

# MA111: Contemporary mathematics

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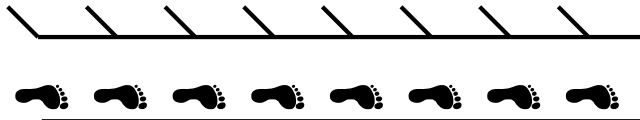
## SCHEDULE:

- Rosette groups HW due two days ago
- Frieze groups HW due two days from now
- Composition HW due Wed, April 4th
- Symmetry exam Fri, April 6th

Today we are going over the seven Frieze groups and border patterns.

# The least of them: Hop symmetry

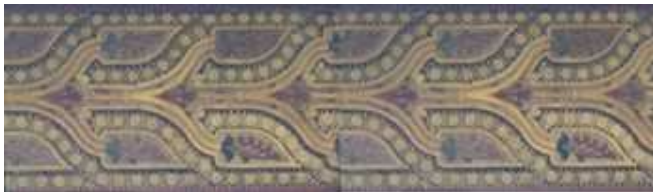
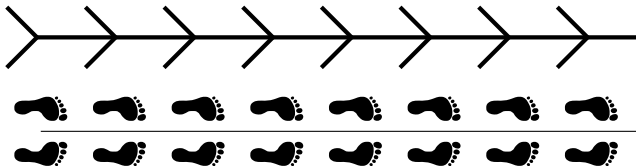
- Hop symmetry is generated by a single translation
- Hop symmetry is determined by a distance  $D$   
It contains all left or right translations by integer multiple of  $D$



- No reflections, no rotations, no glide reflections

# A single reflection: Jump symmetry

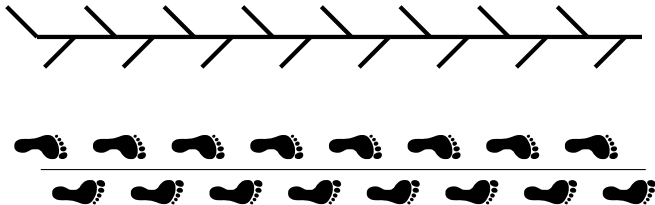
- Jump symmetry is generated by Hop symmetry and a reflection over a horizontal line



- 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

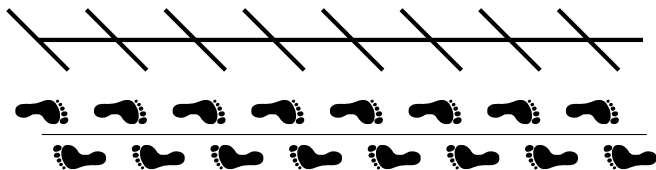
- Sidle is generated by Hop and a reflection over a vertical line



- 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

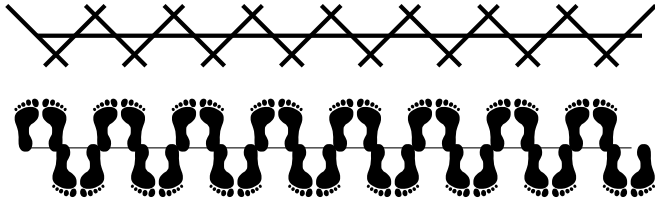
- SpinHop is generated by Hop and a half-turn rotation



- Sneaky SpinHop has **two** half-turn rotations per pattern  
Can you find the “other” one?
- No reflections, no glide reflections

# My favorite: SpinSide symmetry

- SpinSide 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!