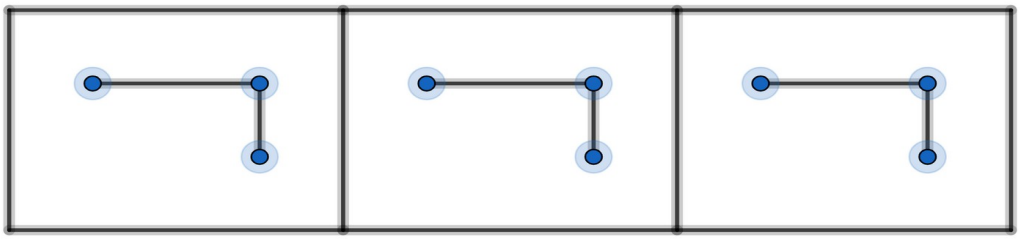
Friezes



Here we have a row of identical tiles that extends indefinitely in both directions. The diagram shows just three of these tiles. Each tile has a design on it. This is called a frieze.

All friezes have translation symmetry with repeat distance d the length of the tile. (see footnote)

We can classify friezes by their other symmetries which can include:

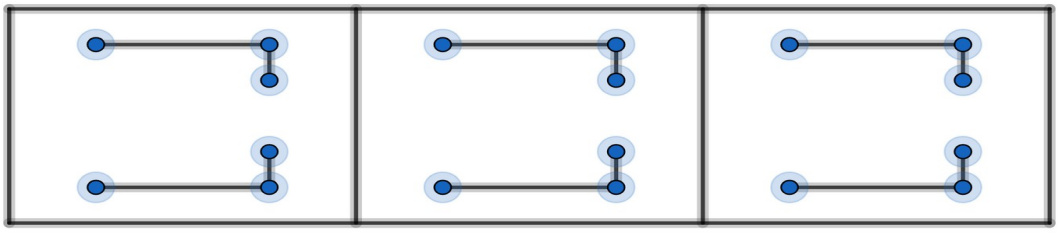
- horizontal mirror line along the middle of the frieze
- vertical mirror lines that are $d/2$ apart
- centres of $180°$ rotation that are $d/2$ apart
- glide-reflections with a glide distance $d/2$

Example 1

no other symmetries

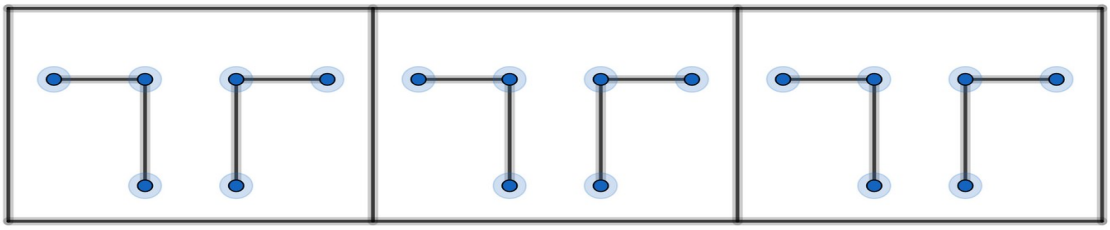
Example 2

horizontal mirror line – can you mark this on the diagram?



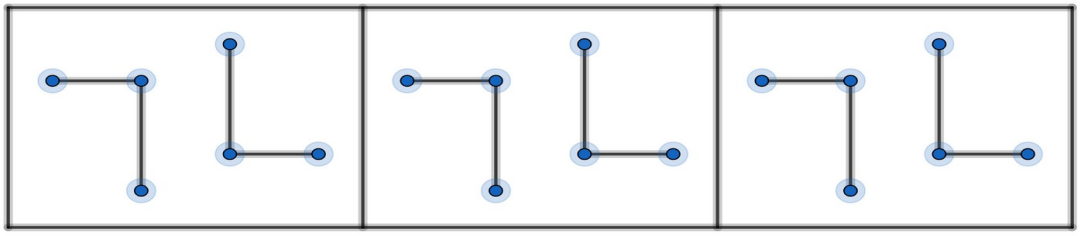
Example 3

vertical mirror lines – can you mark these on the diagram?



Example 4

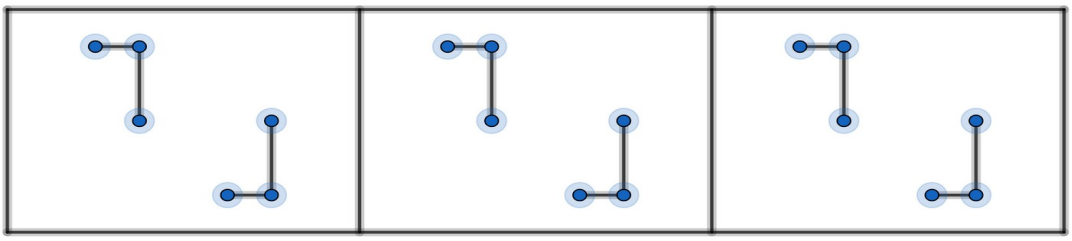
rotation – can you mark the centres of rotation on the diagram?



Example 5

glide-reflection

note: a glide-reflection is a combination of a translation and a reflection in a horizontal mirror line



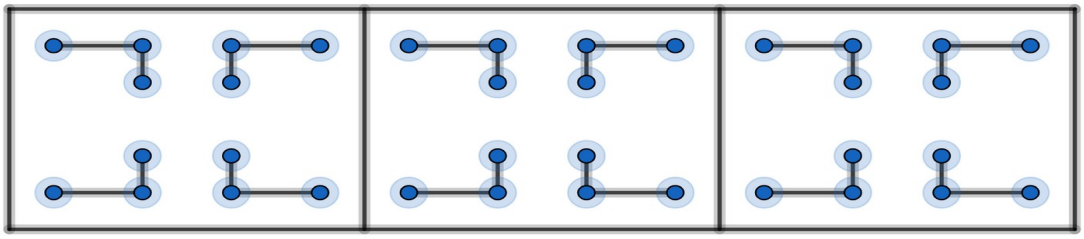
Example 6

horizontal mirror line

vertical mirror lines

rotation

can you mark these on the diagram?



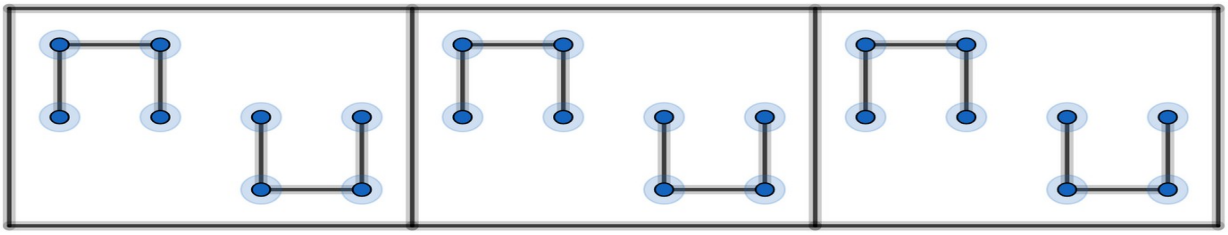
Example 7

vertical mirror lines

rotation

glide-reflection

can you mark these on the diagram?

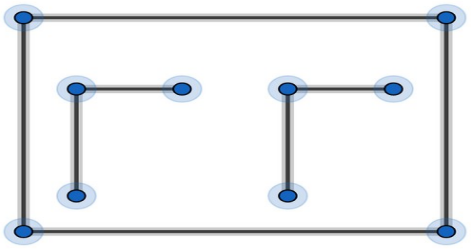


There are no more examples. There are only 7 frieze-symmetry-types. So every possible frieze can be classified as one of these 7 types.

Friezes repeat in one direction. Wallpapers repeat in two directions. It turns out that there are only 17 wallpaper-symmetry-types. So every possible wallpaper can be classified as one of these 17 types.

footnote:

What if our tile had length D and looked like this?



This individual tile has translation symmetry.

To keep things simple we will regard this as two tiles, each of length $d = D/2$