Lesson - Position, direction and patterns

Year: Year 2

Hello, I am Otto! Patterns are everywhere: in the stripes on a scarf, in the tiles on a floor, even in the numbers we count. In this chapter you continue patterns, say where things are, and describe movement and turns using the words that mathematicians use.

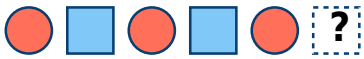
Starter activity

Clap, clap, stamp, clap, clap, stamp. What comes next? Make your own sound pattern for a friend to continue. Then stand in a corner of the room. Take 3 steps forward and turn to the right. Where are you now? Can your friend guess your position?

Patterns

Definition: pattern

A **pattern** is something that repeats in a regular way. The part that repeats is called the **unit** of the pattern.



The pattern is circle, square, circle, square. The unit is "circle, square" and it repeats every 2 shapes. The next shape is a square.

Method: continuing a pattern

1. Say the pattern out loud.
2. Find the part that repeats.
3. Carry on the repeating part to find the missing shapes.



This pattern repeats every 3 shapes: triangle, circle, circle. The missing shape is a circle.

Worked example 1

What are the next two shapes? Square, triangle, triangle, square, triangle, triangle, ...

The unit is "square, triangle, triangle". After the second unit comes **square, triangle**.

Number patterns

Definition: number pattern

A **number pattern** follows a rule. For example, "add 2 each time" gives 4, 6, 8, 10, 12. The numbers in a pattern are called the **terms**.

Method: finding the rule

1. Look at the first two numbers and find the difference.
2. Check that the same difference works for the next numbers.
3. Use the rule to find the missing or the next numbers.

Worked example 2

Find the rule and the next two numbers: 7, 12, 17, 22, __, __

The numbers go up by 5 each time: $12 - 7 = 5$ and $17 - 12 = 5$. The rule is "add 5". $22 + 5 = 27$ and $27 + 5 = 32$. The next two numbers are **27 and 32**.

Worked example 3

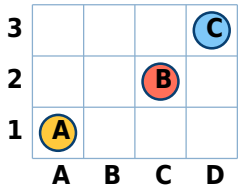
Find the rule: 50, 45, 40, 35, ...

The numbers go down by 5 each time. The rule is "take away 5". The next number is **30**.

Position words

Definition: position words

We use **position words** to say where something is: **above, below, next to, between, in front of, behind, inside, outside, on top of, underneath, left and right**.



Key fact: coordinates on a grid

On a grid, we can give a position using a letter along the bottom and a number up the side. A is in square A1 on the grid above. B is in square C2. C is in square D3. We always read across first, and then up.

Worked example 4

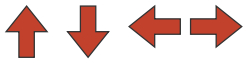
Where is B on the grid above?

B is in the 3rd column, which is labelled C, and in the 2nd row. So B is at **C2**.

Direction words

Definition: direction

We describe movement with **direction words**: forwards, backwards, up, down, left and right. We use numbers of steps or squares: "Move 3 squares right".



Worked example 5

A beetle starts at A1 on the grid. It moves 2 squares right and 1 square up. Where does it finish?

2 squares right from A: C. 1 square up from 1: 2. The beetle finishes at **C2**.

Turns

Definition: turns

A **whole turn** goes right round and back to where you started. A **half turn** goes halfway round. A **quarter turn** goes a quarter of the way round, which is a right angle. We say **clockwise** (the way the clock hands move) or **anticlockwise** (the other way).

Key fact: turns and fractions

- A quarter turn clockwise: from facing north to facing east.
- A half turn: from facing north to facing south.
- Three-quarters of a turn clockwise: from north to west.
- A whole turn: back to the start.

Worked example 6

Tom faces the door. He makes a quarter turn clockwise and then another quarter turn clockwise. What turn is that altogether?

Two quarters make a half. Tom has made a **half turn**, so he now faces the opposite way.

Patterns in real life

We see patterns in nature and in the things people make: the stripes on a zebra, the rows

of seeds in a sunflower, the squares on a chess board and the tiles on a floor. A repeating pattern in a border uses the same unit again and again. A growing pattern gets bigger by the same amount each time.

Worked example 7

Matchsticks are used to make squares in a row. 1 square uses 4 sticks, 2 squares use 7 sticks, 3 squares use 10 sticks. How many sticks do 5 squares use?

The number of sticks goes up by 3 each time: 4, 7, 10, 13, 16. So 5 squares use **16 sticks**.

Watch out

Clockwise and anticlockwise are not the same! Left and right can change when you turn around, so always say which way you are facing. In a number pattern, check that the same rule works for every pair of numbers, not only for the first two.

Did you know?

Many cultures use patterns in their art. Islamic tiles use beautiful repeating patterns of shapes, and Celtic art has patterns of knots. A scientist called Fibonacci found a famous number pattern, 1, 1, 2, 3, 5, 8, 13, which grows in sunflowers, pine cones and shells.

Otto's tip

To find a pattern, say it out loud and look for the part that repeats. For number patterns, find the difference between neighbours. For directions, draw a small map with arrows and walk it with your finger, one step at a time.