

Grade 4 · Number and Shape Patterns · Lesson

Common Core 4.OA.C.5 · mathovore.fr

A number pattern follows a rule, such as "start at 2 and add 3", which gives 2, 5, 8, 11, 14. To build the pattern, start with the first term and apply the rule again and again. You can then look for features the rule does not state, like terms that alternate between odd and even.

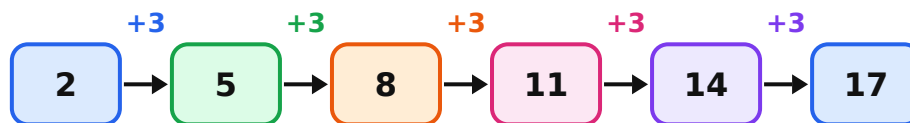
Grade 4 Common Core: 4.OA.C.5

Key facts:

- A pattern rule names a starting number and a repeated operation, such as add 3 or multiply by 2.
- Each number in a pattern is called a term; apply the rule to one term to get the next.
- Shape patterns can be turned into number patterns by counting parts in each figure.
- Features such as odd or even terms, multiples, and repeating digits can be found by studying the terms.
- Check a pattern by repeating the operation between neighbors.

What is a pattern rule?

A **pattern** is a list of numbers or shapes that follows a rule. Each number in the list is called a **term**. The rule tells you how to get from one term to the next. For example, "Start at 2 and add 3" gives 2, 5, 8, 11, 14, 17.



Start at 2 and add 3 each time: 2, 5, 8, 11, 14, 17.

Pattern rule

A **pattern rule** names the starting number and the operation that is repeated, such as "add 3", "subtract 5", or "multiply by 2". The rule gives the same step every time.

How do you make a pattern from a rule?

1. Write the starting number as the first term.
2. Apply the rule to the first term to get the second term.
3. Apply the rule to each new term to get the next one.
4. Check each step by doing the operation again.

Example: use the rule "start at 3, multiply by 2". The terms are 3, $3 \times 2 = 6$, $6 \times 2 = 12$, $12 \times 2 = 24$, $24 \times 2 = 48$.



Start at 3 and multiply by 2: 3, 6, 12, 24, 48.

How can shapes make a pattern?

Shapes can follow a rule too. In the picture, Figure 1 is one square made of 4 toothpicks. Every new square shares one side, so it needs only 3 more toothpicks. The rule is "start at 4, add 3", and the numbers of toothpicks are 4, 7, 10, 13, 16.



Figure 1



Figure 2



Figure 3

Each new square adds 3 toothpicks: 4, 7, 10, and so on.

What features can you find in a pattern?

A pattern can have features that the rule does not say out loud. Look at the terms of "start at 1, add 4".



Start at 1 and add 4: every term is odd.

The rule never says odd or even, but every term is odd. The reason is that adding an even number (4) to an odd number gives another odd number. Here are other features to look for.

Feature	Example
Odd or even terms	Start at 1, add 3: 1, 4, 7, 10 switches between odd and even
Multiples of a number	Start at 0, add 5: every term is a multiple of 5
Repeating digits	Start at 7, add 10: every term ends in 7
Growing steps	Start at 3, multiply by 2: the jumps 3, 6, 12, 24 get bigger

Number and Shape Patterns: frequently asked questions

What is a term in a pattern?

A term is one number or shape in the pattern. In 2, 5, 8, 11, the first term is 2 and the third term is 8.

How do you find the next term in a pattern?

Look at how one term changes to the next, such as adding 6 each time. Then use the same step on the last term. If the pattern is 8, 14, 20, the next term is $20+6=26$.

Can a pattern rule use multiplication?

Yes. The rule "start at 1, multiply by 2" gives 1, 2, 4, 8, 16. The terms grow faster than they do with addition.

Why do the terms of start 1, add 4 stay odd?

An odd number plus an even number is always odd. Since 4 is even, each new term is odd, like $1+4=5$ and $5+4=9$.

How can you tell if a number is in a pattern?

Continue the pattern until you reach or pass the number. You can also use features. In the pattern that starts at 0 and adds 5, only numbers ending in 0 or 5 can appear.