DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Number: Fractions

Level 4 (Year 7-8)

Teacher Booklet

Task 1	What are all the different ways you can use the fraction tiles to make more than one half but less than ten twelfths? 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 make a fraction number that is less than two quarters but more than one tenth? 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 make a fraction number that is more than one whole but less than one and five eighths? As you make these record them and be ready to explain and justify why they are more than one whole. What are all the different ways you can use the fraction tiles to make a fraction number that is the same as three quarters? As you make these record them and be ready to explain and justify why they are equivalent. What are all the different ways you can use the fraction tiles to make a fraction number that is the same as two thirds? As you make these record them and be ready to explain and justify why they are equivalent.
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line.
Curriculum links	NA3-5: Know fractions and percentages in everyday use. NA4-3: Find fractions, decimals, and percentages of amounts expressed as whole numbers, simple fractions, and decimals. NA4-4: Apply simple linear proportions, including ordering fractions.

Learning Outcomes: Students will be able to:	• Combine and recombine different units of fractions to make one whole. • Identify and make equivalent fractions. • Recognise and use improper fractions to represent more than one whole.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, sixths, ninths, twelfths, eighths, whole number, equal, equivalent, greater than, less than, numerator, denominator.
Sharing back/Connect	Select students to share who made combinations of the whole or other fractions using the same size pieces (e.g., 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., $\frac{1}{2} + \frac{1}{4}$ is more than a half and less than $\frac{10}{12}$) and recorded the combinations as numbers, equations or words. **Connect:** Generate sets of fractions that are the same as $\frac{1}{2}$. Can you notice any patterns or rules for why fractions are the same as $\frac{1}{2}$? Generate sets of fractions that are the same as $\frac{3}{4}$. Can you notice any patterns or rules for how you can find fractions that are the same as $\frac{3}{4}$? Generate sets of fractions that are the same as $\frac{2}{6}$. Can you notice any patterns or rules for how you can find fractions that are the same as $\frac{2}{6}$?
Teacher Notes	• Before the launch have the students explore and talk together about when they have used fractions outside of school. • Have fraction tiles available for the students to use to prove and justify. • Monitor for students using the words fractional numbers (not pieces or bits) and greater than, less than, the same as. • Notice students who make conjectures during connect and have students explore and prove these ideas. • Expect students to represent materials and use appropriate notation and the equal sign ($\frac{3}{4} = \frac{6}{8}$).
Independent Tasks	Sepi has 32 marbles. She gives $\frac{1}{8}$ of the marbles to her friend. How many marbles did she give her friend? Marli's little brother has 56 Pokémon card. On the way home from school, he loses $\frac{1}{7}$ of his cards. How many cards did he lose and how many cards does he have left?

	What is $\frac{1}{6}$ of 36? What is $\frac{1}{2}$ of 200? What is $\frac{2}{5}$ of 100? What is $\frac{1}{4}$ of 280? What is $\frac{2}{9}$ of 540? What is $\frac{2}{4}$ of 1 000? Sina ate $\frac{1}{3}$ of a bag of M&M's. Altogether she ate 24 M&M's. How many M&M's are in the bag? Uncle gave Tane $\frac{3}{9}$ of the pinecones he had collected during week. Altogether, he gave Tane 27 pinecones. How many pinecones did Uncle take home?
Anticipations	

Task 2	Anau says that she can write more than 20 numbers that come before 1. Lola isn't sure what numbers could come before one. Anau decides to convince Lola by writing the numbers and using a representation and number-line to prove that they exist. Can you write some numbers you think Anau wrote and show where you think she marked them on her number-line and the representation that she drew?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ 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 is no least or greatest fraction on the number line. There are an infinite number of fractions between any two fractions on the number line.
Curriculum links	NA3-5: Know fractions and percentages in everyday use. NA4-4: Apply simple linear proportions, including ordering.
Learning Outcomes: Students will be able to:	• Record fractions on a number-line. • Find and associate fractions with a unique point on a number line. • Recognise there are an infinite number of fractions between any two whole numbers or any two fractions on a number line.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, sixths, twelfths, eighths, equal, equivalent, mixed numbers, greater than, less than.
Sharing back/Connect	Select students to share who have developed a representation and marked the fraction on a number-line. Draw a number-line on the board and ask all students who share to mark the fraction onto it by partitioning the number-line. **Connect:** What mixed numbers are there between 5 and 10? Mark each one on a number-line to show where they would be.

Teacher Notes	• Facilitate the students to notice fractions can be represented both using a bar model (avoid circles) and on number lines. This shows that fractions may also be thought of as numbers. In the connection refer to the fractions (e.g., $3\frac{1}{2}$) as a mixed number and the whole number as a counting number. • 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…).
Independent Tasks	Draw a number-line starting from 2 and finishing at 8. Put at least 15 different fractions on the number-line. Draw a number-line starting from 4 and finishing at 6. Put at least 15 fractions on the number-line. Don't use the same fractions as you used previously. Draw a number-line starting from 11 and finishing at 12. Put at least 10 fractions on the number-line. Don't use the same fractions as you used previously.
Anticipations	

Task 3	Who gets to eat more? A. Twelve people sharing ten chocolate bars. B. Eight people sharing five chocolate bars. C. Four people sharing three chocolate bars. D. Nine people sharing seven chocolate bars. E. Three people sharing two chocolate bars. Be ready to justify who you thinks gets to eat more and explain in multiple 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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line.
Curriculum links	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. NA4-4: Apply simple linear proportions, including ordering fractions.
Learning Outcomes: Students will be able to:	• Divide wholes into equal parts. • Divide a whole number into fractions. • Compare and order fractions.
Mathematical language	Whole, quarters, fourths, thirds, ninths, twelfths, eighths, equal, equivalent, numerator, denominator.
Sharing back/Connect	Select students to share who have developed multiple representations including numbers, number-line, and drawings and used these to show comparisons between the different fractions. **Connect:** Which is bigger: $\frac{6}{8}$ or $\frac{10}{16}$ What rule or pattern can you use to help you?

	Which is bigger: $\frac{3}{12}$ or $\frac{1}{3}$ What rule or pattern can you use to help you? Which is bigger: $\frac{3}{5}$ or $\frac{6}{15}$ What rule or pattern can you use to help you?
Teacher Notes	• Facilitate the students to notice that the denominator represents the number of pieces the whole has been divided into and the numerator represents the number of pieces. • Monitor for students using fractional number vocabulary, the language of comparison and the use of because to prove their justifications. • Expect students to represent using a range of representations. Orient them to notice that if they draw the chocolate bar as a representation it needs to be the same size. • During the connect, facilitate the students to develop understanding of the need for a common denominator.
Independent Tasks	At the speed chocolate eating contest each contestant has to eat as much of a chocolate bar as they can in 15 seconds. These are the results of how much of 1 chocolate bar each contestant managed to eat: Daniel – $\frac{4}{5}$ Leti – $\frac{2}{6}$ Georgie – $\frac{7}{10}$ Sose – $\frac{2}{3}$ Talasi – $\frac{3}{4}$ Jeni – $\frac{8}{16}$ Can you put the results in order from who ate the most chocolate to who ate the least? Try and prove your answer in a number of different ways.
Anticipations	

Task 4	Lana is working on her homework for fractions. She was asked to put fractions in order from the greatest to the least. This is what she has done: $\frac{2}{3}, \frac{6}{8}, \frac{10}{12}, \frac{12}{15}, \frac{16}{20}$ Do you agree with Lana? Can you use three representations including a number-line to show why you agree or disagree with Lana? What do you think Lana was thinking?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line.
Curriculum links	NA3-5: Know fractions and percentages in everyday use. NA4-4: Apply simple linear proportions, including ordering fractions.
Learning Outcomes: Students will be able to:	• Order and compare fractions. • Find equivalent fractions.
Mathematical language	Whole, thirds, twelfths, eighths, fifteenths, twentieths, fraction, equal, equivalent, greater than, less than, numerator, denominator.
Sharing back/Connect	Select students to share who converted fractions to equivalent fractions using informal methods with representations before they compared the fractions. If any students changed all the fractions to a common denominator than select them to share last. **Connect:** Can you put these in order from smallest to largest? $\frac{1}{10}, \frac{1}{2}, \frac{1}{6}, \frac{1}{15}, \frac{1}{3}, \frac{1}{5}$. What pattern can you notice? Describe the rule you could use to order fractions like these? When does the rule work?

Teacher Notes	• Facilitate the students to notice that the denominator represents the number of pieces the whole has been divided into and the numerator represents the number of pieces. • Expect students to represent using a range of representations including the use of a number line or rectangular blocks which are the same size. • In the connect, students may generalise that the larger the denominator the smaller the fraction, however, facilitate them to notice that this only applies to unit fractions and is not a rule for all fractions.
Independent Tasks	Which is bigger? $\frac{6}{8}$ or $\frac{10}{16}$ $\frac{3}{12}$ or $\frac{4}{16}$ $\frac{3}{5}$ or $\frac{6}{15}$ $\frac{2}{3}$ or $\frac{9}{12}$ What rule or pattern did you use to help you? Write your own fraction comparison tasks for someone else to solve.
Anticipations	

Task 5	Mama Mereana and her sisters have been working together sewing a tivaevae for a family wedding. By last month they had completed two fifths of it. Last week was busy so they only completed another sixth of it. This week they have completed another third. How much have they completed and how much more do they have to sew to complete it?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Change fractions to equivalent fractions. • Solve problems that involve adding or subtracting fractions.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, equivalent, mixed numbers, numerator, denominator.
Sharing back/Connect	Select students to share who converted fractions to equivalent fractions using informal or more formalised methods (multiplication for example) before they added the fractions.

	Connect: What are the common denominators for: $\frac{1}{2}$ and $\frac{1}{4}$ $\frac{1}{3}$ and $\frac{1}{6}$ $\frac{1}{3}$ and $\frac{1}{4}$ and $\frac{1}{5}$ $\frac{1}{2}$ and $\frac{1}{5}$ and $\frac{3}{7}$ $\frac{3}{4}$ and $\frac{4}{5}$ and $\frac{1}{2}$ What do you notice about finding a common denominator? Can you describe a rule to use when adding fractions with different denominators?
Teacher Notes	• Facilitate 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 or 6/8). • In the connect develop a generalisation for rules to find a common denominator through finding a common multiple.
Independent Tasks	Put these fractions in order from smallest to largest: $\frac{1}{10}$ $\frac{1}{2}$ $\frac{1}{6}$ $\frac{1}{15}$ $\frac{1}{3}$ $\frac{1}{5}$ $\frac{2}{3}$ $\frac{5}{6}$ $\frac{6}{8}$ $\frac{2}{12}$ $\frac{1}{2}$ $\frac{3}{4}$ What patterns do you notice? Record the rule you could use to order fractions like these.
Anticipations	

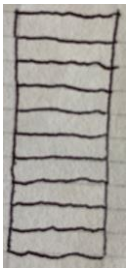
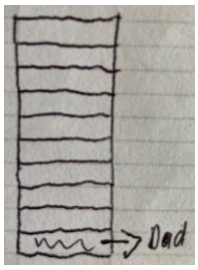
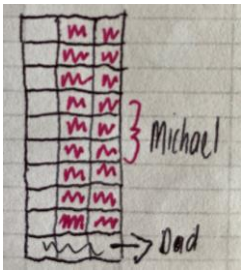
Task 6	Sima and his family went to Samoa for a family reunion. They wanted to make ula lole for their relatives. They used fruit bursts and minties to make the ula lole. Sima had made $\frac{1}{5}$ of one ula lole with minties. He then added 33 fruit bursts and now the string was $\frac{3}{4}$ full. How many lollies would make a complete ula lole? Make sure you are able to justify your explanation using both representations and notation.
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Find and compare equivalent fractions. • Add and subtract fractions. • Find fractions of a set.
Mathematical language	Whole, quarters, fourths, fifths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who represented the problem as $\frac{1}{5}$ + __ [33] = $\frac{3}{4}$ and who have used a common multiple and denominator

	for quarters and fifths to solve the problem along with representation. **Connect:** Solve these problems and think about the process you use: $\frac{1}{4}$ - ? = $\frac{1}{8}$ $\frac{3}{5}$ - ? = $\frac{9}{10}$ $\frac{1}{2}$ + ___ = $\frac{7}{8}$ ___ + $\frac{1}{4}$ = $\frac{1}{12}$ Did you notice what you did each time you solved these? Why?
Teacher Notes	• During the launch, facilitate students to notice that whole number problems and fractional number problems may be start unknown or change unknown problems and not result unknown only. • Expect the students to represent their reasoning using both diagrams (rectangular box for fractions), number-lines, and notation.
Independent Tasks	Litea and her two friends are at the movies. They each buy a big tub of popcorn. Litea eats $\frac{2}{5}$ of her tub. Kaia eats $\frac{7}{8}$ of his tub. Gaylene eats $\frac{8}{10}$ of her tub. They tip all the left-over popcorn into two tubs. How much is left to take home? Litea and her two friends are at the movies. They each buy a big tub of popcorn. Litea eats $\frac{3}{4}$ of her tub. Kaia eats $\frac{5}{7}$ of his tub. Gaylene eats $\frac{3}{8}$ of her tub. They tip all the left-over popcorn into two tubs. How much is left to take home? What are the rules or patterns that you use to add fractions with different denominators?
Anticipations	

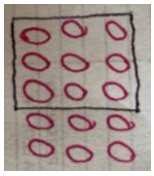
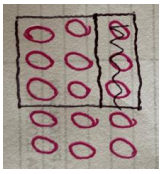
Task 7	Elisapeta's Aunties are making small and big Samoan lli (fans) to sell at the night market. To decorate the lli they add coloured feathers. For every small lli they use $\frac{2}{7}$ of a bag of coloured feathers. For every large lli they use $\frac{5}{9}$ of a bag of coloured feathers. For the twenty-two lli they make in total how many bags of coloured feather do they use?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Multiply a fraction by a whole number.
Mathematical language	Whole, sevenths, ninths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	22 lli can be made from any combination of small or large lli. Selet students who either use repeated addition for the fractional numbers (e.g., for 10 small lli add $\frac{2}{7}$ ten times and get $\frac{20}{7}$) and see

	this as equivalent to two wholes and six sevenths; or solve the problem as $\frac{2}{7}$ x 10 = $\frac{20}{7}$ or 2 $\frac{6}{7}$ bags of feathers. If the multiplicative solution is not used, then model as another way the teacher has seen previously. **Connect:** $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ = ? 3 x $\frac{1}{4}$ = ? $\frac{2}{8} + \frac{2}{8} + \frac{2}{8} + \frac{2}{8}$ = ? 4 x $\frac{2}{8}$ = ? What patterns do you notice when you are multiplying fractions?
Teacher Notes	• During the launch, establish the context of the problem. Explore what a Samoan lli is and similar fans other students have seen and had from other countries. Lli are made from finely woven pandanus or coconut fronds and sometimes are decorated with colourful feathers. Have a picture of lli available • Facilitate the students to notice that there are multiples of the fractional number which they can add or multiply • Notice students who use multiplicative thinking. Also notice and allow students to struggle with the counter intuitive principle of multiplying a whole number by a fractional number where the product gets smaller rather than larger.
Independent Tasks	Malia is making otai. For each bottle of otai she needs: 1 and $\frac{3}{4}$ cups of pineapple. 2 and $\frac{1}{2}$ cups of watermelon. 1 and $\frac{1}{4}$ of a cup of coconut milk. Three quarters of a cup of coconut water. $\frac{1}{2}$ of a cup of lemon juice. Malia wants to make 8 bottles of otai. How much of each ingredient will she need?
Anticipations	

Task 8	Michael's father ate $\frac{1}{10}$ of a loaf of bread before Michael made lunch for his brothers and sisters. Michael used $\frac{2}{3}$ of the loaf of bread that was left. How much of the loaf did Michael use and how much was left?
Big ideas	The whole is important in naming fractions. A fraction is relative to the size of the whole or unit. 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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Multiply a fraction by a fraction. • Represent multiplication of fractions using an array.
Mathematical language	Whole, thirds, tenths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who are able to explain and justify their explanations which draw on representations for example a box model to show how you can multiply a fraction by a fraction. If no students show this, then teacher models this as below.

	   **Connect:** Can you draw a model of: $\frac{3}{4}$ x $\frac{1}{2}$ = $\frac{2}{3}$ x $\frac{1}{2}$ = $\frac{1}{4}$ x $\frac{1}{8}$= Can you explain and justify why you always have to consider the whole?
Teacher Notes	• Facilitate the students to notice the need to consider the fraction as part of one whole • Monitor for students who have maintained a focus on the number of unit parts in all and recognised that the size of the parts determines the number of wholes • Notice students who use a model to represent their reasoning. If students use a formal procedure expect them to be able to explain it in sense-making ways.
Independent Tasks	Draw models of the following equations: $\frac{4}{6}$ x $\frac{1}{2}$ $\frac{4}{5} \times \frac{2}{7} =$ $\frac{1}{3} \times \frac{3}{4} =$ $\frac{5}{8} \times \frac{3}{5} =$ Solve the equations using your model.
Anticipations	

Task 9	Can you solve this problem using counters or dots to explain and justify your solution? $\frac{3}{5}$ x $\frac{2}{3}$ Now write a problem that would correspond with the equation.
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Multiply a fraction by a fraction. • Represent multiplication of fractions using an array.
Mathematical language	Whole, thirds, fifths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who can explain and justify why you have to start with 15 counters in an array and then use these to sense-make [as below]. If no students use this, then teacher to model as a previous student solution.

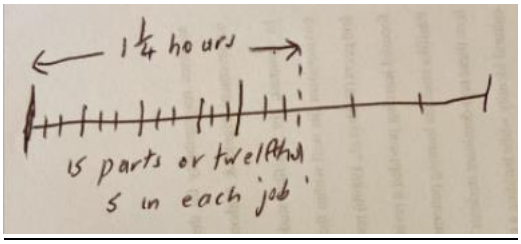
	   **Connect:** How many counters would you need to start with if you were asked to do the following: $\frac{3}{4}$ X $\frac{4}{5}$= $\frac{1}{7}$ X $\frac{2}{3}$ = $\frac{2}{9}$ X $\frac{3}{10}$ = What do you notice? If you were telling someone else what is important about multiplying fractions by fractions what would you say?
Teacher Notes	• During the launch, tell the students that they must use counters as part of their explanation. • Have counters available • Facilitate the students to notice that when you multiply a fraction by a fraction that the answer is smaller (unlike when multiplying whole numbers, the answer is larger). • Notice students who have recognised that you need to start with 15 counters and can then systematically explain that $\frac{2}{3}$ would be 10 counters, $\frac{1}{5}$ of 10 is 2 counters so therefore $\frac{3}{5}$ of 10 are 6 counters.
Independent Tasks	Use counters to make a model of the equation and solve it, then write a story problem to match it. $\frac{3}{4}$ X $\frac{1}{2}$ = $\frac{1}{4}$ X $\frac{1}{8}$ = $\frac{7}{9} \times \frac{1}{4}$ = $\frac{3}{10}$ X $\frac{2}{3}$ = Record an explanation and justification for why you always have to consider the whole.
Anticipations	

Task 10	You and your brother are painting the shed. You decide to divide the garage into sections you will each paint. Your Dad gives you 2 and $\frac{1}{4}$ cans of paint. You find that on average you use $\frac{3}{8}$ of a can of paint to paint each section. How many sections did you and your brother paint altogether?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Divide a mixed number by a fraction. • Use repeated subtraction to solve division problems.
Mathematical language	Whole, thirds, fifths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to who use measurement division (repeated subtraction as division, e.g., $2\frac{1}{4}$ - $\frac{3}{8}$ - $\frac{3}{8}$ - $\frac{3}{8}$ - $\frac{3}{8}$ - $\frac{3}{8}$ - $\frac{3}{8}$) or who use the inverse relationship of multiplication and division ($\frac{3}{8}$ x ? = 2 $\frac{1}{4}$) or

	($\frac{3}{8} + \frac{3}{8} + \frac{3}{8} \ldots = 2\ \frac{1}{4}$). 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): It takes $\frac{1}{4}$ of a pot of paint for a section. I have 1 bucket, how many sections can I paint? It takes $\frac{1}{4}$ of a pot of paint for a section. I have 2 buckets, how many sections can I paint? It takes $\frac{1}{4}$ of a pot of paint for a section. I have 10 buckets, how many sections can I paint? It takes $\frac{1}{4}$ of a pot of paint for a section. I have ½ bucket, how many sections can I paint? It takes $\frac{1}{4}$ of a pot of paint for a section. I have 1 ½ buckets, how many sections can I paint? What pattern do you notice? Could you describe what you are doing when you are dividing by a fraction?
Teacher Notes	• Facilitate the students to notice that there are multiples of the fractional number which they can subtract repeatedly. • 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. • Monitor for students who make the conjecture that when dividing by a fractional number the dividend gets bigger rather than smaller as it does when dividing by a whole number. Record and explore with students. • In the connect, press students to consider division of fractions as how many times something can go into…be subtracted.
Independent Tasks	You and your brother are painting the shed. You decide to divide the garage into sections you will each paint. Your Dad gives you 5 and $\frac{1}{3}$ cans of paint. You find that on average you use $\frac{3}{4}$ of a can of paint to paint each section. How many sections did you and your brother paint altogether?

	Record an explanation to tell someone else what is important about multiplying fractions. You and your brother are painting the shed. You decide to divide the garage into sections you will each paint. Your Dad gives you 9 and $\frac{7}{8}$ cans of paint. You find that on average you use $\frac{3}{7}$ of a can of paint to paint each section. How many sections did you and your brother paint altogether? Record an explanation to tell someone else what is important about multiplying fractions.
Anticipations	

Task 11	Tasa has $1\frac{1}{4}$ hours to do 3 of his jobs around the house. How much time does he have to do each job? Solve this problem using both a number line and counters. Now test your answer against the solution in minutes.
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Divide a mixed number by a fraction. • Use repeated subtraction to solve division problems.
Mathematical language	Whole, fourths, quarters, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who are able to justify their explanation using number lines and counters to represent their solution. **Connect:** What fraction would you need to work with if he had: 4 jobs to do in $1\frac{1}{3}$ hours? 6 jobs to do in $2\frac{1}{3}$ hour?

	5 jobs to do in $1\frac{1}{2}$ hours? What pattern can you notice?
Teacher Notes	• During the launch, reinforce that the students can work out the solution using minutes, but they also need to use both a number line and counters as representations of their reasoning. • Have counters and empty number lines available. • Facilitate the students to notice that one approach is to divide each fourth into 3 parts. Number line representation is as follows  To represent with counters, they need to divide each fourth into three parts. They use a set of 12 counters as a whole in an array of 4 lots of 3 and a second array of 3 for the part of the next hour so that they have represented $1\frac{1}{4}$ hours. They have 15 counters in all. Each counter is $\frac{1}{12}$ or five minutes.
Independent Tasks	Solve these equations: $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}+\frac{2}{3}=$ __ x __ = __ 5 x __= $\frac{5}{7}+\frac{5}{7}+\frac{5}{7}+\frac{5}{7}+\frac{5}{7}=$ $\frac{5}{8}+?=2 \times \frac{5}{8}$ $\frac{1}{4}$ x __ = ___ + ___ + ___ Write a story problem that would match these equations and solve them: $\frac{6}{7} \times 8 =$ $\frac{9}{10}+\frac{3}{5}=$ $8 \div \frac{4}{5}=$

Anticipations	

Task 12	Sammy has $\frac{2}{5}$ of a kilo of fudge. She wants to cut the fudge into $\frac{1}{6}$ of kilo pieces for her friends. How many friends will get a piece of fudge? Sammy has $\frac{4}{5}$ of a kilo of fudge. She wants to cut the fudge into $\frac{1}{7}$ of kilo pieces for her friends. How many friends will get a piece of fudge? Sammy has $\frac{1}{3}$ of a kilo of fudge. She wants to cut the fudge into $\frac{1}{10}$ of kilo pieces for her friends. How many friends will get a piece of fudge?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Divide a fraction by a fraction.

Mathematical language	Whole, fifths, thirds, sevenths, tenths, sixths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who convert to a common denominator to solve the task. For example $\frac{2}{5} \div \frac{1}{6} = \frac{12}{30} \div \frac{5}{30}$ and then consider how many $\frac{5}{30}$ would go into $\frac{12}{30}$. **Connect:** Can you see what would come in the pattern in what you have done in your explanation? $\frac{2}{5} \div \frac{1}{6} = ? \div ? = ? \div ? = \frac{12}{5} = 2\frac{2}{5}$ $\frac{4}{5} \div \frac{1}{7} = ? \div ? = ? \div ? = \frac{28}{5} = ?$ $\frac{1}{3} \div \frac{1}{10} = ? \div ? = ? \div ? = \frac{10}{3} = ?$ What pattern did you notice? Could you write a rule to describe this?
Teacher Notes	• Facilitate the students to notice that there is a left over. Discuss how they could make sense of the left over by estimating what the whole number it is closest to. • Notice students who use reasoned notation to solve the equations.
Independent Tasks	Jia has $1\frac{1}{3}$ hours to do 4 jobs around the house. How much time does she have to do each job? Solve this problem using both a number line and counters then test your answer against the solution in minutes. What fraction would you need to work with if Jia had 6 jobs to do in $2\frac{1}{3}$ hours? What fraction would you need to work with if Jia had 5 jobs to do in $1\frac{1}{2}$ hours? What pattern can you notice?
Anticipations	

Task 13	Siautu is carrying her Pokémon cards when someone bumps her, and she drops them, and they all spread everywhere. One third of the cards fall down a drain out of reach and one sixth of the cards fall in a deep puddle and are too ruined to be saved. Siautu and her friend Sima pick up as many cards as they can but half of the cards that remained have already been picked up by other children who have walked off with them. Siautu counted all the cards she now had and gave one third of these to Sima for helping to pick them up. She put the remaining cards into her pocket. There were 14 of them. How many cards did Siautu have before they were dropped? What fraction of the total number that she was carrying had she lost or given to Sima?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.

Learning Outcomes: Students will be able to:	• Solve addition and subtraction problems involving fractions. • Solve multiplication and division problems involving fractions. • Find a fraction of a set.
Mathematical language	Whole, half, halves, thirds, sixths, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who are able to use a bar representation to solve this problem. If no students use a bar representation then teacher to model this to the students. **Connect:** Can you provide a word problem that will match: $3 \times \frac{1}{2}$ $1 \div \frac{1}{4}$
Teacher Notes	• Facilitate the students to notice that this problem can be solved using a bar representation. • Notice students who start at the end and work backwards to reach a solution.
Independent Tasks	Kiriwai has been given a cake to decorate. She is given 60 lollies to decorate it. She decides to split the cake into three sections and decorate each section but with a different proportion of lollies on each section. She puts $\frac{3}{10}$ of her lollies on the first section. She puts $\frac{2}{5}$ of the lollies on the second section. She puts $\frac{1}{10}$ of the lollies on the third section. How many lollies does she put on each section? Kiriwai has been given a cake to decorate. She is given 81 lollies to decorate it. She decides to split the cake into three sections and decorate each section but with a different proportion of lollies on each section. She puts $\frac{2}{9}$ of her lollies on the first section. She puts $\frac{1}{3}$ of the lollies on the second section. She puts $\frac{4}{9}$ of the lollies on the third section. How many lollies does she put on each section?
Anticipations	

Task 14	Solve these equations: $v = \frac{2}{3} + \frac{3}{7}$ $\frac{5}{16} + b = \frac{3}{4}$ $\frac{1}{3} = \frac{7}{15} - n$ $7\frac{1}{5} = 6\frac{1}{2} + b$ $8\frac{1}{2} = 9\frac{1}{3} - q$ $\frac{2}{3}$ x $w = 3$ $r = \frac{5}{8} \div 5$ $3\frac{3}{5} \div \frac{2}{5} = t$ $\frac{1}{3} = y$ x 4 $u \div \frac{1}{8} = 7$ 12 x $2\frac{3}{4} = 24 + p$ $13\frac{1}{2}$ x $\frac{4}{5} = 27$ x s $48\frac{4}{5} \div 4 = 12 + g$ Be ready to explain and justify your explanations using representations and/or notation.
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers.

	Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Solve missing number problems that involve fractions. • Solve addition problems involving fractions. • Solve subtraction problems involving fractions. • Solve multiplication problems involving fractions. • Solve division problems involving fractions. • Use operational laws to solve missing number problems that involve fractions.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, sixths, eighths, equal, equivalent, mixed numbers, numerator, denominator.
Sharing back/Connect	Select students to share who are able to draw on number properties and operational laws including the understanding of the equals sign to solve the problems. **Connect:** Draw on student solution strategies to highlight operational laws that the students used to solve the problems (e.g., inverse relationship, commutative property). Connect back to number and algebra unit to highlight that the properties work with all numbers including fractions.
Teacher Notes	• Facilitate the students to draw on the relationships they have identified in addition, subtraction, multiplication and division. • Notice students who are able to generalise patterns across denominators.
Independent Tasks	Solve these equations: $h = 1\frac{1}{4} + \frac{1}{2}$ $3\frac{1}{3} + n = 4$ $b = 8 - 5\frac{3}{10}$ $\frac{1}{3} - \frac{1}{10} = s$ $\frac{5}{6} - a = \frac{1}{3}$

	$k = \frac{1}{7} \times \frac{1}{3}$ $10 \div \frac{1}{5} = c$ Record your thinking using representations and/or notation.
Anticipations	

Task 15	Can you write a fraction multiplication problem together and then solve it? Can you write a fraction division problem together and then solve it?
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 ($\frac{a}{b}$ = a ÷ b, a & b are integers & b - 0), and it can be interpreted on the number line in two ways. For example, $\frac{2}{3}$ = 2 ÷ 3. On the number line, 2 ÷ 3 can be interpreted as 2 segments where each is 1/3 of a unit (2 x $\frac{1}{3}$) or $\frac{1}{3}$ of 2 whole units ($\frac{1}{3}$ x 2); each is associated with the same point on the number line. Every fraction/ratio can be represented by an infinite set of different but equivalent fractions/ratios. The real-world actions for addition and subtraction of whole numbers are the same for operations with fractions and decimals. The effects of operations for addition and subtraction with fractions and decimals are the same as those with whole numbers. Fractions with unlike denominators are renamed as equivalent fractions with like denominators to add and subtract.
Curriculum links	NA4-2: Understand addition and subtraction of fractions, decimals, and integers. NA4-4: Apply simple linear proportions, including ordering fractions. NA5-1: Reason with linear proportions. NA5-3: Understand operations on fractions, decimals, percentages, and integers.
Learning Outcomes: Students will be able to:	• Think about and view whole numbers and rational numbers in flexible ways. • Multiply fractions. • Divide fractions.
Mathematical language	Whole, half, halves, quarters, fourths, thirds, sixths, ninths, twelfths, eighths, equal, equivalent, numerator, denominator, common denominator, common multiple.
Sharing back/Connect	Select students to share who have written problems which are realistic to life but require fractions.

	Connect: Explore real life situations when the students have used multiplication and division of fractions in their lives.
Teacher Notes	• Read the reading: Sharp, J. & Welder, R. (2014). Reveal limitations through fractions division problem posing. *Mathematics Teaching in the Middle School*, *19*(9), 540-547. • During the launch, discuss that these problems need to be challenging, yet familiar and realistic contexts. Have students suggest some contexts that fit these criteria. • Discuss discrete (e.g., number of bicycles) and continuous (e.g., distance) quantities. While both can be correctly used in fraction division, problems involving discrete objects can tend to be unrealistic. • Suggest labelling unit words consistently. • Emphasise the relationship between remainders and mixed number answers. • Encourage students to use multiple definitions of fractions and division (e.g., operator and fair sharing).
Independent Tasks	Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity: NR9: Write and solve fraction word problems. NR12: Simplify and order fractions. NR13: Solve fraction operation problems.
Anticipations	

DMIC
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS/PROPORTION, RATIOS & DECIMALS: LEVEL 4 TASK NR9

Write some word problems for a friend involving any of the operations (addition, subtraction, multiplication, division) using fractions, decimals, or percentages. Show how you would solve the problems.

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS/PROPORTION, RATIOS & DECIMALS: LEVEL 4 Task NR12

Put these fractions in order from smallest to biggest.

$$\frac{9}{15} \quad \frac{7}{12} \quad \frac{8}{10} \quad \frac{2}{3} \quad \frac{14}{16} \quad \frac{5}{6}$$

Explain and show how you know this.

DMIC

DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER – FRACTIONS/PROPORTION, RATIOS & DECIMALS: LEVEL 4 Task NR13

Solve these problems and prove and justify your solution:

1) Mum fills up the petrol tank. During the week, she uses $\frac{1}{4}$ of the petrol dropping the kids off at school. She uses $\frac{3}{8}$ of the petrol going to work. She uses $\frac{1}{6}$ of the petrol going to the supermarket. What fraction of the petrol tank is full now?

2) Jodie is selling mandarins from her tree. She is selling them in $\frac{2}{3}$ kg bags. If she picks a bucket of mandarins weighing 5 and $\frac{5}{6}$ kgs for her – how much of the bags will she be able to fill?

3) Talia is making a fruit smoothie. For each bottle she needs:
   $\frac{3}{4}$ of a cup of blueberries $\frac{2}{3}$ of a cup of banana $\frac{4}{5}$ of a cup of ice

   $2\frac{3}{4}$ cups of milk $\frac{1}{5}$ of a table-spoon of vanilla
   Talia wants to make 5 bottles. How much of each ingredient will she need?