

# Math 6 - Act. 11: Measuring Pattern Block Angles

## Summary

This activity is designed to provide exploration of angle types, polygons, and angle measurement through a nonstandard measurement strategy.

## Materials

- pattern blocks
- hinged mirrors
- recording handouts
- pattern block stamps
- ink stamp pads (yellow, orange, red, blue, green, or purple)
- pattern block cutouts or
- pattern block stickers
- glue sticks

## Additional Resource

*A Collection of Math Lessons from Grades 3 through 6*  
, by Marilyn Burns (Math Solutions Publications)

## Background for Teachers

Participants work as partners to figure out how many degrees are in each of the different angles of each of the different pattern blocks. They use hinged mirrors along with the concept that a full rotation is 360 degrees to logically determine the measure of each pattern block angle. Although the mirror is not necessary to find the measures of the angles, it adds a lot of interest and reinforces some mathematical ideas.

Most of the students will easily recognize that the orange pattern block, being a square, has angles that are all 90 degrees. This is a good pattern block to model the measuring process with since, although the measuring method is likely to be new, the result they find is what they expect. Students can then explore the other angles of the other pattern blocks as partners. There is one pattern block angle that will not work with this strategy. The teacher can foreshadow that there is one tricky angle that will not work with the mirror and the students must come up with their own strategy based on what they already know about the other angles.

## Intended Learning Outcomes

3. Reason mathematically.
5. Make mathematical connections.

## Instructional Procedures

### Invitation to Learn

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Review the concept of a full rotation (360 degrees) and half rotation (180 degrees) in the context of where students relate to these terms (e.g., skateboarding, skiing, diving, merry-go-round).

Demonstrate "doing" a 360 or have a volunteer from the class demonstrate it.

### Instructional Procedures:

Have students use a right angle referent to estimate the angles in several of the letters of the alphabet to review concepts of right angle, straight angle, obtuse angle, and acute angle.

Introduce the hinged mirror task and model the use of the materials. Using the square pattern block as an example, the teacher should gather the students where they can see one of the

mirrors in the hinge (several stations may need to be set up). Then, perhaps with student helpers, put one angle of the square pattern block in the hinge and makes sure the mirror is "snug" around the angle. Encourage students to take a look. Have one student build what he or she sees in the mirror using pattern blocks. Have students agree/disagree with what the student builds. Explain how the construction "proves" that the angle placed in the hinge is  $360 \text{ degrees}/4$  (because there are 4 copies of the angle to make a complete rotation of 360 degrees). Explain how to record the findings using a directed arrow to show the rotation (see handout for reference).

Students work as partners to measure each of the different pattern block angles using the hinged materials, and record their results using one (or more) of the suggested methods. Suggest a hint if students get stuck on the "trick" angle (the large angle of the tan pattern block). For instance, point out that although the mirror does not directly help them, they might be able to build a rotation without the mirror using other pattern block angles for which they already know the measurement.

Facilitate a discussion session in order for participants to share findings and draw conclusions about the angle measurements of the pattern blocks.

Encourage students to share their strategies for determining the angle measure of the "mystery" angle.

Lead a closing discussion to summarize the findings.

### Curriculum Integration

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*Math--Geometry and Measurement/Real World* -- This lesson connects geometry with a nonstandard (but conceptual) measurement strategy. It can also connect the concept of angles with places the students encounter them in the real world. Using the materials to construct a design in the first quadrant of a coordinate plane makes it possible for students to "see" what the completed design would look if it were flipped across the x axis and the y axis.

### Extensions

Students can be encouraged to find as many ways as they can to make 360 degrees using the pattern blocks. They should record the ways and include the angle measure of the pattern blocks they used to verify their solution (see handout in Materials section.)

Students can be challenged to find the measure of other angles in a similar way--with or without the mirrors.

### Homework & Family Connections

Students could be asked to use the materials, strategies, and results from this activity to find the measure of a "mystery" angle that the teacher hands out. Students could also be asked to design a tiling pattern in one quadrant and reflect it in another quadrant with the use of the mirrors.

### Assessment Plan

Observation and questioning as students are exploring with the hinged mirrors and pattern blocks are excellent informal strategies. Make sure the students are constructing what they see with pattern blocks before they try to record since some of the angles get difficult to record without visual help to reinforce what happening.

### Authors

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