a chocolate bar. How many chocolate bars does Miri have to share? Miri wants to share her chocolate bars with her eight friends. The nine of them all have one third of a chocolate bar. How many chocolate bars does Miri have to share?
Big ideas	The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.
Learning Outcomes: Students will be able to:	• Add unit fractions (quarters and thirds). • Multiply a fraction by a whole number.
Mathematical language	Whole, quarters, fourths, thirds, equivalent, numerator, denominator.
Sharing back/Connect	Select students who add all the fourths and get six fourths; or add the fourths and get six fourths and see this as equivalent to one whole and two fourths; or solve the problem as 6 x ¼ = 1 2/4 or 1½. If either solution is not used, then model as another way the teacher has seen used previously. Connect: Record the solution for each task: ¼ + ¼ + ¼ + ¼ + ¼ + ¼ = 6 x ¼ = 6/4

	1/3 + 1/3 + 1/3 + 1/3 + 1/3 + 1/3 + 1/3 + 1/3 + 1/3 = 9 x 1/3 = 9/3 How would you record the following two situations: Miri is sharing with 3 friends. She gives each friend ½ Miri is sharing with 6 friends. She gives each friend 1/8
Teacher Notes	• Facilitate the students to notice that there are multiples of the fractional number which they can add or multiply. • Expect students to represent using drawings, number-line or fraction pieces to represent parts of the whole and to use the fractional parts to make wholes.
Independent Tasks	Miri wants to share her chocolate bars with her ten friends. The eleven of them all have one half of a chocolate bar. How many chocolate bars does Miri have to share? Miri wants to share her chocolate bars with her five friends. The six of them all have one quarter of a chocolate bar. How many chocolate bars does Miri have to share? Miri wants to share her chocolate bars with her 8 friends. The nine of them all have one sixth of a chocolate bar. How many chocolate bars does Miri have to share?
Anticipations	

Task 9	I have 2 slices of cheese. It takes one quarter of a slice of cheese to make a snack. How many snacks can I make? I have 3 slices of cheese. It takes one third of a slice of cheese to make a snack. How many snacks can I make? I have 3 slices of cheese. It takes two thirds of a slice of cheese to make a snack. How many snacks can I make?
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. Different real-world interpretations can be associated with division calculations involving fractions (decimals).
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. NA3-5: Know fractions and percentages in everyday use. NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.
Learning Outcomes: Students will be able to:	• Use repeated subtraction as division. • Solve problems that involve dividing a whole number by a fraction.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, fraction, fractional number, whole number, eighths, equal, equivalent, section, piece, fair share, counting numbers, mixed numbers, splitting, partitioning
Sharing back/Connect	Select students to who use measurement division (repeated subtraction as division, e.g., 2 – ¼ - ¼ - ¼ - ¼ - ¼ - ¼ - ¼ - ¼) or who use the inverse relationship of multiplication and division

	(1/4 x ? = 2) or (1/4 + ¼ + ¼ … = 2). If either solution is not used, then model as another way the teacher has seen used previously. **Connect:** Ask students to describe how you would solve the following problems using division and subtraction or multiplication (addition): I have 6 slices of cheese. It takes one third of a slice of cheese to make a snack. How many snacks can I make? I have 8 slices of cheese. It takes two quarters of a slice of cheese to make a snack. How many snacks can I make?
Teacher Notes	• Facilitate the students to notice that there are multiples of the fractional number which they can divide, add or multiply. • Notice students who use relationships to solve these word problems. For example, most students will repeatedly add or subtract but notice the students who see the relationship as groups of in multiplicative ways. • Expect students to represent using drawings and notation.
Independent Tasks	How many halves are there in: • One slice of cheese • Two slices of cheese • Ten slices of cheese How many quarters are there in: • One slice of cheese • Two slices of cheese • Three slices of cheese • Ten slices of cheese What patterns and relationships do you notice? Write and solve your own problems now using a fraction and some slices of cheese.
Anticipations	

Task 10	Tony and Jenny were helping their dad paint a fence. They each had a tin of blue paint that was the same size. Tony used half a tin of paint. Jenny used three fourths of a tin of paint. Dad wants to know how much of the tins of blue paint Tom and Jenny used altogether? Tony and Jenny were helping their dad paint a fence. They each had a tin of blue paint that was the same size. Tony used three eighths of a tin of paint. Jenny used three fourths of a tin of paint. Dad wants to know how much of the tins of blue paint Tom and Jenny used altogether?
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.
Learning Outcomes: Students will be able to:	• Change fractions to equivalent fractions. • Solve problems that involve adding fractions.
Mathematical language	Whole, half, halves, quarters, fourths, eighths, equal, equivalent.
Sharing back/Connect	Select students to share who converted fractions to equivalent fractions using informal methods with representations before they added the fractions. **Connect:** What are all the fractions that would be the same as 1/4?

	What are all the fractions that would be the same as ¾? What patterns and relationships can you use to find equivalent fractions? Can you come up with a rule to change fractions but keep them equivalent.
Teacher Notes	• Have concrete material available if needed for students to select (e.g., fraction tiles). • Facilitate the students to notice that to add fractions the denominators need to be the same • Monitor for students using vocabulary of equivalence and relational thinking. • Notice students who show relational understanding (¾ as ½ + ¼).
Independent Tasks	Tony and Jenny were helping their dad paint a fence. They each had a tin of blue paint that was the same size. Tony used one third of a tin of paint. Jenny used four sixths of a tin of paint. Dad wants to know how much of the tins of blue paint Tom and Jenny used altogether? Tony and Jenny were helping their dad paint a fence. They each had a tin of blue paint that was the same size. Tony used two thirds of a tin of paint. Jenny used half of a tin of paint. Dad wants to know how much of the tins of blue paint Tom and Jenny used altogether?
Anticipations	

Task 11	Leilani has three quarters of a metre of material. Leilani uses half a metre of material to make a tivaevae cushion. How much material is left? Leilani has seven eighths of a metre of material. Leilani uses a quarter of a metre of material to make a tivaevae cushion. How much material is left? Leilani has half of a metre of material. Leilani uses a third of a metre of material to make a tivaevae cushion. How much material is left?
Big ideas	Numbers can be described in many different ways including as fractions. The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.
Learning Outcomes: Students will be able to:	• Change fractions to equivalent fractions. • Solve problems that involve subtracting fractions.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, equal, equivalent.

Sharing back/Connect	Select students to share who converted fractions to equivalent fractions using informal or more formalised methods (multiplication for example) before they subtracted the fractions. **Connect:** Remember the rules for changing equivalent fractions that you developed (re-visit these). What could you change these fractions to in order to solve the problems? ½ – ¼ = ½ - 1/6 = 1 – ½ = 1 – 3/8 =
Teacher Notes	• Have concrete material available if needed for students to select (e.g., fraction tiles, strips of paper). • Facilitate the students to notice that to subtract fractions the denominators need to be the same. • Notice students who show relational understanding (¾ as ½ + ¼; ¼ = 2/8). • Expect students to represent using drawings and other concrete material.
Independent Tasks	Leilani has half of a metre of material. Leilani uses two sixths of a metre of material to make a tivaevae cushion. How much material is left? Leilani has two quarters of a metre of material. Leilani uses one eighth of a metre of material to make a tivaevae cushion. How much material is left? Leilani has two thirds of a metre of material. Leilani uses a two sixths of a metre of material to make a tivaevae cushion. How much material is left?
Anticipations	

Task 12	Jim and his two sisters Nevaeh and Joy have 2 bottles of drink. Jim drinks three quarters of one bottle. Nevaeh drinks five eighths of one bottle. Joy drinks the rest. How much does Joy drink? Jim and his two sisters Nevaeh and Joy have 2 bottles of drink. Jim drinks three sixths of one bottle. Nevaeh drinks 2 thirds of one bottle. Joy drinks the rest. How much does Joy drink?
Big ideas	The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages. NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.
Learning Outcomes: Students will be able to:	• Change fractions to equivalent fractions. • Solve problems that involve subtracting fractions from whole numbers.
Mathematical language	Whole, quarters, fourths, eighths, thirds, sixths, equal, equivalent.
Sharing back/Connect	Select students to share who converted fractions to equivalent fractions using informal or more formalised methods (multiplication for example) before they solved the problem.

	Connect: How would you change these fractions to solve the equations? ½ + ¼ + ¼ = 1/3 + 1/6 + 1/3 = 1/8 + ¼ =
Teacher Notes	• Have concrete material available if needed for students to select (e.g., fraction tiles, strips of paper). • Facilitate the students to notice that to add or subtract fractions the denominators need to be the same. • For the independent task, have fraction tiles or strips of paper available for the students to use if needed.
Independent Tasks	Change the fractions to solve these problems: ½ + ¼ + ¼ = ½ – ¼ = 1 – ½ = 1 – 3/8 = 1/3 + ½ + 1/3 = ½ - 1/6 = 1/8 + ¼ = Record your thinking to represent your ideas.

Task 13	Leilani is decorating her birthday cake with jellybeans. She has 20 jellybeans. Her mum says she has to divide the cake into quarters and put the same number of jelly beans on each section. How many jellybeans does she put on each section? Leilani is decorating her birthday cake with jellybeans. She has 18 jellybeans. Her mum says she has to divide the cake into thirds and put the same number of jelly beans on each section. How many jellybeans does she put on each section? Leilani is decorating her birthday cake with jellybeans. She has 40 jellybeans. Her mum says she has to divide the cake into fifths and put the same number of jelly beans on each section. How many jellybeans does she put on each section?
Big ideas	The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages.
Learning Outcomes: Students will be able to:	• Find fractions of a set
Mathematical language	Whole, quarters, fourths, thirds, fifths, section, piece, fair share, divide.
Sharing back/Connect	Select students to share who have used a representation split into fraction parts and then have either used partitive division (e.g., 20 ÷ 4 = ?) or have used the inverse relationship and repeated addition or multiplication (e.g., 4 x ? = 20). If either solution is not used, then model as another way the teacher has seen used previously.

	Connect: Record the solution for each of the problems: ¼ of 20 = 5 20 ÷ 4 = 5 1/3 of 18 = 6 18 ÷ 3 = 6 1/5 of 40 = 8 40 ÷ 5 = 8 What patterns and relationships do you notice? What is a rule for finding a fraction of a set?
Teacher Notes	• During the launch, ensure that you reinforce that the set of jellybeans are one whole as part of developing the context. • Have concrete material available if needed for students to select (e.g., fraction tiles, strips of paper) and counters to represent the jellybeans. • Facilitate the students to notice that they are finding a fraction of a whole even when there are a number of items in that set. Also, draw attention to the denominator as naming what the whole is divided into.
Independent Tasks	You have a bag of 12 lollies, and you share them equally with your friend. What fraction do you each get? How many lollies will you each get? You have a bag of 24 lollies, and you share them equally with three friends. What fraction do you each get? How many lollies will you each get? What is a quarter of 8? What is a quarter of 80? What is a half of 10? What is a half of 100? What is a third of 6? What is a third of 60?
Anticipations	

Task 14	Gabriella is making a headband using different coloured sequins. She has 16 red sequins, 40 blue sequins and 24 gold sequins. She divides the headband into 4 sections and uses the same number of each colour in each section. How many of each colour sequin will she put on each section? What about if she divides it into 8 sections? How many of each colour sequin will she put on each section?
Big ideas	The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages.
Learning Outcomes: Students will be able to:	• Find fractions of a set.
Mathematical language	Whole, half, halves, quarters, fourths, equal, equivalent, section, piece, fair share.
Sharing back/Connect	Select students to share who have used a representation split into fraction parts and then have either used partitive division (e.g., 16 ÷ 4 = ?) or have used the inverse relationship and repeated addition or multiplication (e.g., 4 x ? = 16). If either solution is not used, then model as another way the teacher has seen used previously. **Connect:** Remember the rules for finding a fraction of a set that you developed (re-visit these). Describe how you would find the following:

	1/4 of 48 1/3 of 99 1/n of b
Teacher Notes	• During the launch, ensure that you reinforce that the set of sequins are one whole as part of developing the context. • Have concrete material available if needed for students to select (e.g., fraction tiles, strips of paper) and counters to represent the sequins. • Facilitate the students to notice that they are finding a fraction of a whole even when there are a number of items in that set. Also, draw attention to the denominator as naming what the whole is divided into. • Monitor for students using vocabulary of the whole and parts of the set.
Independent Tasks	What is ¼ of 12? What is 1/8 of 24? What is 1/3 of 33? What is 1/2 of 34? What is 1/5 of 45?
Anticipations	

Task 15	Prove and justify your answer using at least 3 different representations: Is 6/8 of a chocolate bar the same as ¾ of a chocolate bar? Is 2/3 of a chocolate bar the same as ½ of a chocolate bar? Is 1/3 of a chocolate bar the same as 2/6 of a chocolate bar? Is ½ of a chocolate bar the same as 2/4 or 3/6 or 4/8 of a chocolate bar? Is 7/8 of a chocolate bar bigger than ¾ of a chocolate bar? Is 1 chocolate bar bigger than ¾ + ½ chocolate bars? Are 2 chocolate bars bigger than 3 – ½ chocolate bars? Is ¾ of a chocolate bar bigger than ½ + ¼ of a chocolate bar?
Big ideas	The whole is important in naming fractions. A fraction is relative to the size of the whole or unit A comparison of a part to the whole can be represented using a fraction. A fraction describes the division of a whole (region, set, segment) into equal parts. The bottom number in a fraction tells how many equal parts the whole or unit is divided into. The top number tells how many equal parts are indicated. A fraction describes division (a/b = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, 2/3 = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x 1/3) or 1/3 of 2 whole units (1/3 x 2); each is associated with the same point on the number line. Each fraction can be associated with a unique point on a numberline.
Curriculum links	NA2-1: Use simple additive strategies with whole numbers and fractions. NA2-5: Know simple fractions in everyday use. NA2-6: Communicate and interpret simple additive strategies, using words, diagrams (pictures), and symbols. NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages.
Learning Outcomes: Students will be able to:	• Change fractions to equivalent fractions. • Compare fractions with different denominators. • Solve problems that involve adding or subtraction fractions.

Mathematical language	Whole, half, halves, quarters, fourths, thirds, fractional number, eighths, equal, equivalent, numerator, denominator.
Sharing back/Connect	Select students to share who converted fractions to equivalent fractions using informal or more formalised methods (multiplication for example) to compare them. **Connect:** Write your own true or false sentences involving fractions.
Teacher Notes	• Have students work through these together in their groups or pairs, one by one, discuss and explain and then complete the next one. • Facilitate the students to notice that they do not always need to use materials or drawings if they can use the notation to explain and justify their reasoning. • Notice students who use relational reasoning.
Independent Tasks	Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity: N8A: Fractions: Fifths and tenths. NR2A: Finding fractions of a set.
Anticipations	

DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS (region): LEVEL 2 Task N8A

Willow says she can prove $\frac{3}{5}$ is equal to $\frac{6}{10}$.

Do you agree or disagree with her? Explain why you agree or disagree.

What fractions do you know that are equal to each other? Explain how you know.

DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS (set): LEVEL 1-2 Task NR2A

At school the classes are planting seeds. They have:

One quarter ($\frac{1}{4}$) of a bag of 32 seeds.

One sixth ($\frac{1}{6}$) of a bag of 36 seeds.

One fifth ($\frac{1}{5}$) of a bag of 35 seeds

Which bag has the most seeds? Show your thinking.