DEVELOPING MATHEMATICAL INQUIRY COMMUNITIES

Number and Algebra: Patterns and Relationships

Level 4 (Year 7/8)

Copy Masters

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Level 4 Year 7/8: Number and Algebra: Patterns and Relationships

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 10th position?

How would you draw the 25th position?

How many stars would you need for the fourth position?

How many stars would you need for the 10th position?

How many stars would you need for the 25th position?

Represent what you have found in a table of data.

Task 1 (independent)

Tasa has a giant bag of M & Ms. He likes to eat his M & Ms in a specific order: orange, green, red, yellow, blue, brown.

What will be the colour of the 93rd M & M that he eats?

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

What do you notice about the brown M & Ms in relation to their pattern position?

What rule could you use to find the location of every brown M & M?

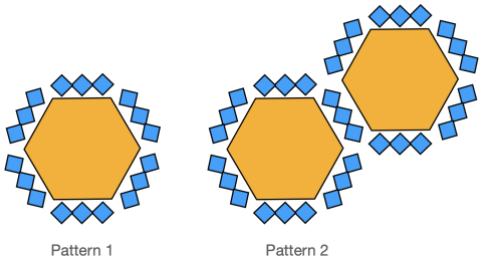
What do you notice about the yellow M & Ms in relation to their pattern position?

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

Task 2

A group of Mamas meet at Manihiki Hall every week to sew tivaevae. Tivaevae ta'orei is a type of patchwork quilt made with small squares of fabric. This is a beautiful treasure which takes many years to make.

Mama Jane is sewing a design which uses small diamonds around the border.



How many diamonds would Mama Jane need for pattern one to pattern five?

How many diamonds would Mama Jane need for pattern ten?

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 Mama Jane work out how many diamonds she would need for pattern 100?

Task 2 (independent)

Tasa is helping his Mum build a fence around their property. They are trying to work out how many posts they will need. The photo below shows the third section of the fence.

Build and then draw what the first, second, and fourth section would look like.

Complete the table:

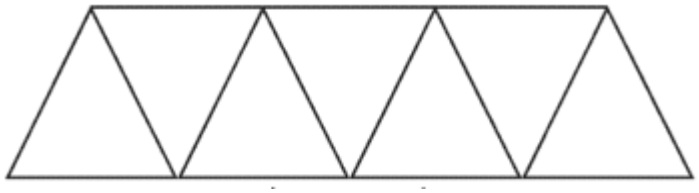
Fence section	Number of posts
1	
2	
3	
4	
5	
8	
10	
13	
21	
25	

What patterns do you notice?

Can you develop a rule for the number of posts for the fence section of any size?

Task 3

Beams are used as a support for different types of bridges. The beams are constructed using steel rods. The number of rods used to construct the bottom of the beam determines the length of the beam. Below is a beam of length 4.



1 rod 2 rods 3 rods 4 rods

Make and then draw the beams of length 2, 3, and 5.

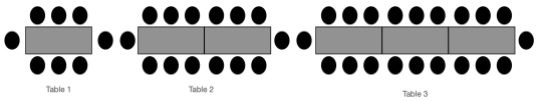
How many rods are needed to make each?

How many rods would you need to make a beam of length 10? Of length 20? Of length 45?

Task 3 (independent)

Emmy and Astyn are organising tables and seats for a family reunion dinner.

They've worked out that 186 people are coming.



How many people can be seated at 5 tables, 11 tables, 22 tables?

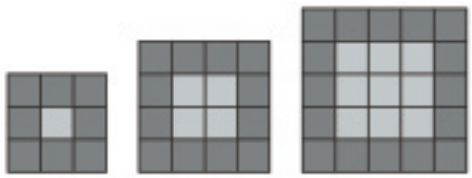
Represent how the pattern grows using a table of data or graph.

How many tables do Emmy and Astyn need to organise for 186 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 4

Ayesha was helping to design a tile pattern and border for a square floor. She thought she could find a way to work out how many square tiles would be needed.



Pattern 1 Pattern 2 Pattern 3

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

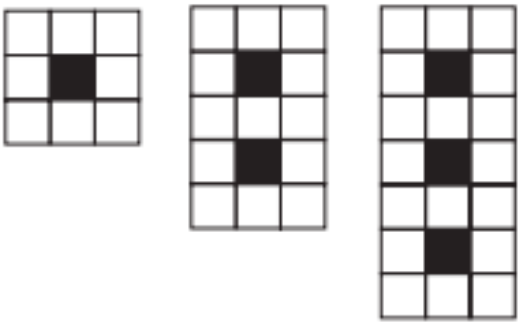
Complete the table:

Pattern number	Border squares	Light grey 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 4 (independent)

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



Position 1 Position 2 Position 3

How is the pattern growing?

Use colours or number to show how you see it growing.

Draw Position 4 and 5.

How many white squares would there be for position 7?

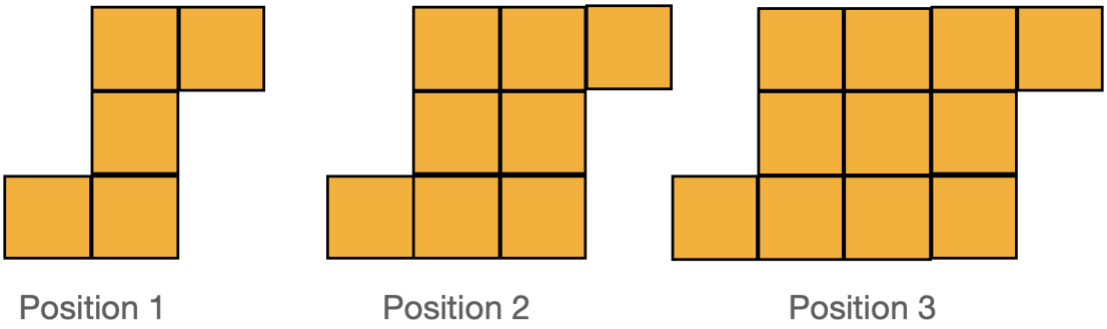
How many white squares would there be for position 14?

How many white squares would there be for position 145?

Can you work out a rule for the number of white squares?

What would the rule be for the total number of squares?

Task 5



How is this pattern growing?

Use numbers and colours to show how the pattern changes as it grows.

How would you draw the next two positions?

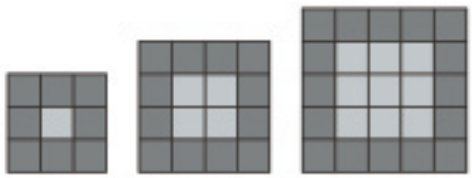
How many squares would the 10^{th} position have?

How many squares would the 12^{th} position have?

How many squares would the 100^{th} position have?

Task 5 (independent)

Ayesha was helping to design a tile pattern and border for a square floor. She thought she could find a way to work out how many square tiles would be needed.



Pattern 1 Pattern 2 Pattern 3

Can you find a rule to help Ayesha work out how many dark grey tiles she will need for the border for any pattern number?

Can you find a rule to help Ayesha work out how many light grey tiles she will need for the middle for any pattern number?

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

Ayesha thinks that she has found some different ways to work out the number of tiles that would be needed for the border. Check her ideas and see whether the rules work or not:

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

Task 6

Destiny has joined a gym and is deciding on the best offer for her. The gym has two offers:

Offer A: $8 per class

Offer B: $50 for the first 5 classes of the month and then $4 for every additional class.

Develop a rule for each of the two offers.

Show the costs for Offer A and Offer B in a table.

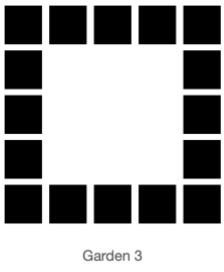
Number of classes	Offer A	Offer B
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Which offer is better?

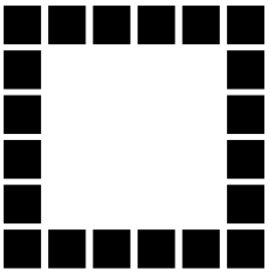
What advice would you give to someone considering both the offers?

Task 6 (independent)

Melvin is designing a square garden plot with a tile border. He is wondering how many tiles he will need for gardens of different sizes.



Garden 3



Garden 4

Draw what the square garden plot would look like for Garden 1 and Garden 4.

How many tiles would be used for Garden 5?

How many tiles would be used for Garden 8?

What do you notice?

Can you explain how you would find the number of tiles for Garden 100?

If Melvin had 100 tiles, what garden number would he be able to make and would he have any tiles left over?

Task 7

Touch NZ are organising a community touch rugby event. Each team will play each other **once**.

If there are four teams how many games of touch are there?

If there are five teams how many games of touch are there?

If there are six teams how many games of touch are there?

Can you prove you know how many games there will be?

Develop a clear representation to show all the games that will be played between each team.

Task 7 (independent)

Smart data is currently offering two deals for phone data.

Deal 1 costs $14 per month for 1 GB plus $4 per GB.

Deal 2 costs $18 per month for 3 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
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Which deal is better?

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

Task 8

Touch NZ are organising a community touch rugby event. Each team will play each other once.

If there are ten teams how many games of touch are there?

If there are twenty teams how many games of touch are there?

How would you find out the number of games for 100 teams?

See if you can explain how to find all the games no matter how many teams there are. Make sure you can explain and justify why your rule works.

Task 8 (independent)

Tiana and Lyonel are selling different types of calendars to fundraise for the AIMs tournament. .

Tiana has saved $16. Additionally for each calendar she sells, she gets $3.

Lyonel gets $5 per calendar he sells.

Write a rule to represent each situation.

Use a table of data and graph to show when Tiana and Lyonel will have the same amount of money and how many calendars, Lyonel will need to sell to have more money.

Task 9 (optional task)

Sima has saved some money (he only has dollars and no cents). His Grandma wants to reward him for some jobs that he has finished well. She offers him two options.

Option 1: She will double his money

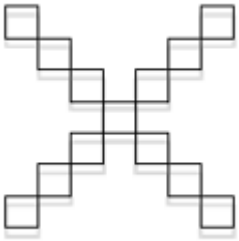
Option 2: She will triple his money and then take away $7

Develop a rule for each of the two options.

Which option is better? Justify your thinking using a representation (graph, table of data)

What advice would you give to Sima?

Task 9 (independent optional 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 (optional task)

Tasha is making smiley face rods for market day by joining cubes together and putting smiley face stickers on each side that you can see:

Rod 1 Rod 2 Rod 3

How many smiley face stickers would Tasha need for rods of length 1 – 10?

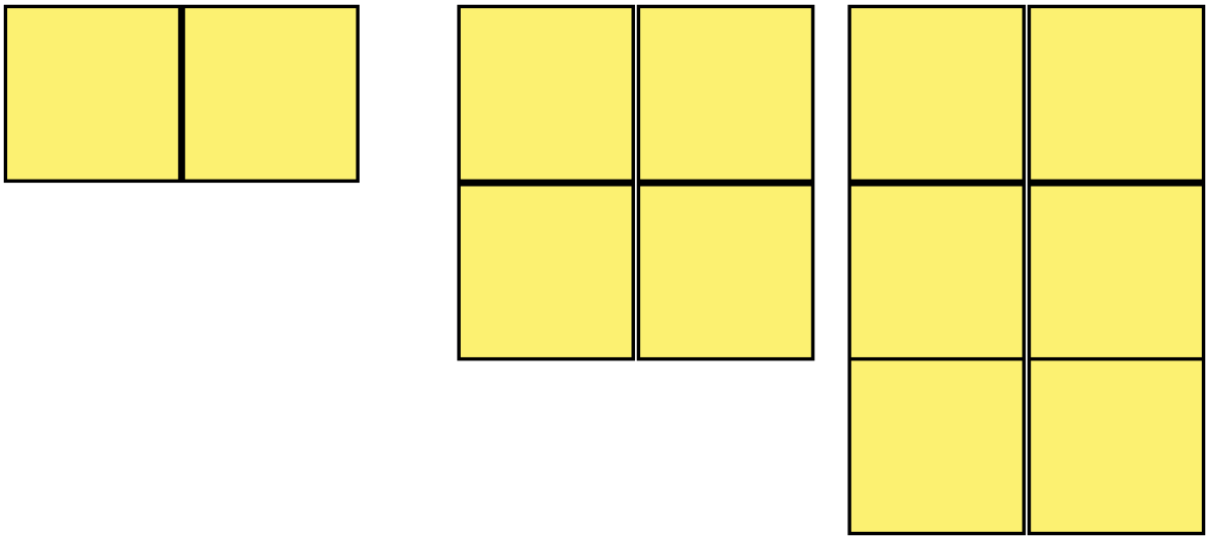
How many stickers would Tasha need for a rod of length 27?

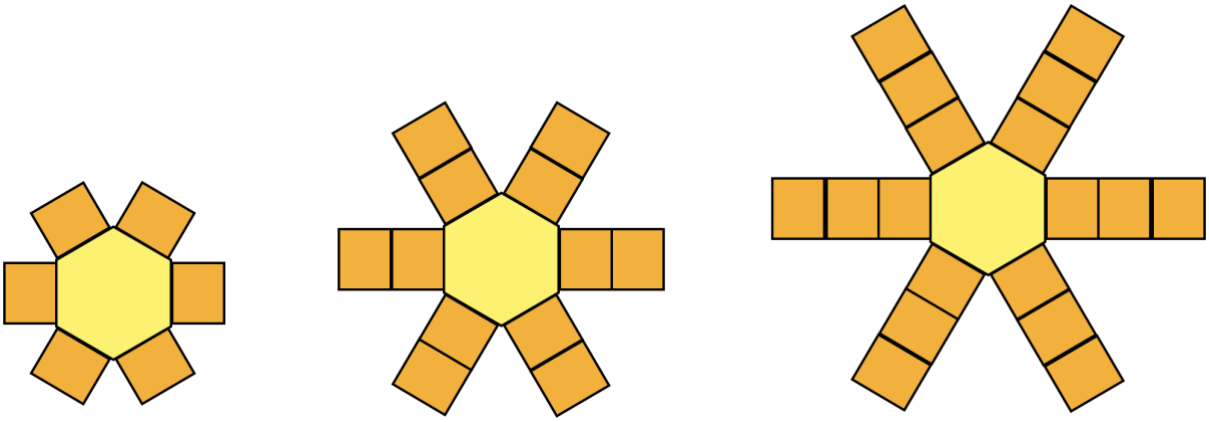
How many stickers would Tasha need for a rod of length 40?

How many stickers would Tasha need for a rod of length 111?

What rule could Tasha use to work out how many stickers she would need for a rod of any length?

Quick Images (Warm Ups)





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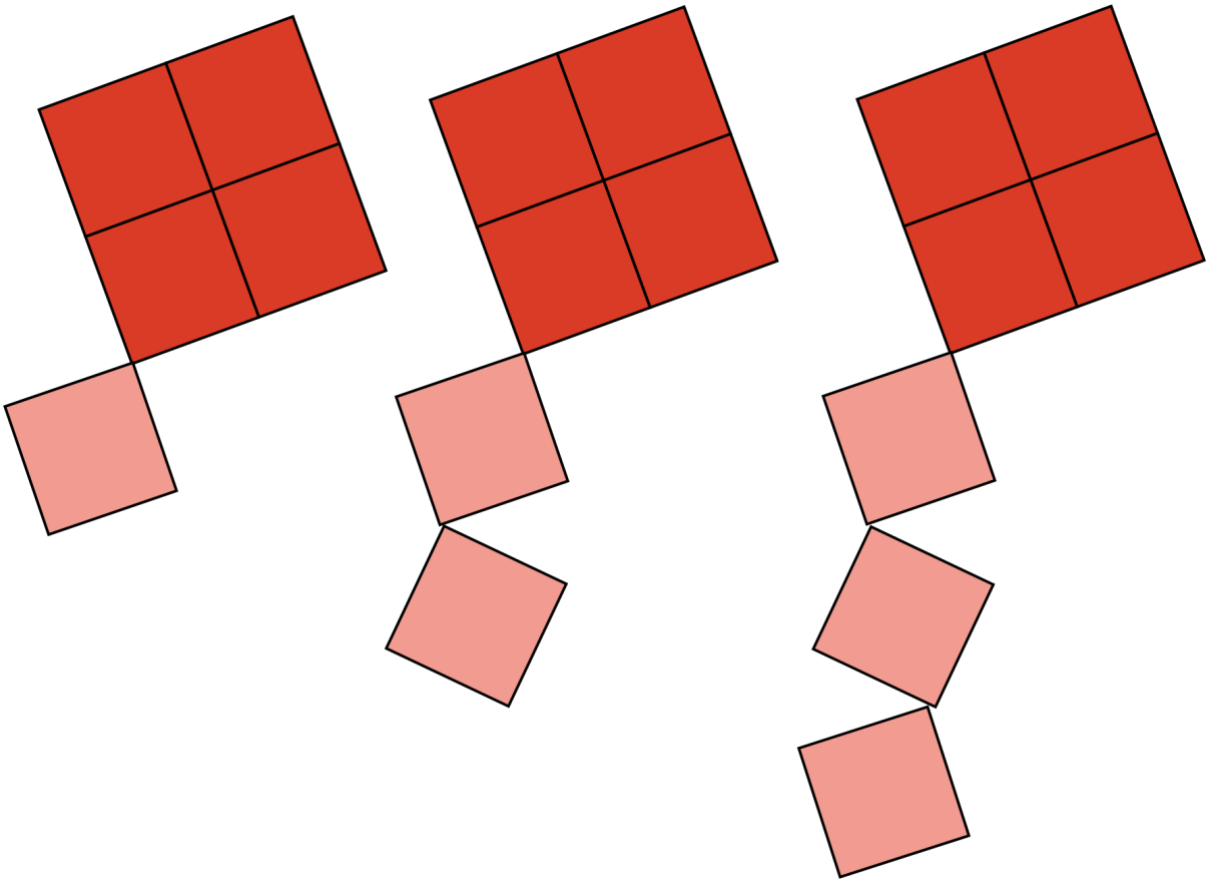

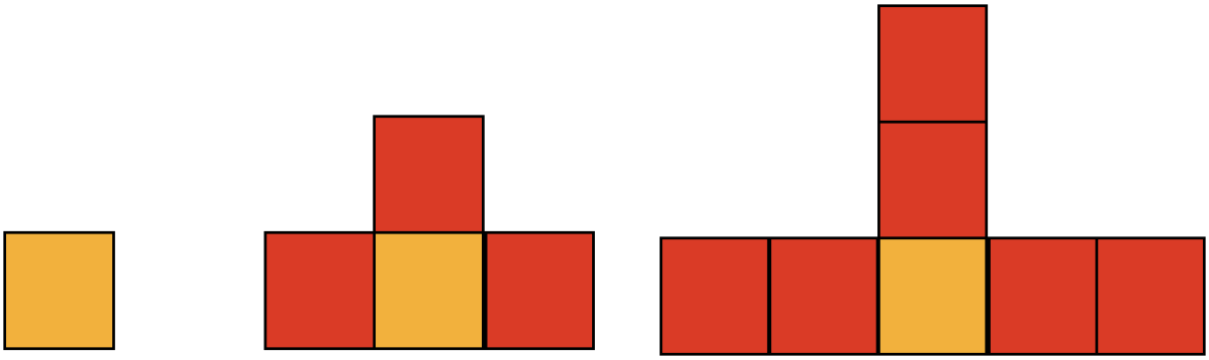

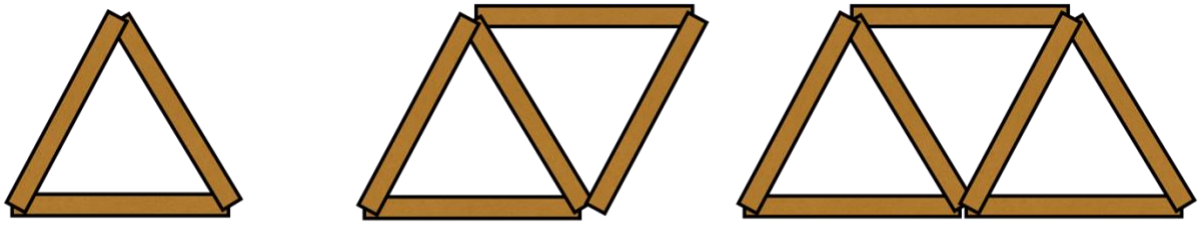

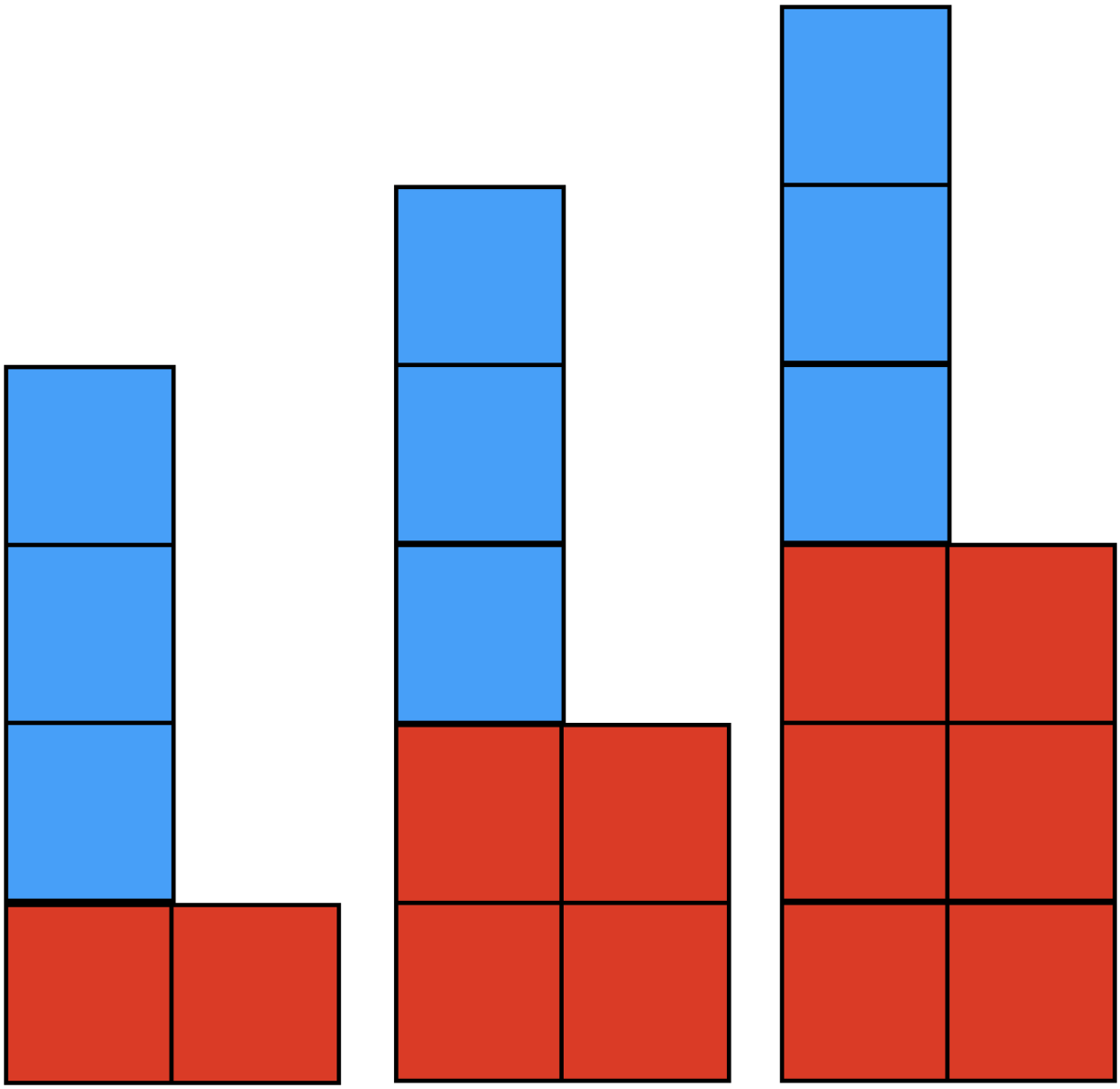
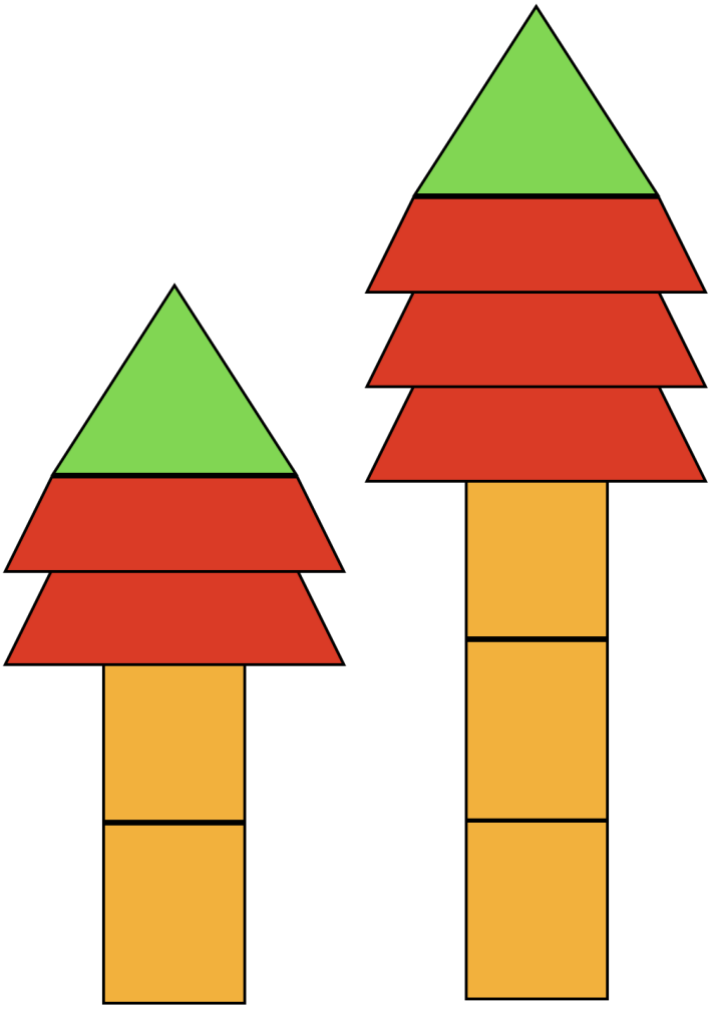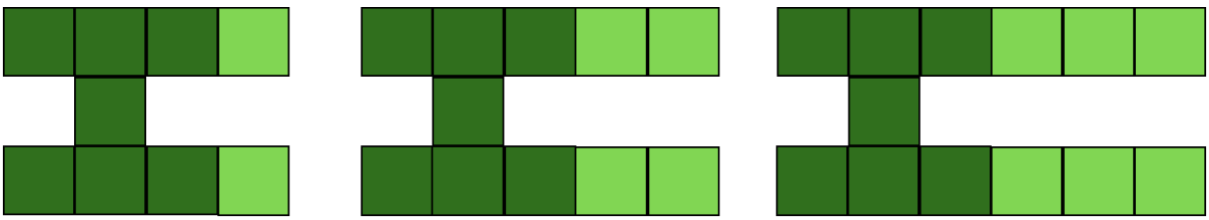
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