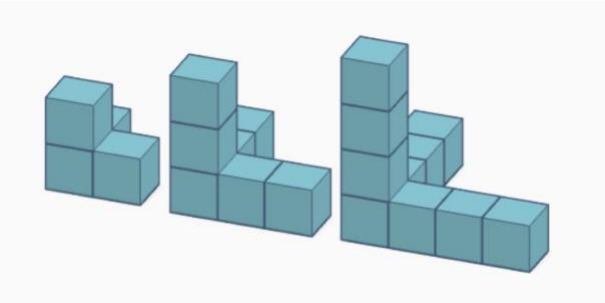
RICH MATHEMATICAL TASK BOOKLET

ALGEBRA

YEAR 7/8
ODD YEARS

Copy Masters

Task 1



How many different patterns can you see in this drawing?

Use diagrams to show all the patterns that you can see.

How would you draw the next position?

How would you draw the 8^{th} position?

How many cubes would you need for the sixth position?

How many stars would you need for the 12th position?

How many stars would you need for the 24^{th} position?

Represent what you have found in a table of data.

Task 1 (independent)

Parvati is making mala for a Diwali decoration. She is threading the flowers in a pattern: purple, green, red, orange, yellow, blue.

What will be the colour of the 86^{th} flower that she threads?

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

What do you notice about the yellow flowers in relation to their pattern position?

What rule could you use to find the location of every yellow flower?

What do you notice about the green flowers in relation to their pattern position?

What rule could you use to find the location of every green flower?

Task 2

Tukutuku panels can be made from kaho (wooden rods) with tuinga (cross stitches).

How many tuinga would there be for position 6?

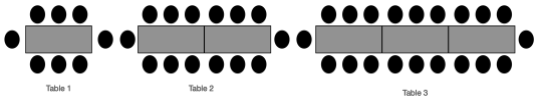
How many tuinga would there be for position 10?

Represent the parts of the pattern that are staying the same and the part of the pattern that changes as it grows using different colours.

How could you work out how many tuinga there would be for position 100?

Task 2 (independent)

Leith and Hemi are arranging seating for the Year 8 graduation dinner.



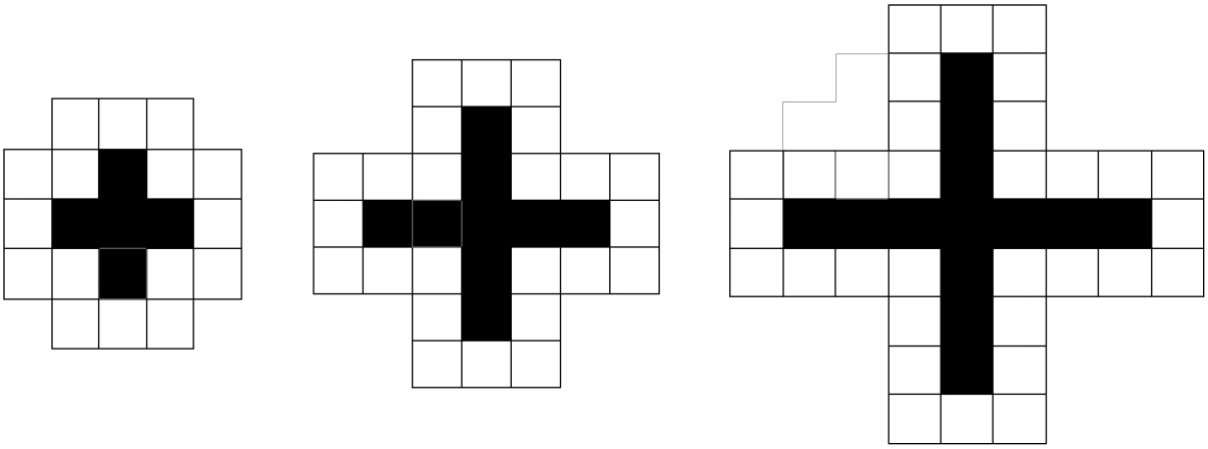
How many people can be seated at 6 tables, 15 tables, 28 tables?

Represent how the pattern grows using a table of data or graph.

How many tables do Leith and Hemi need to organise for 147 people?

Can you find the relationship between the number of tables and chairs in words or symbols and justify how the rule works with your representation.

Task 3



How many white tiles would there be for the fifth pattern?

How many white tiles would there be for the 10^{th} pattern?

How do you see the pattern growing?

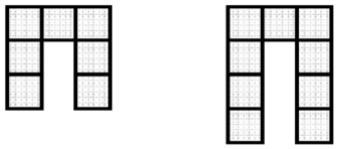
What is the relationship between the black tiles and the white tiles?

How many black tiles would there be for the 100^{th} pattern?

How many white tiles would there be for the 100^{th} pattern?

Task 3 (independent)

Leoni builds a pattern with tiles. This is the second and third position:



Draw the first position of the pattern that Leoni is building.

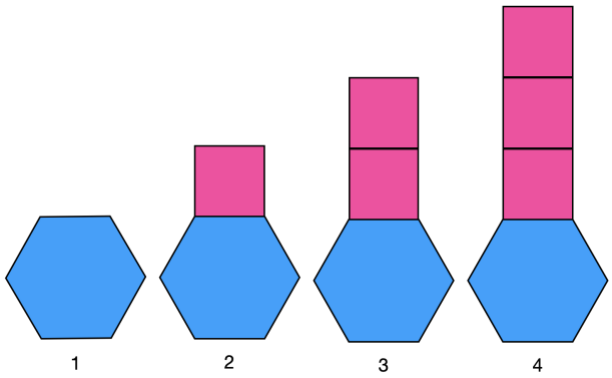
How many tiles would the 5^{th} position have?

How many tiles would the 9^{th} position have?

What rule could Leoni use to work out how many tiles she would need for the 1000^{th} position?

Task 4

Chaewon was helping to design a walkway that followed this pattern:



She thought she could find a way to work out the perimeter for the walkway to buy the lining.

Complete the table:

Pattern number	Number of squares	Perimeter
1		
2		
3		
4		
5		
6		
7		
8		

What patterns can you see in the table?

What would the perimeter be if there was one hexagon and 122 squares?

Task 4 (independent)

Develop a growing pattern to match these rules:

Squares = $5n + 2$

Ice-block sticks = $6h - 3$

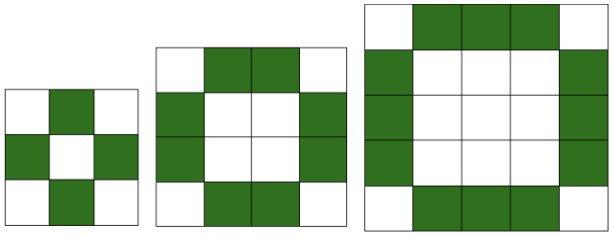
Counters = $2g + 3$

Represent each pattern as a graph.

Develop your own growing patterns and write a rule to match them. Represent the pattern as a graph.

Task 5

Lotu was helping to design a tile pattern for a square floor. She thought she could find a way to work out how many square tiles of each colour would be needed.



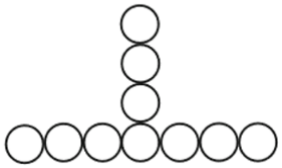
What would the pattern look like for pattern 4 and 5?

Complete the table:

Pattern number	Green squares	White squares	Total number of squares
1			
2			
3			
4			
5			
6			
7			
8			

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

Task 5 (independent)



This is Pattern 3.

Draw what you think Pattern 2 and Pattern 1 would look like.

How many different patterns can you see in this drawing?
Show all the patterns that you can see.

Continue the pattern for Pattern 4 – 10.

Use a table of data and a graph to represent the pattern.

Explain the patterns that you have found.

Task 6

Imagine that you get a holiday job for a month. You can choose from the following options to be paid:

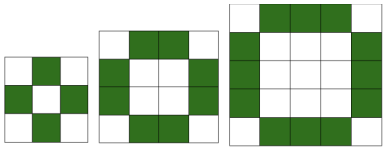
A) You will be paid $10 every day.
B) You will be paid $3 on the first day and this will increase by 0.50 cents each day (e.g., $3.50 on the second day; $4 on the third day).
C) You will be paid 1 cents on the first day but the amount paid will double each day (e.g., 2 cents on the second day; 4 cents on the third day).

Use a table to show how much you would earn depending on how many days are in the month.

Develop an explanation of when each option would be better than another option.

Task 6 (independent)

Lotu was helping to design a tile pattern for a square floor. She thought she could find a way to work out how many square tiles of each colour would be needed.



Can you find a rule to help Lotu work out how many green square tiles she will need for any pattern number?

Can you find a rule to help Lotu work out how many white square tiles she will need for any pattern number?

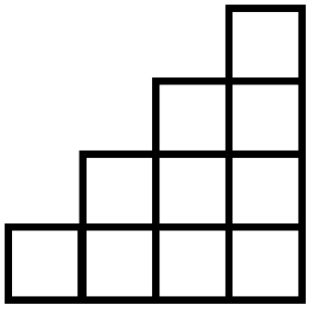
Can you find a rule to help Lotu work out how many square tiles she will need in total for any pattern number?

Lotu thinks that she has found some different ways to work out the total number of square tiles. Check her ideas and see whether the rules work or not:

- $(d + d + d + d + 4) + d^2$
- $4g + g^2 + 4$

Task 7

This is the fourth position for a staircase pattern:



What would the third position look like?

What would the fifth position look like?

How many squares would there be for the tenth position?

How many squares would there be for the 18^{th} position?

What do you notice about how the pattern is growing?

Task 7 (independent)

Smart data is currently offering two deals for phone data.

Deal 1 costs $12 per month for 3 GB plus $4 per GB.

Deal 2 costs $10 per month for 5 GB plus $5 per GB.

Represent each deal using a rule.

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

Number of GB	Deal 1	Deal 2
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

Which deal is better?

What advice would you give to someone considering both the deals?

Task 8

The Fibonacci Sequence reflects growth that we can see in nature.

Each term is calculated by adding the previous two terms together.

1, 1, 2, 3, 5, 8, 13, 21

Continue the Fibonacci sequence and find the following terms.

The Fibonacci sequence also has other patterns in it.

Choose any four consecutive Fibonacci numbers. Add the first and last number and divide by two.

Record the results in a table.

What do you notice?

Can you explain it?

Adding any six consecutive Fibonacci numbers together and divide by four.

Record the results in a table.

What do you notice?

Can you explain it?

Task 8 (independent)

Sione and Tyrone are selling different types of chocolate bars to fundraise for the AIMs tournament.

Sione has saved $17. Additionally for each chocolate bar he sells, he gets $2.

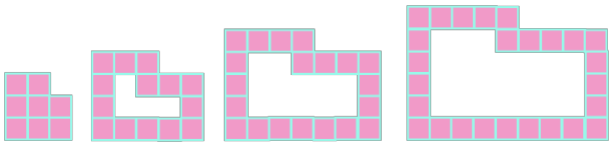
Tyrone gets $2 per chocolate bar he sells.

Write a rule to represent each situation.

Use a table of data and graph to show when Sione and Tyrone will have the same amount of money and how many chocolate bars, Tyrone will need to sell to have more money.

Task 9

Soraya is making a pattern with tiles.



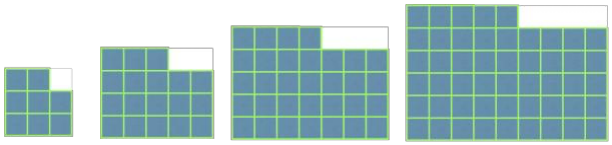
Describe the next two patterns in the sequence.

Record the number of squares in each pattern in a table of data.

How many squares would there be for the 10^{th} pattern?

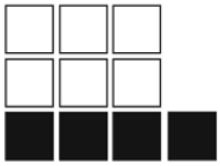
What would be a quick way to work out the number of squares in the 50^{th} pattern?

Soraya makes a second pattern with the tiles.



What is the same and different between the two patterns?

Task 9 (independent task)



This is Pattern 3.

Draw what you think Pattern 2 and Pattern 1 would look like.

How many different patterns can you see in this drawing?

Show all the patterns that you can see.

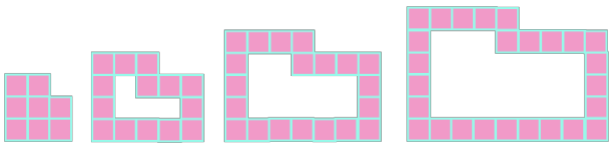
Continue the pattern for Pattern 4 – 10.

Use a table of data to represent the pattern and explain the patterns that you have found.

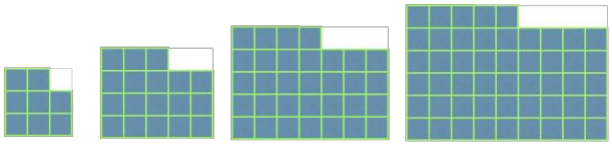
Task 10

Soraya is making a pattern with tiles.

This is her first pattern:



This is her second pattern:



For the second pattern, describe the next two patterns in the sequence.

Record the number of squares in each pattern in a table of data.

How many squares would there be for the 10^{th} pattern?

What would be a quick way to work out the number of squares in the 50^{th} pattern?

Think about the relationships between the two patterns. Use colours and diagrams to show the relationship between the two patterns.