RICH MATHEMATICAL TASK BOOKLET

ALGEBRA

YEAR 4

Teacher Booklet

Task 1

Litea has a giant bag of M & Ms. She likes to eat her favourite colours of M & Ms in a specific order: brown, blue, red, green, yellow, orange.

What colour will the 83rd M & M that she eats be?

Find two different ways of solving the task and show representations to prove your solutions.

Teacher Notes

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

Have multilink cubes available for the students to model the pattern.

Facilitate the students to model the pattern in a way that highlights the structure of the pattern.

Use the model to support students to notice that certain elements align with specific numbers or multiples.

Use the term unit of repeat for the pattern base.

Notice students who use grouping or identify multiples to solve the task.

Expect students to represent using blocks and numbers and to identify the number patterns associated with the specific colours (similar to choral counting).

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).

In a pattern, the relationship between the ordinal position (e.g., first, second, and third) and the corresponding element is more useful for finding the pattern's rule than the relationship between successive elements. Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Variables are symbols that take the place of numbers, or ranges of numbers. They have different meanings depending on whether they are being used as representations of quantities that vary or change, representations of specific unknown variables, or placeholders in a generalised expression or formula.

Teacher Notes

For the connect, students might notice that the yellow Skittles are all multiples of 4 so the rule for yellow Skittle would be multiply by 4. Ask the students for the rule in words and then model explicitly writing the steps to find the colour before modelling as a rule with variables or informal variables. Ask the students to explicitly create a set of steps to find a specific coloured skittle and then write the rule. For example: For the green Skittle, you could multiply by 4 and add 3 or multiply by 4 and subtract 1.

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

Shareback

Select students to share who use a grouping strategy to solve the task. For example, students might notice that an orange M & M is always a multiple of 6 and use this to get close to 83 by stating that 78 would be orange and then using the pattern structure.

Connect

What do you notice about all of the orange M & Ms in relation to their pattern position?
How could you find the location of every orange M & M?
What rules can you use to find the different coloured M&Ms?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue repeating patterns.

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

Identify the element for a repeating pattern for far terms.

Explain that a pattern has consistency.

Develop generalisations for a repeating pattern and express it in words.

Write a set of explicit instructions to find specific parts of a pattern

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

create and use an algorithm for generating a pattern or pathway.

Mathematical Language

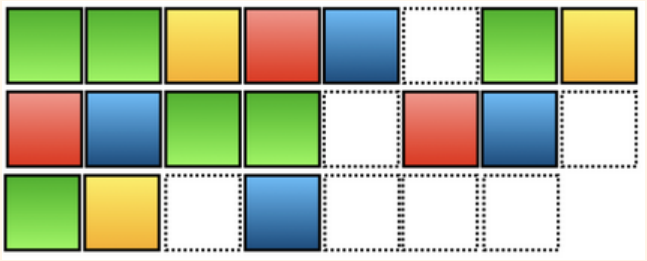
Sequence, element, rule, unit of repeat.

Independent Tasks

Lulu is making a snake with cubes. This is his first snake:

Copy the pattern.
What is the unit of repeat? How many cubes in the unit of repeat?
How many cubes are there altogether?

Draw a picture of the snake and colour it.



What colours would the missing cubes be?

Lulu continues making his pattern.

What colour would the 56th block be?
What colour would the 77th block be?
What colour would the 110th block be?

What do you notice about all of the yellow blocks in relation to their pattern position?

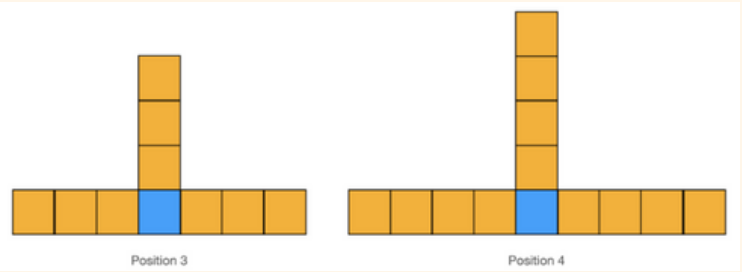
What do you notice about all of the blue blocks in relation to their pattern position?

Anticipations

Solutions, Misconceptions

Task 2

Jona is using the shapes to make a pattern:



Make and draw position 1 and 2 and 5.

How do you see the pattern growing? Represent this with numbers.

How would you draw position 10?

Complete the table:

Position number	Number of blocks
1	
2	
5	
10	
12	
15	

Teacher Notes

Do a pattern quick image warm-up before you launch the task. Show the students the pattern for three seconds and ask them to describe it. Show the pattern again for three seconds and ask them to draw it. Display the pattern and ask them to draw the next term.

Have square shapes available for students to model the pattern.
Expect students to represent using blocks and numbers and to show how they see the pattern growing.

Notice students who use grouping or identify the recursive add 3 element for the growing pattern. Facilitate the students to connect this to multiplication (e.g., adding three multiple times is the same as × 3). Facilitate the students to notice that the blue square is the constant and stays the same as the pattern grows. This can be linked to the + 1 in the rule during the connect.

Introduce students to the idea that rules can be written using a variable (letters or shapes) to represent any number. Model this during the connect.

For the independent task, have multilink cubes available to model the pattern.

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).

In a pattern, the relationship between the ordinal position (e.g., first, second, and third) and the corresponding element is more useful for finding the pattern's rule than the relationship between successive elements. Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

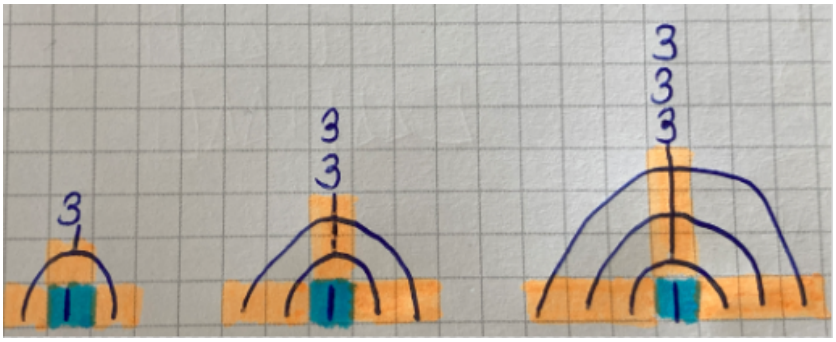
Variables are symbols that take the place of numbers, or ranges of numbers. They have different meanings depending on whether they are being used as representations of quantities that vary or change, representations of specific unknown variables, or placeholders in a generalised expression or formula.

Shareback

Select students to share who have developed different generalisation strategies. This includes the use of a whole object generalisation:

1) To find the number of blocks for position 10, they double the number of blocks for position 5 and subtract one block to avoid over-counting the blue block
OR explicit generalisation strategies:
2) Identify the growing element as increasing by one block each time on three sides with one block in the middle.

3) Identify the growing element as increasing by three blocks each time with one block in the middle.



Connect

Describe how to find the number of blocks for position 100?
What rule could you use to find the number of blocks for any position number?
[Model writing this as 3 × b + 1]

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

Position, element, rule, unit of repeat, variable.

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

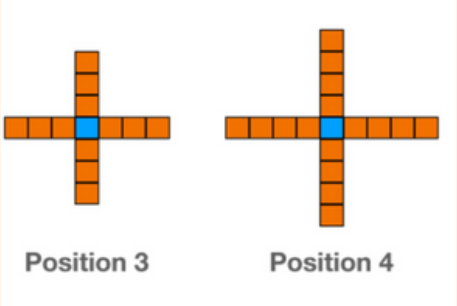
Continue a growing pattern.

Find further terms in a growing pattern.

Develop generalisations for a repeating pattern and express it in words.

Independent Tasks

Jona is using the shapes to make a pattern:



How many blocks would I need to make:

Position 8:
Position 12:

If I had 65 orange blocks, what position number could I make?
Would I have some orange blocks left over?

Anticipations

Solutions, Misconceptions

Task 3

Tevita's group is practising their sasa for the Polyfest.
The first sequence is: clap, slap, slap, clap
The second sequence is: clap, slap, slap, clap, slap, slap, clap
The third sequence is: clap, slap, slap, clap, slap, slap, clap, slap, slap, clap

What would the next sequence be?
Represent the pattern sequence using the shape blocks.

Complete the table:

Sequence number	Number of claps	Number of slaps	Total number of movements
1			
2			
3			
	5		
		10	
			19

Identify three patterns across the table rows and three patterns down the table columns.

Teacher Notes

Before you launch the task, ask the students to share examples of dances they know from their culture. Ask them to give an explicit set of instructions for a movement sequence for the dance. Record this on the board. Ask students to follow the instructions and see if they work.

During the launch, ask students to share different types of dance patterns that they know. Position them to represent the dance patterns in different ways (e.g., using letters, shapes, or colours).

Have shape blocks and counters available.

Notice students who use relational patterns for the rules (e.g., n + 1 for the claps). If students use recursive patterns (+ 2 for the slaps or + 3 for the total number of movement), facilitate them to connect this to multiplication (e.g., adding three multiple times is the same as × 3). Facilitate the students to notice that the clap at the beginning is the constant and stays the same as the pattern grows. This can be linked to the + 1 in the rule for the total number of movements or for the claps.

Big Ideas

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Teacher Notes

Facilitate the students to notice patterns in the table vertically. This may, include sequential or single variational thinking (e.g., the claps increase by one, the slaps increase by 2 each time) or horizontally co-variational or relational thinking (e.g., the slaps are × 2 the sequence number or the number of slaps are number of claps × 2 – 2).

Introduce students to the idea that rules can be written using a variable (letters or shapes) to represent any number. Model this during the connect. For the independent task, have square shape pieces available.

Shareback

Select students to share who develop explicit generalisations using multiplication and relationships to work out the different number of movement and who identify co-variational patterns in the table (e.g., total number of movements is slaps + claps).

Connect

If there are 100 slaps, how many claps will there be?
What rules can you use to find the different types of movements?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a growing pattern.

Identify the growing element and constant in a linear growing pattern.

Represent the growing element and the constant using numbers and symbols.

Represent a growing pattern in a table of data.

Identify patterns in a table of data that draw on single variational thinking or co-variational thinking.

Develop generalisations for a repeating pattern and express it in words.

Write a set of explicit instructions to find specific parts of a pattern

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Create and use an algorithm for generating a pattern or pathway.

Mathematical Language

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

Independent Tasks

Tevita's group is practising their sasa for the Polyfest.
The first sequence is: clap, slap, slap, clap
The second sequence is: clap, slap, slap, clap, slap, slap, clap
The third sequence is: clap, slap, slap, clap, slap, slap, clap, slap, slap, clap

Represent the pattern using different material.
Represent the pattern again using another type of material.

Create your own dance pattern.
What is the unit of repeat for your pattern?

Represent your dance pattern using different material.
Represent the pattern again using another type of material.

Anticipations

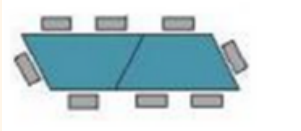
Solutions, Misconceptions

Task 4

You are having a family reunion at your church hall and need to help set the tables up so everyone will fit.

One table looks like this:

Two tables look like this:



How many people could sit around three tables?

How is the pattern growing?
Use drawings and numbers to show how it is growing.

How many people could sit around six tables?
How could you find out how many people could sit around 10 tables?

If there were 65 people seated, how many tables would there be?

Teacher Notes

Do a pattern quick image warm-up before you launch the task. Show the students the pattern for three seconds and ask them to describe it. Show the pattern again for three seconds and ask them to draw it. Display the pattern and ask them to draw the next term.

Expect students to represent using drawings, colours, and numbers to show how they see the pattern growing.

Notice students who use grouping or identify the recursive add 3 element for the growing pattern. Facilitate the students to connect this to multiplication (e.g., adding three multiple times is the same as × 3). Facilitate the students to notice that the chair at the end would need to be moved out to avoid getting squashed, physically model this if necessary.

Support students to develop an explicit generalisation in words and number ($3h + 2$) to find the number of people who can be seated.

For the independent task, use the task below.

Big Ideas

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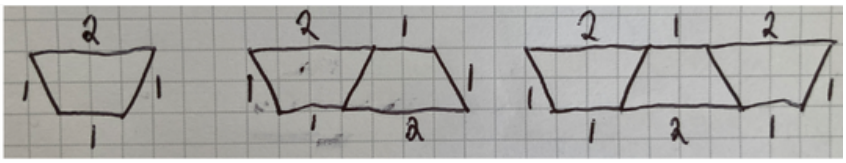
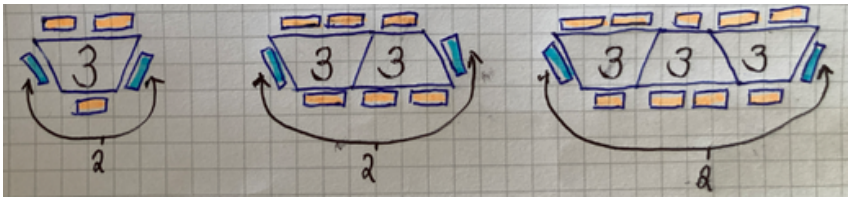
Shareback

Select students to share who can show how the pattern increases using representations, colours, and numbers:

1)



2)



Connect

How could you find out how many people can be seated for 100 tables?

What rule could you use to find out how many people can be seated for h tables?

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a growing pattern.

Identify the growing element and constant in a linear growing pattern.

Represent the growing element and the constant using numbers and symbols.

Represent a growing pattern in a table of data.

Identify patterns in a table of data that draw on single variational thinking or co-variational thinking.

Develop generalisations for a repeating pattern and express it in words.

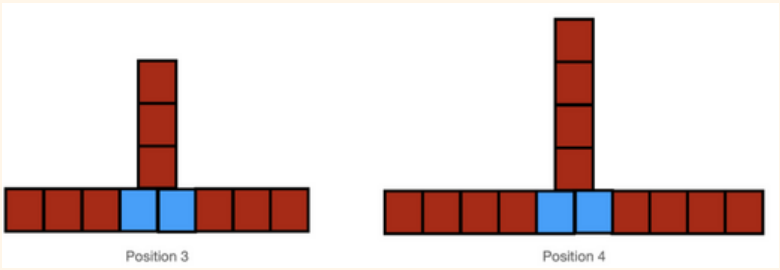
Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

Position, element, rule, unit of repeat, variable.

Independent Tasks



Draw the following position numbers: 1, 2, 5, and 6.

How would you draw position 10?

Complete the table

Position number	Number of red squares	Total number of squares
1		
2		
3		
4		
5		
6		
7		
8		

Identify three patterns going horizontally and three patterns going vertically.

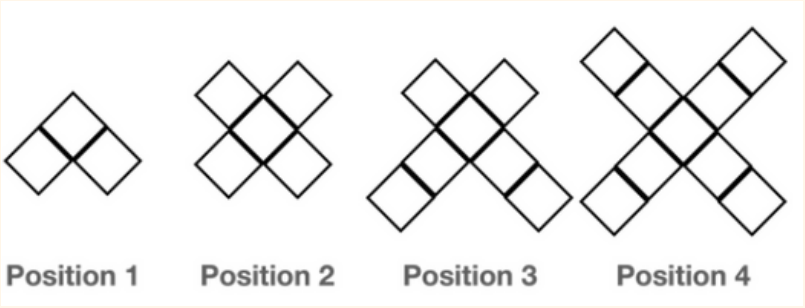
What rules could you use to find the number of different shapes?

Anticipations

Solutions, Misconceptions

Task 5

Tui is weaving and develops a pattern that looks like this:



How many squares does each position have?

Use colours, numbers, and drawings to show how the pattern is growing.

Complete the table:

Position	Number of squares
1	
2	
3	
4	
5	
8	
10	
12	
25	

Teacher Notes

Have square shapes to construct the pattern if needed.

Facilitate the students to notice that the pattern is growing in two directions and ask them to use colours and numbers to illustrate how the pattern is growing.

Support students to develop an explicit generalisation in words and number $(2j + 1)$ to find the number of people squares.

For the independent task, have rectangle shapes and counters.

Big Ideas

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

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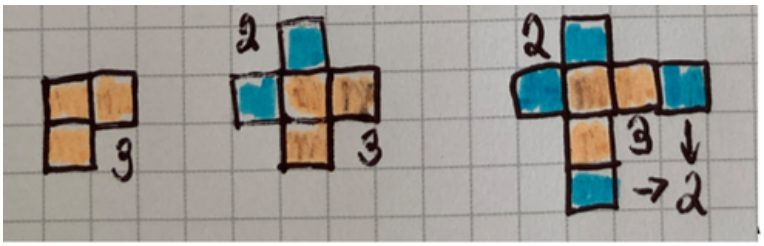
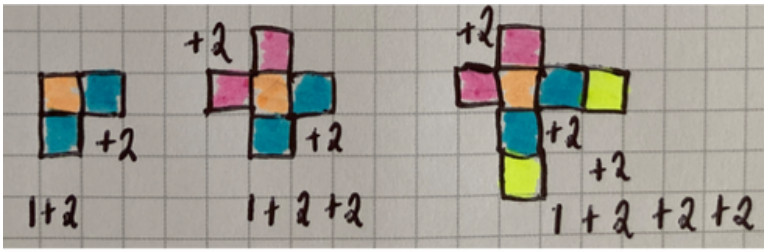
Generalisations can be expressed with both words and symbols.

Shareback

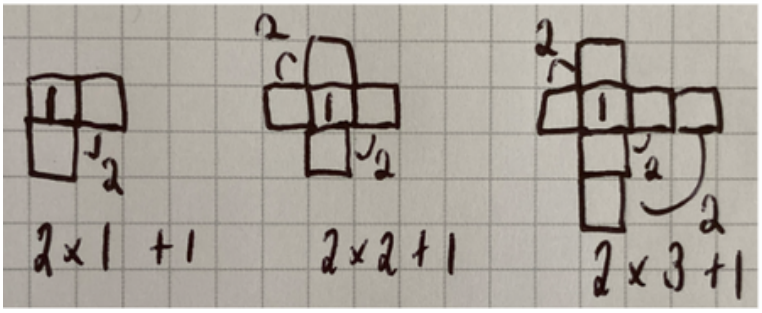
Select students to share who use generalisation strategies such as:
1) Chunking generalisation



2) Recursive generalisation



3) Explicit generalisation



Model any of the generalisation strategies if students have not used them.

Connect

What is different about the generalisation solutions?
What is the same about the generalisation solutions?
What connections can you make between the different types of generalisation?
Can you connect this to a rule?

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

Position, element, rule, unit of repeat, generalisation.

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a growing pattern.

Identify the growing element and constant in a linear growing pattern.

Represent the growing element and the constant using numbers and symbols.

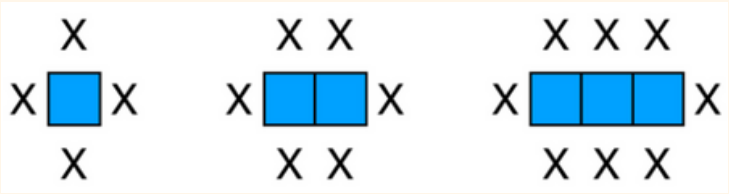
Represent a growing pattern in a table of data.

Develop generalisations for a repeating pattern and express it in words.

Independent Tasks

You are having a party at a hall and need to help set the tables up so everyone will fit.

The first three tables look like this:



How many people could sit around four tables?

How is the pattern growing?
Use drawings and numbers to show how it is growing.

How many people could sit around 5 tables?
How many people could sit around 10 tables?
How many people could sit around 20 tables?

How could you find out how many people could sit around 200 tables?

What is a rule that could be used to find out how many people could sit around p tables?

Anticipations

Solutions, Misconceptions

Task 6

Parveen and her family are preparing for her cousin's wedding. The women and girls are all having their hands decorated with mehndi. Parveen notices that there is a pattern in one of the designs her aunty is creating.

Parveen is interested in working out how many circles there will be for different amounts of loops.

How many loops and circles would there be for positions 4, 5 and 6? How is the pattern growing as the position increases?

Use what you notice to work out the number of circles and loops for position 12 and 24.

Can you come up with a rule to find out how many loops and circles there would be for any position?

Teacher Notes

During the launch, ask students to share different types of patterns that they know from their culture or every-day life.

Facilitate the students to notice the connection and relationship between the loops and the circles.

Notice students who use a table of data or a structured way of tracking the number of circles as the pattern grows. Position students to use a table of data if needed.

Expect students to move from recursive generalisation (it increases by + 2 after the first pattern) to an explicit generalisation. Note that this pattern has a different structure.

For the independent task, have ice-block sticks.

Big Ideas

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Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who develop recursive or explicit generalisations in words for the pattern. If no students develop an explicit generalisation then support them to turn the recursive generalisation into an explicit generalisation.

Connect

Parveen develops three different possible rules for the pattern. Can you help her by checking which are true?

1. Position number add position number subtract one (b + b − 1)
2. Position number multiplied by one add one (p × 1 + 1)
3. Position number multiply by two subtract one (h × 2 − 1)

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a growing pattern.

Identify the growing element and constant in a linear growing pattern.

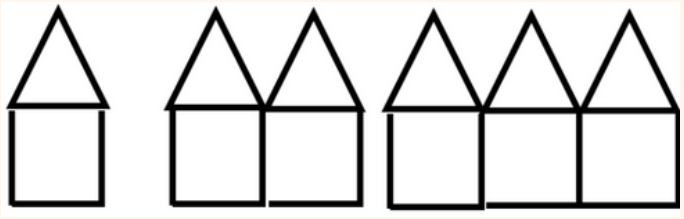
Represent the growing element and the constant using numbers and symbols.

Represent a growing pattern in a table of data.

Develop generalisations for a repeating pattern and express it in words.

Test whether a generalisation works for a growing pattern.

Independent Tasks



How many different patterns can you see in the picture?
Use colours and or number to show the different patterns.

How would you draw the next stage?
How would you draw the 10th stage?

How many houses would there be if there were 103 ice-block sticks?
Would there be any sticks left over?

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

Position, element, rule, unit of repeat, generalisation.

Anticipations

Solutions, Misconceptions

Task 7

Viliami has saved some money (he only has dollars and no cents). His Kui fefine wants to reward him for helping her with some jobs. She offers him two deals:

Deal 1: She will double his money

Deal 2: She will add $10 to his savings.

Use a number sentence to represent the two deals.

Show the results for Deal 1 and Deal 2 in a table.

Viliami's savings	Deal 1	Deal 2

Which deal is better?

What advice would you give Viliami depending on the amount of money he has saved?

Teacher Notes

Do a pattern quick image warm-up before you launch the task. Show the students the pattern for three seconds and ask them to describe it. Show the pattern again for three seconds and ask them to draw it. Display the pattern and ask them to draw the next term.

Facilitate the students to notice that the different deals will vary depending on the amount of savings that Viliami starts with.

Expect students to represent the story using number sentences and a variable and a table of data.

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Generalisations can be expressed with both words and symbols.

Shareback

Select students to share who can represent the unknown using a letter or informal variable (shape) and use the table of data to compare the results.

Connect

Ask students to show the results for both deals on a line graph using two different colours.
Ask them to discuss how the graph could help them make predictions.

Suggested Learning Outcomes

Represent a situation with unknowns using a number sentence.

Solve number sentences with different quantities.

Represent a function in a table of data.

Compare functional situations for different quantities.

Independent Tasks

Principal has decided to have a 'best reader' contest for all the students at school. The student who reads the most books in their year level will get a lollipop. The principal has a box with 200 lollipops. Each day 7 lollipops are taken and given to the 'best reader' for each year level (Year 0 – 6).

How many lollipops will be left in the box after the contest has lasted 4 days? 6 days? 10 days? 20 days?

Write a number sentence or rule that calculates the number of lollipops after any number of days.

How many days will there be until the lollipops run out?

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

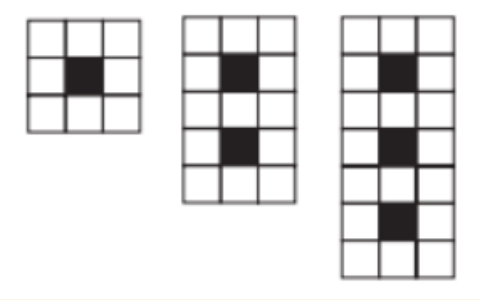
Position, element, rule, unit of repeat, generalisation.

Anticipations

Solutions, Misconceptions

Task 8

Niu was looking at a design to make a mat. She would like your help to work out how many white squares she will need.



How does the pattern grow?

Show how the pattern grows using colours and or numbers.
What part stays the same and what part grows?

How many white squares would there be for position 6?
How many white squares would there be for position 9?
How many white squares would there be for position 11?

Teacher Notes

Have coloured squares available for students to construct the pattern.

Facilitate the students to notice that the pattern has a constant (the part that stays the same) and a part that grows. Support them to colour the part that stays the same in one colour and the part that grows in a different colour and link their number sentences to this.

Notice students who use a table of data or a structured way of tracking the number of white squares as the pattern grows. Position students to use a table of data if needed.

Expect students to move from recursive generalisation (it increases by + 5 after the first pattern) to an explicit generalisation.

For the independent task, have shapes available and grid paper for the students to work with.

Big Ideas

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).

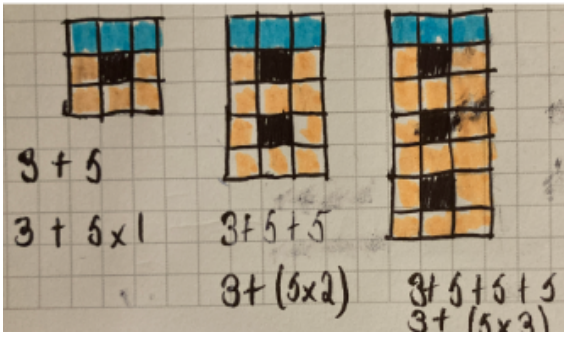
In a pattern, the relationship between the ordinal position (e.g., first, second, and third) and the corresponding element is more useful for finding the pattern's rule than the relationship between successive elements. Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Variables are symbols that take the place of numbers, or ranges of numbers. They have different meanings depending on whether they are being used as representations of quantities that vary or change, representations of specific unknown variables, or placeholders in a generalised expression or formula.

Shareback

Select students to share who have developed different generalisations and number sentences or a coloured representation to justify this.



Connect

What is the same about the generalisations that have been developed?
What is different about the generalisations that have been developed?

Suggested Learning Outcomes

Solve number sentences with different quantities.

Represent a function from a table of data.

Compare functional situations for different quantities.

Independent Tasks

Develop a growing pattern to match these rules:

Tiles = Position number multiplied by two (g = 2 x k)

Tiles = Position number add four (a = b + 4)

Tiles = Position number multiplied by two add two (f = d × 2 + 2)

Develop your own growing patterns and write a rule to match them.

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

Position, element, rule, table of data

Anticipations

Solutions, Misconceptions

Task 9

Use the coloured squares to create your own tivaivai pattern. Make sure that parts of the pattern repeat or grow.

Write out the instructions and steps for a pattern to create your tivaivai.

Make sure to include steps in your instructions that could be repeated multiple times.

Test your instructions using the coloured squares and revise them to solve any potential problems.

Teacher Notes

Before you launch the task, show the students this picture of a tivaivai:

Draw their attention to the square in the middle and ask them to talk with a partner and develop a set of step-by-step instructions that someone could follow to make the pattern without looking at the picture. Ask students to share back the instructions to a different pair and have them follow the steps to make the pattern to test and refine the instructions.

Give students the coloured squares to design their own tivaivai pattern, ensure that they use repeating and growing patterns in the design.

Facilitate the students to understand that they need to make sure that the steps are detailed and clear enough that someone else could create the tivaivai if they did not have a photo of the finished version.

Shareback

Select students to share who have created a clear set of instructions to follow. Without showing the students the picture of the design, ask the other students to follow the instructions and make the design to check whether the set of instructions is clear enough.

Big Ideas

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).

In a pattern, the relationship between the ordinal position (e.g., first, second, and third) and the corresponding element is more useful for finding the pattern's rule than the relationship between successive elements. Identifying the rule of a pattern brings predictability and allows generalisations to be developed.

Generalisations can be expressed with both words and symbols.

Variables are symbols that take the place of numbers, or ranges of numbers. They have different meanings depending on whether they are being used as representations of quantities that vary or change, representations of specific unknown variables, or placeholders in a generalised expression or formula.

Connect

Compare the instructions for the pattern designs.

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a growing pattern.

Identify the growing element in a growing pattern.

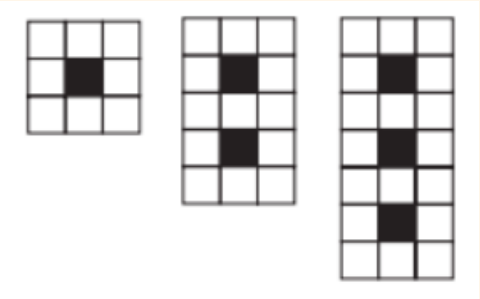
Represent the growing element using numbers and symbols.

Develop generalisations for a repeating pattern and express it in words.

Write a set of explicit instructions to find specific parts of a pattern

Independent Tasks

Niu was looking at a design to make a mat.



What position number would have 18 white squares?

What position number would have 53 white squares?

What position number would have 123 white squares?

Write a set of instructions to make the pattern for the third position. Use the squares to test whether your instructions work and refine them further.

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Create and use an algorithm for generating a pattern or pathway.

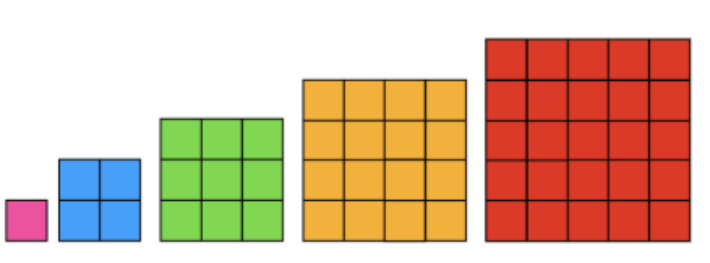
Mathematical Language

Position, element, rule, table of data

Anticipations

Solutions, Misconceptions

Task 10



How many squares are there on each card?
Why are these called square numbers?

Place your cards in order from the smallest to the largest.
What do you notice changing?

Now draw the pattern on the grid paper and write a number sentence that matches the pattern.

How many squares would be in the next position?

Teacher Notes

Have each of the squares available for students to order and manipulate to recognise the pattern.

Facilitate the students to explain why these are called square numbers. When the students order the squares, ask them to put them on a baseline and make sure each square is connected.

Notice whether the students recognise the pattern growing explicitly or see it as adding an L shape to the previous square.

Shareback

Select students to share who have used the structure of the pattern to continue the pattern and can both draw this and use number sentences to illustrate the growth (e.g., $4 \times 4 = 16$; $5 \times 5 = 25$).
In relation to finding the next pattern, students can either add an L shape to the previous square OR recognise that after 5×5 it

Big Ideas

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).

In a pattern, the relationship between the ordinal position (e.g., first, second, and third) and the corresponding element is more useful for finding the pattern's rule than the relationship between successive elements. 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 many squares would the tenth square have?
Remove the squares and ask the students to draw the pattern from memory.

Suggested Learning Outcomes

Reproduce a pattern using objects, drawings, or symbols.

Continue a growing pattern.

Develop generalisations for a repeating pattern and express it in words.

Test whether a generalisation works for a growing pattern.

Independent Tasks

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

Task 1: Cross pattern

Task 2: Squares pattern

Curriculum Links

Recognise and describe the rule for a growing pattern using words, tables, and diagrams, and make conjectures about further elements in the pattern.

Mathematical Language

Position, element, square numbers, multiple.

Anticipations

Solutions, Misconceptions

Assessment Task 1 - Algebra - Year 4

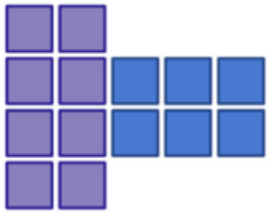
First position Second position Third position

Look at this growing pattern. Can you:

- Show how the number of squares grows using a diagram, numbers, or a table of data. graph.
- Describe the pattern in words and/or numbers
- Show how you work out the number of squares for the following pattern numbers: Pattern 5; Pattern 10; Pattern 50
- Write the rule for the number of squares in words or symbols.

Assessment Task 2 - Algebra - Year 4

Position Two



Position Three

Look at this growing pattern. Can you:

- Draw Position One and Position Four.
- Describe the pattern in words and/or numbers.
- Show how you work out the total number of squares for the following pattern numbers: Pattern 5; Pattern 10; Pattern 50.
- Write the rule for the number of squares in words or symbols.