Definitions, page 33

A **transformation** of the points in the plane is a rearrangement of all the points in the plane.

A transformation is **rigid** if it preserves distance. Such transformations are called **symmetries**.

Basic Symmetries: Rotations

A rotation is defined by an angle θ and a centre C, and is denoted by $f = rot(C, \theta)$.

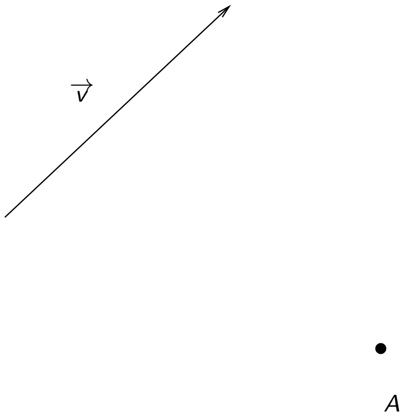
Basic Symmetries: Reflections

A reflection is defined by a line ℓ and is denoted by $f = \mathit{refl}(\ell)$.

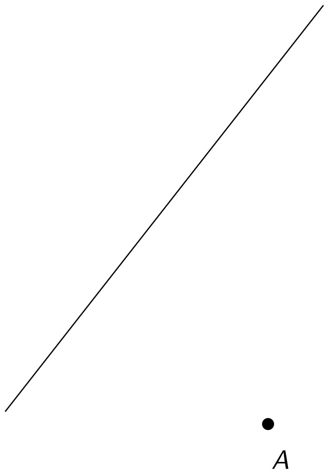
Basic Symmetries: Translations

A translation is defined by a vector $\overrightarrow{v}$ and is denoted $f = trans(\overrightarrow{v})$.

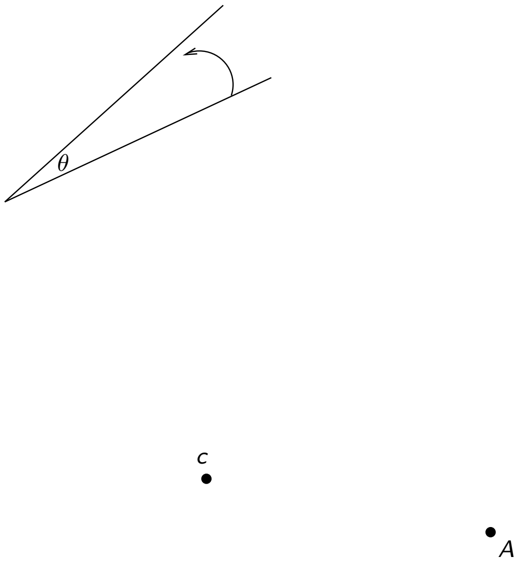
Find the image of A under the symmetry $f = trans(\overrightarrow{v})$



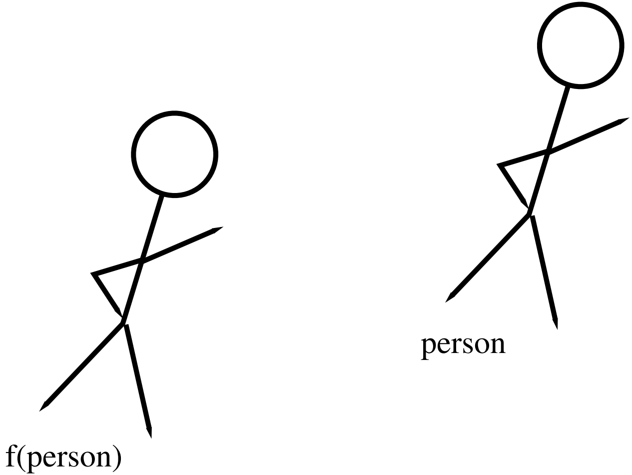
Find the image of A under the symmetry $f = \mathit{refl}(\ell)$



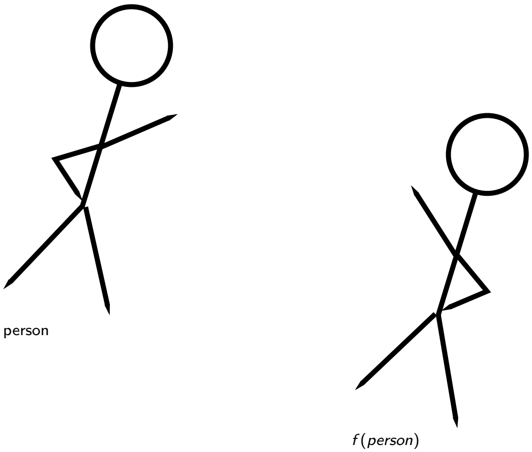
Find the image of A under the symmetry $f = rot(c, \theta)$



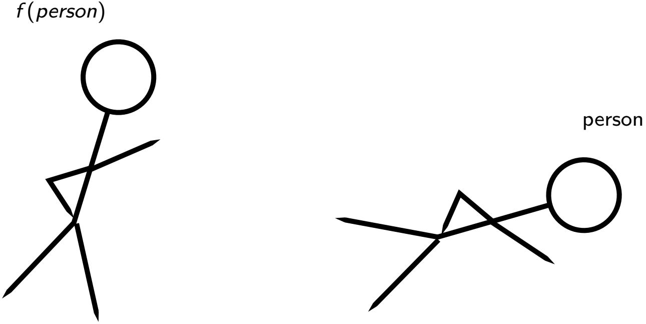
Find $\overrightarrow{v}$ the vector of translation of the symmetry $f = trans(\overrightarrow{v})$



Find ℓ the line of reflection of the symmetry $f = refl(\ell)$



Find the center and angle of the symmetry $f = rot(c, \theta)$



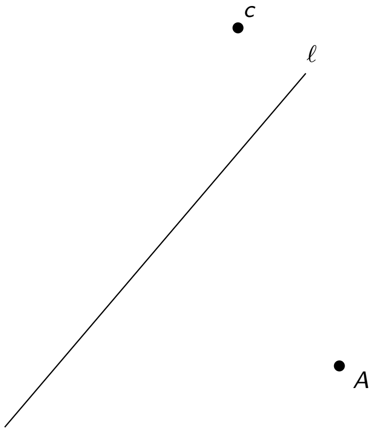
Compositions of Symmetries

The composition of two symmetries is also a symmetry.

Theorem (The Classification Theorem for Plane Symmetries)

Every symmetry of the plane is either a composition of a translation followed by a rotation, or it is a composition of a translation followed by a reflection.

Find the image of A under the composition of the symmetries $f = refl(\ell)$ followed by $f = rot(c, 60^\circ)$



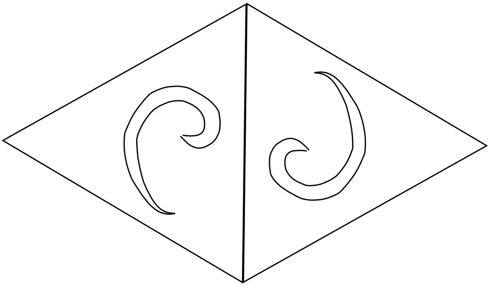
Definitions, page 55 & 56

Given an object O in the plane, a **symmetry of the object** O is a symmetry of the plane that rearranges the points of O within the points of O.

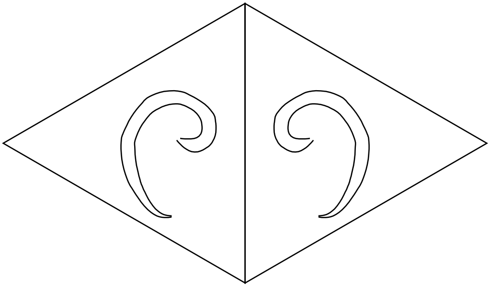
(We can think of this as a symmetry under which the object 'looks' the same)

The set of all symmetries of an object is called the **group of symmetries** of the object.

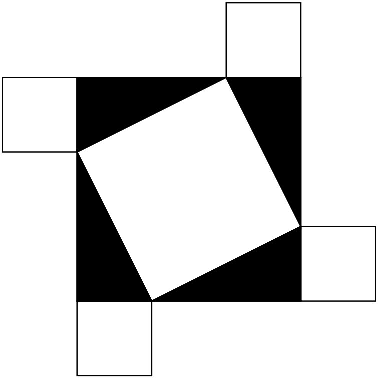
Find the group of symmetries of the following object



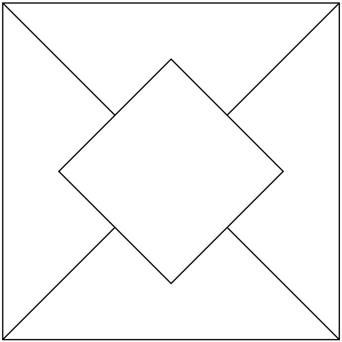
Find the group of symmetries of the following object



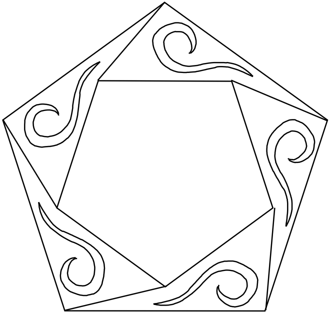
Find the group of symmetries of the following object



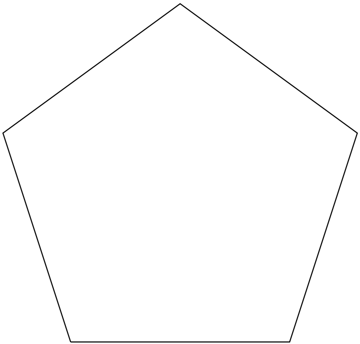
Find the group of symmetries of the following object



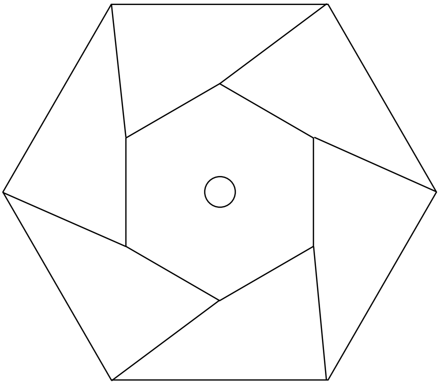
Find the group of symmetries of the following object



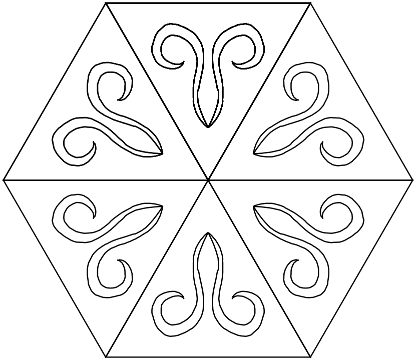
Find the group of symmetries of the following object



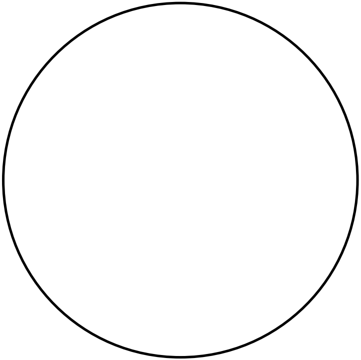
Find the group of symmetries of the following object



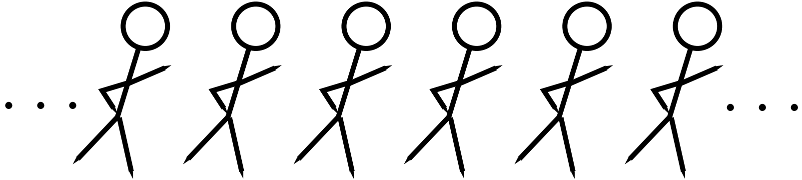
Find the group of symmetries of the following object



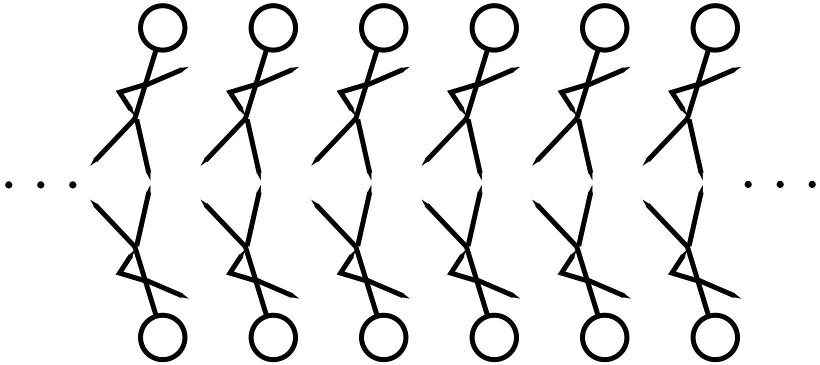
Find the group of symmetries of the following object



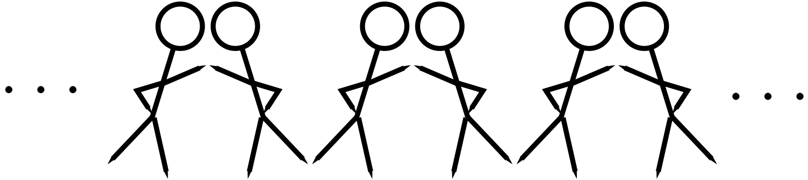
Frieze Patterns



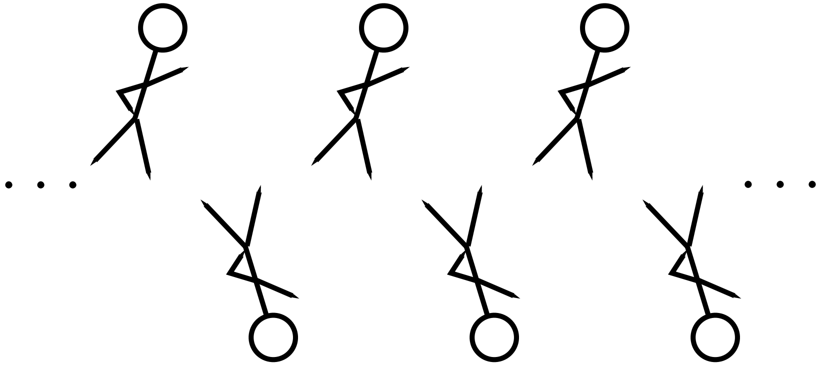
Frieze Patterns



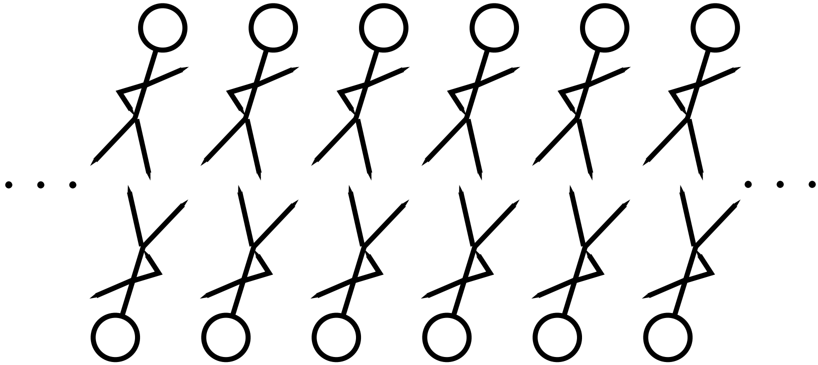
Frieze Patterns



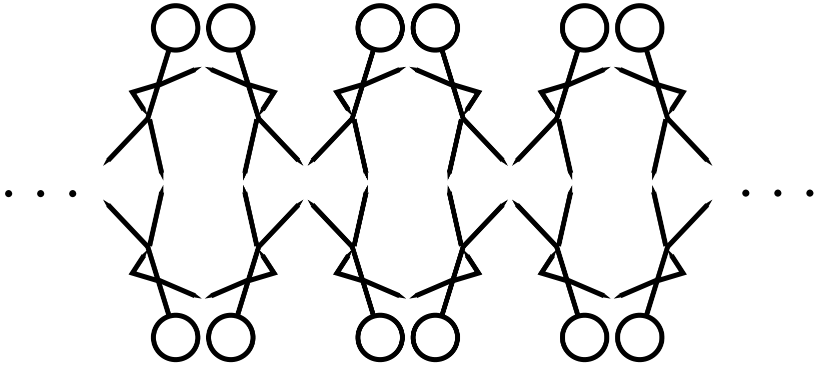
Frieze Patterns



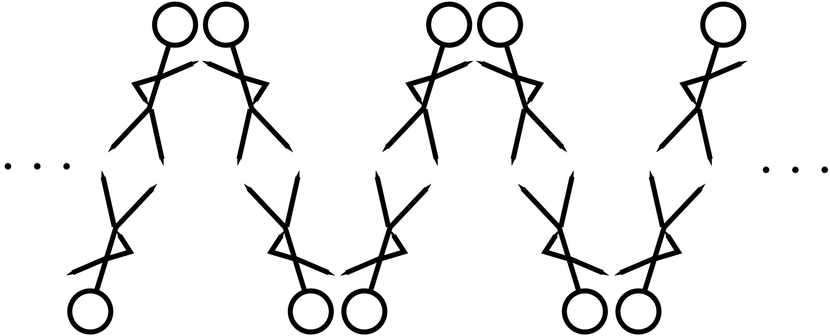
Frieze Patterns



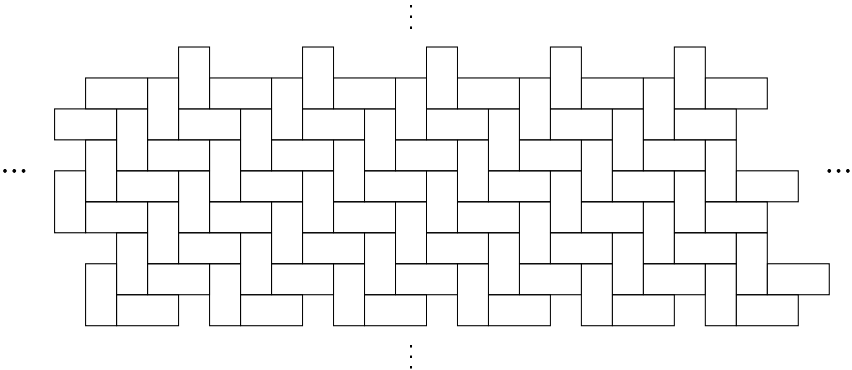
Frieze Patterns



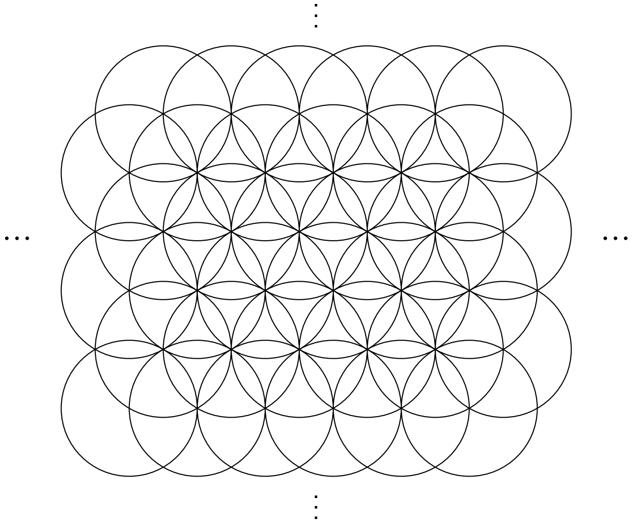
Frieze Patterns



Wallpaper group



Wallpaper group



Wallpaper group