MA111: Contemporary mathematics

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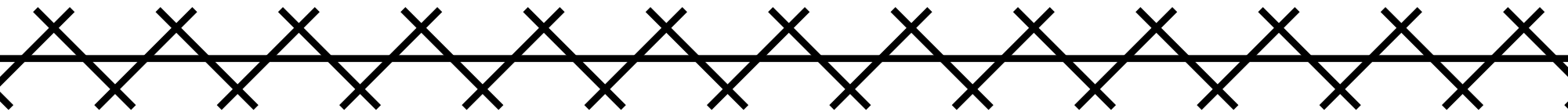
Entrance Slip (due 5 min past the hour):



- Draw a portion of this picture, and
- label the centers of rotation clearly.

Today: Frieze groups

Context:

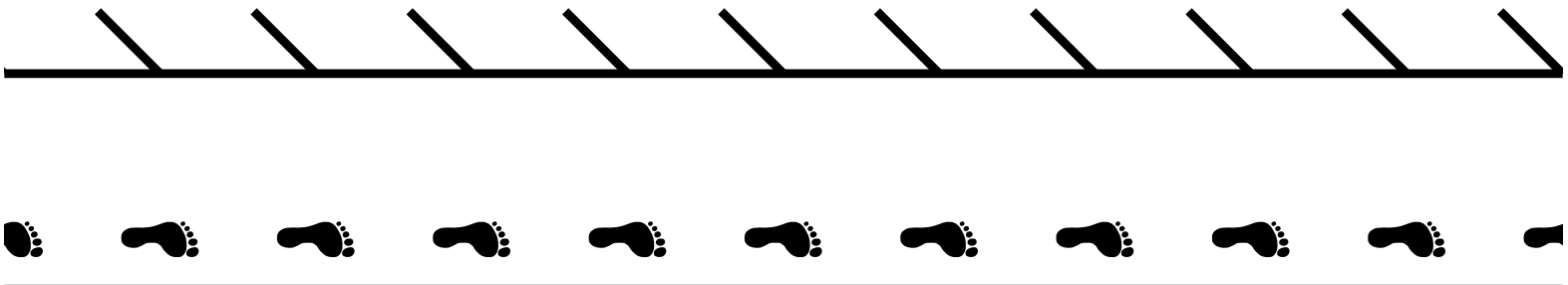
- Some pictures are very long.
- We want to figure out what sort of symmetry groups they can have
- An infinitely long pattern (but not very tall)
- It can only have 180 degree (half-turn) or 360 degree (full-turn) rotations
- It can only have vertical lines of symmetry and/or a single horizontal line
- Left-to-right there is not really a “middle”
- Left-to-right the pattern repeats

Activity: I draw, you label

- Draw 4 Rosette patterns, but don't label them
- Draw 5 Frieze patterns, but don't label them
- Switch papers and label your neighbor's paper
- Switch back and check your and their work.

The least of them: Hop symmetry

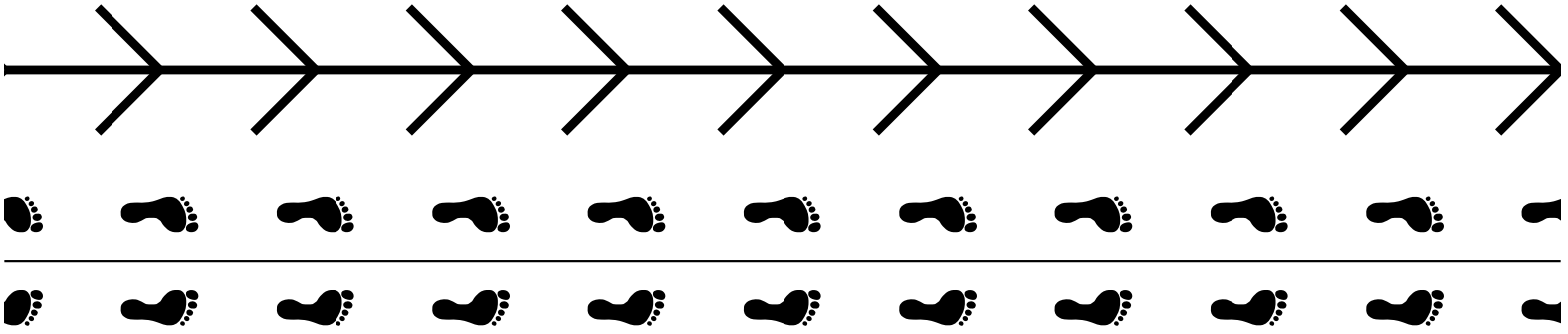
- Hop symmetry is generated by a single translation
- Hop symmetry is determined by a distance D
  It contains all left or right translations by integer multiple of D

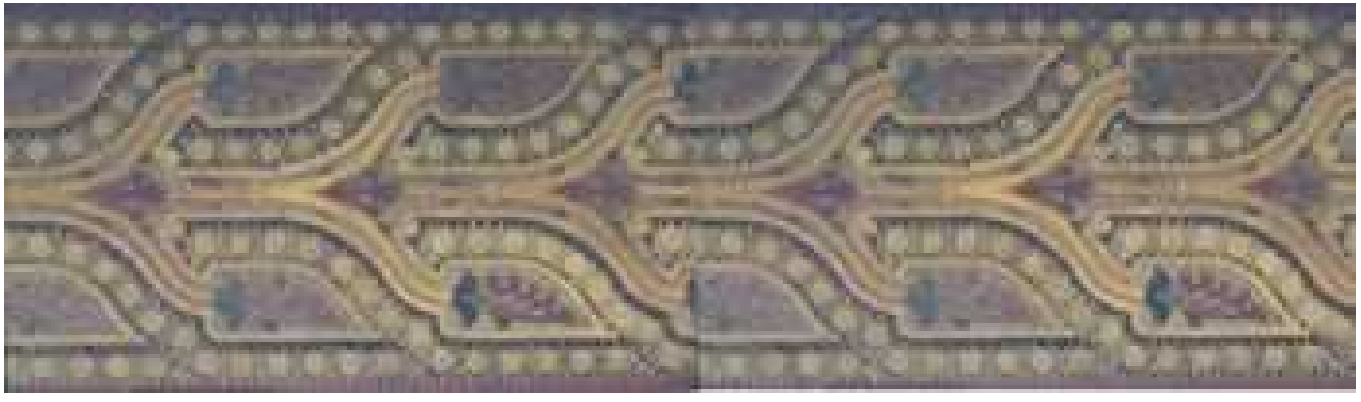


- No reflections, no rotations, no glide reflections

A single reflection: Jump symmetry

- Jump symmetry is generated by Hop symmetry
  and a reflection over a horizontal line

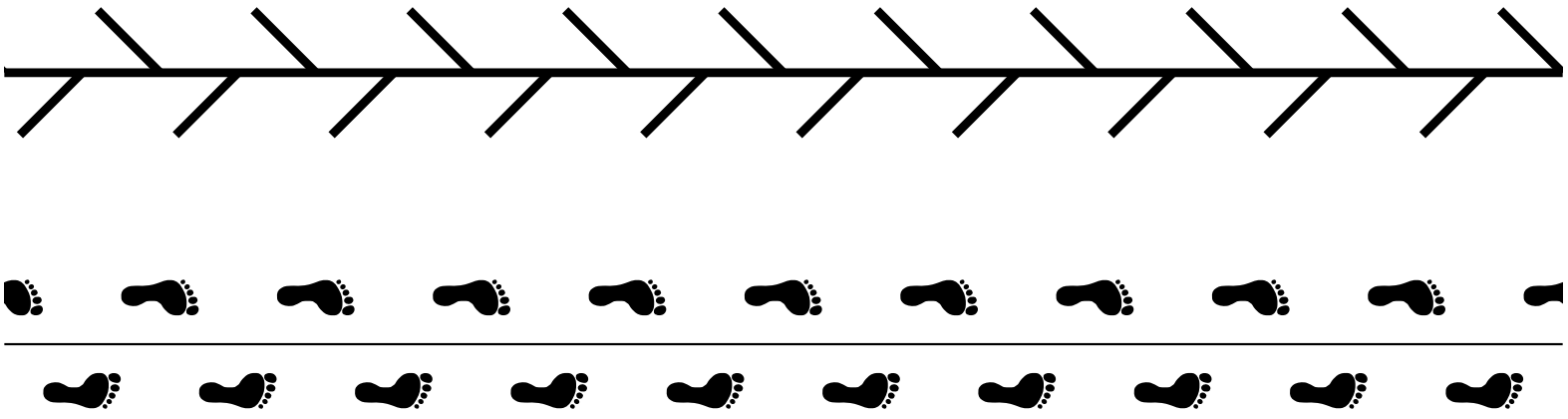




- Jump symmetry also contains glide reflections,
  but it contains both the “glide” and the “reflection” separately
  so the homework and book sometimes claim it has none

A glide reflection: Walk symmetry

- Walk is generated by Hop and a glide reflection



- No rotations, no horizontal reflection, no vertical reflections

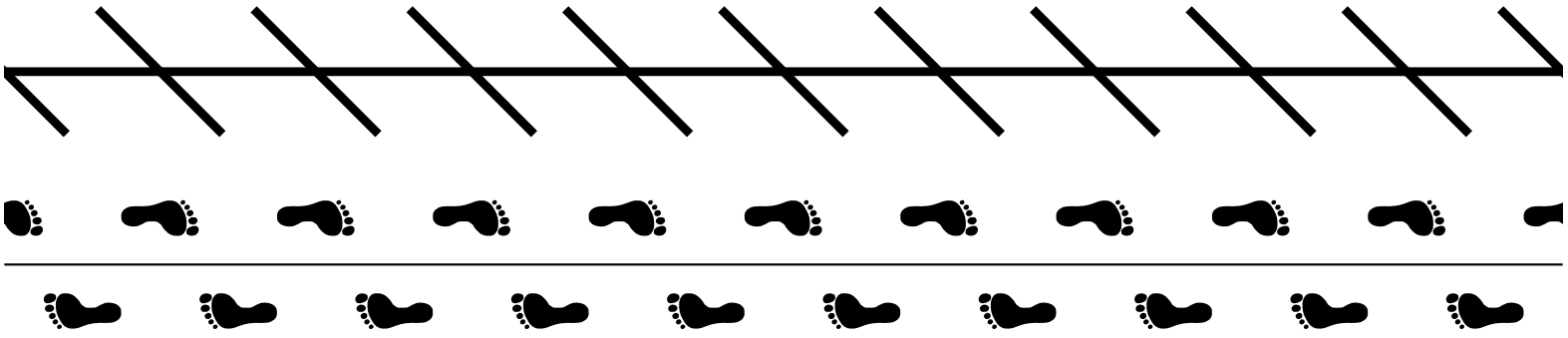
Two vertical reflections per: Sidle symmetry

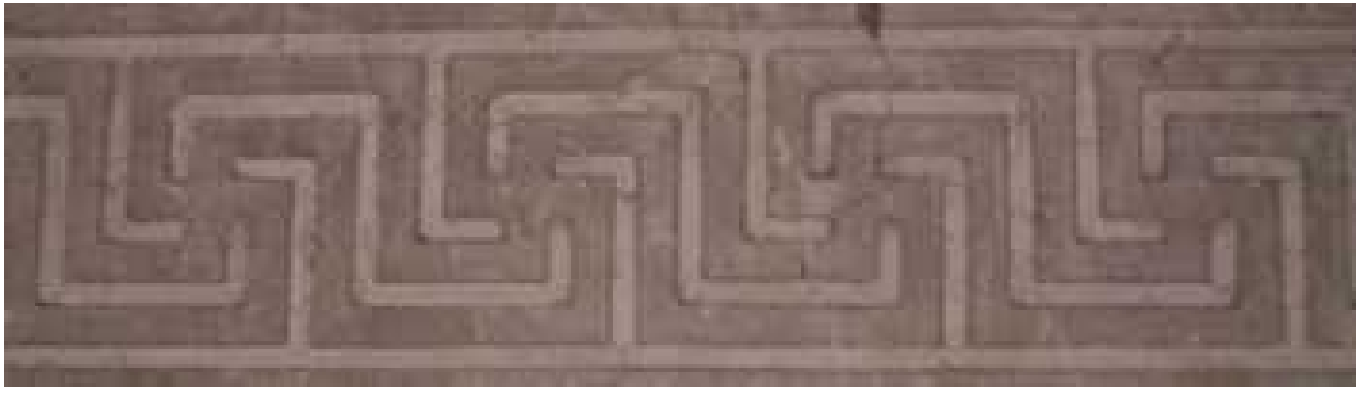
- Sidle is generated by Hop and a reflection over a vertical line

- Sneaky sidle has **two** vertical reflections per pattern
  Can you find the "other" one?
- No rotations, no glide reflections, no horizontal reflection

Two half-turn rotations per: SpinHop symmetry

- SpinHop is generated by Hop and a half-turn rotation



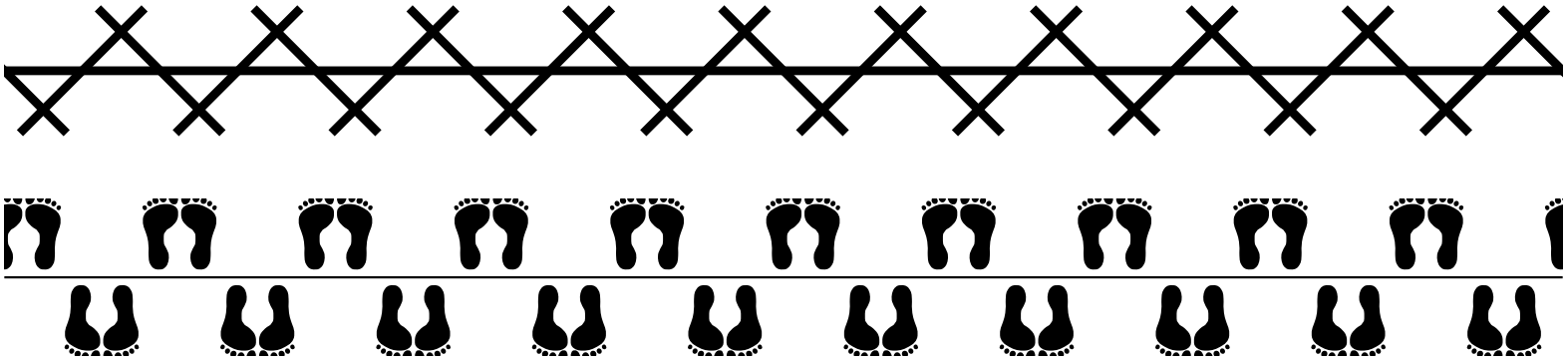


- Sneaky SpinHop has **two** half-turn rotations per pattern
  Can you find the "other" one?

- No reflections, no glide reflections

My favorite: SpinSidle symmetry

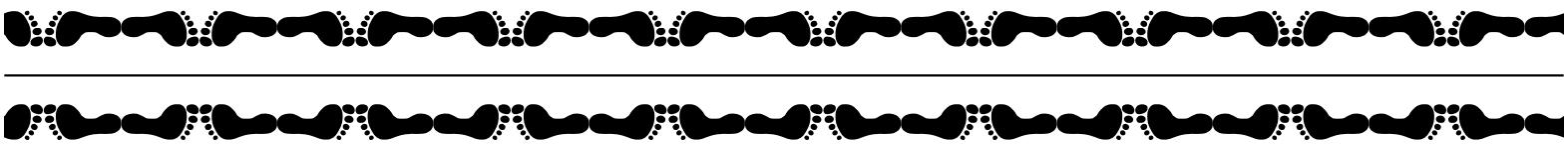
- SpinSidle is generated by SpinHop and Sidle



- Sneaky SpinHop has **two** of each half-turns and vertical reflections
- Has a "primitive" glide reflection (so no horizontal reflection)

Everything: SpinJump symmetry

- SpinJump is generated by SpinHop and Jump



- SpinJump has everything!

Assignments and exit slip

- Read the entire chapter 11
- **Exit Slip:** What symmetry group does this Frieze pattern have?