



Math that Matters:

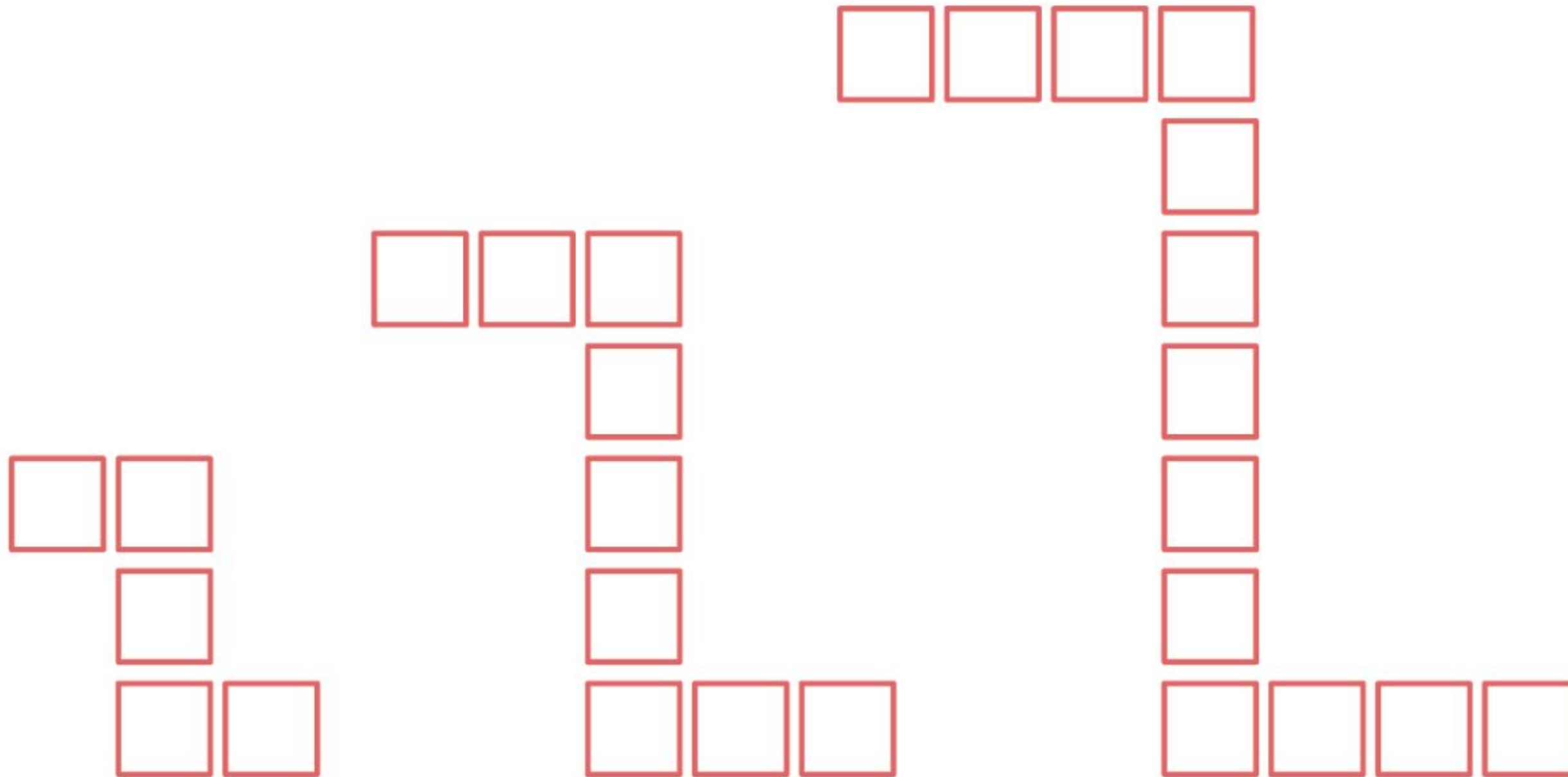
Reaching Every Student

Molly Basham, Early Learning Mathematics Specialist
Melissa Garber, Elementary Mathematics Specialist
Mike Spencer, Secondary Mathematics Specialist

Introductions



Roll Call: Who is in the room?

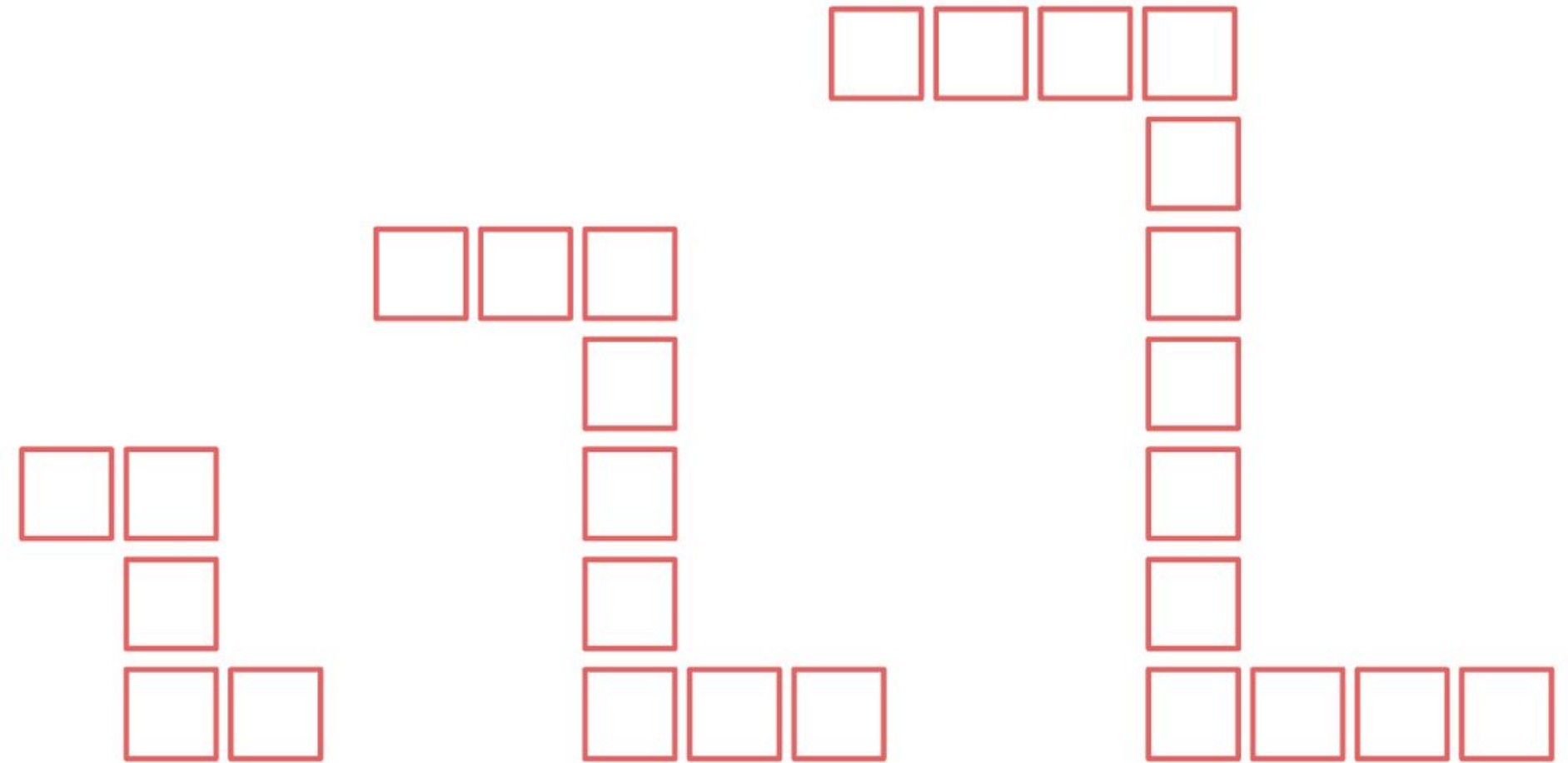


[Task Credit: Visualpatterns.org](https://visualpatterns.org)



How is it growing?

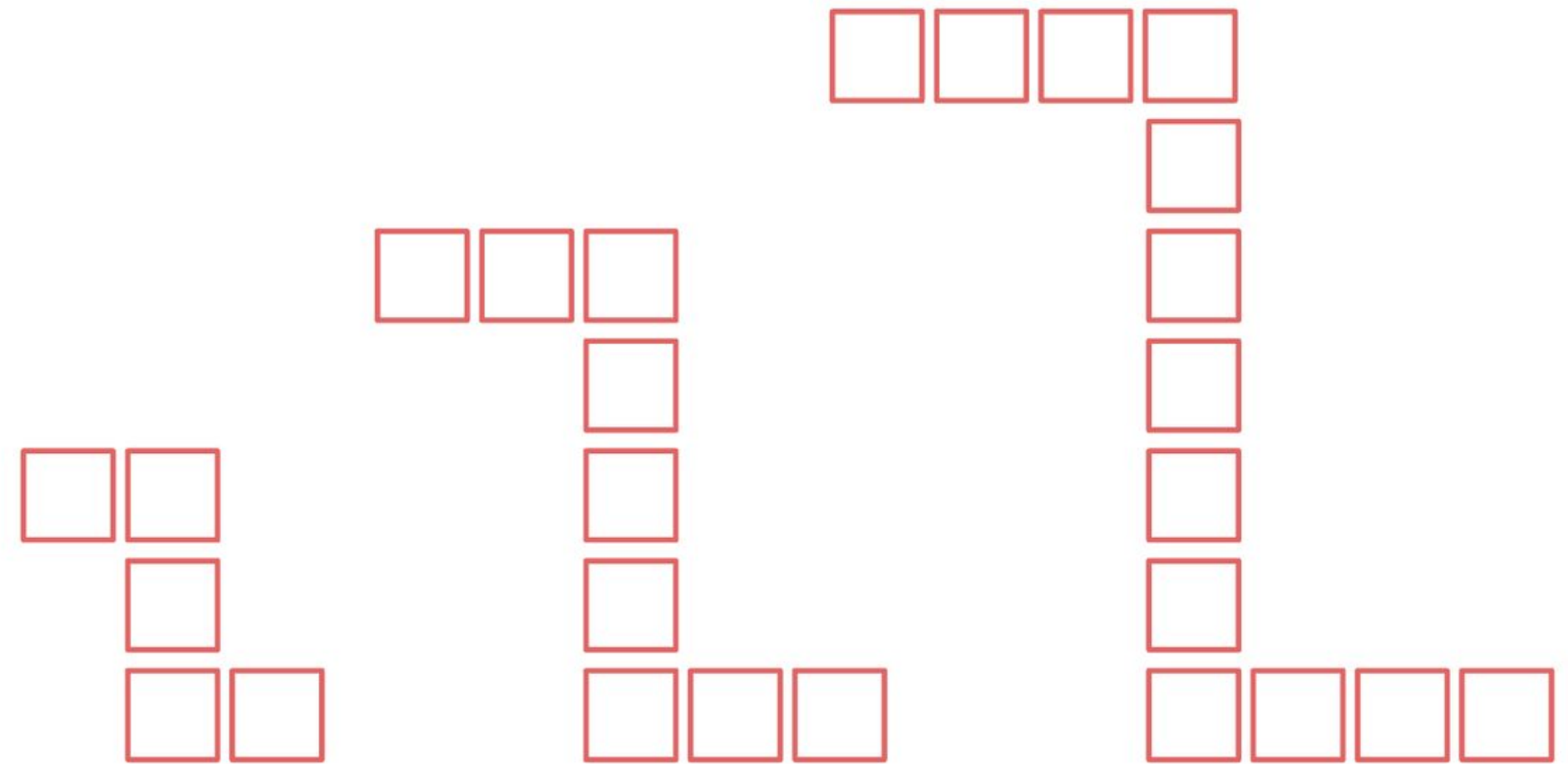
- Discuss with a partner. How did you see the pattern grow?
- Create a representation that shows the next three terms in the sequence.
 - What kind of representations could you use?



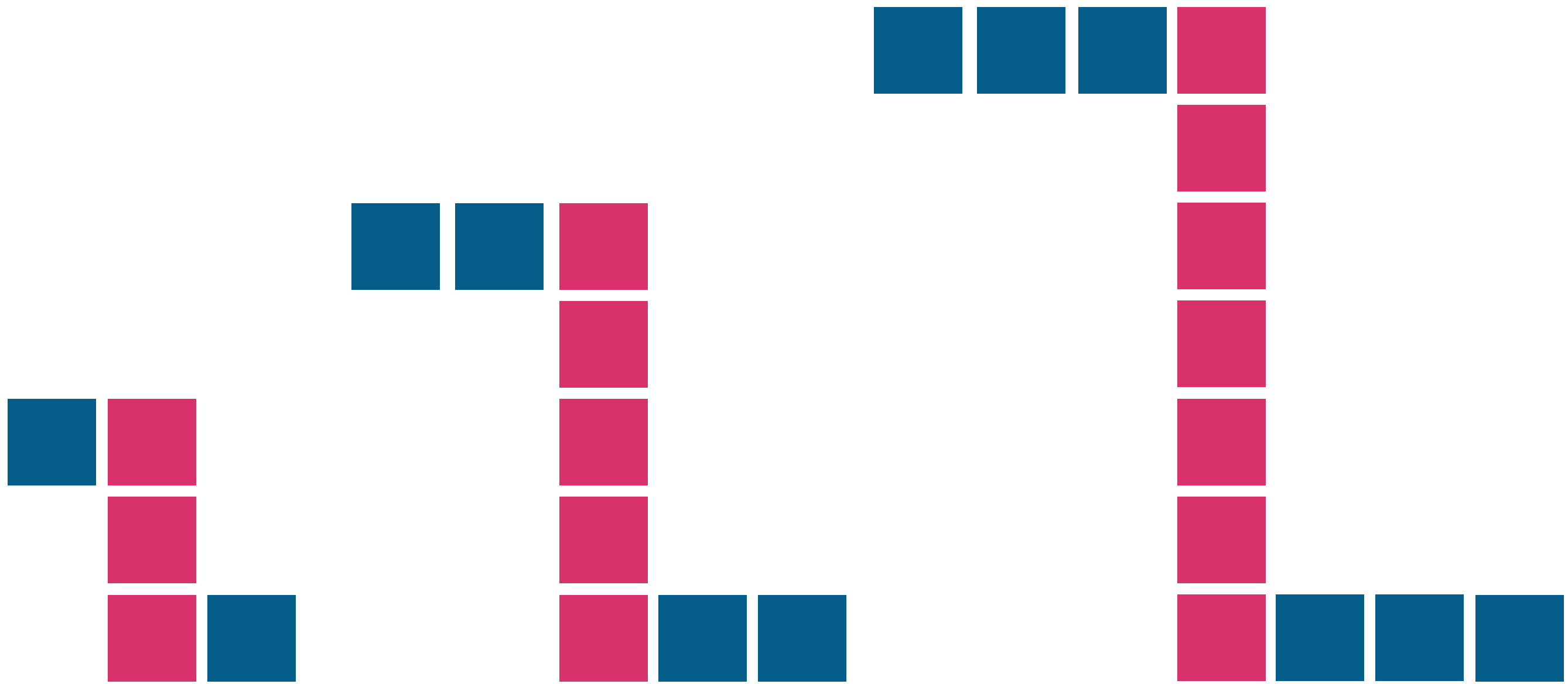


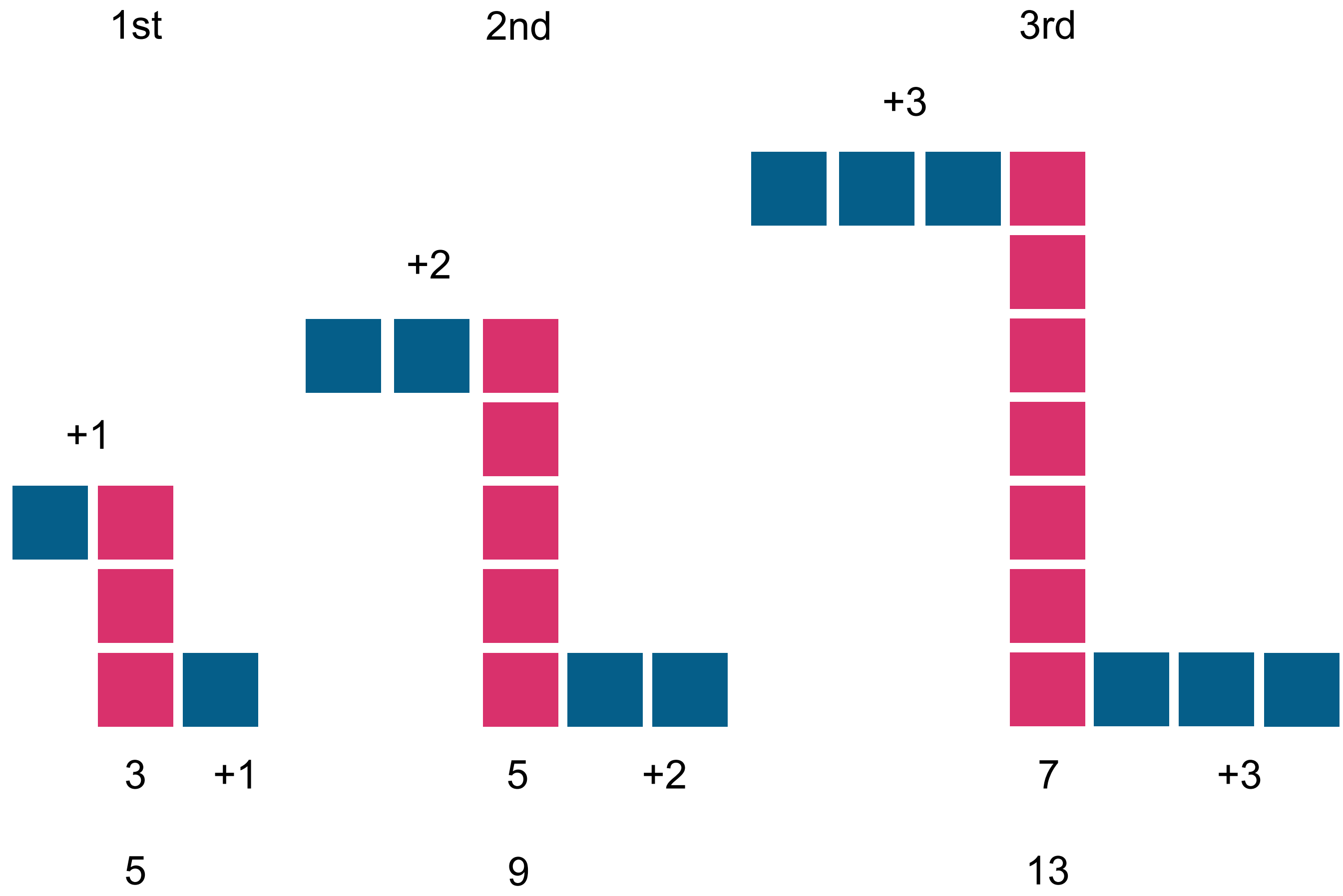
How is it growing?

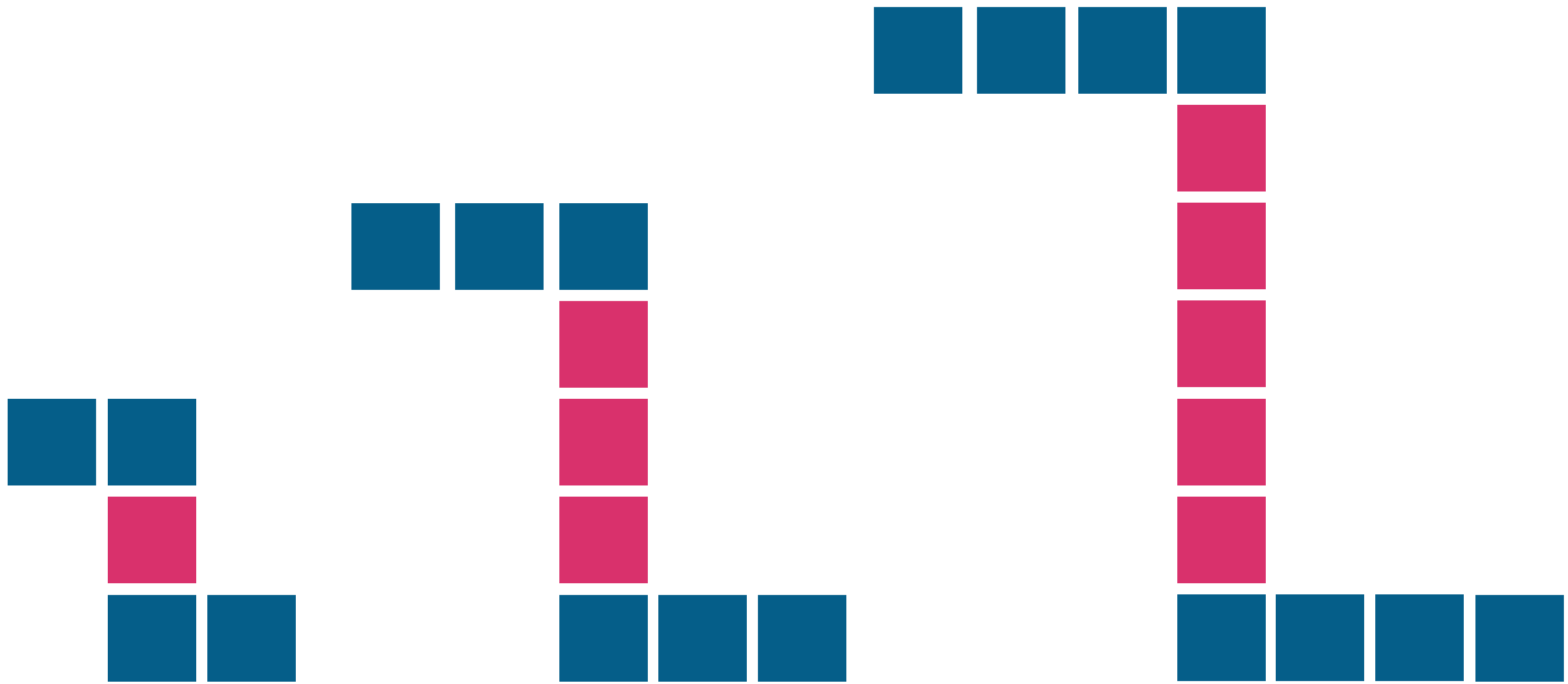
- Create a representation that shows the next three terms in the sequence.
- How many tiles would there be in the 10th term?
- Can you develop a strategy to determine how many tiles will be in the 100th term?



Discuss Student Work



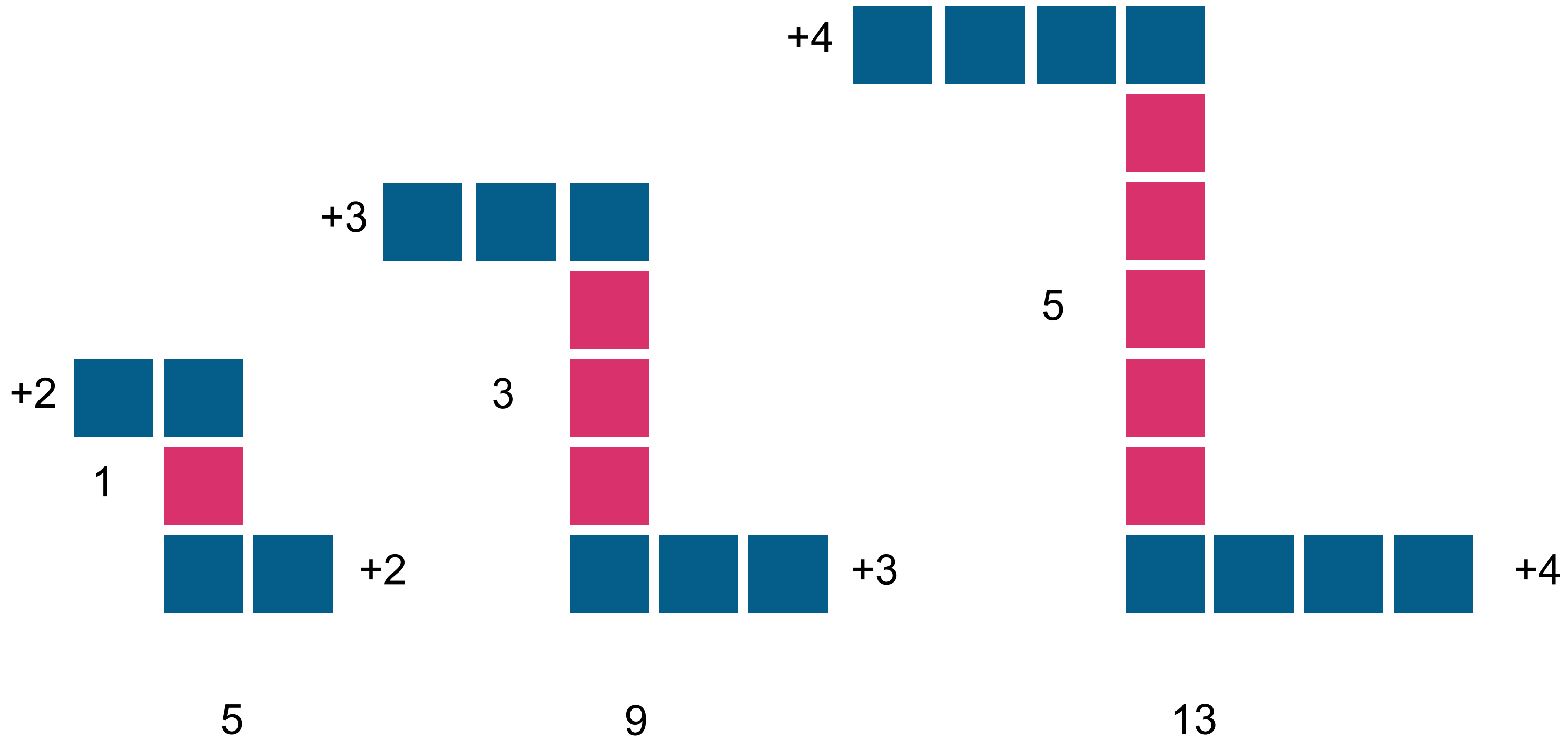


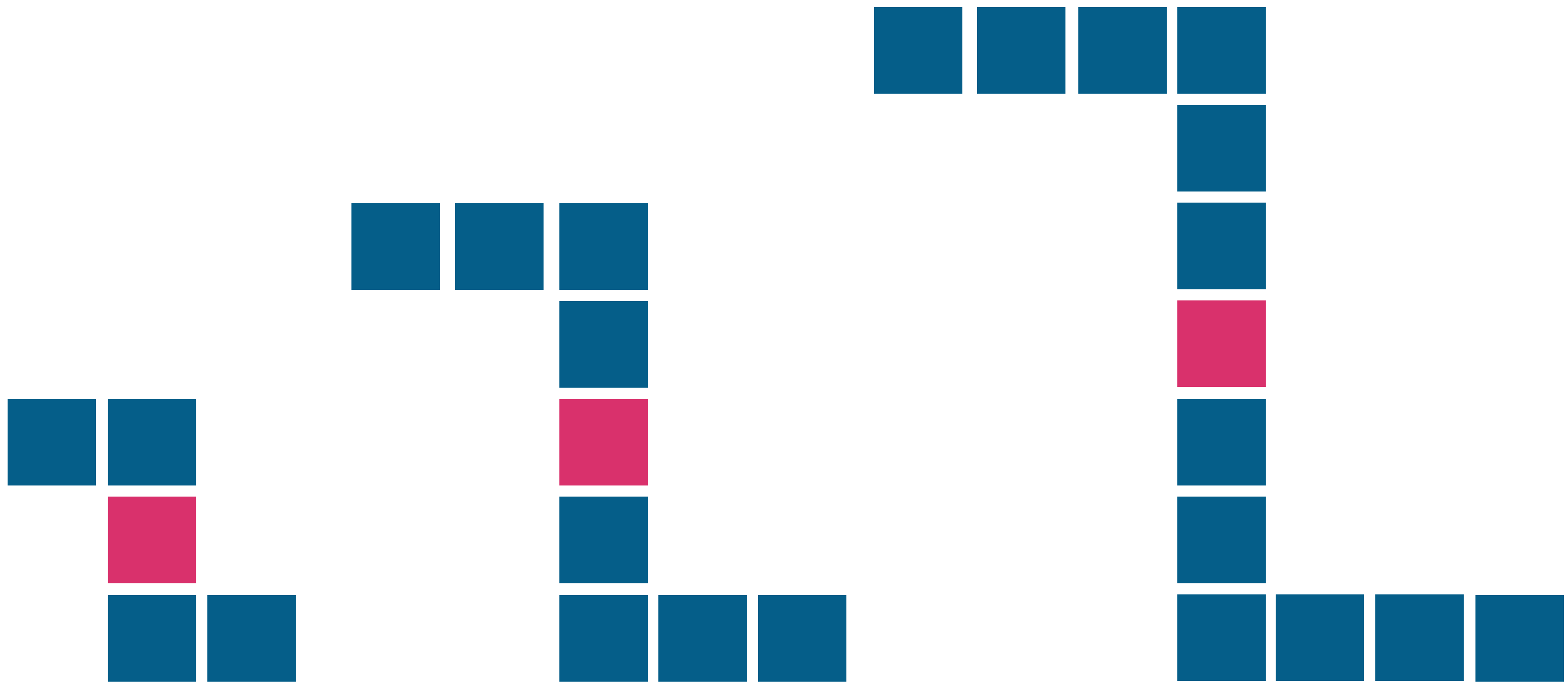


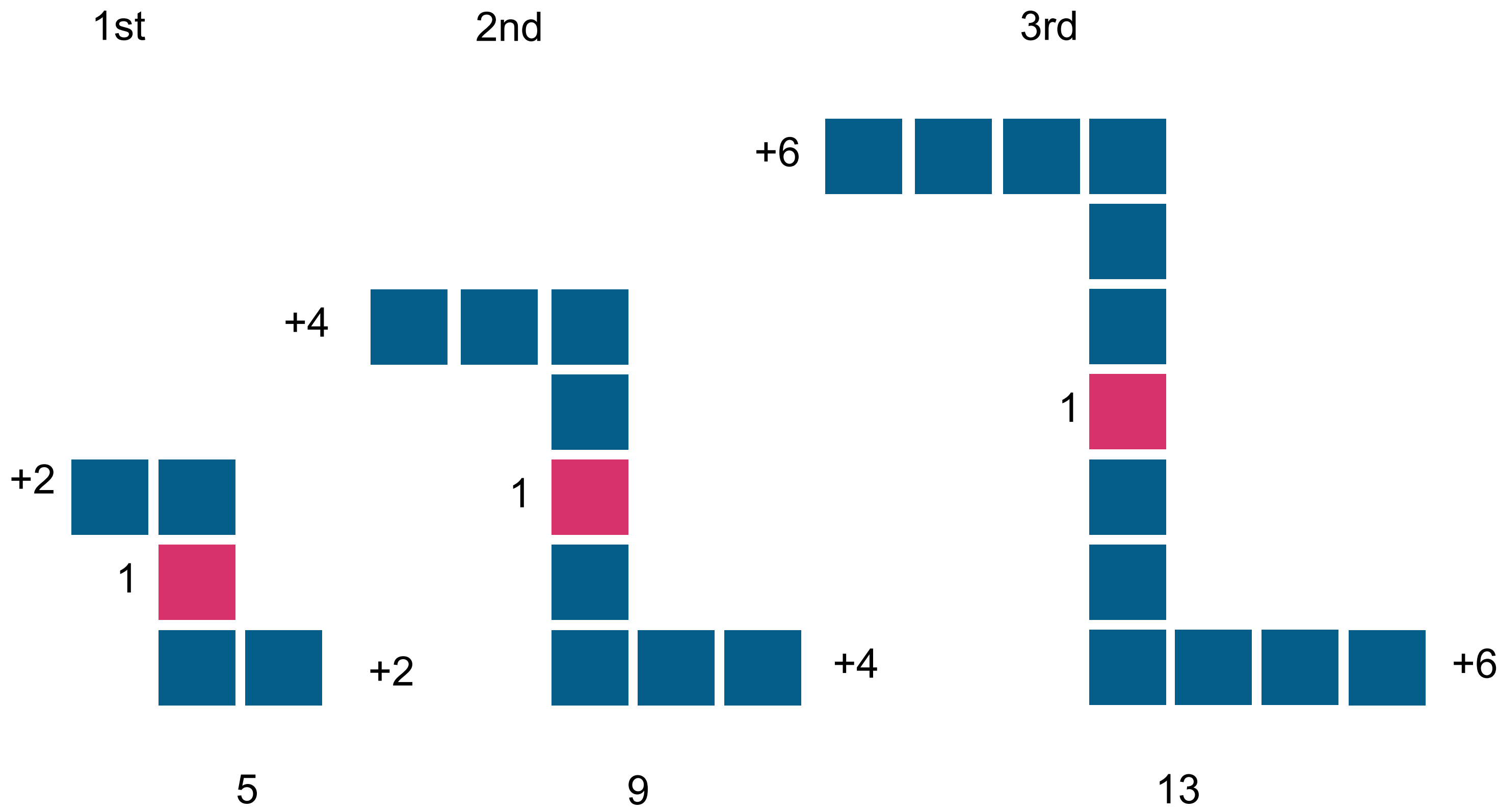
1st

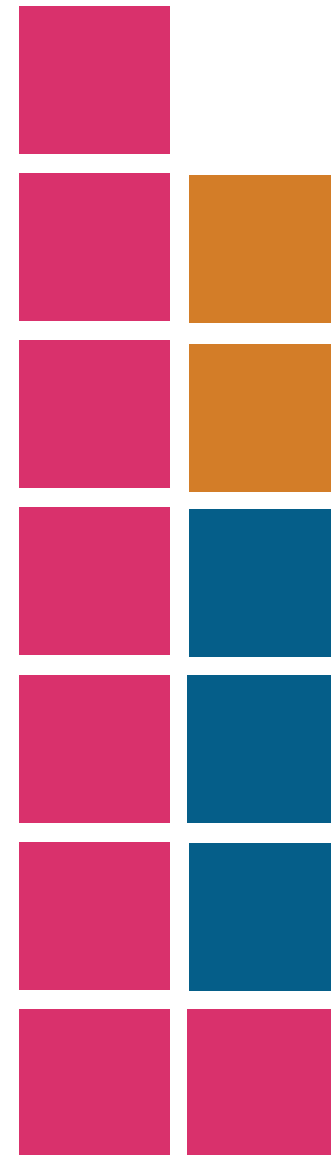
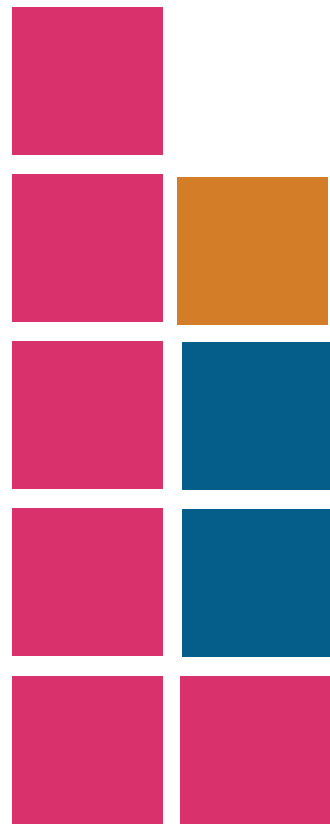
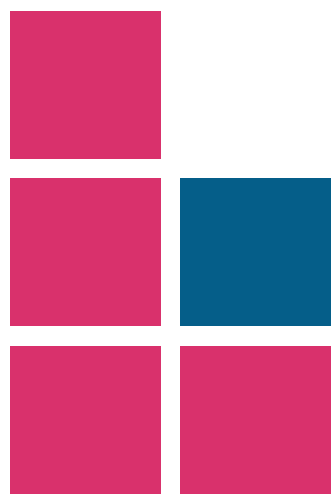
2nd

3rd

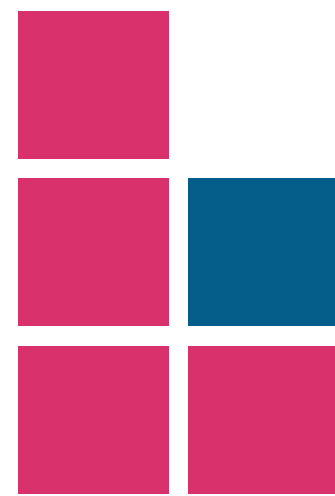








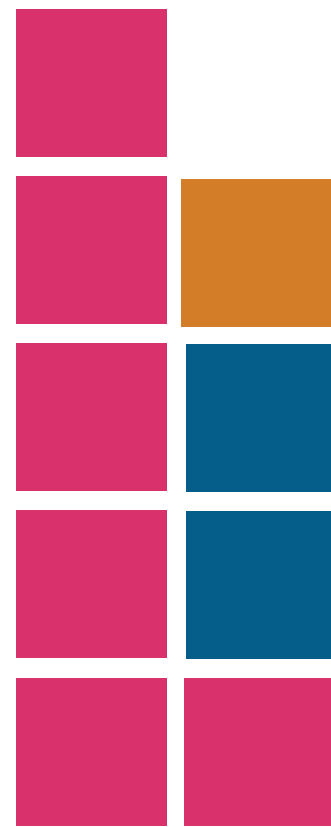
1st



$$3 + 2$$

5

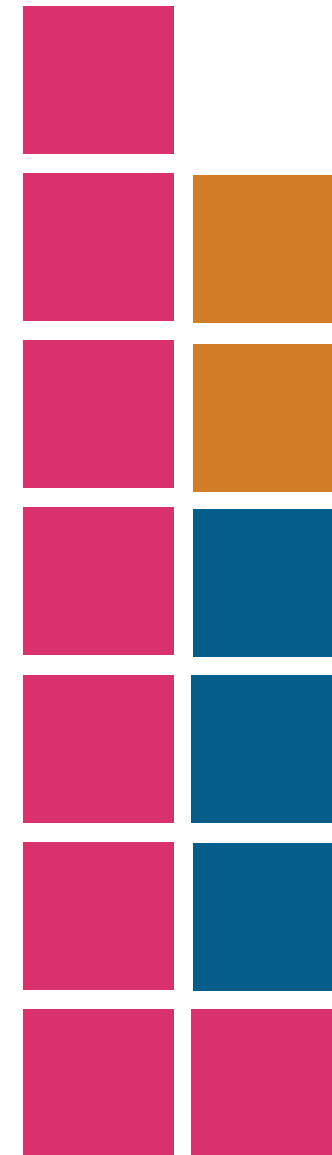
2nd



$$5 + 4$$

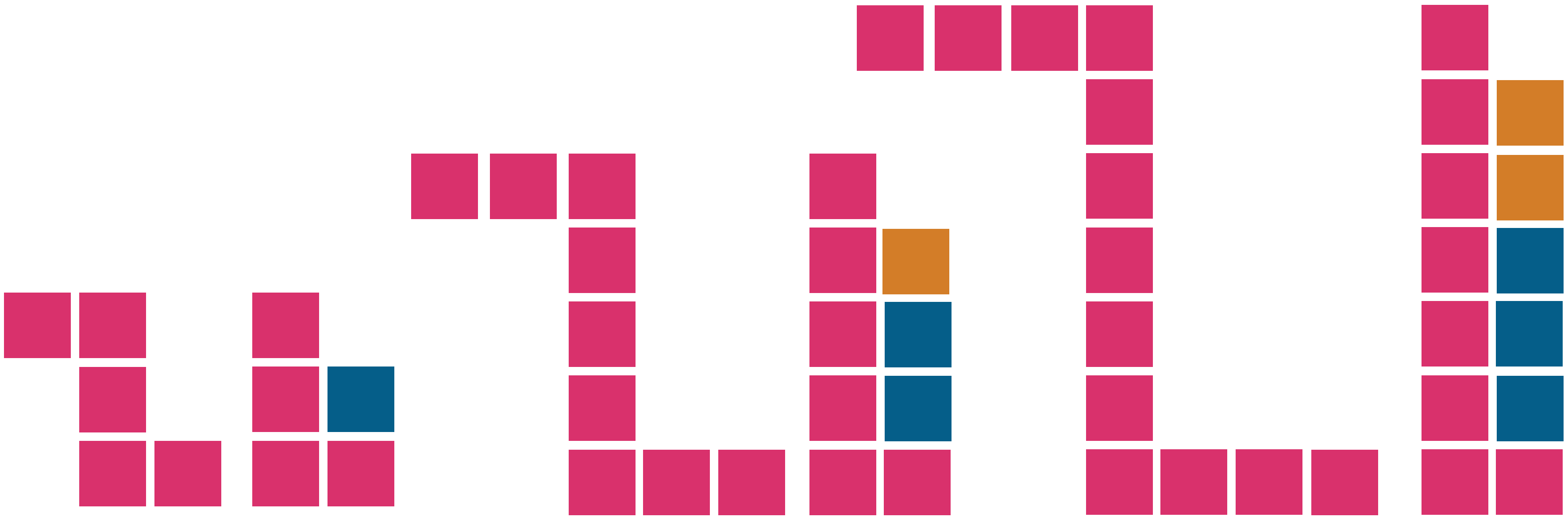
9

3rd

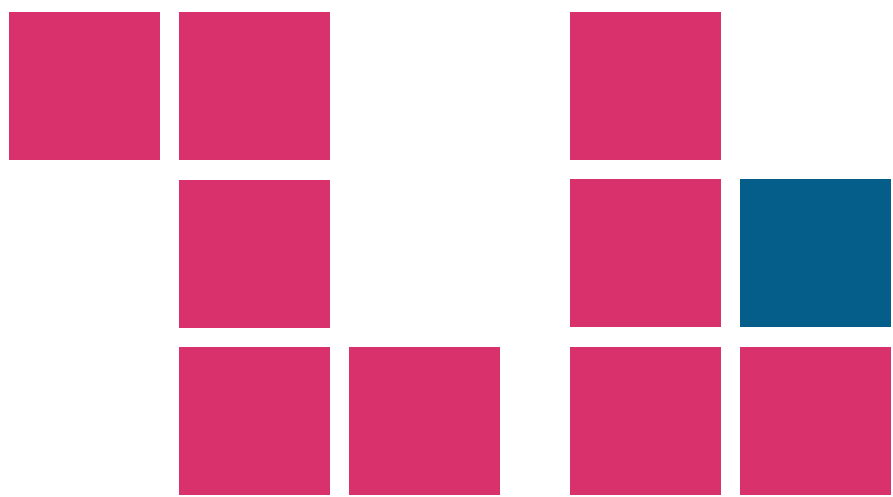


$$7 + 6$$

13



1st



5

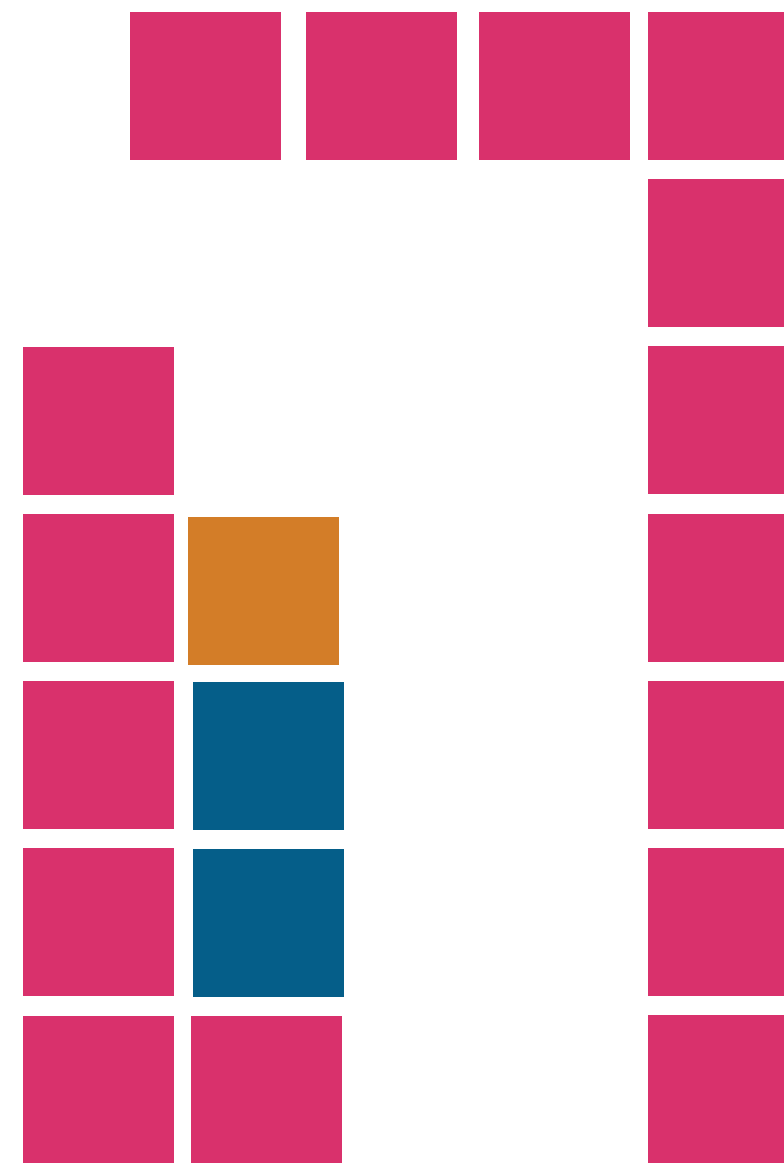
3 + 2

2nd



9

5 + 4

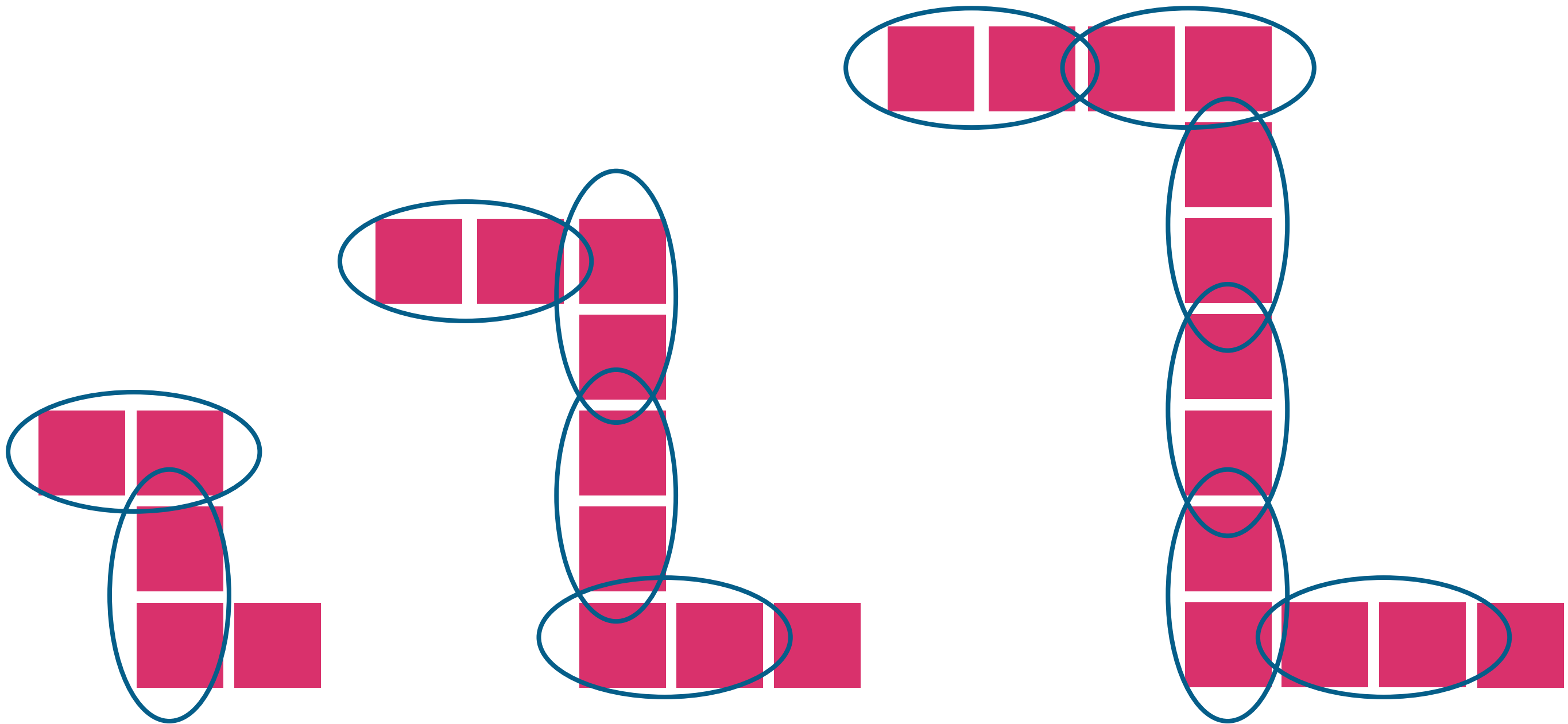


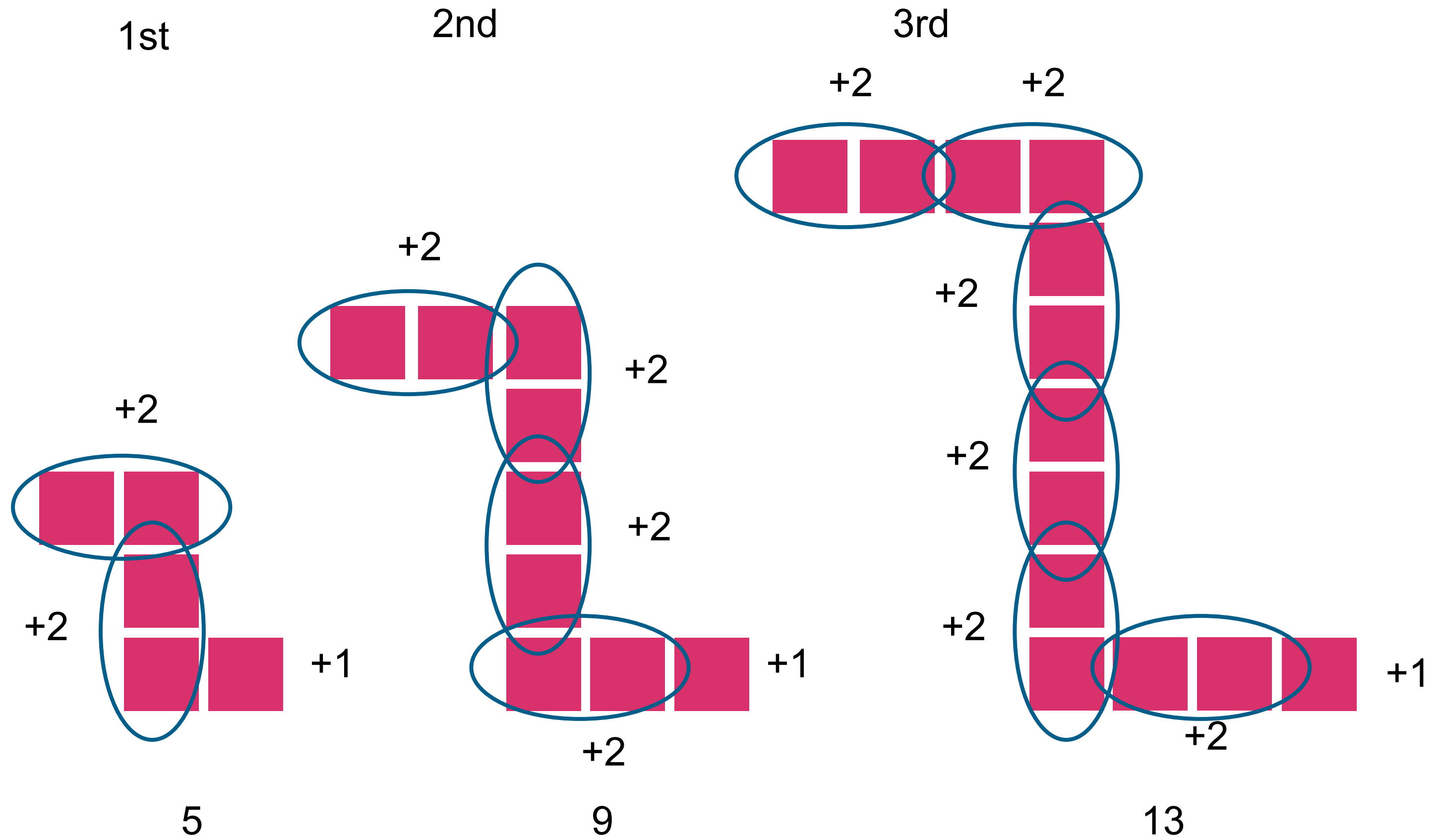
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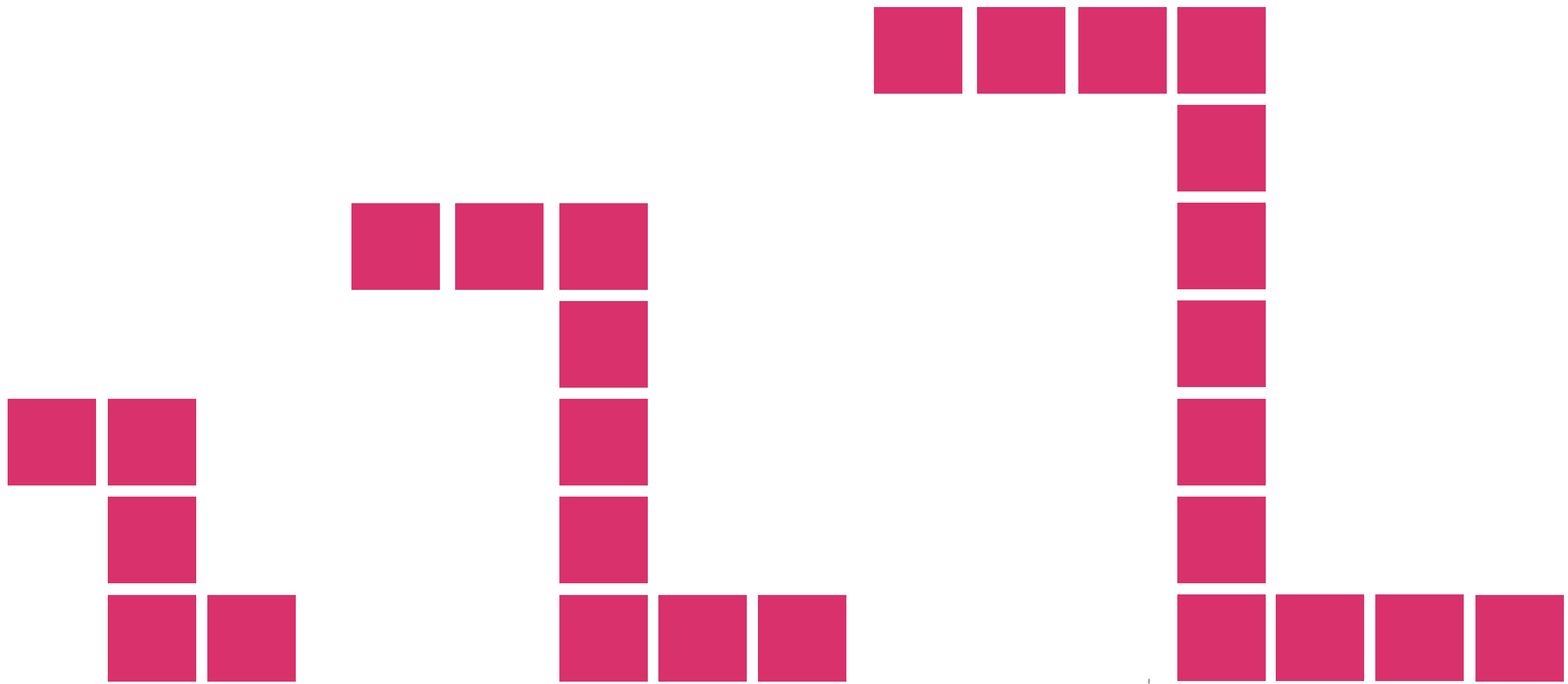
3rd

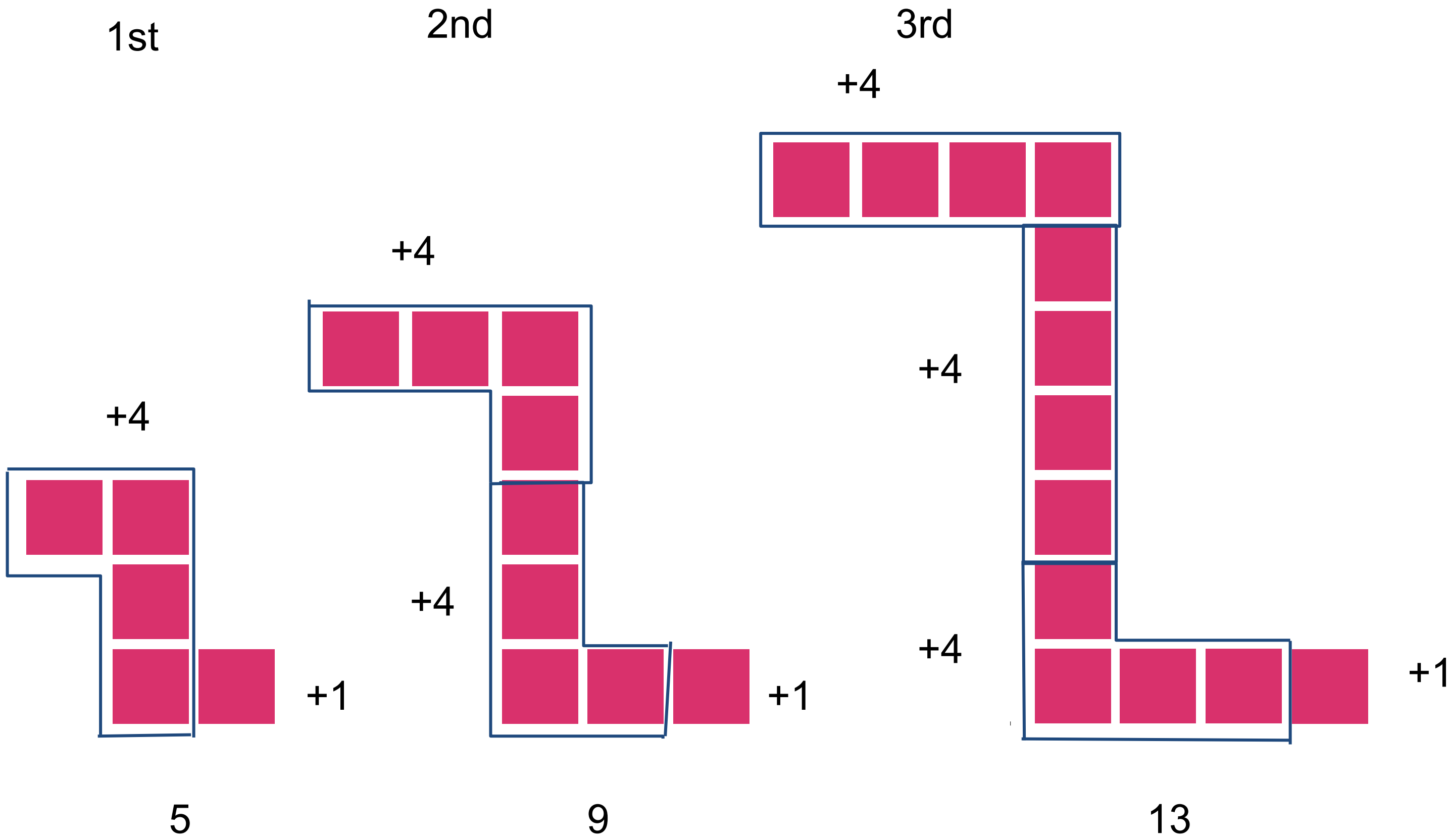


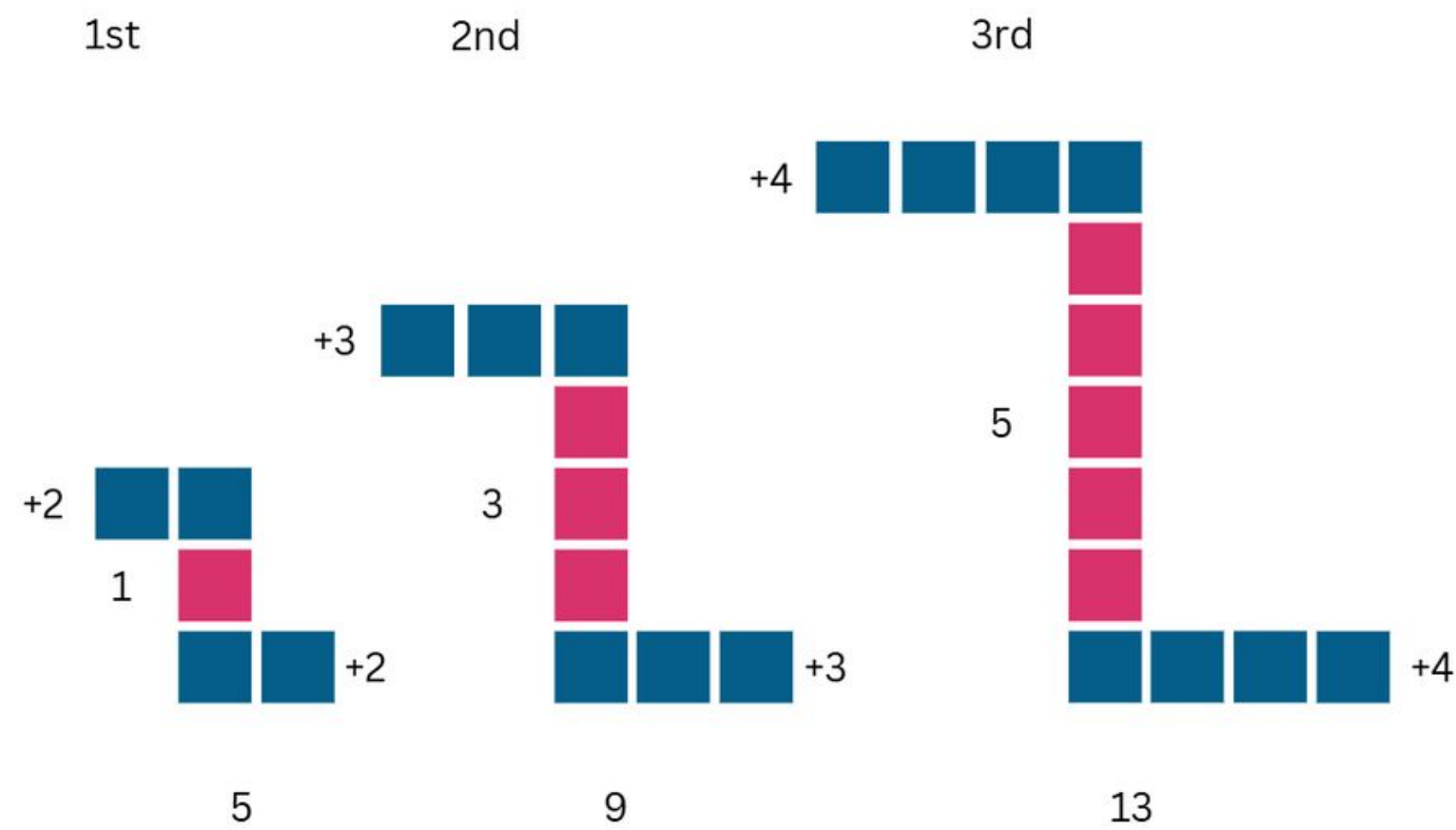
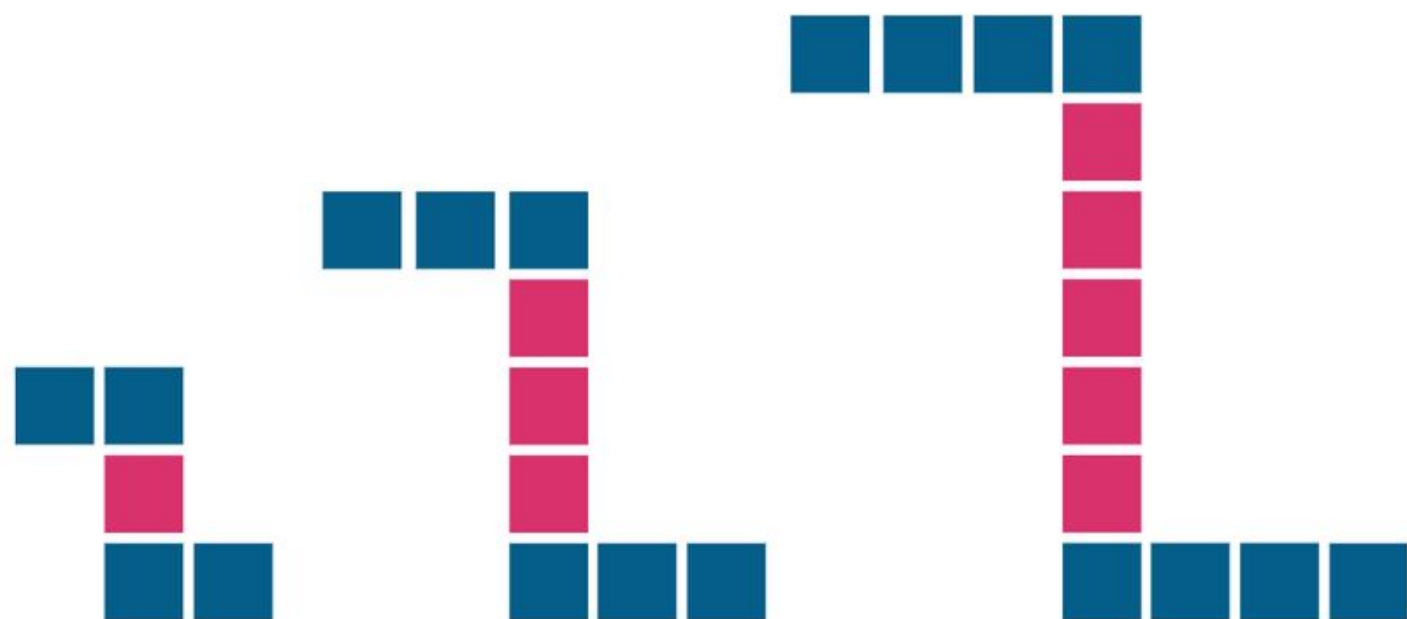
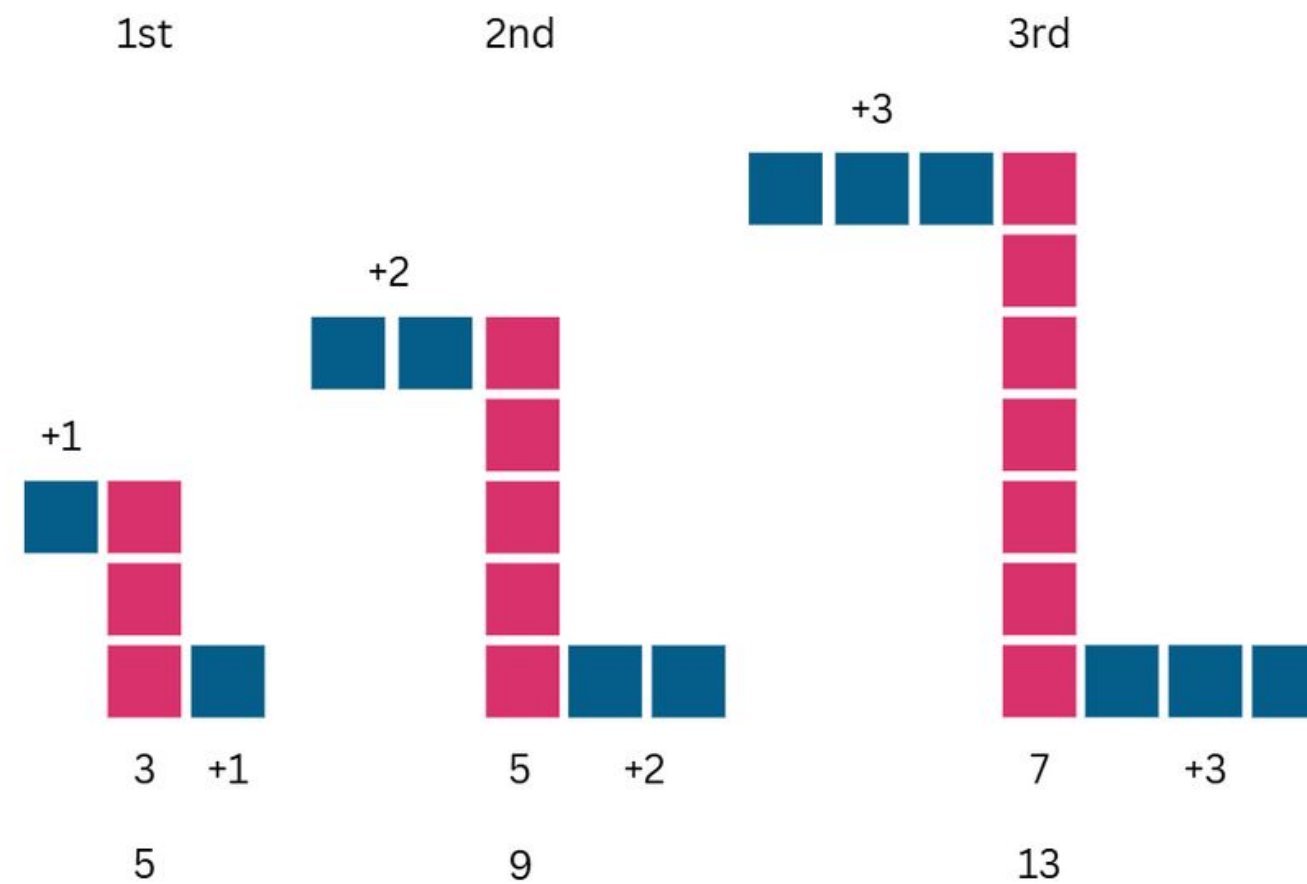
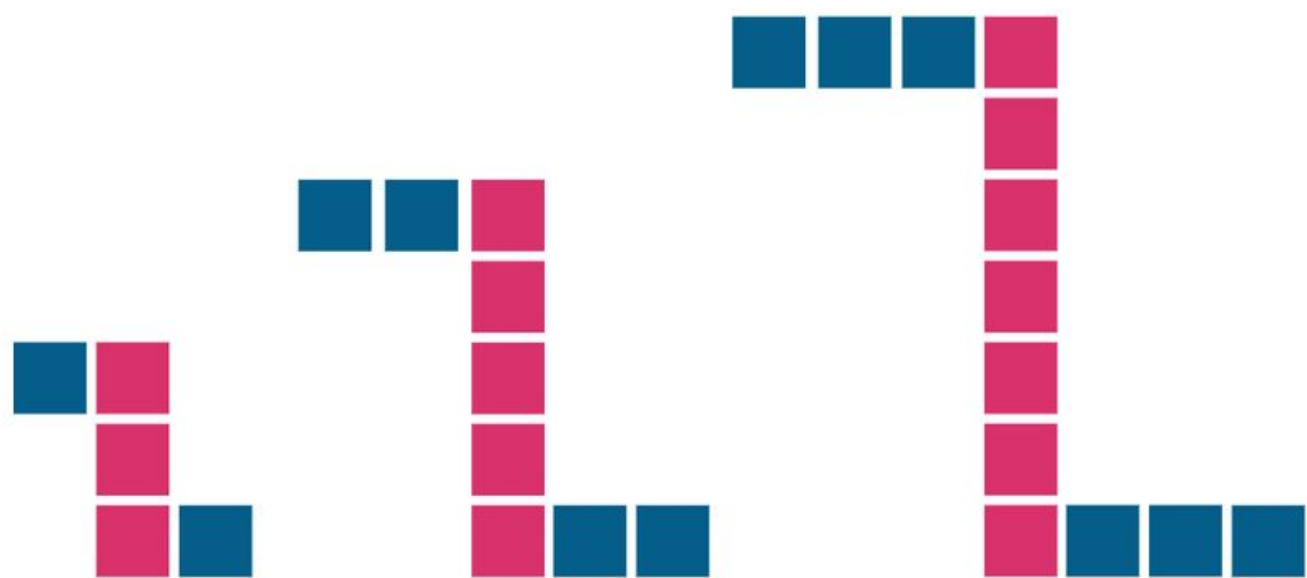
7 + 6

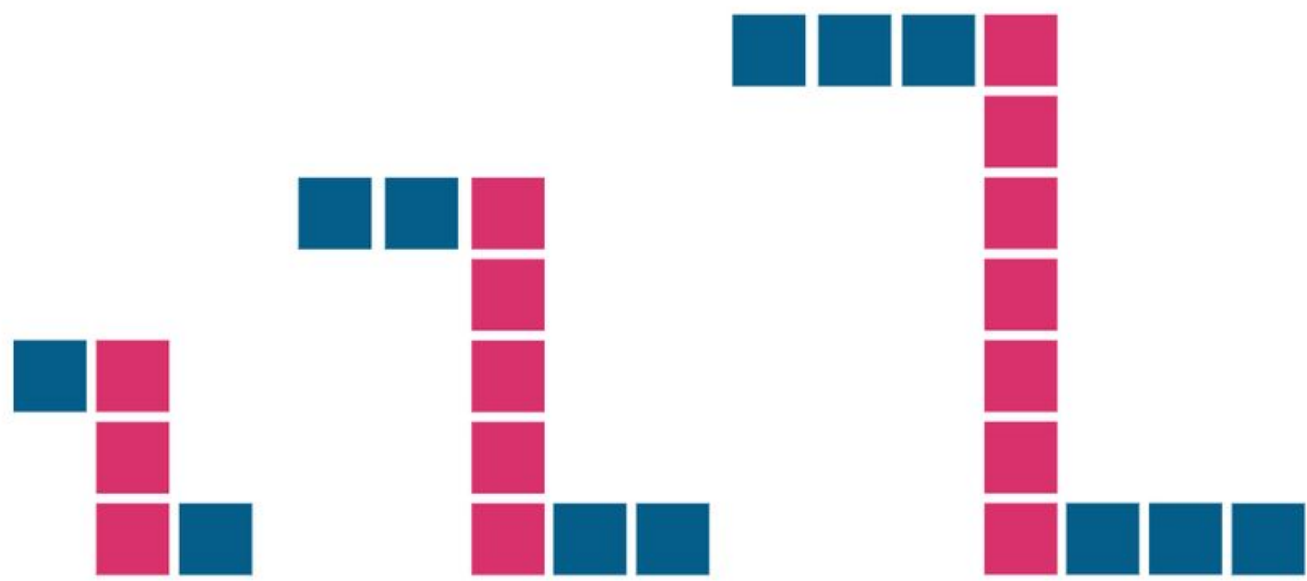




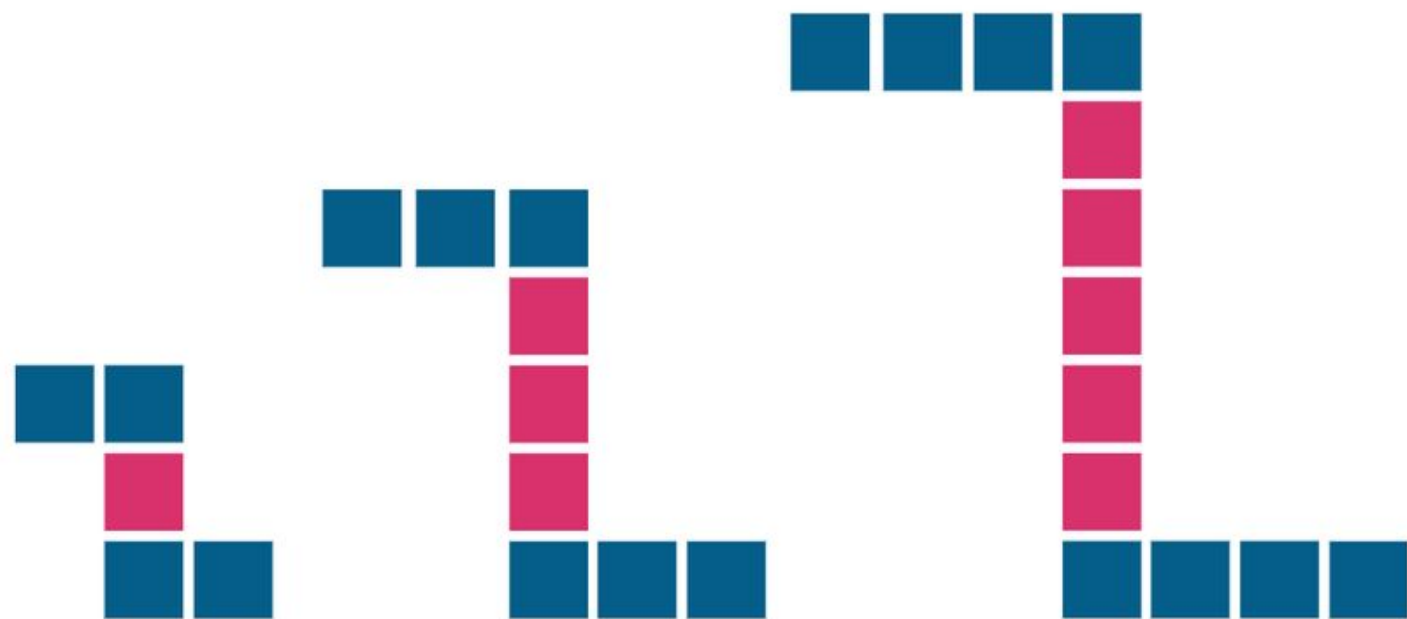
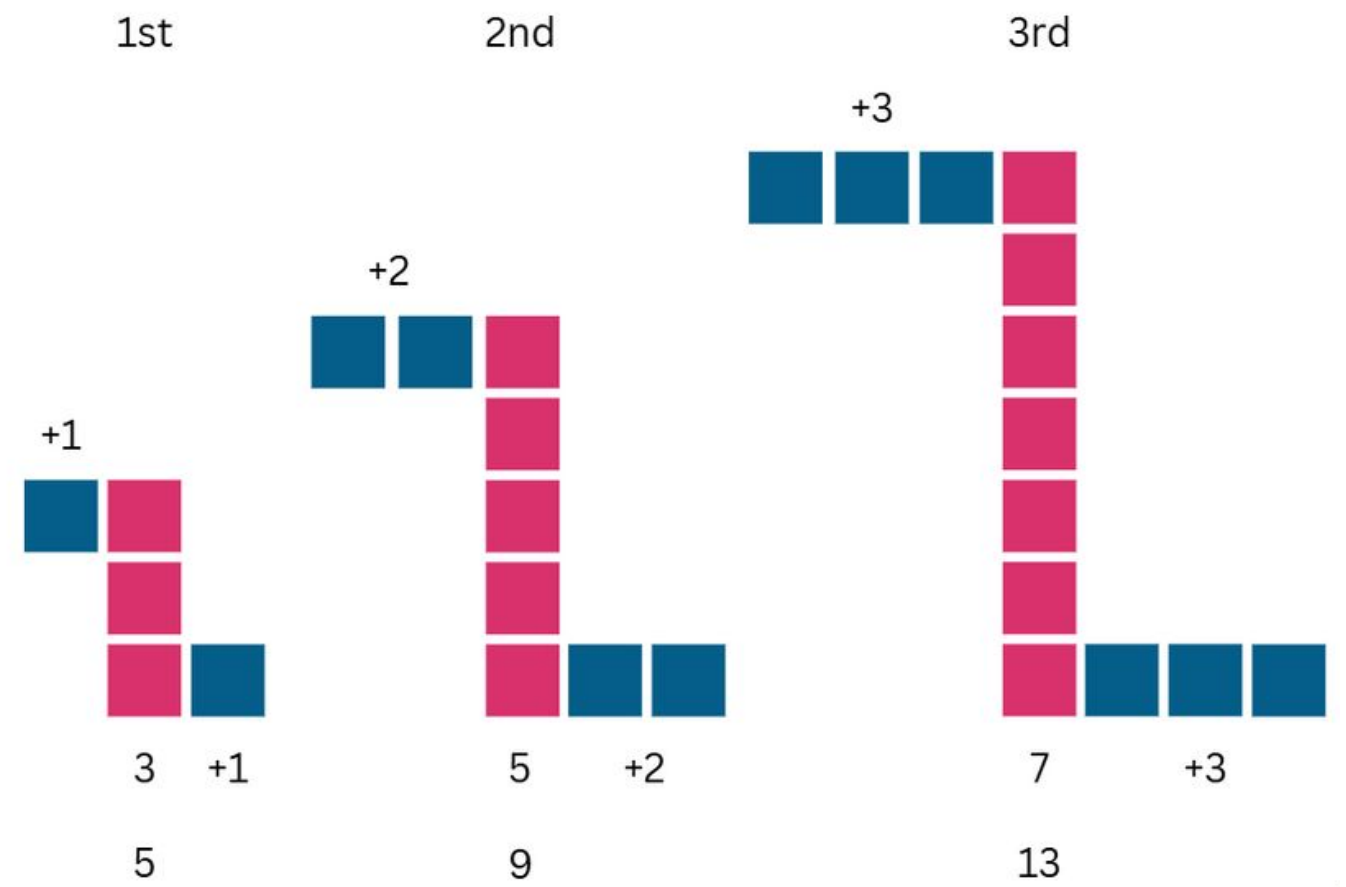




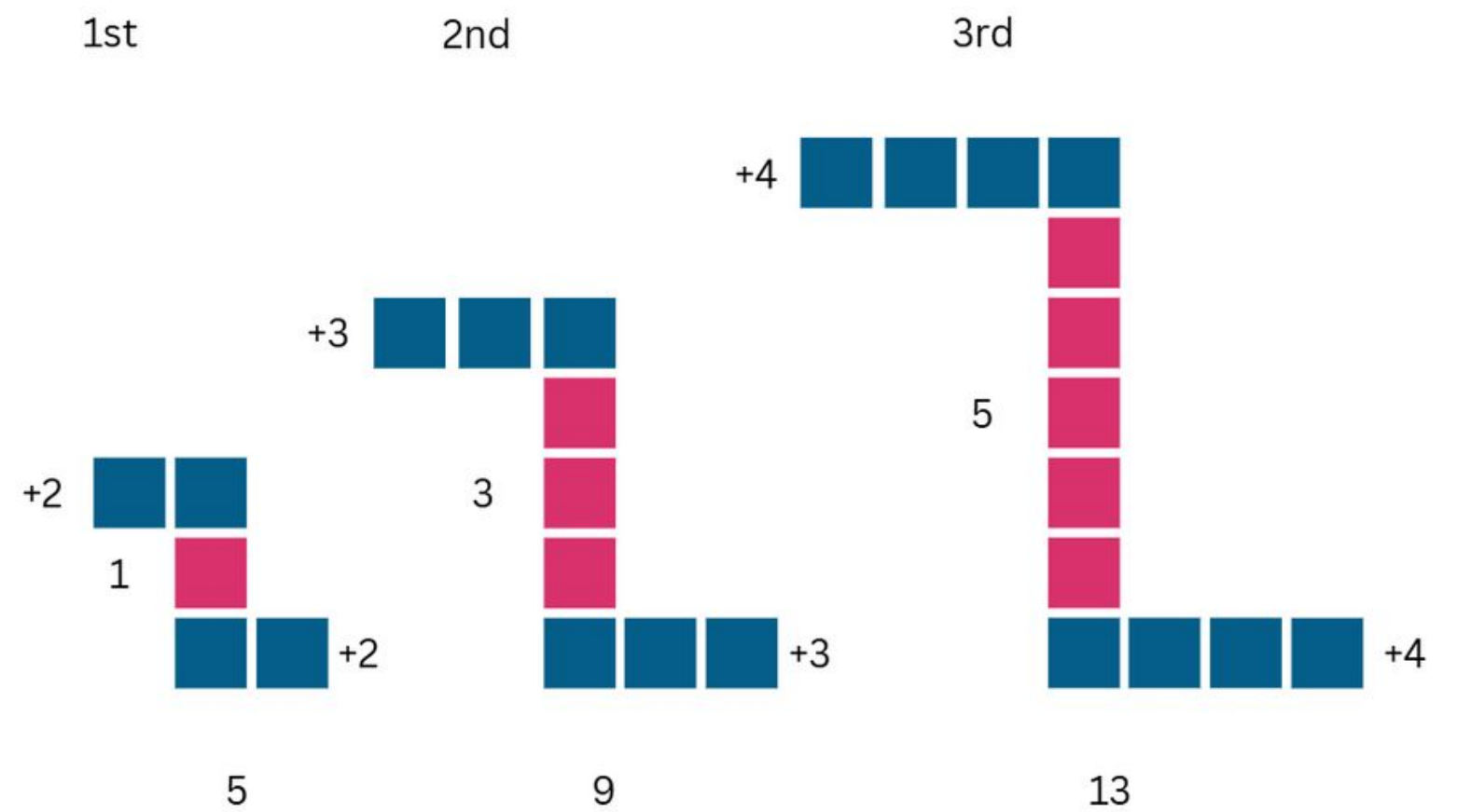


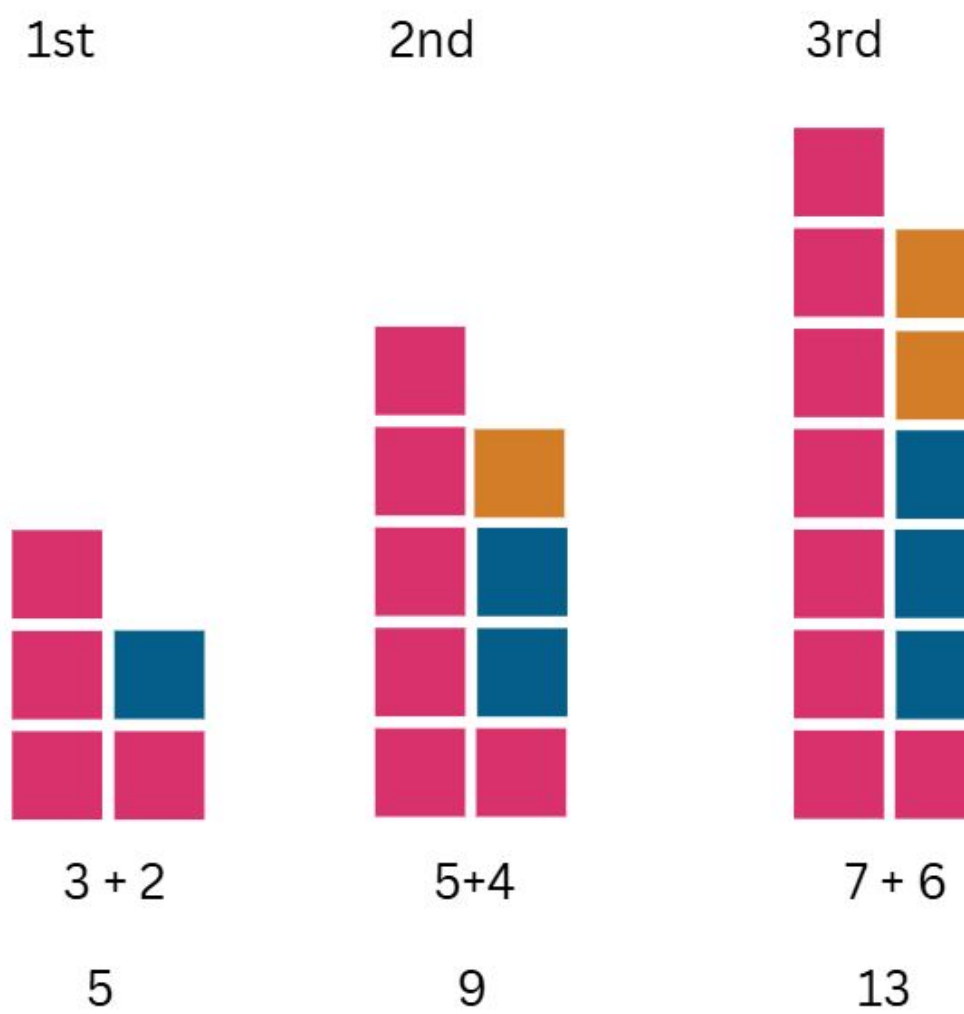
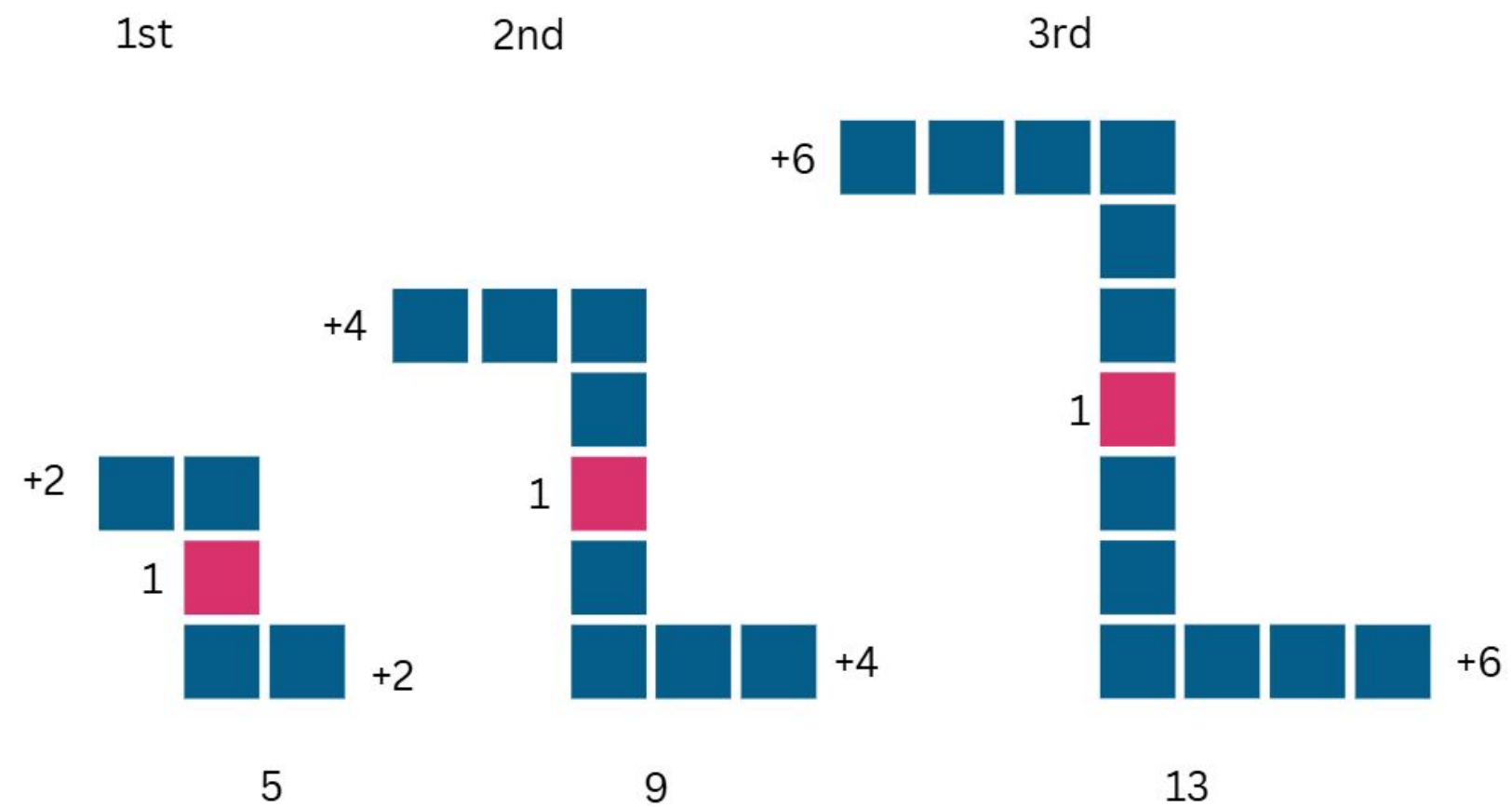
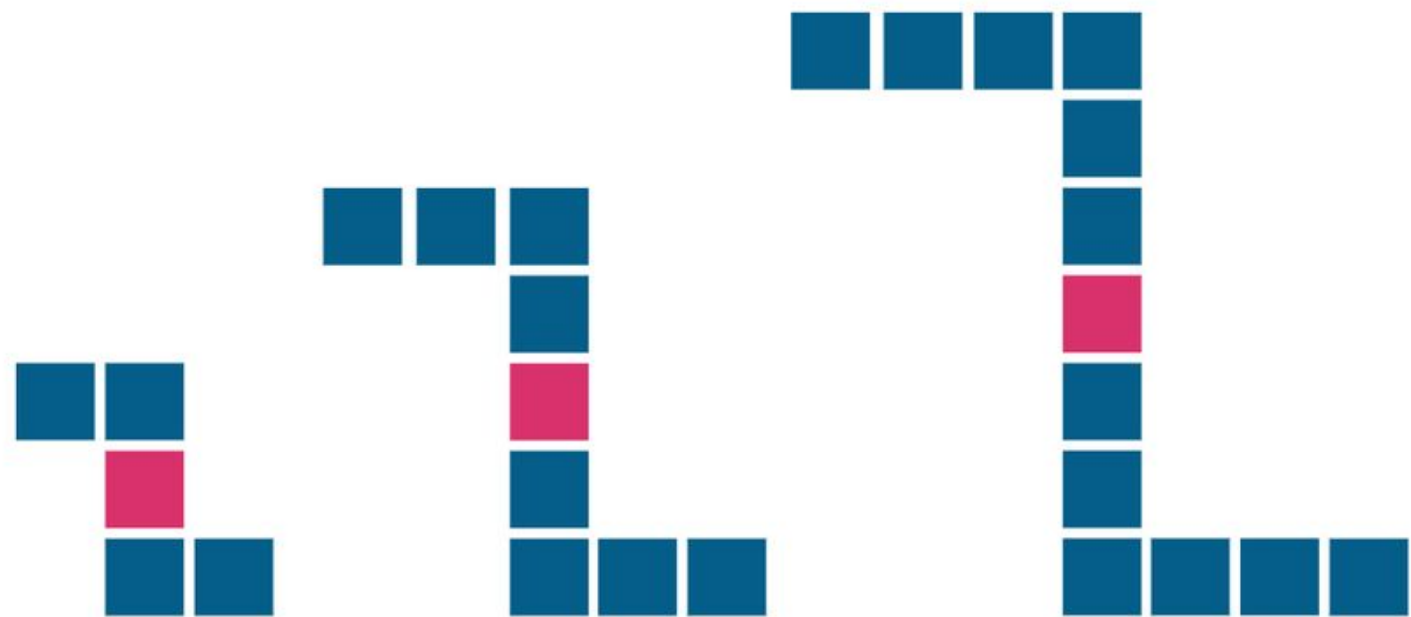


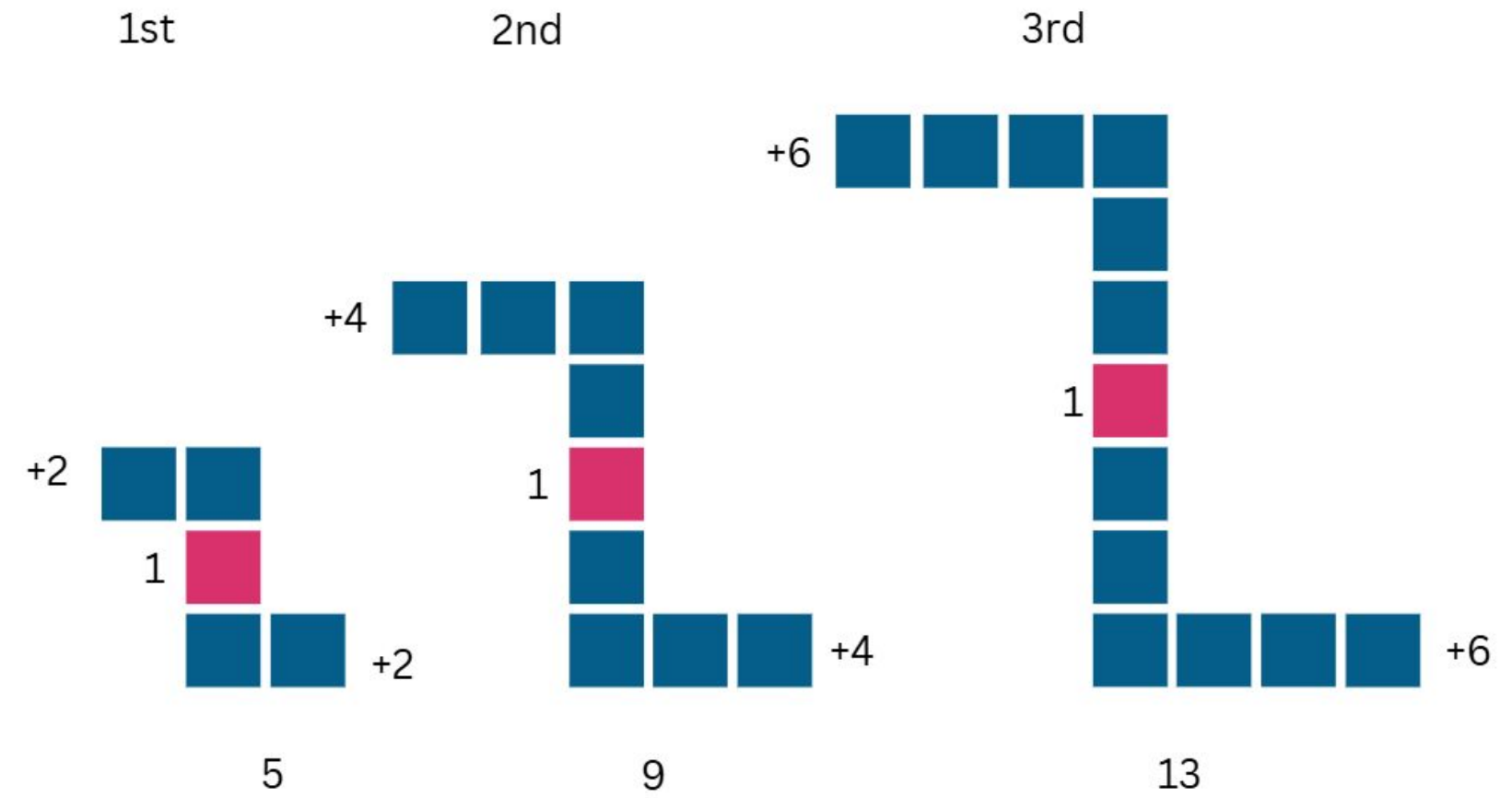
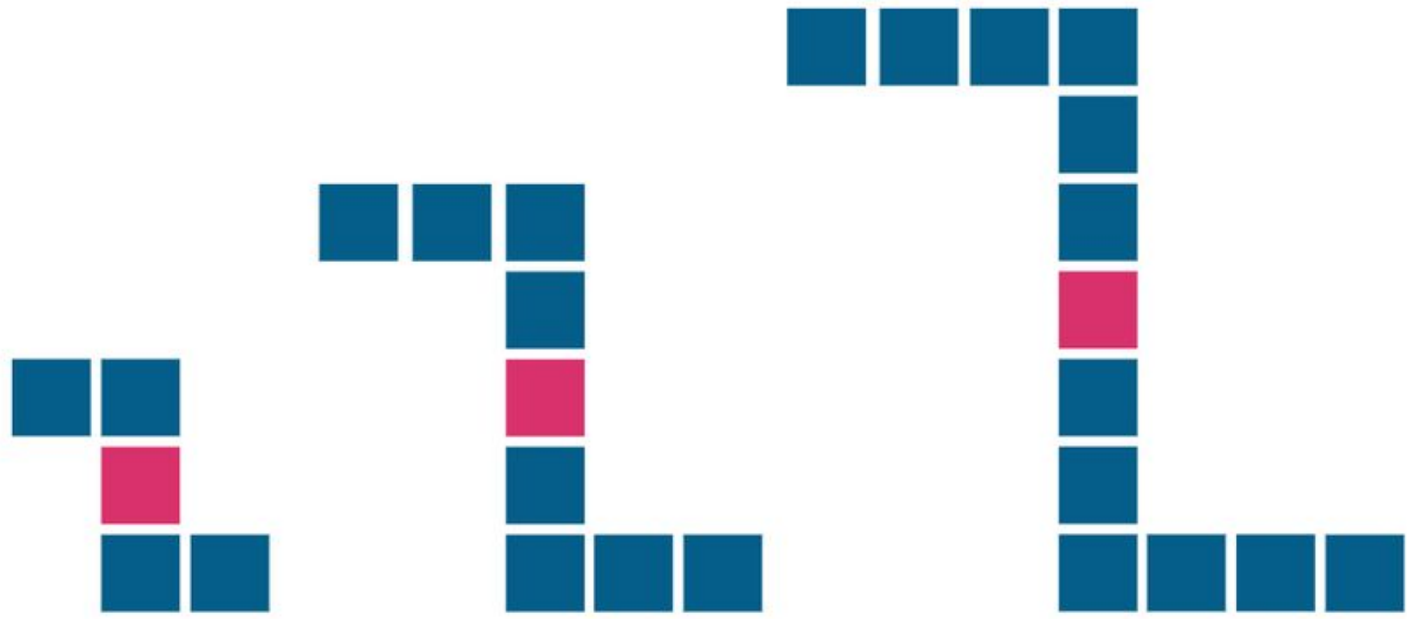
For each new figure add two to the column in the center and one on each end.



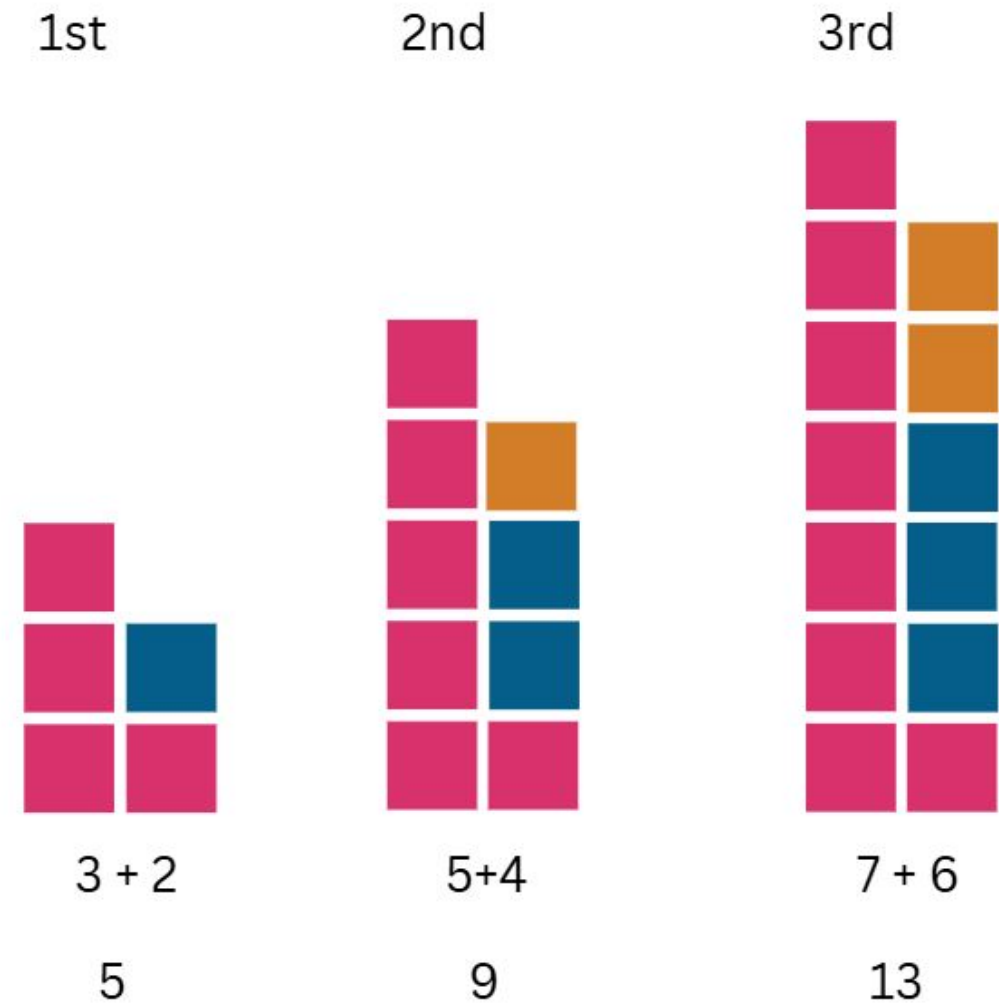
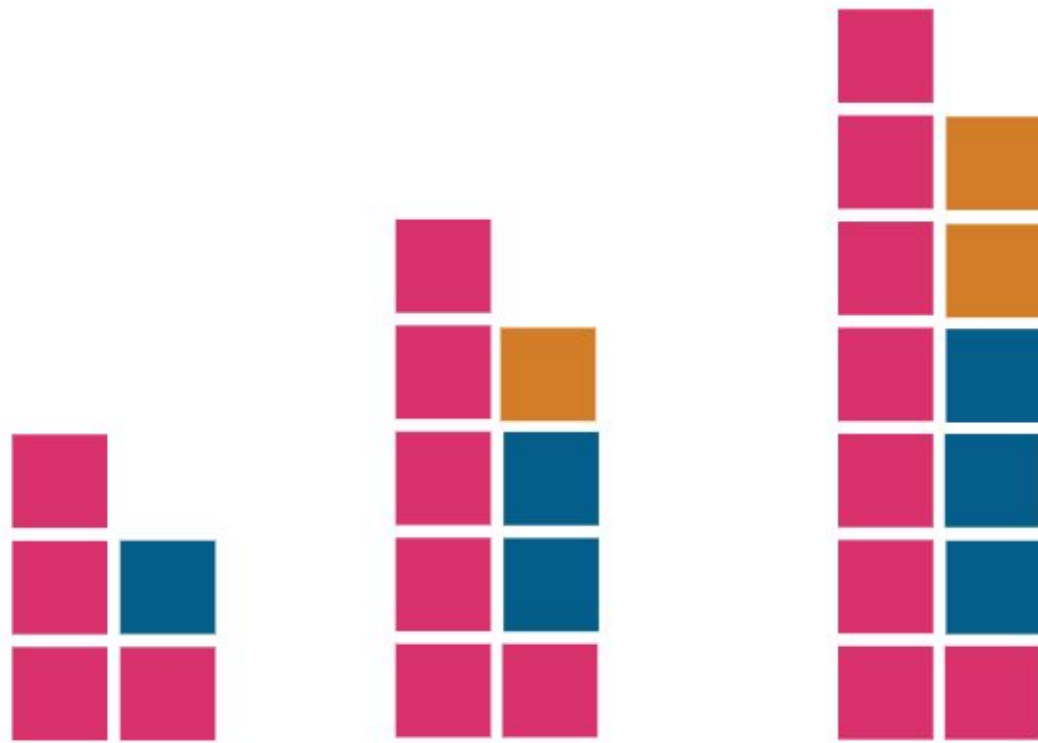
For each new figure add two rows in the center and one square to each column on the side.



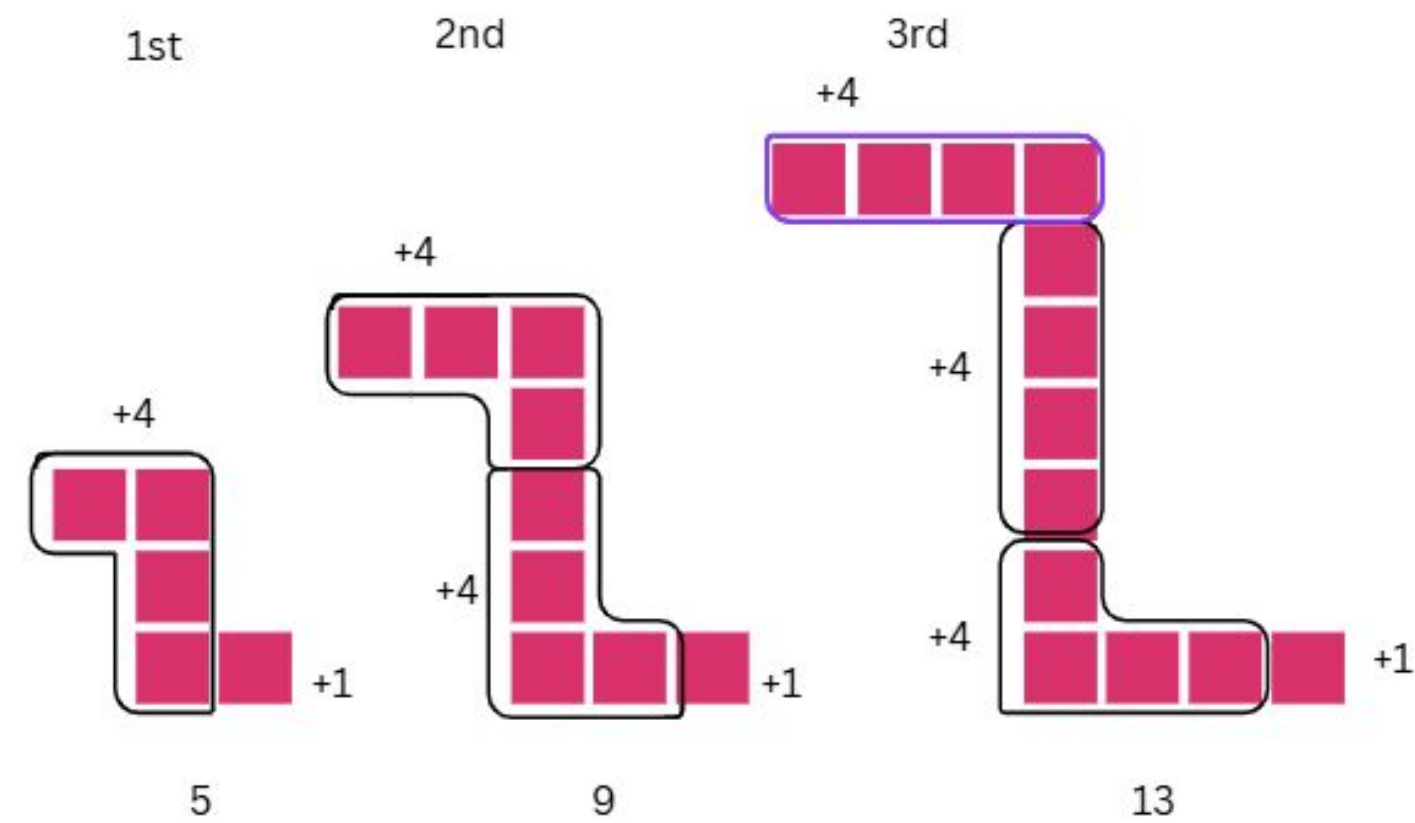
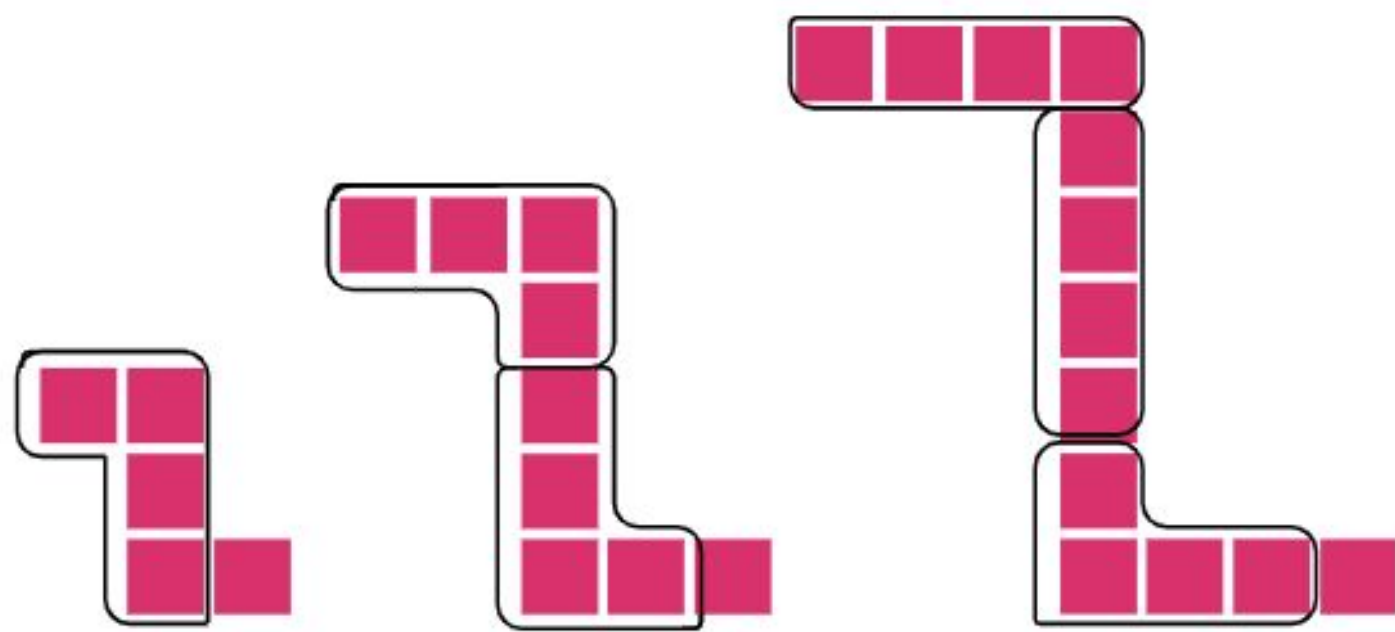
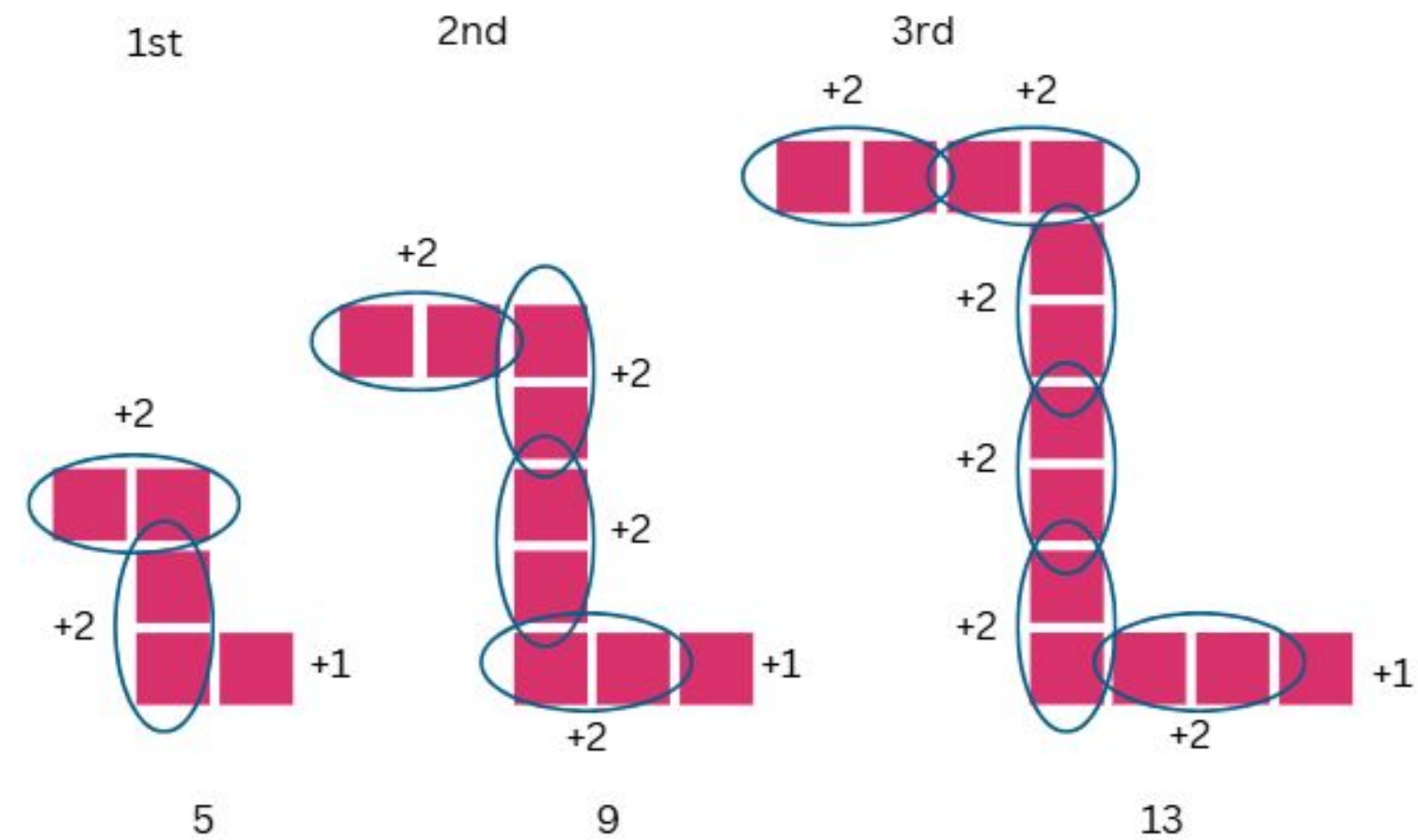
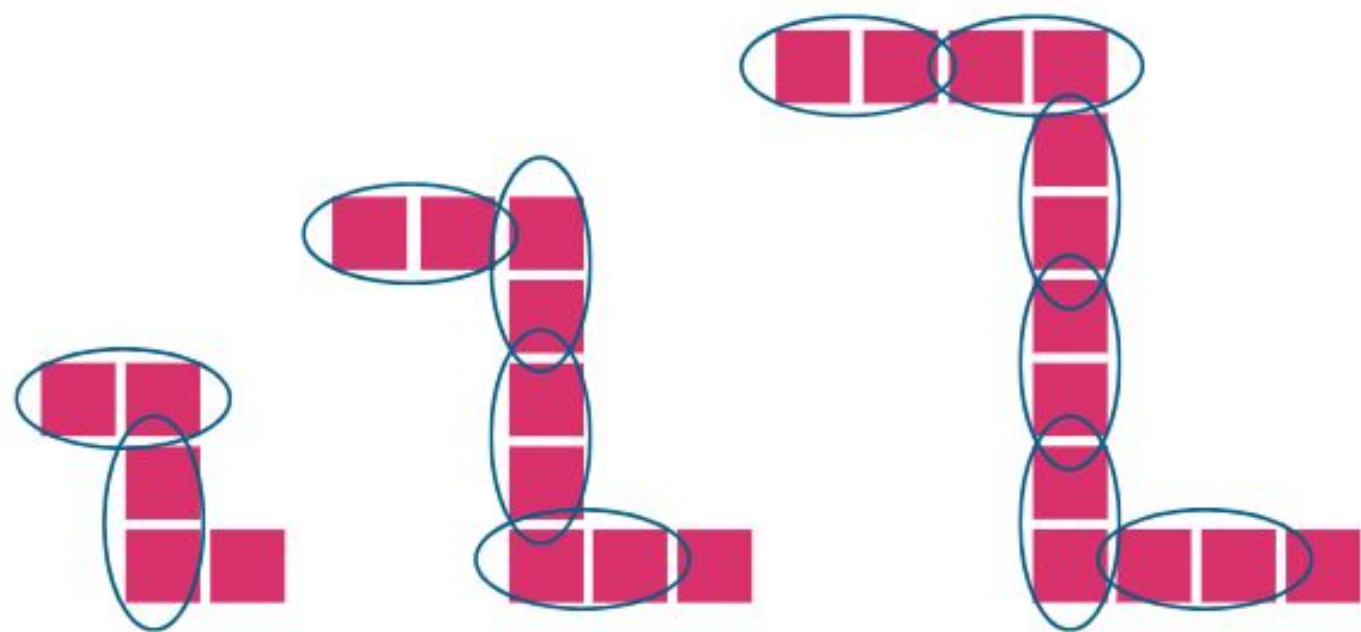


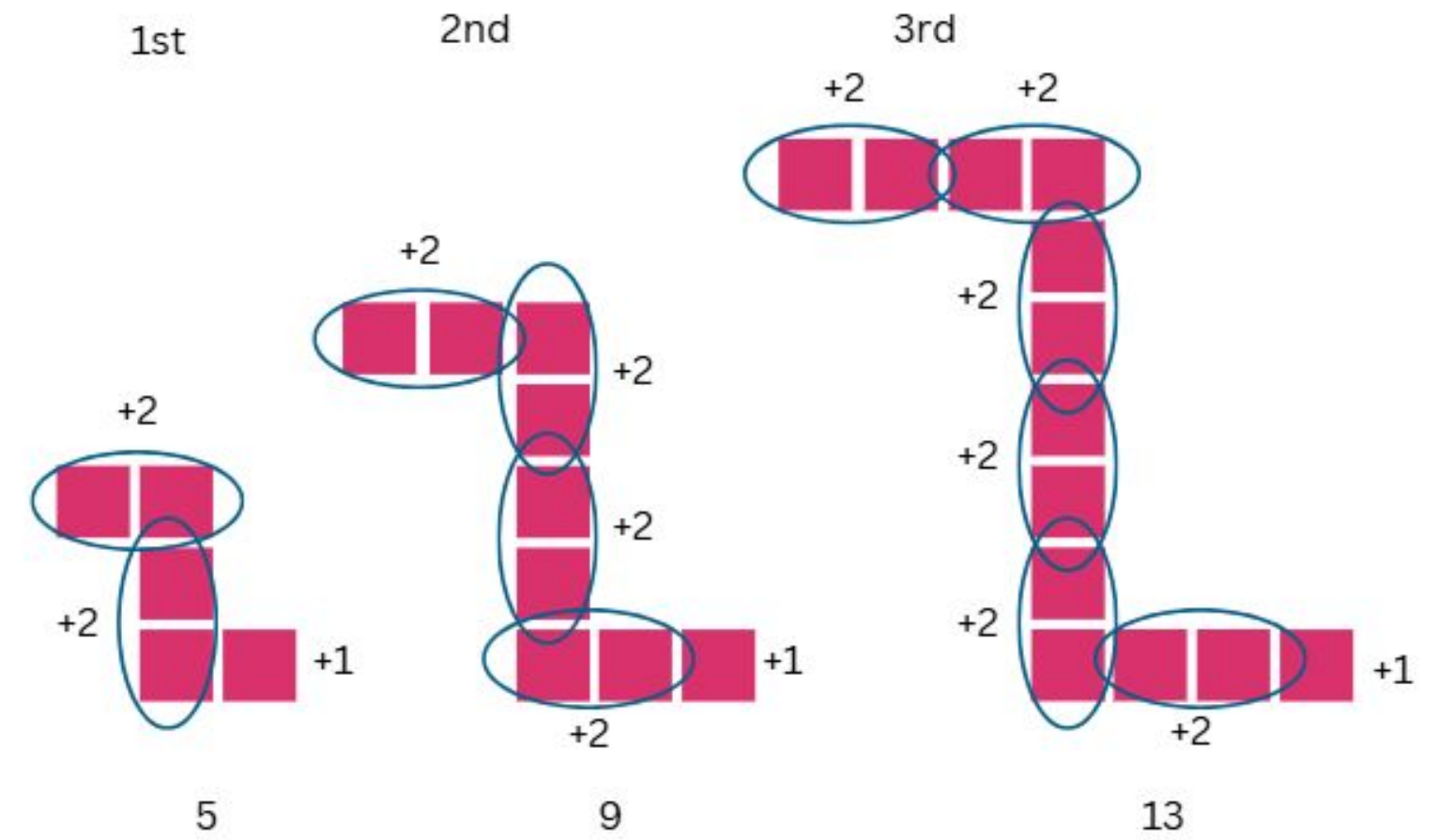
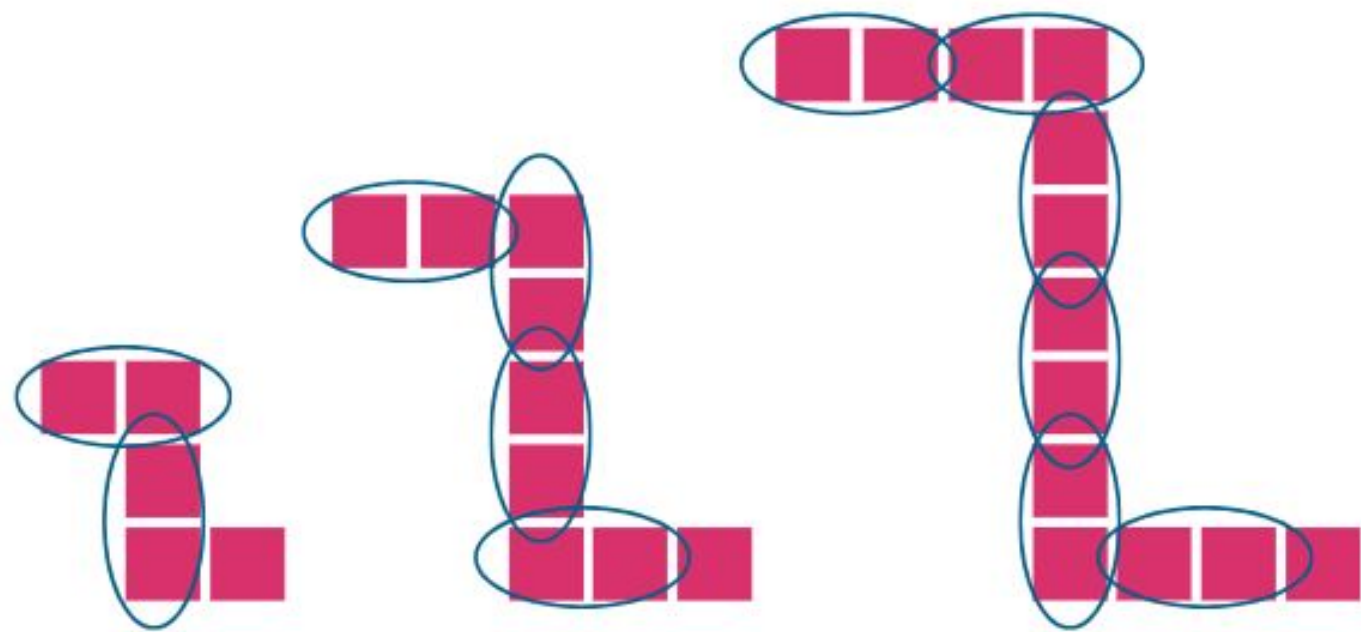


For each new figure you extend one on the top and one on the left side, and one on the bottom and one on the right side.

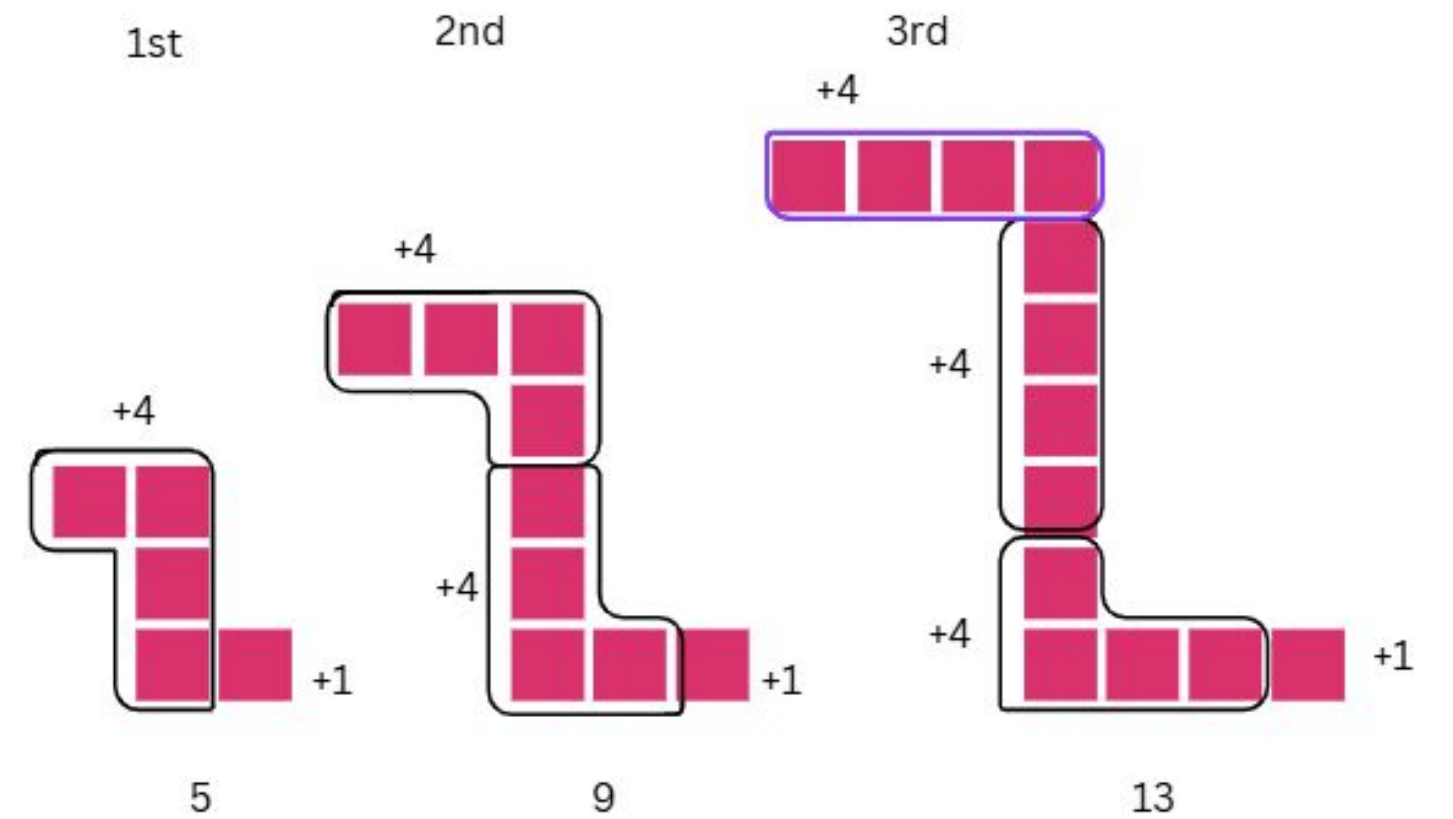
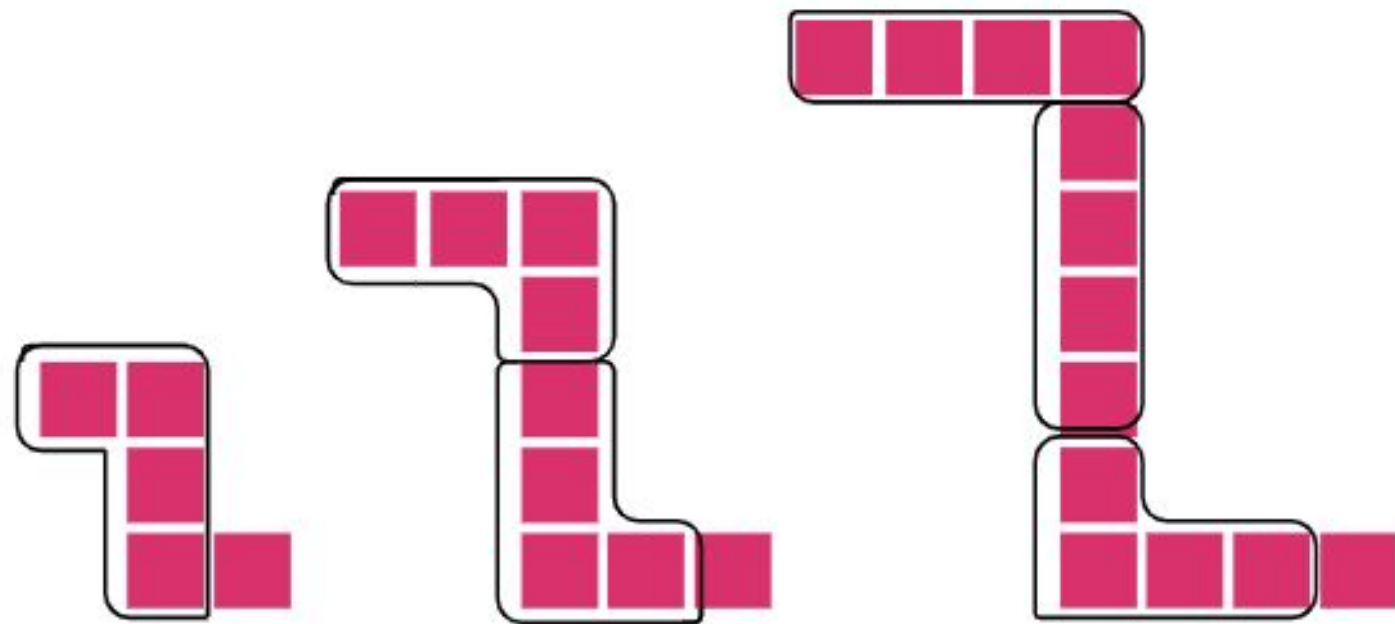


For each new figure add two to the top and two to the ends. You will always have two towers with one tower higher than the other.

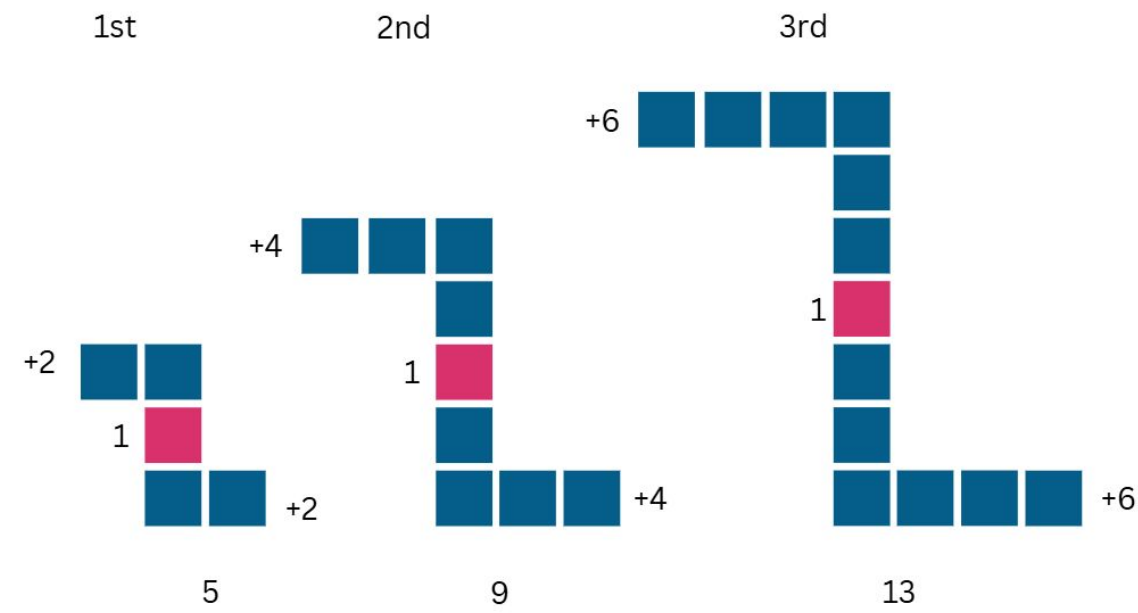




For each new figure you circle all the groups of two.
There is always one left over..



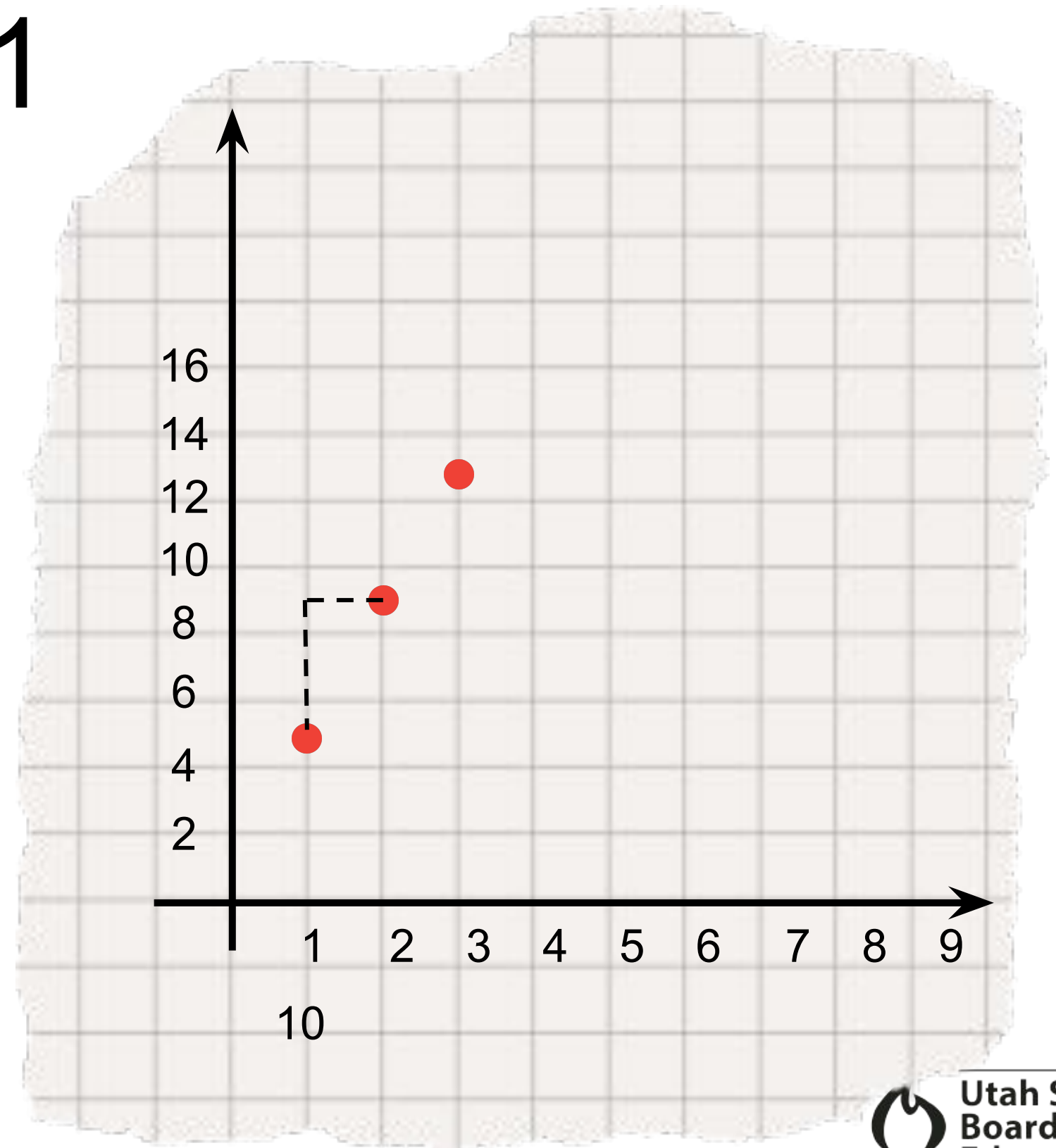
For each new figure you circle all the groups of four.
There is always one left over..



$$(2n + 2n) + 1$$

$$(4n) + 1$$

Figure	Number of squares	1st Difference
1	5	
2	9	+4
3	13	+4



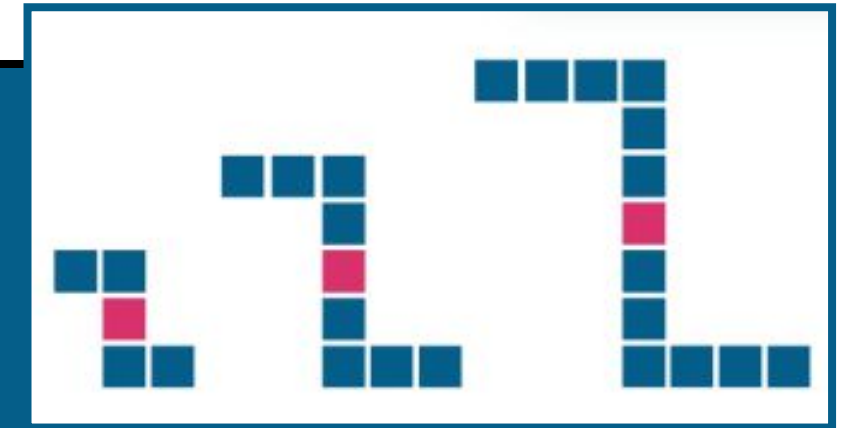


Figure	Number of squares	How did it grow?	How did it grow?	
1	5		$1 + (4)$	$1 + 4(1)$
2	9	$5 + 4$	$1 + (4 + 4)$	$1 + 4(2)$
3	13	$9 + 4$	$1 + (4 + 4 + 4)$	$1 + 4(3)$
4	17	$13 + 4$	$1 + (4 + 4 + 4 + 4)$	$1 + 4(4)$
5	21	$17 + 4$	$1 + (4 + 4 + 4 + 4 + 4)$	$1 + 4(5)$
n	$f(n)$	$(n-1) + 4$	$1 + 4(n)$	

Reflection



- What mathematics content was evident in today's task?
- How did different representations support you as a learner?
- What teacher moves helped make this task successful?

Utah's PCBL Framework:

ESSENTIAL COMPONENTS

CULTURE OF LEARNING

Each learner is supported by communities committed to creating the culture, structure, policies and instructional practices that engage them in their journey towards college, career and life readiness. By leveraging a learner's unique assets and interests, holding high expectations, executing teacher clarity and fostering meaningful relationships, an inclusive culture of learning allows each learner to define their pathway to success.

LEARNER AGENCY

Each learner develops understanding, skill and responsibility for the learning design and process in pursuit of achieving the characteristic of Utah's Portrait of a Graduate. Learner agency is achieved through a broad range of instructional strategies including goal setting, choice in learning pathways, voice in how to demonstrate competency and learner self-assessment.

DEMONSTRATED COMPETENCY & ASSESSMENT

Each learner progresses through their learning based upon applying their knowledge, essential skills and dispositions. Timely, effective feedback and data from a variety of formative assessment processes are used to measure learner growth, progress and advancement based on high expectations.

CUSTOMIZED SUPPORTS

Each learner is provided with or selects appropriate and timely support to achieve growth or competency and to engage in personalized learning pathways. These customized supports are based on data about the learner's demonstrated strengths, interests and needs.

SOCIAL EMOTIONAL LEARNING

Each learner is provided with opportunities to acquire and apply the knowledge, attitudes, and skills necessary for understanding and managing their emotions; setting and achieving positive goals; feeling and showing empathy for others; establishing and maintaining positive relationships; making responsible decisions; and self-advocating. The development of these characteristics is critical for a student to learn to effectively work with others, overcome challenges, and achieve success in multiple settings. Social Emotional Learning is intentionally and seamlessly integrated into classroom activities to allow students to continually build these skills.

Effective Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Reflection

- In what ways did this math task attend to the five PCBL components?
- How do the 8 Effective Teaching Practices align to the five PCBL Components?



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PCBL Component	How did today's task address the PCBL component?	Which of NCTM's 8 Effective Teaching Practices support this PCBL Component?
<p>Culture of Learning: Each learner is supported by communities committed to creating the culture, structure, policies and instructional practices that engage them in their journey towards college, career and life readiness. By leveraging a learner's unique assets and interests, holding high expectations, executing teacher clarity and fostering meaningful relationships, an inclusive culture of learning allows each learner to define their pathway to success.</p>		
<p>Learner Agency: Each learner develops understanding, skill and responsibility for the learning design and process in pursuit of achieving the characteristic of Utah's Portrait of a Graduate. Learner agency is achieved through a broad range of instructional strategies including goal setting, choice in learning pathways, voice in how to demonstrate competency and learner self-assessment.</p>		
<p>Demonstrated Competency & Assessment: Each learner progresses through their learning based upon applying their knowledge, essential skills and dispositions. Timely, effective feedback and data from a variety of formative assessment processes are used to measure learner growth, progress and advancement based on high expectations.</p>		

<p>Customized Supports: Each learner is provided with or selects appropriate and timely support to achieve growth or competency and to engage in personalized learning pathways. These customized supports are based on data about the learner's demonstrated strengths, interests and needs.</p>		
<p>Social Emotional Learning: Each learner is provided with opportunities to acquire and apply the knowledge, attitudes, and skills necessary for understanding and managing their emotions; setting and achieving positive goals; feeling and showing empathy for others; establishing and maintaining positive relationships; making responsible decisions; and self-advocating. The development of these characteristics is critical for a student to learn to effectively work with others, overcome challenges, and achieve success in multiple settings. Social Emotional Learning is intentionally and seamlessly integrated into classroom activities to allow students to continually build these skills.</p>		

Call to Action

On the back of your *Effective Mathematics Teaching Practices* handout, write down one thing from today's session that you want to take back and implement in your classroom, school, or district.



Draft P-12 UT Core Mathematics Standards

<https://bit.ly/UTmathstandardsdraft>

bit.ly/UTmathstandardsfeedback



Thank you for your participation!

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Mike Spencer, mike.spencer@schools.utah.gov

