RICH MATHEMATICAL TASK BOOKLET

ALGEBRA

YEAR 1

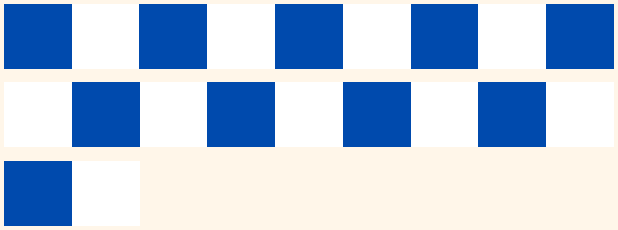
Teacher Booklet

Task 1

Kaiser likes making trains with cubes. This is his first train:

Copy the pattern.
Represent the train using letters and circle the unit of repeat.
How many cubes in his first train?

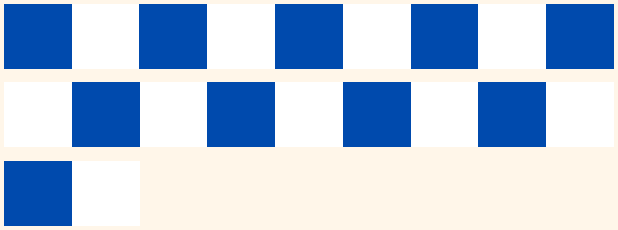
This is his second train:



Copy the pattern.
Represent the train using letters and circle the unit of repeat.

How many cubes in his second train?

This is his third train:



Copy the pattern.
Represent the train using letters and circle the unit of repeat.

How many cubes in his third train?

Use the hundred board table and highlight which numbers the blue blocks match with.

What patterns do you notice?

Big Ideas

Patterns are sequences (repeating or growing) made of numeric or spatial elements governed by a rule.

Patterns exist both in the world and in mathematics. The same pattern structure can be found in many different forms (e.g., numbers, shapes, colours, and rhythm).

A pattern can be described using a rule or you can create a pattern from a rule. To find the rule for a pattern, you need to identify the unit of the pattern (what is repeated or what grows).

Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Teacher Notes

Have cubes or multi-link cubes, and hundred boards.

During the launch, ask students to share where they see patterns in their lives. Reinforce discussion that patterns have repeating elements.

If students have difficulty making the pattern, support them to notice by putting their pattern next to a picture of the correct pattern and ask them to identify what is the same and what is different.

Facilitate the students to use the term unit of repeat or chunks. Support students to notice that each unit of repeat should be the same and all cubes should be included.

Expect students to represent using numbers and words and help them make links to multiplication.

For the independent task, have cubes or multi-link cubes available.

Shareback

Select students to share who use the unit of repeat to group the cubes to work out the total and use numbers to record this (e.g., 9 chunks/unit of repeats makes 18 cubes). Otherwise, model this to the students. Ask students how they could use the unit of repeat to find the total number of items, support them to generalise that the total number of cubes is double the number of units of repeat.

Connect

Link to the hundred board and ask the students to say patterns that they notice (e.g., white cubes will fall on even numbers or multiples of two and blue cubes on odd numbers).

Ask students to use the patterns to predict what colour cubes would be for numbers: 76, 81, 100, 121.

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.
Continue patterns.
Explain and justify the pattern in relation to ordinal aspects of counting.
Explain that a pattern has consistency.

Curriculum Links

Follow step-by-step instructions to complete a simple task

Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern

Mathematical Language

Unit of repeat, pattern, sequence.

Independent Tasks

Copy the pattern.

What is the unit of repeat? Circle this.

How many blocks are there altogether?
How many yellow blocks?
How many green blocks?

Draw the missing blocks.

Copy the pattern.

What is the unit of repeat? Circle this.

How many shapes are there altogether?
How many triangles?
How many squares?

Draw the missing shapes.

Make your own pattern.

What is the unit of repeat for your pattern?

Anticipations

Solutions, Misconceptions

Task 2

Sina is playing with her Lego and making rows on the floor. Her baby brother keeps knocking the pieces. Can you help Sina fix the rows?

This is her first Lego row:

Colour in the missing Lego pieces.

Copy the pattern.

Draw the Lego row.

What is the unit of repeat?

How many cubes in the unit of repeat?

What colour would the 18th piece be?
What colour would the 21st piece be?
What colour would the 28th piece be?

Teacher Notes

Have cubes and a hundred board available.

If students have difficulty making the pattern, support them to notice by putting their pattern next to a picture of the correct pattern and ask them to identify what is the same and what is different.

Facilitate the students to notice the pattern is made of chunks (unit of repeat). This could be linked to multiplication when identifying the number of elements in the pattern. Use the term unit of repeat with the students.

After students have drawn the lego pattern, ask them to circle the unit of repeat or chunks of the pattern. Support students to notice that each unit of repeat should be the same and all cubes should be included.

Expect the students to connect to multiplication when working out different elements. The hundred board can be used to highlight the patterns.

Big Ideas

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A pattern can be described using a rule or you can create a pattern from a rule. To find the rule for a pattern, you need to identify the unit of the pattern (what is repeated or what grows).

Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who use patterns of multiples of two or odd and even numbers to work out the far elements. If students do not use patterns and multiplication, then model this to them.

Connect

Use a hundred board and ask students to colour the green and red pieces in relation to the numbers.

What patterns do you notice?
What rule could you use to predict which number the green piece would be?
What rule could you use to predict which number the red piece will be?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a repeating pattern.

Explain and justify the pattern in relation to ordinal aspects of counting.

Communicate, explain, and justify their pattern.

Predict a point in a sequential pattern.

Explain that a pattern has consistency.

Curriculum Links

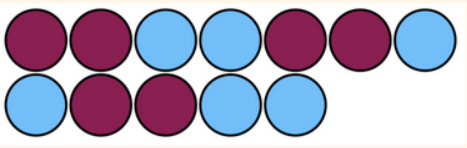
Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern.

Follow step-by-step instructions to complete a simple task.

Mathematical Language

Unit of repeat, pattern, sequence, rule.

Independent Tasks

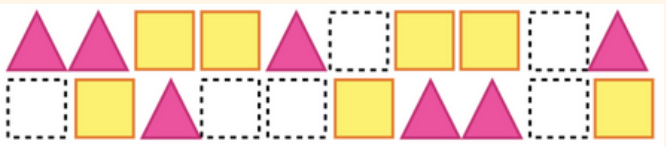


Copy the pattern.

What is the unit of repeat? Circle this.

Use the equipment to make a second snake that matches but uses different colours. Extend this by one unit of repeat.

Use the equipment to make another pattern that matches and extend this by one unit of repeat.



Draw the missing shapes.

Make your own pattern.

What is the unit of repeat for your pattern?

Anticipations

Solutions, Misconceptions

Task 3

Use the shape blocks to copy these patterns and continue them:

What is the unit of repeat?
What would the 15th shape be?
What would the 22nd shape be?
What would the 30th shape be?

What is the unit of repeat?
What would the 15th shape be?
What would the 22nd shape be?
What would the 30th shape be?

What is the unit of repeat?
What would the 15th shape be?
What would the 22nd shape be?
What would the 30th shape be?

Teacher Notes

Have 2D shapes available.

If students have difficulty making the pattern, support them to notice by putting their pattern next to a picture of the correct pattern and ask them to identify what is the same and what is different.

Facilitate the students to notice the pattern is made of chunks (unit of repeat). Use the term unit of repeat with the students.

Facilitate the students to notice that elements in the pattern can be found without creating the whole pattern by instead noticing and using relationships and patterns.

For the independent task, have pegs and other concrete material (e.g., counters, cubes, teddies) for the students to use.

Big Ideas

Patterns are sequences (repeating or growing) made of numeric or spatial elements governed by a rule.

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A pattern can be described using a rule or you can create a pattern from a rule. To find the rule for a pattern, you need to identify the unit of the pattern (what is repeated or what grows).

Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who use patterns and multiplication to work out the far elements. If students do not use patterns and multiplication, then model this to them.

Connect

Ask the students to reproduce each pattern using different material (teddies, drawing, movement) but the same unit of repeat.

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a repeating pattern.

Explain and justify the pattern in relation to ordinal aspects of counting.

Communicate, explain, and justify their pattern.

Predict a point in a sequential pattern.

Explain that a pattern has consistency.

Curriculum Links

Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern.

Mathematical Language

Unit of repeat, pattern, sequence, element, rule.

Independent Tasks

Hamuera is playing with the washing pegs and makes this pattern:

Use the picture cards to copy the pattern.
What is the unit of repeat?

Draw the missing pegs.

Hamuera continues the pattern using the pegs.

What colour would the 20th peg be?
What colour would the 25th peg be?
What colour would the 40th peg be?

Can you use different material and make the same pattern?

Anticipations

Solutions, Misconceptions

Task 4

Tagi is making a kahoa using pomea seeds, tuitui (candlenut), and shells.

This is her pattern:

Use the picture cards to copy the pattern.

What is the unit of repeat?

Draw the missing pieces.

What would the 20th piece be?

What would the 24th piece be?

What would the 28th piece be?

Teacher Notes

Have pictures of each item available.

If students have difficulty making the pattern, support them to notice by putting their pattern next to a picture of the correct pattern and ask them to identify what is the same and what is different.

Facilitate the students to notice the pattern is made of chunks (unit of repeat). Use the term unit of repeat with the students.

Facilitate the students to notice that elements in the pattern can be found without creating the whole pattern by instead noticing and using relationships and patterns.

For the independent task, have pegs and other concrete material (e.g., counters, cubes, teddies) for the students to use.

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Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who use patterns and multiplication to work out the far elements. If students do not use patterns and multiplication, then model this to them.

Connect

Use the picture cards to show each necklace vertically and write the corresponding numbers.

etc up to 20.

What patterns do you notice?
What would the 30th piece be?
What would the 31st piece be?
What would the 36th piece be?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a repeating pattern and identify missing elements in the sequence.

Explain and justify the pattern in relation to ordinal aspects of counting.

Predict far elements in a sequential pattern.

Explain that a pattern has consistency.

Curriculum Links

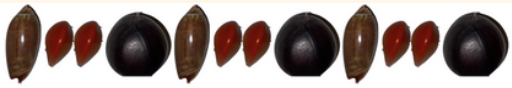
Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern.

Mathematical Language

Unit of repeat, pattern, sequence.

Independent Tasks

Tagi is helping to make kahoa for her cousin's party. Each kahoa uses the following pattern:



Use the picture cards to copy the pattern.

What is the unit of repeat?

Draw the missing pieces.

Use different materials and make the same pattern.

Anticipations

Solutions, Misconceptions

Task 5

Tane is looking at the dogs at the park.

He decides to count all the eyes for the dogs that he sees.
If there was one dog, how many eyes would there be?
If there were two dogs?
If there were four dogs?

Complete the table:

Number of dogs	Eyes
1	
2	
3	
4	
5	
6	
7	
8	

How many eyes would there be for 10 dogs?
How many eyes would there be for 20 dogs?
Find three patterns in the table.

Teacher Notes

Have the pictures of dogs printed onto individual cards for students to use if necessary.

If needed . complete the table show the corresponding number of dog cards, continue to use this process for the five dogs. Facilitate the students to notice the relationship between the number of dogs and total number of eyes. This can be connected to counting in groups or multiplication.

Notice students who use grouping or multiplication to work out the number of eyes (e.g., 4 dogs and 2 eyes so 8 in total).

Patterns in the table vertically may include sequential or single variational thinking (e.g., the number of eyes increase by two) or horizontally co-variational or relational thinking (e.g., the eyes are double the number of dogs).

For the connect, model to students how the rule could be written using informal variables, e.g., n = 2a or □ = 2 △

Big Ideas

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Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who use grouping/multiplication or patterns and relationships to work out the number of eyes.

Connect

If Tane saw 100 dogs, how many eyes would he see?

If Tane saw 100 eyes, how many dogs would he see?

What rule could Tane use to work out the number of eyes no matter how many dogs there are?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a repeating pattern.

Explain and justify the pattern in relation to ordinal aspects of counting.

Communicate, explain, and justify their pattern.

Predict a point in a sequential pattern.

Explain that a pattern has consistency.

Independent Tasks

Leeanna sees some children riding bicycles at the park.
She decides to count the number of wheels that she sees.

Complete the table:

Number of bicycles	Wheels
1	
2	
3	
4	
5	
6	
7	
8	

How many wheels would Leeanna see for 10 bicycles?
How many wheels would Leeanna see for 15 bicycles?
Write three patterns that you notice in the table.

What rule could Leeanna use to find the number of wheels for any number of bicycles?

Curriculum Links

Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern.

Mathematical Language

Unit of repeat, pattern, sequence.

Anticipations

Solutions, Misconceptions

Task 6

Niu is making an ‘ula lole.
She is making this pattern:

Complete the table below:

Number of units of repeat	Fruit burst	Minties	Total number of lollies
1			
2			
3			
		4	
5			
	12		
			21

What patterns do you notice in the table?

Teacher Notes

During the launch, ask students to share where they see patterns in their lives. Reinforce discussion that patterns have repeating elements and that they can grow.

If necessary complete the table, using a piece of card and cover up the lollies so only one unit of repeat is visible, for the second set, use the card to show only two units of repeat, continue to use this process.

Facilitate the students to notice the relationship between the number of the unit of repeat and number of lollies. This can be connected back to multiplication.

Notice students who use grouping or multiplication to work out the number of lollies (e.g., 5 units of repeat and 2 fruit bursts in each so 10 fruit bursts in total) OR relational reasoning (e.g., the number of minties matches the number of the unit of repeats).

Big Ideas

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Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Teacher Notes

For the connect, patterns in the table vertically may include sequential or single variational thinking (e.g., the minties increases by one, the total lollies increases by 3 each time) or horizontally co-variational or relational thinking (e.g., the total lollies are three times the number of minties).

Facilitate students to write rules using informal variables, e.g., n = 3 × a or $n=3\ x\ \Delta n=3\ x\ \Delta$ (total number of lollies).

Explain that the letter or shape represents any number for an unknown amount.

For the independent activity, have picture cards available.

Shareback

Select students to share who use grouping/multiplication or patterns and relationships to work out the number of lollies.

Connect

Find three patterns across the table and three patterns down the table.

What rules could you use to find different parts of the pattern?

Fruit bursts

Minties

Total number of lollies

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue growing patterns.

Generalise the number of elements in a multiplicative growing pattern for certain points.

Explain that a pattern has consistency.

Develop a rule for a growing pattern in words.

Curriculum Links

During Year 1
Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern.

Mathematical Language

Unit of repeat, pattern, sequence.

Independent Tasks

Mereana is making an ‘ula lole with Crunchie and Mars bars
She is making this pattern:

Use the picture cards to copy the pattern.
What is the unit of repeat?

Represent the pattern using letters or shapes.

Complete the table below:

Number of units of repeat	Crunchie	Mars bars	Total number chocolate bars
1			
2			
3			
4			
5			
6			

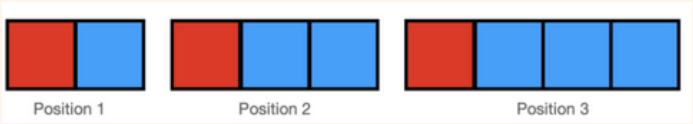
What patterns do you notice in the table?

Anticipations

Solutions, Misconceptions

Task 7

Teanau is using the shape blocks to build patterns.



Use the picture cards and drawings to show Position 4.

What about Position 5?

Draw these patterns.

Draw what Position 10 would look like.

Describe in words what Position 15 would look like.

Teacher Notes

Have square blocks or picture cards available. Facilitate students to construct the pattern with material and to draw the pattern.

If students have difficulty constructing the pattern, show them the picture of the pattern and ask them what is the same and what is different and support them to change their pattern construction.

This growing pattern introduces a constant which is the first square so the rule for the total number of shapes would be t + 1 (this could be modelled to the students using informal variables).

For the connect, the rule would be the position number multiplied by one for the blue squares and add one for the total number of squares.

For the independent task have square shapes or cards available.

Shareback

Select students to share who continue the pattern and develop a generalisation for the pattern structure.

Big Ideas

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Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Connect

How would you tell someone to draw any position at all for the pattern?
What rule could you use to find the number of blue squares?
What rule could you use to find the total number of shapes?

Suggested Learning Outcomes

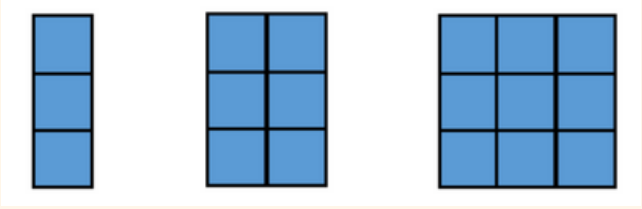
Explain and justify the pattern using the visual characteristics of the geometric pattern.

Explain that a pattern has consistency.

Generalise the number of elements in a geometric growing pattern for certain points.

Provide a rule in words for the generalisation.

Independent Tasks



Copy the pattern using the shapes cards.

Draw the pattern.

Draw what the pattern would look like for pattern 5.

Draw what the pattern would look like for pattern 10.

Describe what the pattern would look like for pattern 20.

Curriculum Links

Recognise, continue and create repeating and growing patterns, and describe a rule to explain a pattern

Mathematical Language

Unit of repeat, pattern, sequence, elements, rule.

Anticipations

Solutions, Misconceptions

Task 8

This is my pattern:

Copy the pattern using the square cards.

What might Position 4 look like?

Complete the table:

Position number	Number of Green Squares	Number of Red Squares	Total number of squares
1			
2			
3			
4			
5			
6			
7			
8			

Teacher Notes

Have square shape blocks or picture cards available.
Facilitate students to construct the pattern with material and to draw the pattern.

If students have difficulty constructing the pattern, show them the picture of the pattern and ask them what is the same and what is different and support them to change their pattern construction.

This growing pattern introduces a constant which is the square in the middle so the rule for the total number of shapes would be $t = 3a + 1$ (this could be modelled to the students using informal variables).

For the connect, the rule would be the position number multiplied by 3 for the red squares and the position number multiplied by 3 add one for the total number of squares.

Shareback

Select students to share who continue the pattern by using grouping or multiplication.

Big Ideas

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Generalisations can be expressed with both words and symbols.

Connect

Describe how you would find the number of squares for position 100.
What rule could you use to find the number of red squares for any position number?
What rule could you use to find the total number of squares for any position number?

Suggested Learning Outcomes

Explain and justify the pattern using the visual characteristics of the geometric pattern.

Explain that a pattern has consistency.

Generalise the number of elements in a geometric growing pattern for certain points.

Provide a rule in words for the generalisation.

Independent Tasks

Leilani is building a Lego tower:

What is the unit of repeat?

What colour would the 20th brick be?

What colour would the 31st brick be?

Complete the table:

Number of units of repeat	Red bricks	Blue bricks	Yellow bricks	Green bricks	Total number of bricks
1					
2					
3					
4					
5					

Curriculum Links

Recognise, continue and create repeating and growing patterns, and describe a rule to explain a pattern

Mathematical Language

Unit of repeat, pattern, sequence, elements, rule, position.

Anticipations

Solutions, Misconceptions

Task 9

At Kapa Haka, the group is learning tī rākau. As part of the game, they used these movements:

Tap tī rakau on the ground, tap tī rakau on the ground, tap tī rakau together, throw tī rakau to partner.

They repeat these moves lots of times throughout the game.

If they repeat the moves two times, how many taps on the ground would there be? How many taps together would there be? How many throws would there be?

Complete the table below:

Number of sequence	Tap ground	Tap together	Throw
1			
			2
	6		
4			
		5	
6			

Teacher Notes

Have pictures of movements printed onto individual cards for students to use if necessary.

To complete the table, support the students to work with a buddy to complete the tī rakau sequence and count if needed but facilitate the students to notice the relationship between the number of sequences and the total number of the different types of actions. This can be connected back to grouping and multiplication so students move beyond counting single actions.

For the connect, patterns in the table vertically may include sequential or single variational thinking or horizontally co-variational or relational thinking. Also facilitate students to write their rules using informal variables.

Have different types of concrete material available to make patterns.

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Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who use grouping/multiplication or patterns and relationships to work out the number of different types of movements.

Connect

Find three patterns across the table and three patterns down the table.

What rules can you use to find the number for different actions when playing tī rakau?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue growing patterns.

Generalise the number of elements in a multiplicative growing pattern for certain points.

Explain that a pattern has consistency.

Develop a rule for a growing pattern in words.

Independent Tasks

Karlos is eating M & Ms. He like to eat his two favourite colours in a pattern:

Complete the table below:

Number of units of repeat	Blue M & Ms	Red M & Ms	Total number of M & Ms
1			
2			
3			
4			
5			

What patterns do you notice in the table?

Curriculum Links

Copy, continue, create, and describe a repeating pattern with three elements, and identify missing elements in a pattern.

Mathematical Language

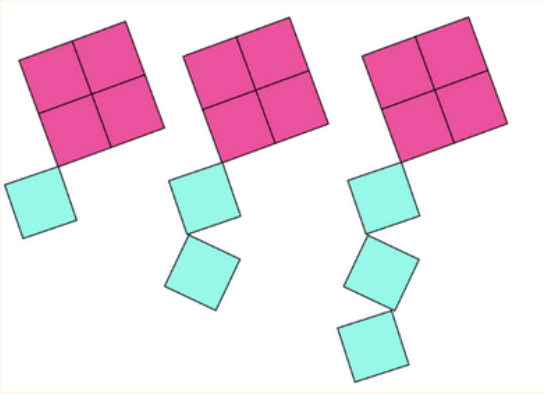
Unit of repeat, pattern, sequence.

Anticipations

Solutions, Misconceptions

Task 10

This is my squares pattern:



Copy the pattern using the square shapes.

Build and draw Position 5.

Build and draw Position 8.

Describe what Position 10 would look like.
How many squares would you need for Position 10?

Teacher Notes

Have picture cards or square shapes available. Facilitate students to construct the pattern with material and to draw the pattern.

If students have difficulty constructing the pattern, show them the picture of the pattern and ask them what is the same and what is different and support them to change their pattern construction.

For the connect, the rule would be the position number multiplied by one add four for the total number of shapes

Big Ideas

Patterns are sequences (repeating or growing) made of numeric or spatial elements governed by a rule.

Patterns exist both in the world and in mathematics. The same pattern structure can be found in many different forms (e.g., numbers, shapes, colours, and rhythm).

A pattern can be described using a rule or you can create a pattern from a rule. To find the rule for a pattern, you need to identify the unit of the pattern (what is repeated or what grows).

Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who generalise the geometric pattern structure and describe the pattern using grouping or multiplication.

Connect

Describe how you would find the number of squares for position 100.

What rule could you use to find the total number of squares for any position number?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a repeating pattern.

Explain and justify the pattern in relation to ordinal aspects of counting.

Communicate, explain, and justify their pattern.

Predict a point in a sequential pattern.

Explain that a pattern has consistency.

Independent Tasks

Complete the following assessment tasks (attached at the end of the document) as the independent activity:

Task 1: Shell patterns

Task 2: Jellybean patterns

Curriculum Links

Recognise, continue and create repeating and growing patterns, and describe a rule to explain a pattern

Mathematical Language

Unit of repeat, pattern, sequence.

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Algebra - Year 1

Nevaeh made a pattern with shells she collected from the beach. Her pattern looked like this:

What shape would the 15th shell be?

What about the 19th?

What about the 29th?

Complete the table below:

Number of units of repeat	Pipi shell	Fan shell	Total number of shells
1			
2			
3			
4			

What patterns do you notice?

Assessment Task 2 - Algebra - Year 1

Nevaeh is eating jellybeans and she likes to eat them in this order:

What colour would the 8th jellybean be?

What about the 15th?

What about the 31st?

Complete the table below:

Number of units of repeat	Purple jellybean	Green jellybean	Total number of jellybeans
1			
2			
3			
4			
5			

What patterns do you notice?