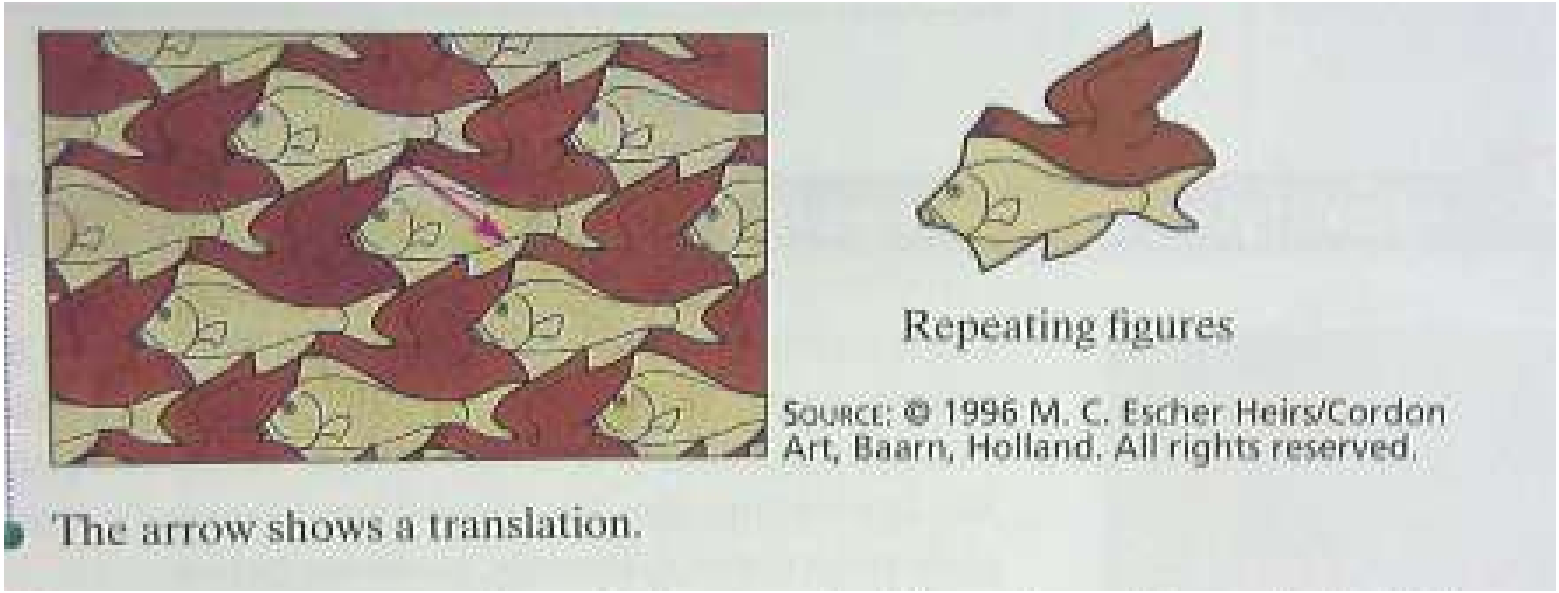
Tessellations!

- A *tessellation* or *tiling,* is a repeating pattern of figures that completely covers a plane without gaps or overlaps.
- You can create tessellations with translations, rotations, and reflections. You can find tessellations in art, nature (ex. honeycomb), and everyday tiled floors.

Identifying the Transformations in a Tessellations

- Identify a transformation and the repeating figures in this tessellation.

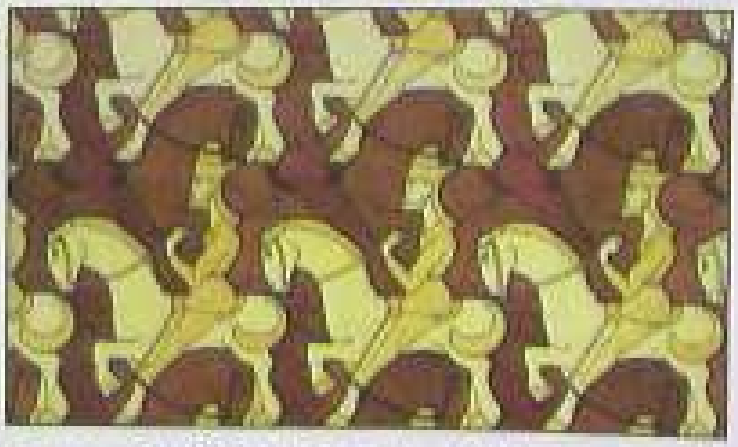


Identifying the Transformations in a Tessellations

- Identify a transformation and the repeating figures in this tessellation.

a.

b.



Determining Figures That Will Tessellate

- Because the figures in a tessellation do not overlap or leave gaps, the sum of the measures of the angles around any vertex must be 360°. If the angles around a vertex are all congruent, then the measure of each angle must be a factor of 360°.

Determining Figures That Will Tessellate

- Determine whether a regular 18-gon tessellates a plane.
- a = $\frac{180\ (n - 2\ )}{n}$ Use the formulas for the measure
- of an angle of a regular polygon.
-

$$a = \frac{180(18-2)}{18}$$

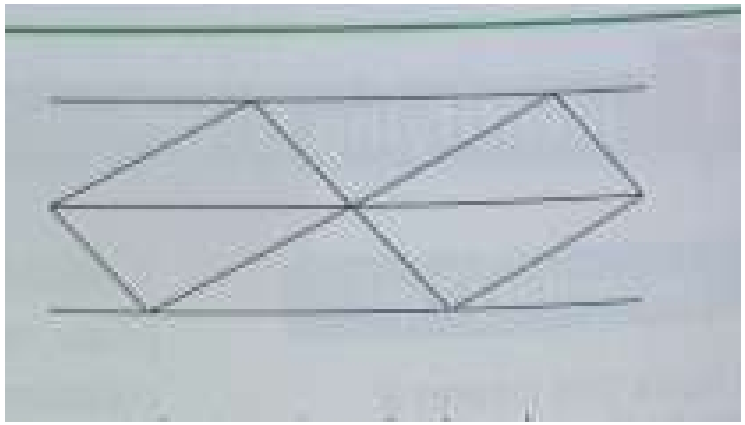
Since 160 is not a factor of 360, the 18-gon will not tessellate.

$$a = 160$$

Determining Figures That Will Tessellate

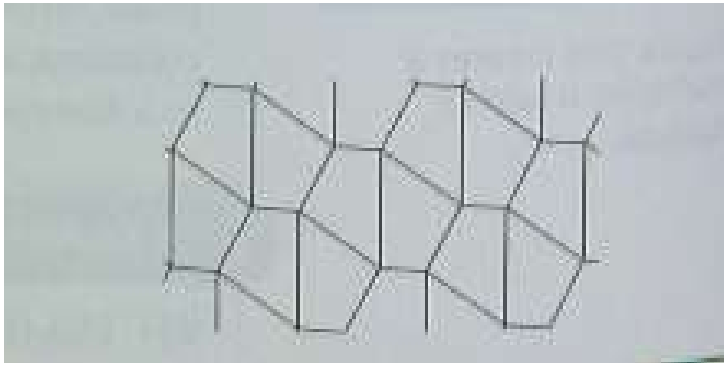
- Explain why you can tessellate a plane with an equilateral triangle.

- A figure does not have to be a regular polygon to tessellate.
  - Theorem 9-6:
    - Every triangle tessellates.
      - Explain why?



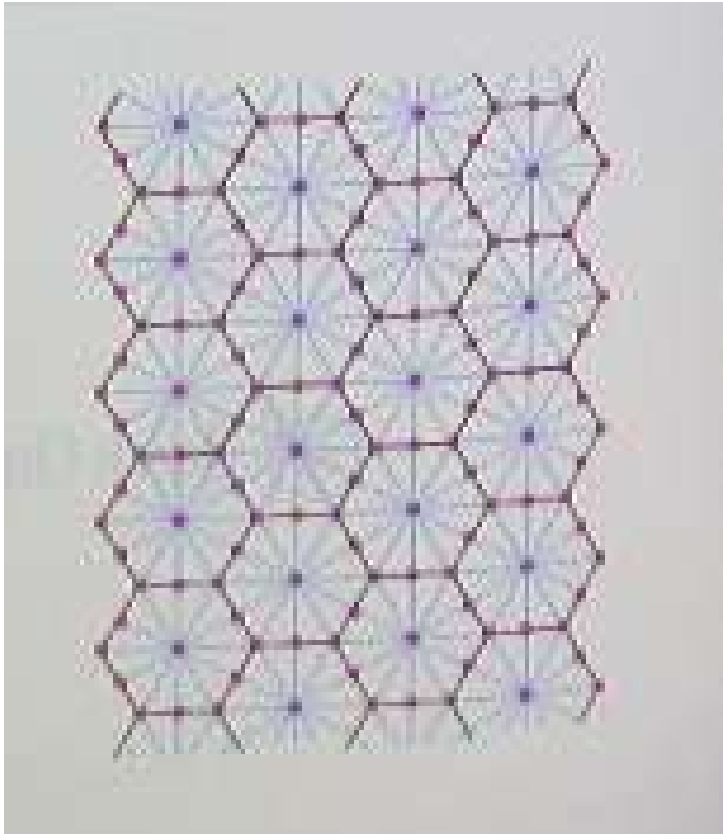
- Theorem 9-7
- Every quadrilateral tessellates.

- Explain why?



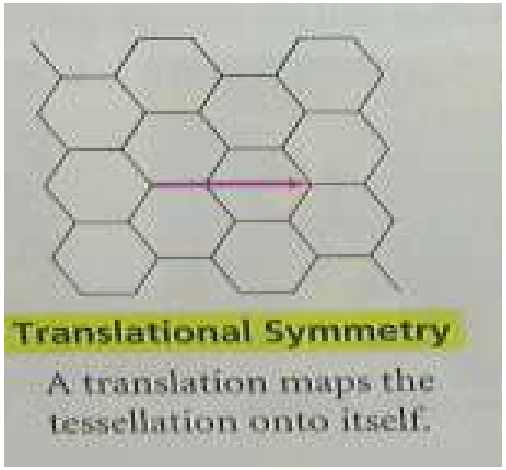
Identifying Symmetries in Tessellations

- The tessellations with regular hexagons at the right has reflectional symmetry in each of the blue lines. It has rotational symmetry centered at each of the red points.



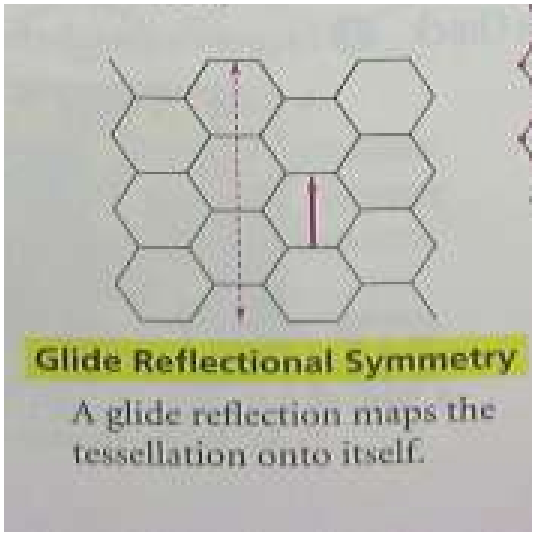
Identifying Symmetries in Tessellations

- The tessellation also has translational symmetry and



- A translation maps onto itself.

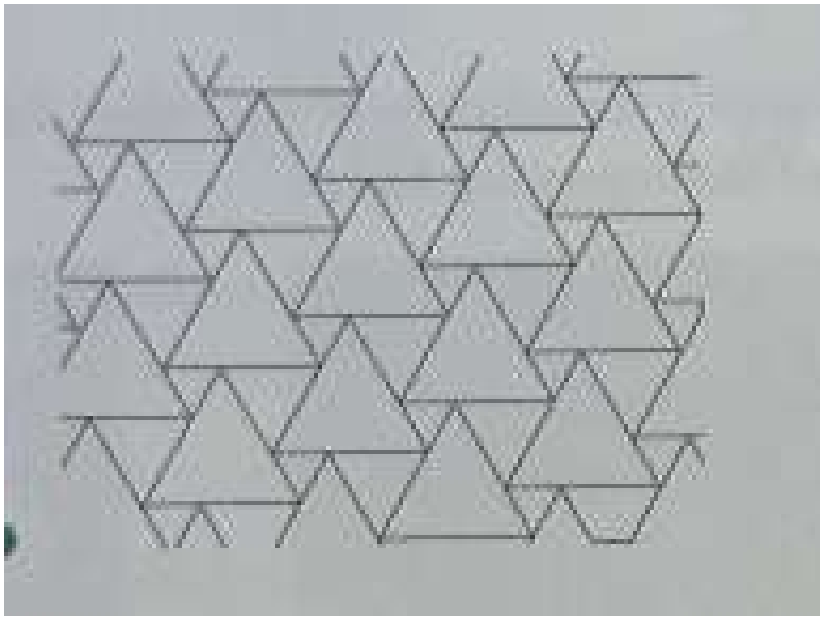
- Glide reflectional symmetry.



- A glide reflection maps onto itself.

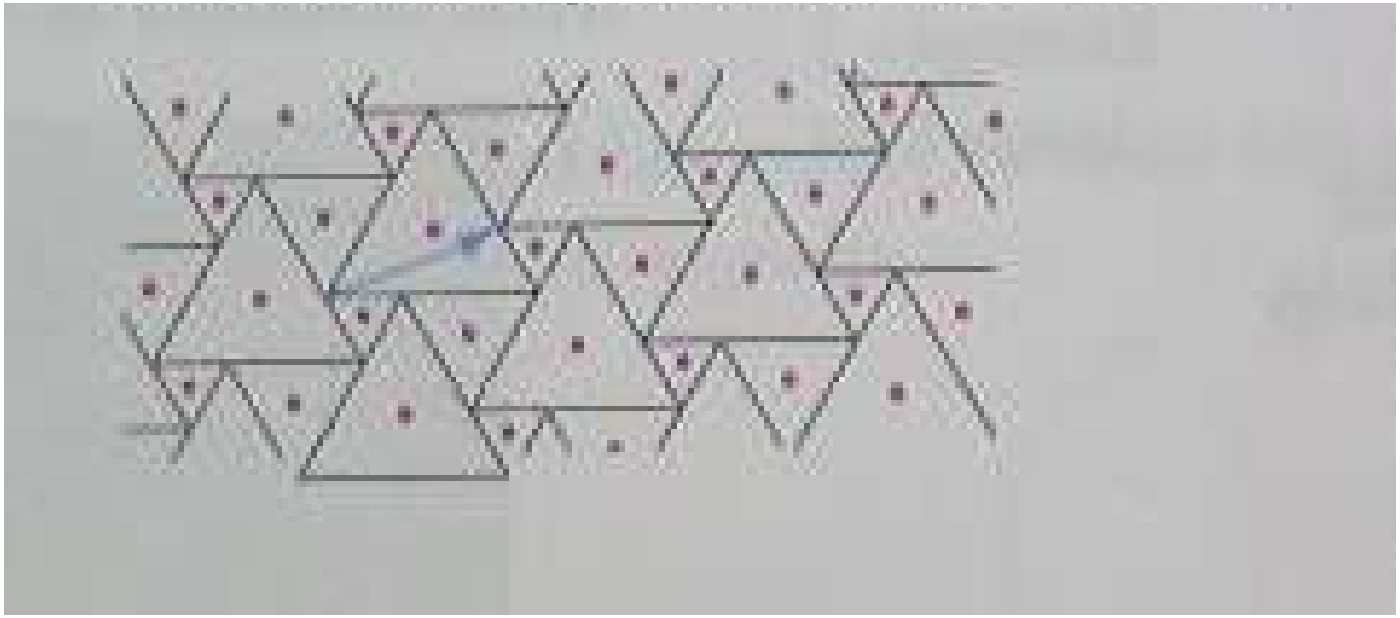
Identifying Symmetries in Tessellations

- List the symmetries in the tessellation.



Identifying Symmetries in Tessellations

- *Solution:* Rotational symmetry centered at each red point Translational symmetry (blue arrow)



Identifying Symmetries in Tessellations

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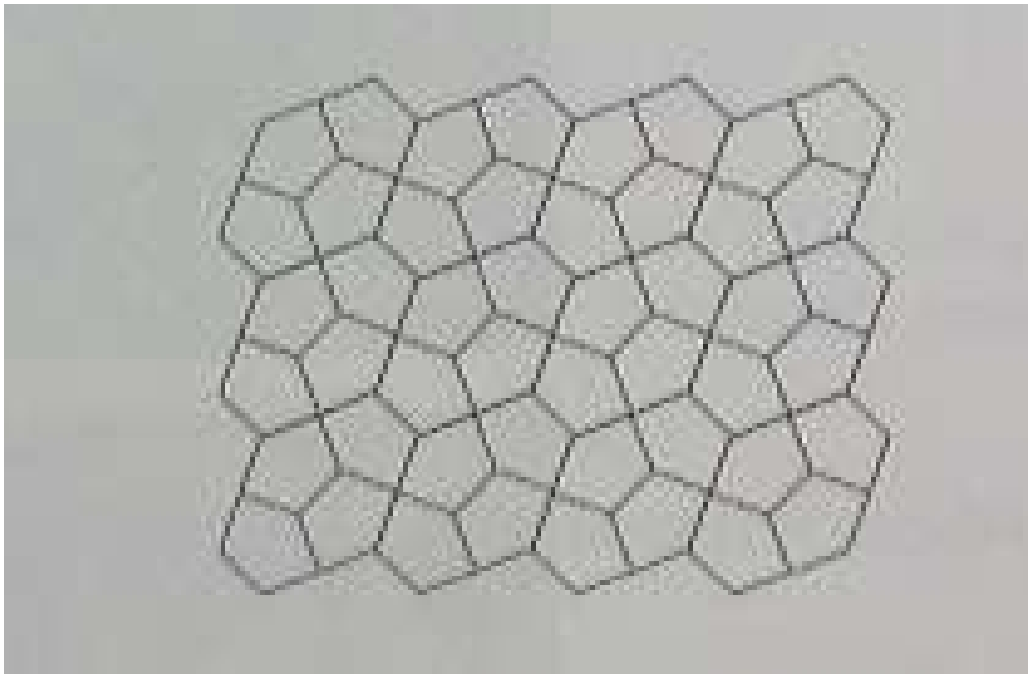
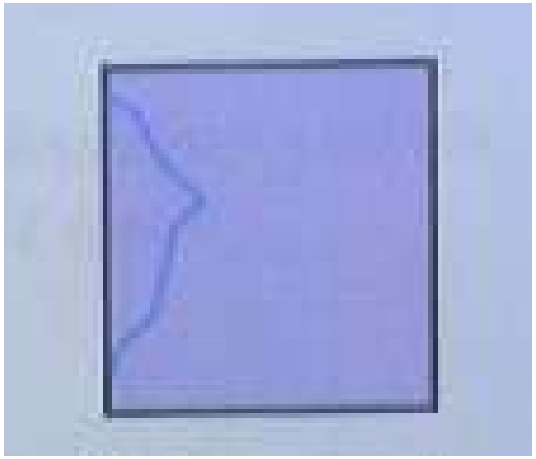


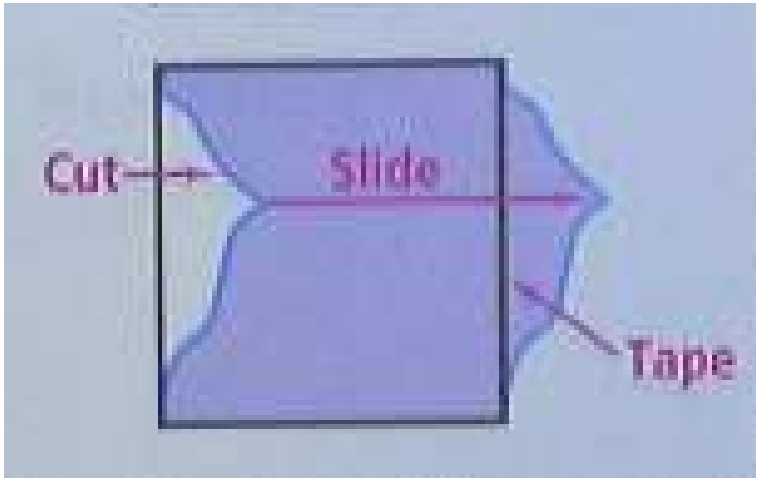
Creating Tessellations

- Draw a 1.5 inch square on a blank piece of paper and cut it out.
- Draw a curve joining two consecutive vertices.



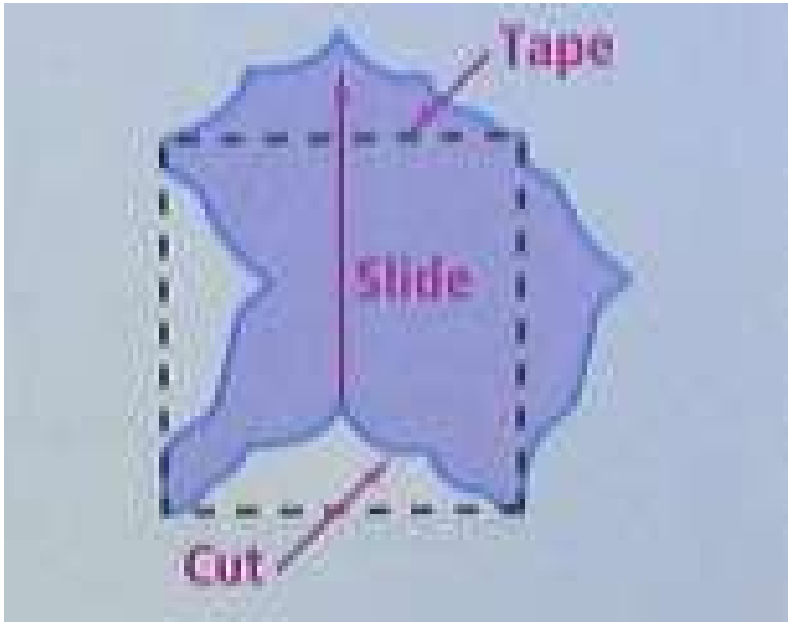
Creating Tessellations

- Cut along the curve you drew and slide the cutout piece to the opposite side of the square. Tape it in place.



Creating Tessellations

- Repeat this process using the other two opposite sides of the square.



Creating Tessellations

- Rotate the resulting figure. What does your imagination suggest it looks like?
- Is it a penguin wearing a hat or a knight on horseback? Could it be a dog with floppy ears? Draw the image on your figure.
- Create a tessellation using your figure.

Summary:
Answer in complete sentences.

- A pure tessellation is a tessellation made up of congruent copies of one figure. Explain why there are three, and only three pure tessellations that use regular polygons.

- Homework: If you haven't finished your "tile" with a picture inside of it, that is your homework.