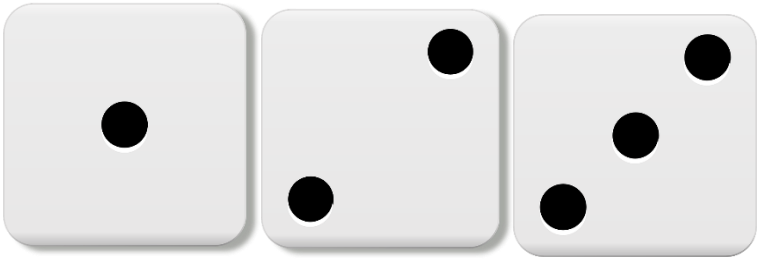
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Number and Algebra

Level 0 (NE / Year 0)

Teacher Booklet

Task 1 (Whole class option)	Sam and Jade are making dice to play snakes and ladders. This is the pattern they used for the first three numbers:  What is the same and different about the patterns? Which pattern is easiest to recognise? Can you create the dot patterns for 4, then 5, then 6?
Big Ideas	Quantity is an attribute of a set of objects and we use numbers (represented by words and symbols) to name specific quantities. A quantity (whole) can be decomposed into different parts, the parts can be composed to form the whole.
Curriculum Links	**NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Make and identify groupings for numbers from 0-10. Represent, explain, and justify number groupings between 0-10 using pictures, numbers, and words.
Mathematical language	Number words (e.g., one, two, three…).
Sharing back/Connect	Select students who have used different forms of structured grouping. Record their representations and the number symbol. Ask the students to practice copying the different groupings and record the matching number symbol. **Connect:** Can you create a dot pattern for 8? Highlight how 8 can be represented and counted as 4 twos or 2 fours. Represent this in a variety of ways and make connections between - materials → drawing → numbers → equations.
Teacher Notes	• Provide students with counters or stickers and other materials but also ask them to draw to represent each pattern they have created. • Provide coloured markers for students to draw groupings. • Notice their representations. Consider, are their drawings structured so that the groups are clear and easy to see? Are they showing an understanding of groupings within their representations?

Independent Tasks	Mere and Ana are playing with acorns and using them to make dice patterns for the numbers 1 to 8. What are some of the patterns they make? Can you draw the pattern and write the numbers to match? Can you write a number sentence to represent it?
Anticipations	

Task 2 (Whole class option)	Fau and Mepa are inventing a game to play at home. They want to make a dice that has dot patterns for the numbers 7 to 10 on it. Can you create the dot patterns for dice for 7, 8, 9, 10? How many different patterns can you create?
Big Ideas	Quantity is an attribute of a set of objects and we use numbers (represented by words and symbols) to name specific quantities. A quantity (whole) can be decomposed into different parts, the parts can be composed to form the whole.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Make and identify groupings for numbers from 0-10. Represent, explain, and justify number groupings between 0-10 using pictures, numbers, and words.
Mathematical language	Number words (e.g., one, two, three…).
Sharing back/Connect	Select students who have used different forms of structured grouping. Record their representations and the number symbol. Ask the students to practice copying the different groupings and record the matching number symbol. **Connect:** Can you create a dot pattern for 12? Highlight how 12 can be represented and counted using groupings - six 2s, two 6s, three 4s, 10 and 2 etc. Represent this in a variety of ways and make connections between - materials → drawing → numbers → equation.
Teacher Notes	• Provide students with counters or stickers and other materials but also ask them to draw to represent each pattern they have created. • Provide coloured markers for students to draw groupings. • Notice their representations. Consider, are their drawings structured so that the groups are clear and easy to see? Are they showing an understanding of groupings within their representations?
Independent Tasks	Mary and Sima are playing with pinecones and using them to make dice patterns for the numbers 4 to 12. What are some of the patterns they make? Can you draw the pattern and write the numbers to match? Can you write a number sentence to represent it?

Anticipations	

Task 3	John has a set of marbles. He wants to know how many marbles he has. Can you help him find out how many marbles he has? What is the quickest way John can count the marbles? Levi has a set of marbles, and he wants to know how many marbles he has. Can you help him find out how many marbles he has? What is the quickest way Levi can count the marbles?
Big Ideas	Objects in a set can be grouped and counted to get a final total. Quantity is an attribute of a set of objects and we use numbers (represented by words and symbols) to name specific quantities. A quantity (whole) can be decomposed into different parts, the parts can be composed to form the whole.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Count in groups. Represent and explain reasoning using pictures, numbers, and words. Compare two sets.
Mathematical language	Number words (e.g., one, two, three…).
Share back/Connect	For first task with ten marbles, select any students who are counting in twos or using groups to share their reasoning. If all students are using one to one counting, then model counting in twos and record this on the board as two dots and write the number 2 underneath and then another two dots and the number 4. The focus is to move students beyond one to one counting. Repeat this for the second task with 14 marbles. **Generalise:** Who has more marbles, John or Levi? Can you explain and prove your answer?
Teacher Notes	• Have sets of marbles or change this to objects relevant to your students. For the first task, give the students a set of 10 marbles. For the second problem, give the students a set of 14 marbles. • While students are finding out how many marbles are in the set, note the students who count in twos or use groups. Highlight this reasoning during share back. • Students should represent how they counted by drawing and/or writing numbers. • The key focus is to move students beyond one-to-one counting.

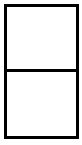
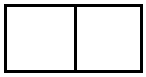
	• For the independent task, use round counters to represent the stickers. Have bags of counters with between 12 – 20 counters for the students to choose.
Independent Tasks	Liana has some stickers. She wants to know how many stickers she has. Can you help her count the stickers? Can you arrange the stickers into an easy way to count them? Now make sure that you draw your pattern and write the numbers to match.
Anticipations	

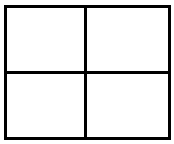
Task 4	Hala has collected some leaves. She wants to know how many leaves she has. Can you help her work out how many leaves she has? What is the quickest way Hala can count the leaves? Can you find a different way to count the leaves using groups?
Big Ideas	Objects in a set can be grouped and counted to get a final total. Quantity is an attribute of a set of objects and we use numbers (represented by words and symbols) to name specific quantities. A quantity (whole) can be decomposed into different parts, the parts can be composed to form the whole.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Count by using groups. Represent and explain reasoning using pictures, numbers, and words. Justify that quantity does not change when the objects are regrouped.
Mathematical language	Number words (e.g., one, two, three…).
Sharing back/Connect	Select any students who are counting in twos or using groups to share their reasoning. If all students are using one to one counting, then model counting in twos and record this on the board as two dots and write the number 2 underneath and then another two dots and the number 4. The focus is to move students beyond one to one counting. Select students who used different forms of structured grouping (4, 5, 10) to share their solution. Have children practice copying these different groupings and recording the number symbol alongside them. **Generalise:** Either choose the set number/s which children did not use e.g., 2s, 4, 5, 10 and ask them to group the set into those numbers OR if all set numbers were shared back then give students 16 leaves and ask them to arrange into groups to count quickly. Show how this can be represented, and make connections between different forms of representation: materials → drawing → numbers → equation
Teacher Notes	• Make links to yesterday's task as part of the launch. Remind children that they can count in different ways. • Have a set of 20 leaves or change this to an object relevant to your students. • Move beyond 1-1 counting and focus on counting in groups. • Notice students who use groups of 4, 5, or 10 and support them to write the numbers under the set. Select these students to share back.

	• Children represent how they counted by drawing or writing numbers or equations. • For the independent task, use round counters or pictures to represent the cicada shells. Have bags ready with between 12 – 20 counters for the students to choose.
Independent Tasks	Liana has been collecting cicada shells. She wants to know how many cicada shells she has. Can you help her count them? Can you arrange the cicada shells in different ways to find out how many of them she has? Make sure that you show the groups that you used and write the numbers to match them.
Anticipations	

Task 5 (Whole class option)	Tupou has 10 tipani for two baskets. What are the different ways that she could put the tipani into the baskets? Can you record your ideas using drawings and number sentences?
Big Ideas	Quantity is an attribute of a set of objects and we use numbers (represented by words and symbols) to name specific quantities. A quantity (whole) can be decomposed into different parts, the parts can be composed to form the whole. Equations show relationships of equality between parts on either side of the equal sign. The properties of equality are: If the same real number is added or subtracted to both sides of an equation, equality is maintained; If both sides of an equation are multiplied or divided by the same real number (not dividing by 0), equality is maintained; Two quantities equal to the same third quantity are equal to each other.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Group objects to 10 in different ways. Use patterns and relationships to solve problems. Represent and explain reasoning using pictures, numbers and words.
Mathematical language	Number words (e.g., one, two, three…).
Sharing back/Connect	Select students who have used patterns to find different possibilities to share their solution strategies. Record these using both pictorial representations (tens frames and equations). **Connect:** Select a student who has developed a systematic way to find all possibilities and ask other students to use that way to find all the possibilities for 14 pinecones. Otherwise use the following example… Tupou has worked out a way to find all the different combinations. She begins by putting 10 tipani in one basket and none in the other. (Record as ten counters and nothing and 10 + 0 = 10) Then she knows that the next one will be 9 tipani in one basket and one tipani in the other basket. (Record as 9 counters and 1 counter and 9 + 1 = 10) Can you use Tupou's idea to find all the different combinations?

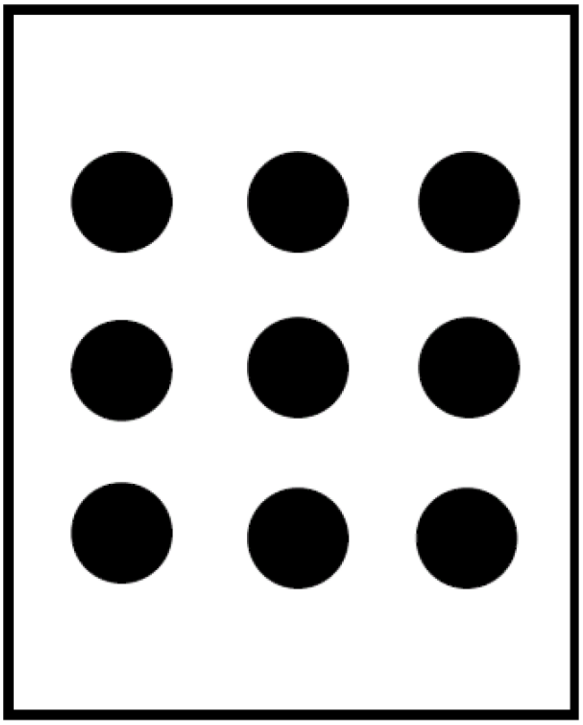
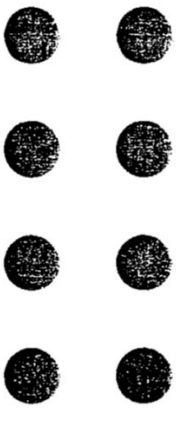
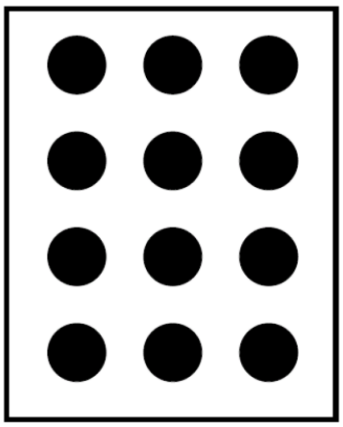
	What patterns do you notice?
Teacher Notes	• Have sets of tipani or materials to represent them or change this to an object/ context relevant to your students. • Notice students using patterns to find the different combinations and highlight this during sharing back. • Expect students to represent using counting and by writing numbers. Note those who used structured and clear representations. • Discuss and show with materials the commutative property (4 + 6 = 6 + 4)
Independent Tasks	Jenna has 12 grapes and two bowls. What are all the different ways that she could put the grapes into the bowls? Record your ideas using drawings and number sentences.
Anticipations	

Task 6	Sunlou and Amaya are playing with tiles. They have two square tiles that are the same. They make a pattern, so the tiles join together. Can you make a pattern with your tiles the same as they have? Can you draw your pattern? Now Sunlou and Amaya have 4 squares. Can you make a pattern out of the four squares so that each tile joins on two sides? Can you draw your pattern?
Big Ideas	Numbers can be grouped in an infinite number of ways - the number in a set stays the same no matter how it is arranged or represented. An array can represent a group.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Represent a grid in a structured way.
Mathematical language	Square, sides.
Sharing back/Connect	Begin by selecting students to share the two different ways (horizontal, vertical) they have oriented the tiles.   Ask students whether the horizontal and vertical representation is the same or different. Draw their attention to it being the same no matter which direction it is placed in. Ask students to draw the grid representation and compare it to the model. Repeat until the drawing is accurate.

	For the second task, note the students who make a square out of the tiles and orient other student's attention to this. Ask all students to make a square out of the tiles.  Ask the students to draw a representation of the square and note students who draw this in a structured way. Have students practice drawing this until it is accurate. **Connect:** Remove the tiles and ask students to draw on a blank piece of paper what the four squares would look like when placed together to make a large square.
Teacher Notes	• Have 2-D tiles or cardboard squares available for students to manipulate. • During first task progression notice whether they have placed tiles horizontally or vertically and whether they are in a line. • Ask students whether the horizontal and vertical representation is the same or different. Draw their attention to it being the same no matter which direction it is placed in. • Ask students to draw their grid representation and compare to the model. Repeat until drawing is accurate. • The focus of this activity is for the students to develop structural thinking.
Independent Tasks	Sunlou and Amaya are playing with tiles. They have four square tiles that are the same. They make a pattern so the tiles join together on two sides. Can you make the pattern with your tiles? Can you draw what the pattern looks like? Can you make a pattern with 8 tiles and draw this?
Anticipations	

Task 7	Bobbi and Leesa are playing with tiles. They have six square tiles that are the same. They make a grid so the tiles join together, can you make a grid with your tiles so that they are joined together? Can you draw the pattern you have made with your tiles? Now can you have a go at drawing these grids? A grid that is 3 by 3 A grid that is 2 by 4 A grid that is 4 by 3
Big Ideas	Numbers can be grouped in an infinite number of ways - the number in a set stays the same no matter how it is arranged or represented. An array can represent a group.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Describe how an array represents a group. Represent a grid in a structured way.
Mathematical language	Square, pattern.
Sharing back/Connect	Begin by selecting students to share the two different ways (horizontal, vertical) they have oriented the tiles. Model describing the groups of tiles using language such as 6 by 1, 2 by 3, 3 by 2, 1 by 6. Ask students to draw their grid representation and compare it to the model. Repeat until drawing is accurate. **Connect:** Can you use these sticks to make the same grids you made with the tiles? Provide students with ice-block sticks.
Teacher Notes	• Have 2-D tiles or cardboard squares available for students to manipulate. • Provide grid paper for those who are struggling to draw representations. • During first task progression, notice whether students have placed the tiles horizontally or vertically and whether they are in a line.

	• Ask students whether the horizontal and vertical representation is the same or different. Draw their attention to it being the same no matter which direction it is placed in. • Ask students to draw their grid representation and compare to the model. Repeat until drawing is accurate. • Provide students with grid paper or squares if they have difficulty drawing the grids.
Independent Tasks	Draw these grids first and then make them with the ice-block sticks. A grid that is 2 by 5 A grid that is 4 by 2 A grid that is 3 by 3 A grid that is 5 by 4
Anticipations	

Task 8	How many dots are there? Draw a picture of the array and record the numbers you used to find the number of dots.
	Examples of dot cards: Three by three array  Other examples:  
Big Ideas	Objects in a set can be grouped and counted to get a final total. Quantity is an attribute of a set of objects and we use numbers (represented by words and symbols) to name specific quantities. A quantity (whole) can be decomposed into

	different parts, the parts can be composed to form the whole.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Describe how numbers can be grouped in an infinite number of ways - the number in a set stays the same no matter how it is arranged or represented. Describe how an array represents a group. Represent an array in a structured way.
Mathematical language	Number words (e.g., one, two, three…).
Sharing back/Connect	For the tens frame, select students who represent the ten as five columns of two or two columns of five squares. If no students suggest this, then model how the ten could be represented in this way. For the 3 by 3 array, select students to share whose solutions have used groups. Record the solutions. For the dot cards, select students to share who have used groups in their solutions. Record the groups using number sentences. **Generalise** Can you draw two arrays of dots to represent 4 by 3. Use small dots for one and big dots for the other. What is the same and what is different?
Teacher Notes	• Begin by using a blank tens frame. Ask the students how many squares there are in total by imagining pulling the tens frame apart into a number of identical pieces. Ask, what is the quickest way to do this? • Show students a 3 by 3 array of dots. Ask the students to imagine how to pull this apart to find the total number of dots. • Provide students with dot cards and ask them to work out how many dots there are using grouping strategies. • Support students to group beyond counting by ones. Encourage and notice students who count or sort using groups. Highlight this to all students. • Model how to use number sentences to record the groupings.
Independent Tasks	Can you make these arrays using counters and draw them? Record a matching number sentence. 3 by 2

	3 by 3 4 by 2 2 by 5 3 by 5 4 by 5
Anticipations	

Task 9	Seini was collecting some flowers. She picked 3 red flowers and 3 yellow flowers. How many flowers did she pick altogether? Sepi was collecting some flowers. She picked 4 orange flowers and 3 white flowers. How many flowers did she pick altogether? Tiana was collecting some flowers. She picked 4 blue flowers and 5 yellow flowers. How many flowers did she pick altogether?
Big Ideas	Objects in a set can be grouped and counted to get a final total. Number operations and strategies to solve number operations can be recorded using words, numbers, diagrams, and symbols.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Solve one digit addition problems. Explain how to use known facts to solve addition problems.
Mathematical language	Add
Sharing back/Connect	Select students who use their knowledge of doubles or counting on to share their reasoning. If all students count all, then model how you could use doubles or counting on. **Connect:** Ask students to work out 5 + 6 = using knowledge of doubles and/or counting.
Teacher Notes	• Introduce each problem one at a time and given students an opportunity to solve it and share back before introducing the next problem. • Have concrete material available if needed for students to select (e.g., tens frames, counters). • Expect to students to draw/record their number sentences. Model this if needed. • Notice if students see patterns in each set of problems.
Independent Tasks	Seini was collecting some flowers. She picked 4 red flowers and 4 yellow flowers. How many flowers did she pick altogether? Sepi was collecting some flowers. She picked 5 orange flowers and 4 white flowers. How many flowers did she pick altogether? Tiana was collecting some flowers. She picked 5 blue flowers and 5 yellow flowers.

	How many flowers did she pick altogether? Lia was collecting some flowers. She picked 6 red flowers and 5 white flowers. How many flowers did she pick altogether? 4 + 3 = 3 + 4 = 7 + 6 = 6 + 7 =
Anticipations	

Task 10	Vimi's soccer team scored 3 goals in one game and 6 goals in another game. How many goals did her team score altogether? Nate's soccer team scored 7 goals in one game and 4 goals in another game. How many goals did his team score altogether? Leti's soccer team scored 5 goals in one game and 9 goals in another game. How many goals did her team score altogether?
Big Ideas	Objects in a set can be grouped and counted to get a final total. Number operations and strategies to solve number operations can be recorded using words, numbers, diagrams and symbols. There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Solve one digit addition problems. Explain how to use known facts to solve addition problems. Explain the commutative property of addition.
Mathematical language	Add, commutative property.
Sharing back/ Connect	Select students who are using counting on to solve the problem to share. Record this on board or if no students are using counting on, then model as another way the teacher has seen used before. If students are able to use counting on, then select students using a grouping solution to share or model this as an alternative solution strategy. If students use the commutative property (e.g., 3 + 6 = 6 + 3), highlight this and discuss with the other students. **Connect**: Ask students to describe how you would solve the following problem by counting on or using grouping: 6 + 8 =
Teacher Notes	• Introduce each problem one at a time and given students an opportunity to solve it and share back before introducing the next problem.

	• Have concrete material available if needed for students to select (e.g., tens frames, counters). • Expect to students to draw/record their number sentences. Model this if needed. • Notice and highlight if students use the commutative property of addition.
Independent Tasks	Vimi's soccer team scored 6 goals in one game and 2 goals in another game. How many goals did her team score altogether? Nate's soccer team scored 8 goals in one game and 6 goals in another game. How many goals did his team score altogether? Leti's soccer team scored 9 goals in one game and 4 goals in another game. How many goals did her team score altogether? 7 + 5 = 6 + 8 = 5 + 9 =
Anticipations	

Task 11	Mele had 6 felt tips and her friend Sarah borrowed 3 felt tips. How many felt tips does Mele have now? Rita had 9 felt tips and her friend Leesa borrowed 5 felt tips. How many felt tips does Rita have now? Sangeeta had 12 felt tips and her friend Mata borrowed 3 felt tips. How many felt tips does Sangeeta have now?
Big Ideas	Objects in a set can be grouped and counted to get a final total. Number operations and strategies to solve number operations can be recorded using words, numbers, diagrams and symbols. There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Solve subtraction problems by splitting a set into groups. Solve subtraction problems by bridging decades. Represent and explain reasoning using pictures, numbers, and words.
Mathematical language	Subtract, inverse relationship, addition, subtraction.
Sharing back/Connect	Select student solution strategies where they have used inverse relationships, grouping, and knowledge of sets (e.g., 3 + 3 = 6 so 6 – 3 = 3) or have subtracted in parts. If no students use grouping or subtraction in parts, then model this as a solution strategy that students have used in the past. **Connect:** Ask students to describe how you would solve the following problem using knowledge of sets or subtraction in parts: 14 – 5 =
Teacher Notes	• Introduce each problem one at a time and given students an opportunity to solve it and share back before introducing the next problem. • Have concrete material available if needed for students to select (e.g., tens frames, counters). • Expect to students to draw/record their number sentences. Model this if needed. • Notice students who use grouping to help solve the problems or known facts

	that draw on the inverse relationship of addition and subtraction, e.g. 3 + 3 = 6 so 6 - 3 = 3
Independent Tasks	Sima caught 7 fish and gave his friend 4 fish. How many fish does Sima have left? Timo caught 9 fish and gave his friend 4 fish. How many fish does Timo have left? Max caught 11 fish and gave his friend 2 fish. How many fish does Max have left? 8 – 3 = 6 – 4= 5 – 3 = 4 – 4 =
Anticipations	

Task 12	Tina had 8 beads and gave her friend Mellie 4 beads. How many beads does Tina have now? Daisy had 10 beads and gave her friend Ana 6 beads. How many beads does Daisy have now? Kelly had 12 beads and gave her friend Alisi 7 beads. How many beads does Kelly have now?
Big Ideas	Objects in a set can be grouped and counted to get a final total. Number operations and strategies to solve number operations can be recorded using words, numbers, diagrams and symbols. There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Solve subtraction problems by splitting a set into groups. Solve subtraction problems by bridging decades. Represent and explain reasoning using pictures, numbers and words.
Mathematical language	Subtract, inverse relationship, addition, subtraction.
Sharing back/Connect	Select student solution strategies where they have used inverse relationships, grouping and knowledge of sets (e.g., 4 + 4 = 8 so 8 – 4 = 4) or have subtracted in parts. If no students use grouping or subtraction in parts, then model this as a solution strategy that students have used in the past. **Connect:** Ask students to describe how you would solve the following problem using knowledge of sets or subtracting in parts: 16 – 7 =
Teacher Notes	• Introduce each problem one at a time and given students an opportunity to solve it and share back before introducing the next problem. • Have concrete material available if needed for students to select (e.g., tens frames, counters). • Expect to students to draw/record their number sentences. Model this if needed. • Notice students who use grouping to help solve the problems or known facts

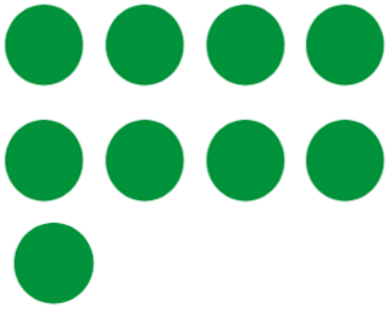
	that draw on the inverse relationship of addition and subtraction.
Independent Tasks	Mere had 5 shells and gave her mum 3 shells. How many shells does Mere have left? Sam had 8 shells and gave her mum 5 shells. How many shells does Sam have left? Martha had 12 shells and gave her mum 6 shells. How many shells does Martha have left? 7 – 2 = 8 – 3 = 9 – 4 = 12 – 4 =
Anticipations	

Task 13 (Whole Class option)	Work with your partner to work out which number sentences are true or false. 8 = 8 4 + 3 = 7 + 4 9 = 5 + 4 8 + 6 = 9 + 5 10 – 8 = 9 – 7 14 – 6 = 14 – 6 7 = 10 Explain why you think the number sentences are true or false.
Big Ideas	Equations show relationships of equality between parts on either side of the equal sign. The properties of equality are: If the same real number is added or subtracted to both sides of an equation, equality is maintained; If both sides of an equation are multiplied or divided by the same real number (not dividing by 0), equality is maintained; Two quantities equal to the same third quantity are equal to each other.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Explain and justify relationships between numbers in an equation. Write statements of equivalence in words and using notation. Solve equivalence problems and explain and justify the solutions.
Mathematical language	Equal sign, relationship, same, different.
Sharing back/Connect	Allow students to share misconceptions related to the equal sign to position them to engage in argumentation. Draw out discussion that the equal sign means the same on both sides but also that it shows a relationship. Select students to share who have used patterns and noticed relationships to recognise equivalence. **Connect:**

	Ask students to write their own true and false number sentences. Note students who use the equal sign flexibly.
Teacher Notes	• Ensure that students understand what true and false means. Introduce notation of not equal (≠) for the number sentences that they think are false. • Focus on the equal sign as showing an equivalent relationship across both sides. • Students may begin by demonstrating misconceptions (4 + 3 = 7 + 4 is true because 4 + 3 = 7). This can be used to position students to agree/disagree. • Teacher to notice students who are able to accept the use of the equals sign to show equivalent relationships. • Use arrows and notation to show relationships on the equations to the students.
Independent Tasks	Solve these problems: 3 + 9 = 4 + 8 = 5 + 7 = 6 + 6 = 7 + 5 = 8 + 4 = 9 + 3 = What patterns do you notice in the equations? Could you write more equations that match the pattern?
Anticipations	

Task 14	Here are some number sentences. What are the answers? 5 + 3 = 8 3 + 5 = 9 + 6 = 15 6 + 9 = 13 + 7 = 20 7 + 13 = What patterns do you notice? Did you find an easy way to find the answer?
Big Ideas	There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: Students will be able to:	Explain and justify the commutative property of addition. Represent and explain reasoning using pictures, numbers, and words.
Mathematical language	Addition, commutative property.
Connect	Select students who use the commutative property rather than calculating. Highlight to the students that you do not need to calculate but can use the relationship to solve different equations. Ask students to consider whether this will always work and when it will not work. Model writing the number sentences for the children as 9 + 6 = 6 + 9. **Connect**: Use quasi-variables (large numbers) to press students to generalise. 89 + 63 = 152

	63 + 89 = ? Can you write your own number sentences that use this pattern? Does this always work?
Teacher Notes	• Students may compute each sum separately or draw on the commutative property of addition. • This task is about exploring the commutative property - the idea that you can add in any order and the sum will be the same. • A quasi variable is a large number that can represent any number/ model a mathematical relationship. The students don't need to solve but can generalise mathematical relationships with them. • Equipment could be used to prove the commutative property.
Independent Tasks	Complete the following problems: 11 – 1 = 12 – 1 = 13 – 1 = 11 – 2 = 12 – 2 = 13 – 2 = 11 – 3 = 12 – 3 = 13 – 3 = 11 – 4 = 12 – 4 = 13 – 4 = 11 – 5 = 12 – 5 = 13 – 5 = What patterns do you notice? Did you find an easy way to find the answer?
Anticipations	

Task 15 **(Whole class option)**	 Use number sentences to represent this pattern in as many ways as you can.
Big Ideas	There are arithmetic properties that characterise addition and multiplication as operations. These are the commutative, associative, distributive, and identity properties. Addition and subtraction and multiplication and division have an inverse relationship. Equations show relationships of equality between parts on either side of the equal sign. The properties of equality are: If the same real number is added or subtracted to both sides of an equation, equality is maintained; If both sides of an equation are multiplied or divided by the same real number (not dividing by 0), equality is maintained; Two quantities equal to the same third quantity are equal to each other.
Curriculum Links	**NA1-1:** Use a range of counting, grouping, and equal-sharing strategies with whole numbers and fractions. **NA1-3:** Know groupings with five, within ten, and with ten. **NA1-4:** Communicate and explain counting, grouping, and equal-sharing strategies, using words, numbers, and pictures.
Learning Outcomes: **Students will be able to:**	Represent the same number in lots of different ways. Identify the inverse relationship between addition and subtraction. Explain and justify the commutative property.
Mathematical language	Commutative property, inverse relationship, addition, subtraction, equal.
Connect	Select students who have number sentences that show patterns to share (e.g., 5 + 4 = 9 and 4 + 5 = 9, 9 – 5 = 4, 9 – 4 = 5). Ask students to identify the patterns and discuss whether they will always work. Record the conjectures and generalisations. **Connect** Ask students to whether they notice any number sentences that match and explain why they match.
Teacher Notes	• Notice students' use of patterns e.g., 5 + 4 = 9 and 4 + 5 = 9, 9 – 5 = 4, 9 – 4 =

	5, 2 + 2 + 2 + 2 + 1 = 9, or 1 + 2 + 2 + 2 + 2 = 9. Develop discussion using student generated number sentences that show patterns and relationships. • Encourage students to write equations. Model this for them if needed and use materials to make a connection.
Independent Tasks	Select one or more of the following assessment tasks (attached at the end of the document) as the independent activity: N1: Addition and subtraction problems to solve. NA1: Write number sentences related to a dot pattern. NA2: Properties of numbers and operations.
Anticipations	

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER.- ADD/SUB: LEVEL 1 TASK N1

Write one or more word problems for a friend involving addition or subtraction. Show how you would solve them.

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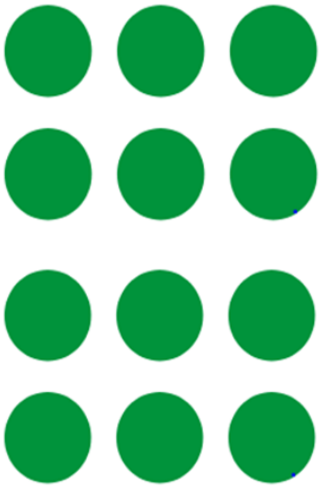
DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER - PATTERNS: LEVEL 1 Task NA1



Write number sentences about the dots above.

Describe what patterns you can find.

Why do your patterns work?

Do they work with other numbers?

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DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES
ASSESSMENT TASK

NUMBER - PATTERNS: LEVEL 1 Task NA2

3 + 4 = 9 + 5 = 2 + 2 + 2 = 4 + 3 =

7 + 3 = 3 + 7 = 10 - 7 =

10 - 3 = 3 x 2 = 10 + 5 = 2 x 3 =

Look at the number sentences above.

- Describe what patterns you can find.
- Why do your patterns work?
- Do they work with other numbers?