Chapel Hill Math Circle

Intermediate Group

Angles[1]

January 21, 2017

Warmup problems

1. Using a wooden 40° angle piece, how can you make a 20° angle?
2. Using a wooden 19° angle piece, how can you make a 1° angle?
3. How can you draw a right angle on a piece of paper without using a straightedge?

Problems

4. Prove that vertical angles are congruent.
5. A set of identical angles whose degree measures are positive integers has been cut out from paper. Twenty-one of these angles are insufficient to complete a circle, while 22 are too many. What is the measure of each angle?
6. How many degrees does the minute hand of a clock move in one minute? What about the hour hand?
7. What is the angle between the two hands of a clock at 3:05pm? (Keep in mind that the hour hand is also moving.)
8. ★ At noon, the minute and hour hands coincide. How long will it take for them to coincide again?

[1] Based on Alexander Shen's *Geometry in Problems*, from MSRI's Mathematical Circles Library.