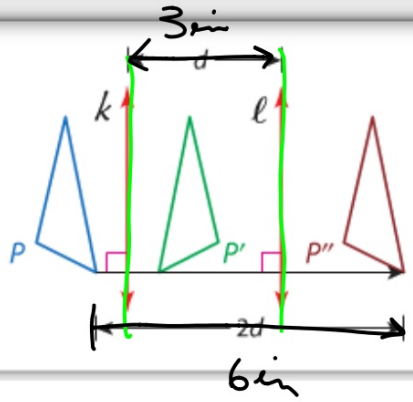
Geometry 9.4
Recognize and describe tessellations
Tessellation
regular tessellation
semi-regular tessellation
uniform
not uniform
Polygon tiles

Left from yesterday (compositions)

Theorem 9.2 Reflections in Parallel Lines

The composition of two reflections in parallel lines can be described by a translation vector that is

- perpendicular to the two lines, and
- twice the distance between the two lines.



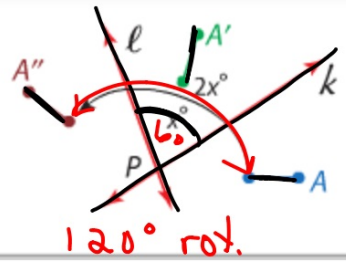
2x distance

letters

Theorem 9.3 Reflections in Intersecting Lines

The composition of two reflections in intersecting lines can be described by a rotation

- about the point where the lines intersect and
- through an angle that is twice the measure of the acute or right angle formed by the lines.



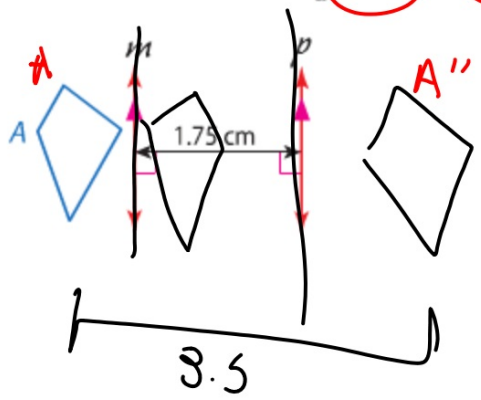
2x angle

letters

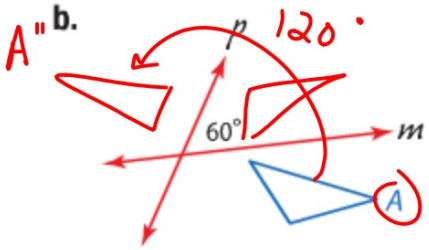
Example 3 Reflect a Figure in Two Lines

Copy and reflect figure A in line m and then line p. Then describe a single transformation that maps A onto A''.

a.



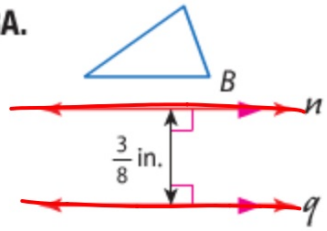
b.



GuidedPractice

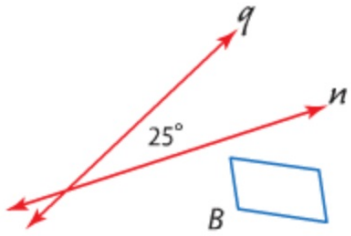
Copy and reflect figure B in line n and then line q. Then describe a single transformation that maps B onto B''.

3A.



3/4 in.

3B.

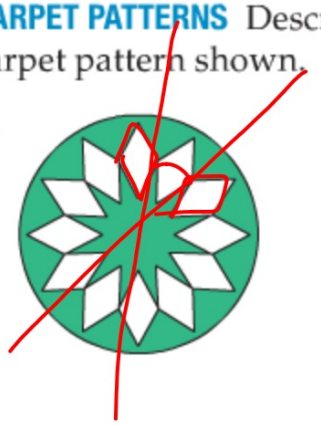


50° rot. CCW

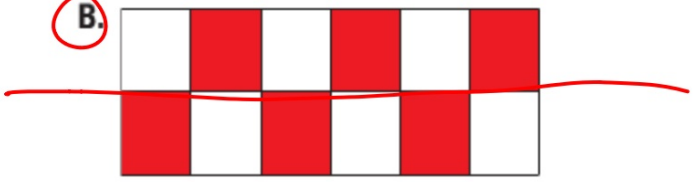
GuidedPractice

4. CARPET PATTERNS Describe the transformations that are combined to create each carpet pattern shown.

A.



B.



trans <1, 0>
ref. horiz line

ConceptSummary Compositions of Translations

Glide Reflection	2x Translation	2x Rotation
the composition of a reflection and a translation	the composition of two reflections in parallel lines	the composition of two reflections in intersecting lines

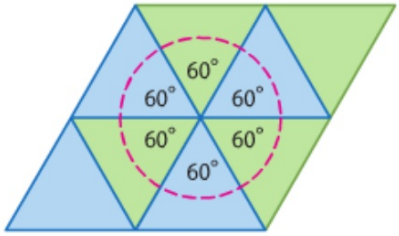
ConceptSummary Compositions of Translations

Glide Reflection	Translation	Rotation
the composition of a reflection and a translation	the composition of two reflections in parallel lines	the composition of two reflections in intersecting lines

Tessellation: tile
Makes a pattern
It should be repeating
There should be no gaps in the pattern
Tiles may not overlap

A **tessellation** is a pattern of one or more figures that covers a plane so that there are no overlapping or empty spaces. The sum of the angles around the vertex of a tessellation is 360°.

A **regular tessellation** is formed by only one type of regular polygon. A regular polygon will tessellate if it has an interior angle measure that is a factor of 360. A **semi-regular tessellation** is formed by two or more regular polygons.



Activity 1 Regular Tessellation

Determine whether each regular polygon will tessellate in the plane. Explain.

a. hexagon

$\frac{360}{120} = 3$

heptagon

$180(5)$

$\frac{900}{7}$ 128.6

$\frac{360}{128.6}$

b. decagon

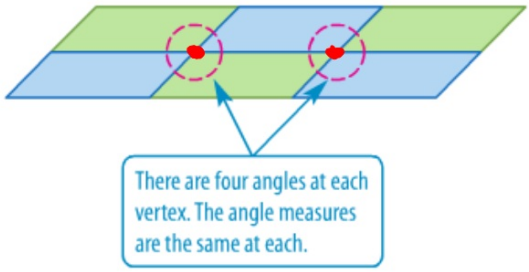
$180(8) = \frac{1440}{10} = 144$

$\frac{360}{144}$

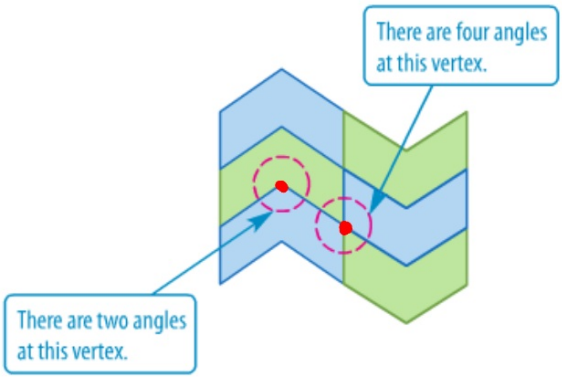
factor of 360

A tessellation is **uniform** if it contains the same arrangement of shapes and angles at each vertex.

Uniform



Not Uniform

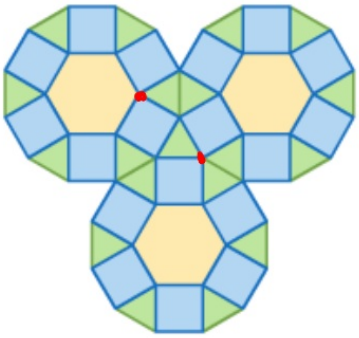


Regular: all parts are the same regular polygon
Semi-regular: all parts are regular polygons but not all the same polygon

Activity 2 Classify Tessellations

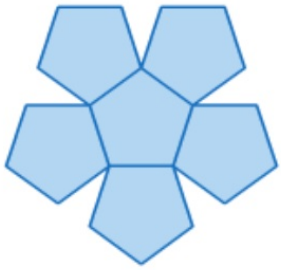
Determine whether each pattern is a tessellation. If so, describe it as *regular*, *semi-regular*, or *neither* and *uniform* or *not uniform*.

a.



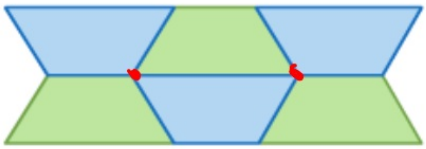
yes
semi-reg
not uniform

b.



no

c.

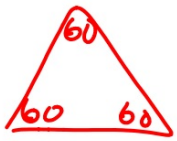


yes
neither
uniform

Exercises

Determine whether each regular polygon will tessellate in the plane. Write *yes* or *no*. Explain.

1. triangle



360 / 60

yes

2. pentagon

360 / 108

180(3)

540 / 5

no

3. 16-gon

360 / 157.5

180(14)

2520 / 16

157.5

no

Does it have angles that are factors of 360?

equil △

Create tessellation