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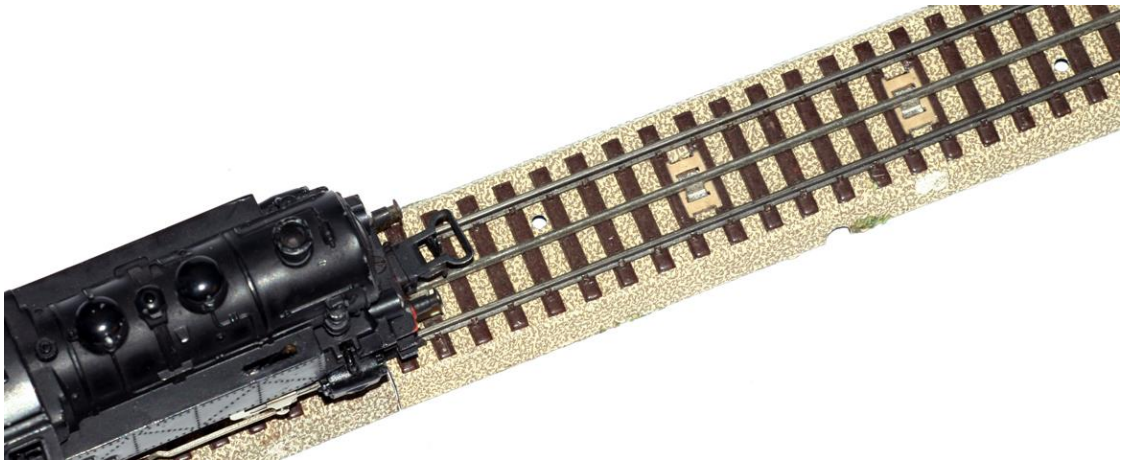
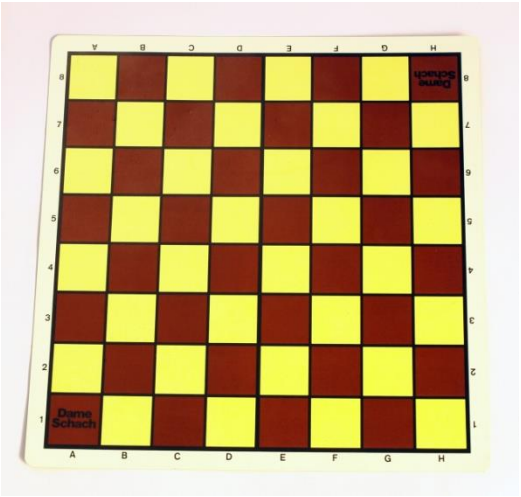
Translational symmetry – symmetry by sliding patterns

By "translational symmetry" we mean the repeated sliding of the same pattern (or element) in the same direction, and with the same spacing. A new pattern emerges through this uniform repetition.



The photo shows a railroad track. This is a simple example of translational symmetry.

A pattern that repeats and extends in two dimensions to fill an area is called "tiling." You are probably familiar with tiling as a floor surface or a checkerboard.



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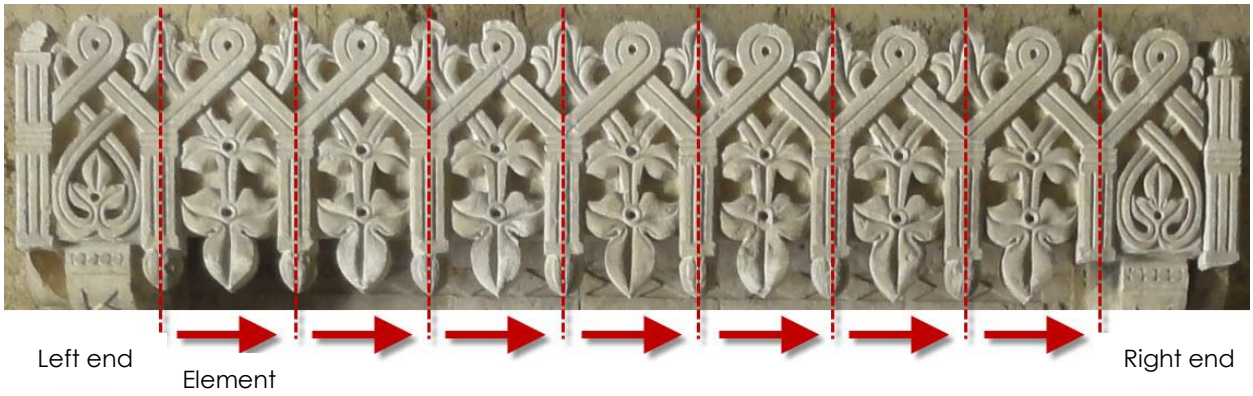
Use as adornment

People discovered early on that there was a certain appeal in the repetition of patterns, and they began to create frieze patterns.
These ornaments were used as adornment or embellishment. The frieze pattern below embellishes an emperor's throne. If we look at it more closely, we can easily detect the individual elements that make up the pattern:



- Each pattern or element is marked off by two red vertical lines.
- The spacing between the lines is called the "elementary space."
- Each arrow indicates a slide by one elementary space.
  Only the ends at the very left and right are designed somewhat differently so that the frieze pattern has a beginning and an end.

Assignment 1

Can you find a different division of the slidable elements in this frieze pattern other than the division drawn above? Draw it on the picture using a colored pencil.

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Sliding and more

Rather than simply sliding the individual elements, you can also rotate, offset, and mirror them across an axis to create very artful patterns. This is true even if the starting element is a figure as simple as the symbol for an "escalator."

Assignment 2

In how many different ways does the escalator symbol appear in this pattern? How was the symbol shifted each time?

Number: _____

Shift: _____

Assignment 3

Study the escalator frieze pattern for axes of symmetry and slides.
Draw in the axes of symmetry using a colored pencil and a ruler.
Mark the slides with arrows.

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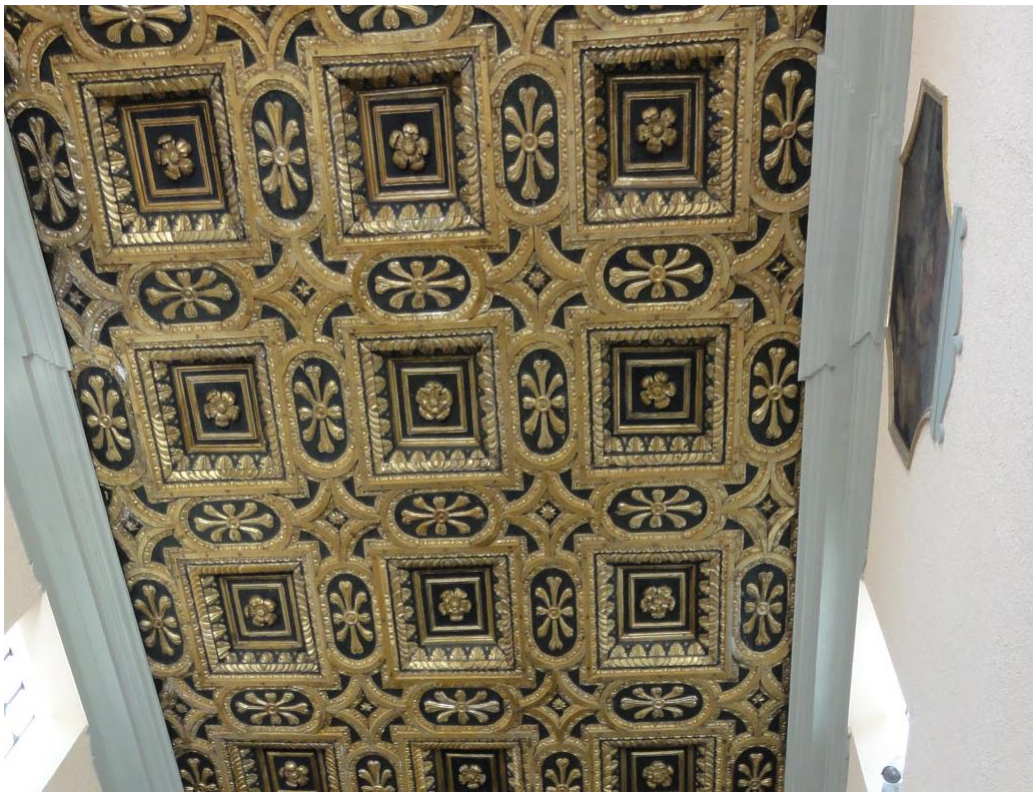
Tiling

If one or more patterns are arranged repeatedly across an area in two dimensions, we speak of "tiling." A bathroom wall covered with patterned tiles, a floor made from colorful tiles, a checkerboard, and paved sidewalks are examples of tiling. The next photo shows the richly adorned ceiling of a church, which you can observe here without having to tilt your head back.



Assignment 4

How many different pattern elements can you find here?

Number: _____

Outline the different pattern elements with a colored pencil.