

MA111: Contemporary mathematics

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Entrance Slip (due 5 min past the hour):

- What symmetry group does this picture have? (See board)

Today: Reflections and rotations

Context: Reflection + reflection = ?

- A picture has a line of reflection symmetry if it looks the same before and after you flip it
- What if it looks different?
- Well, instead of ink, use sticky paint.

Even if it looks different before, after you fold it (squelch) and open it (slurp) it looks the same

- We have forced it to have a line of symmetry!

Activity: Reflect with the Mira

- What if you fold it along another line too?

Now it has a new line of symmetry.

Does it still have the old one?

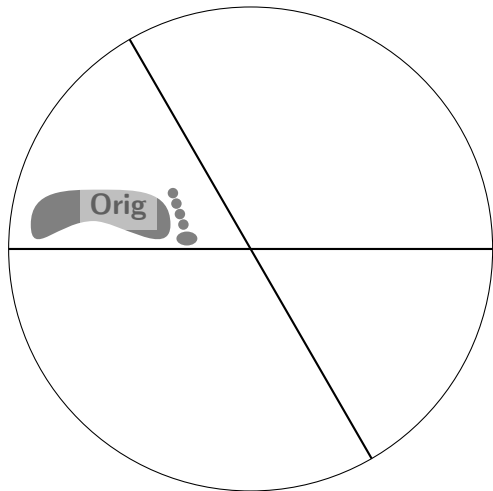
- What if you alternately fold those two lines?

Will it finally get both lines?

Will it get others, automatically?

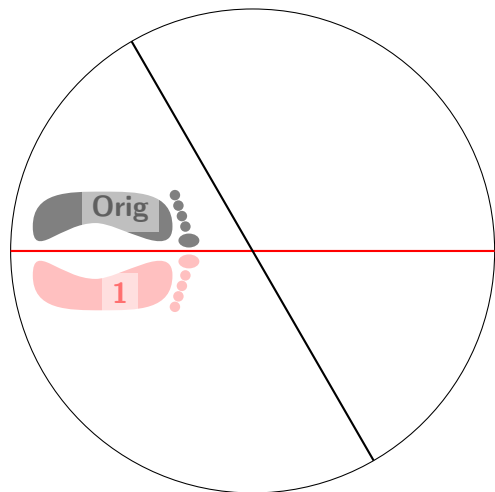
- Before the smart-phone, people made pictures with their feet
- Today we revive the lost art of photography

Activity Recap: Here are the reflections



Here is the original.

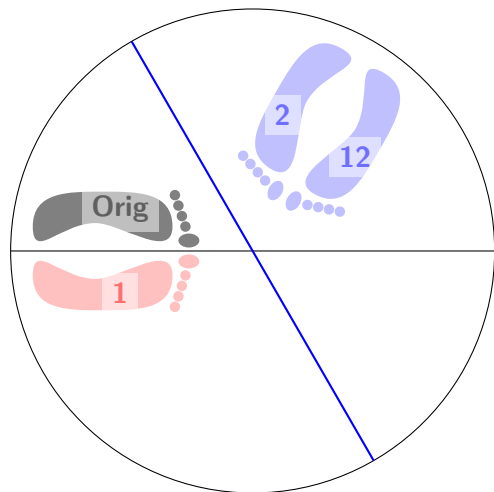
Activity Recap: Here are the reflections



Here is the original.

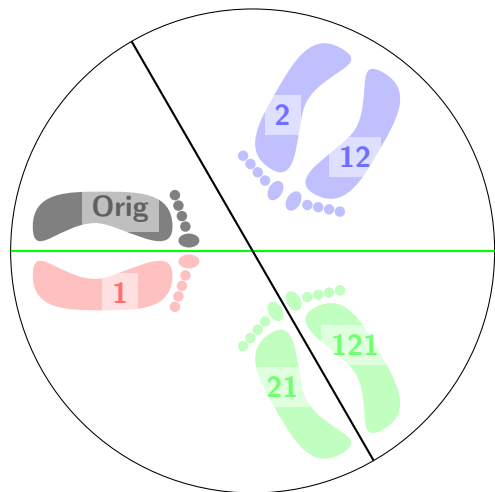
Now reflect over horizontal

Activity Recap: Here are the reflections



Here is the original.
Now reflect over horizontal
Now over diagonal,
but something is missing?

Activity Recap: Here are the reflections



Here is the original.

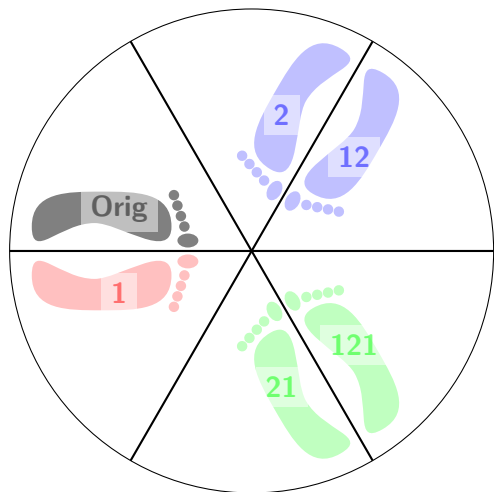
Now reflect over horizontal

Now over diagonal,

but something is missing?

Reflect over horizontal again!

Activity Recap: Here are the reflections



Here is the original.

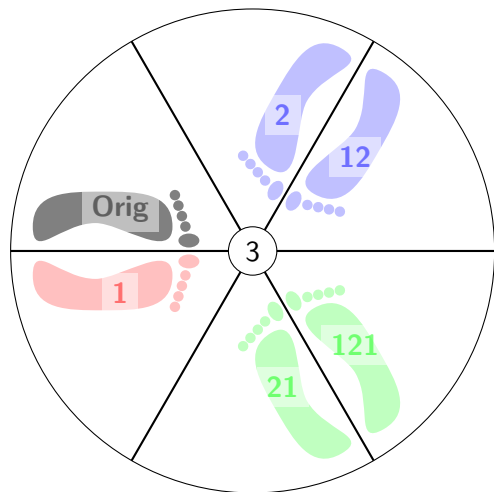
Now reflect over horizontal

Now over diagonal,
but something is missing?

Reflect over horizontal again!

A new line of symmetry!

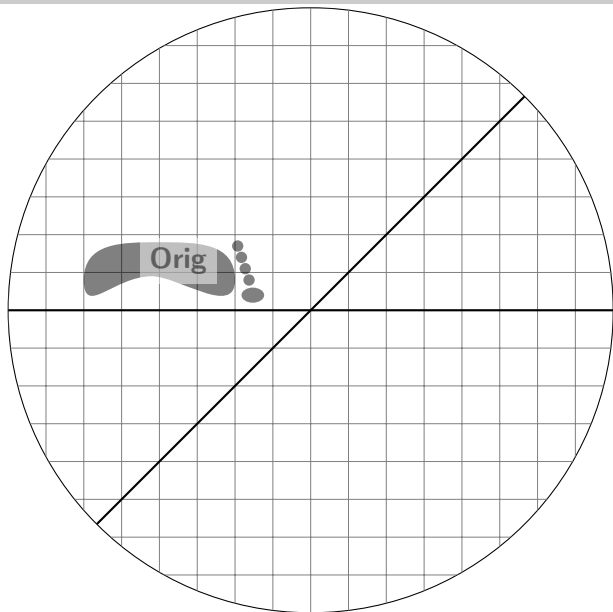
Activity Recap: Here are the reflections



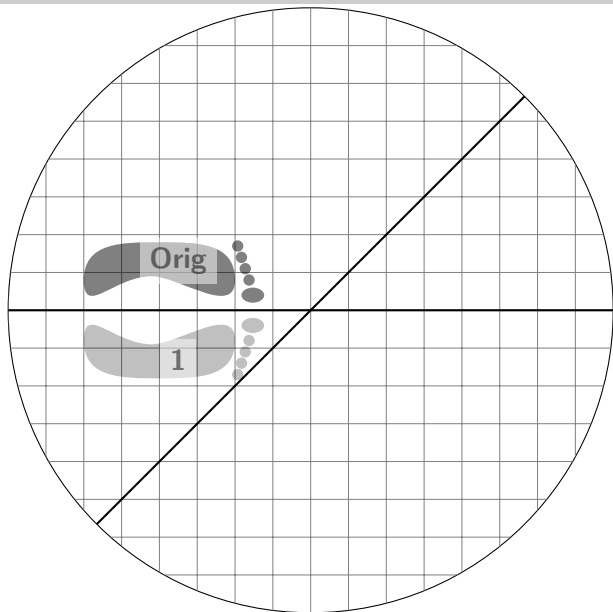
Here is the original.
Now reflect over horizontal
Now over diagonal,
but something is missing?
Reflect over horizontal again!

A new line of symmetry!
Every other wedge has
a left foot.
Rotation moves twice as much
around as the line angle.
6 wedges, but angle is "3"

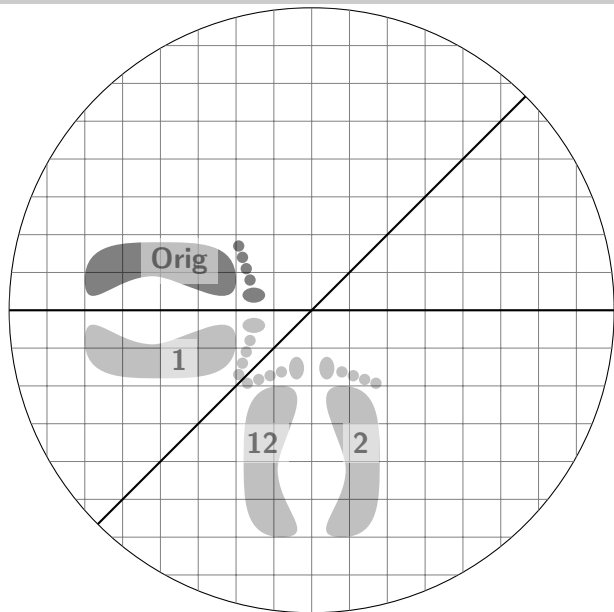
Activity recap: Four version



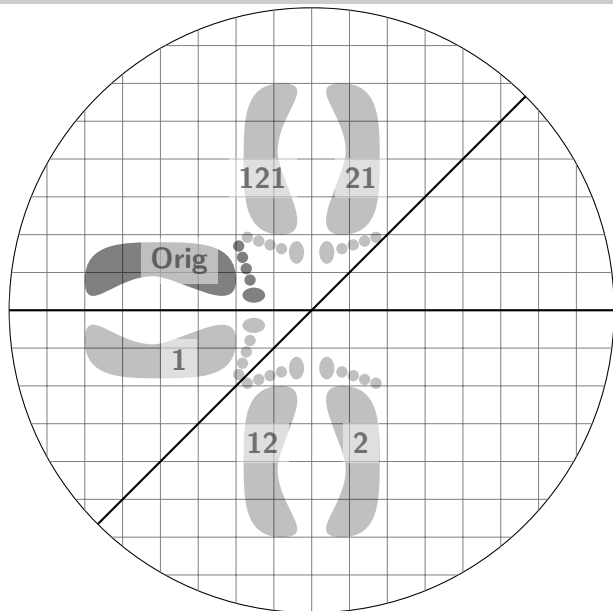
Activity recap: Four version



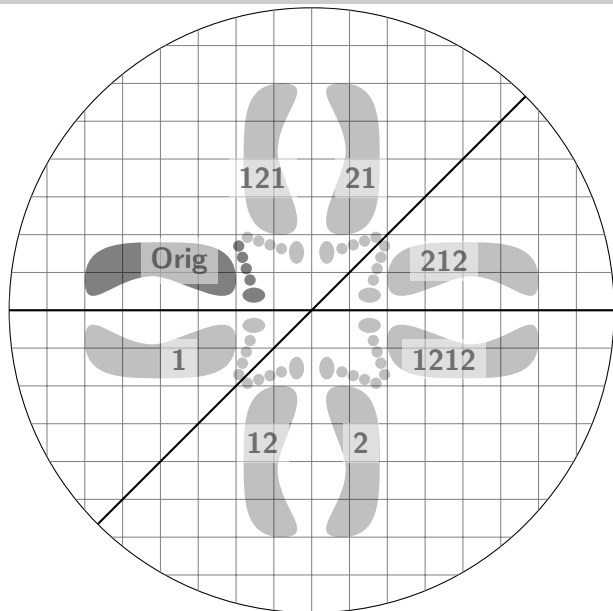
Activity recap: Four version



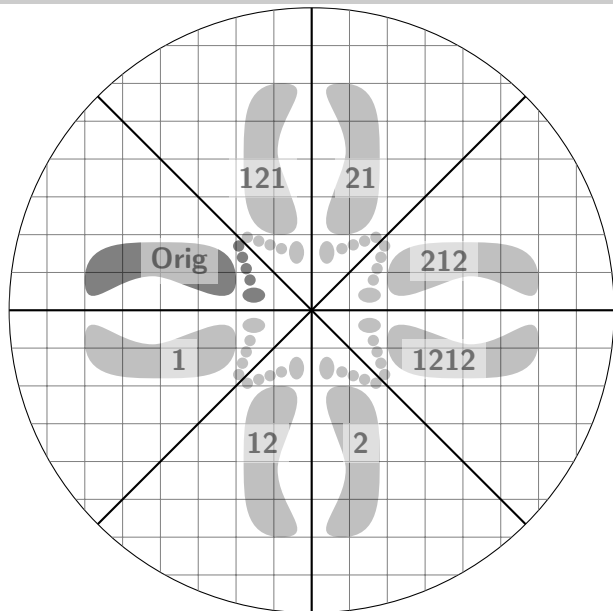
Activity recap: Four version



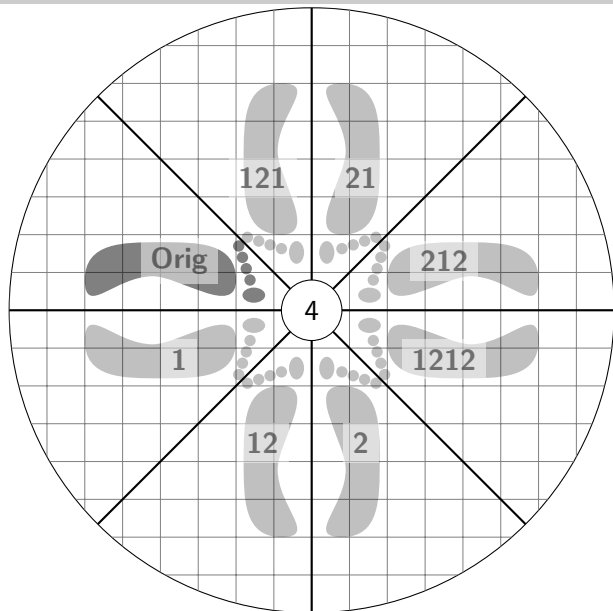
Activity recap: Four version



Activity recap: Four version



Activity recap: Four version



Fast: Crossing reflections

- Two lines of reflections intersect at a center of rotation
- The angle of the rotation is double the angle between the lines
- If there are only two lines of reflection, they should meet at 90° (1/4 turn)

The rotation is 180° (1/2 turn)

- If the two lines are really the same line, then they “cancel”

The rotation is 0° (whole turn? no turn?)

Fast: Double rotations

- Two rotations about the same center is easy:

Rotation with the same center, add the angles

- Two rotations with different centers is trickier

Write them as reflections, using only three lines

“Middle” line used twice (goes through both centers)

“Middle” line cancels, so the other two lines

They cross at the center, double the angle

Assignment and exit slip

- Skim chapter 11 (especially 11.4, 11.5, 11.7's Border Patterns).
- Reread and understand 11.1, 11.2, 11.3, 11.6.
- Make sure the textbook exercises are not a problem (we will do some on review day).
- Practice identifying symmetry groups in the world around you
- **Exit slip:** Draw a motif (like a foot) and then repeat it with a Z_4 (4-swirl) symmetry.