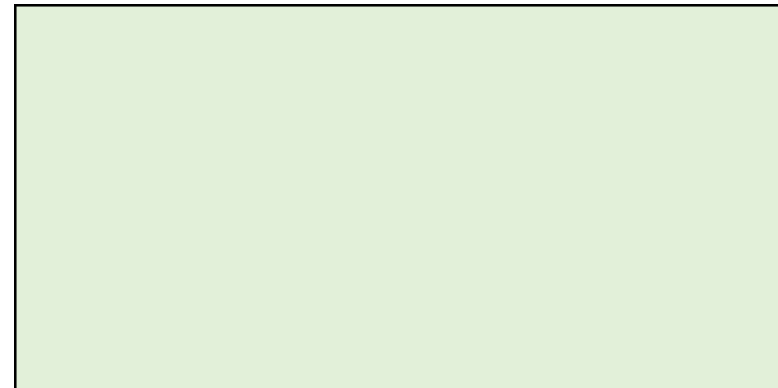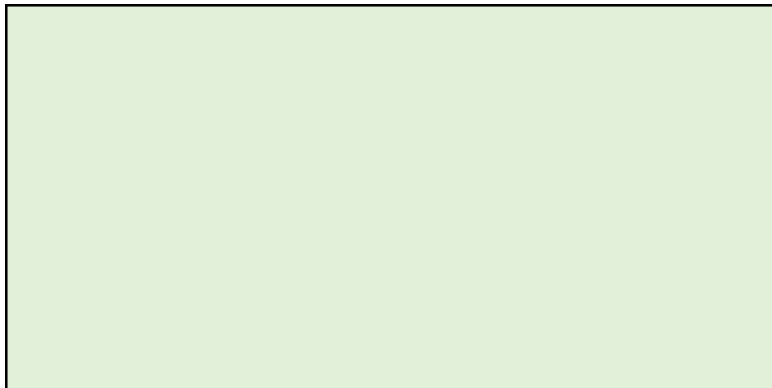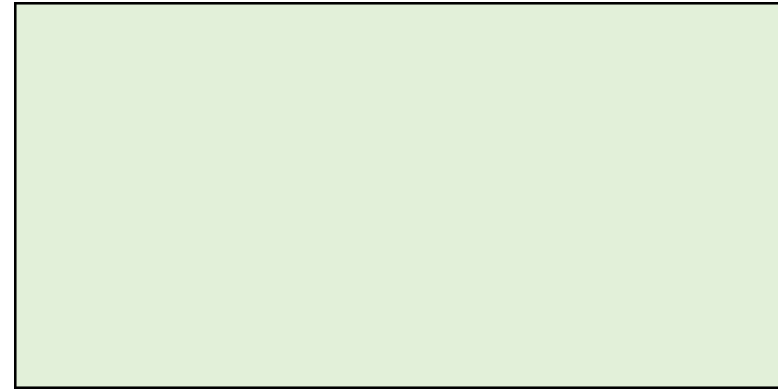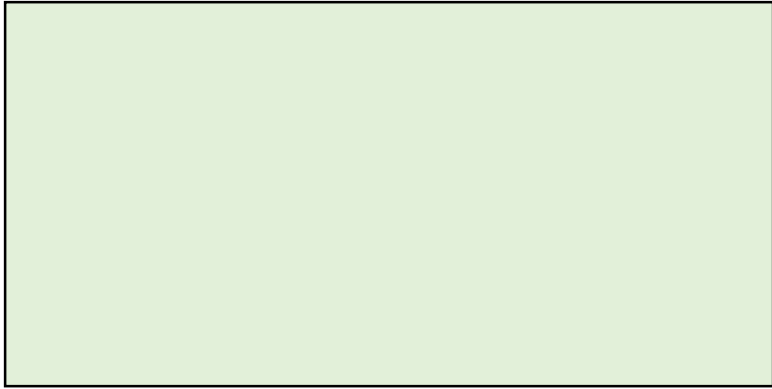# Geometry and Triangular Billiards
Activity Packet

Su Gao
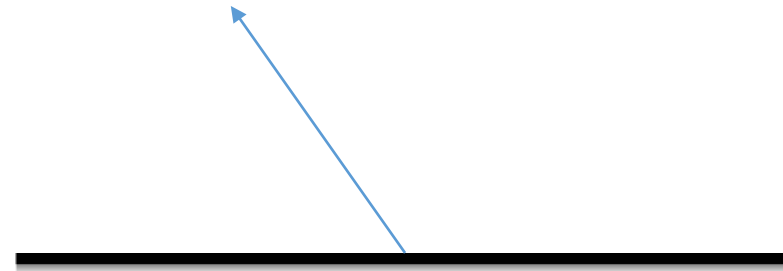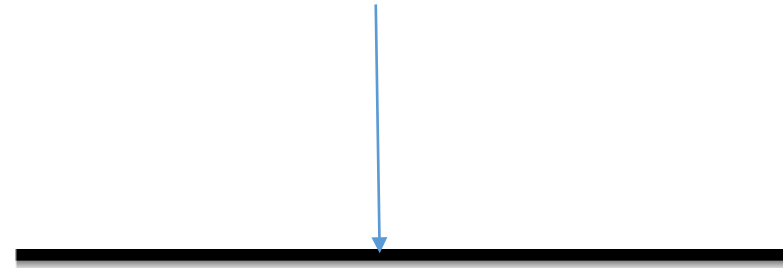
Professor of Mathematics
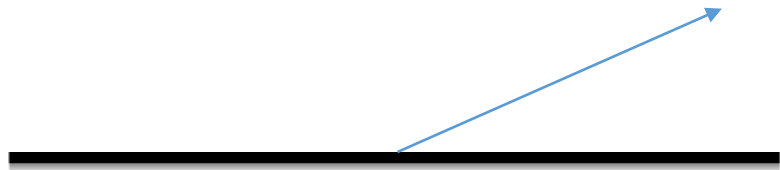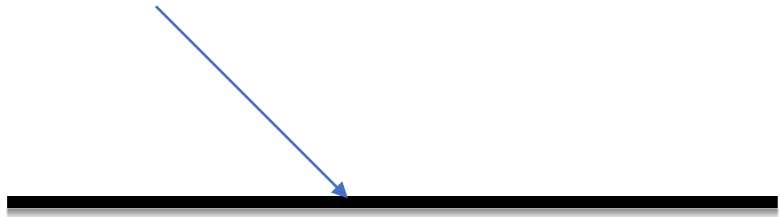
UNT College of Science

October 21, 2017

Try to find some periodic paths on the following regular 3x6 pool tables. Share your attempts and results with class and discuss why they work or might not work.
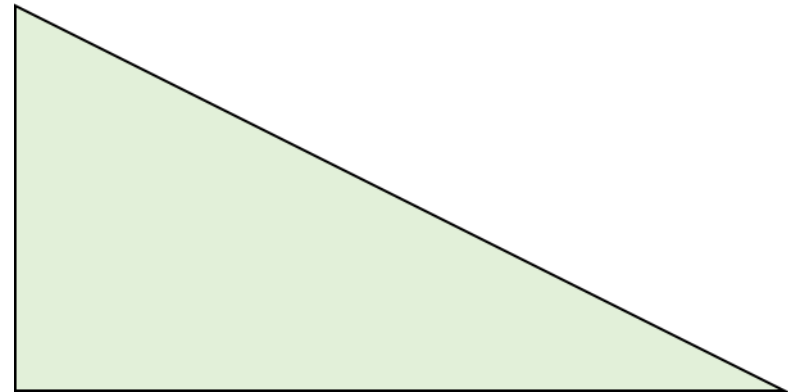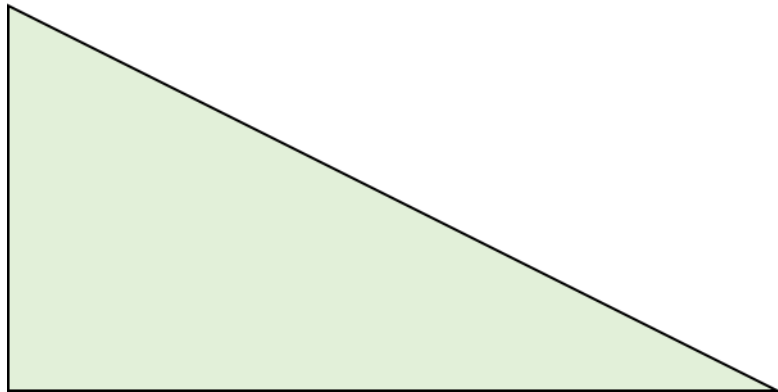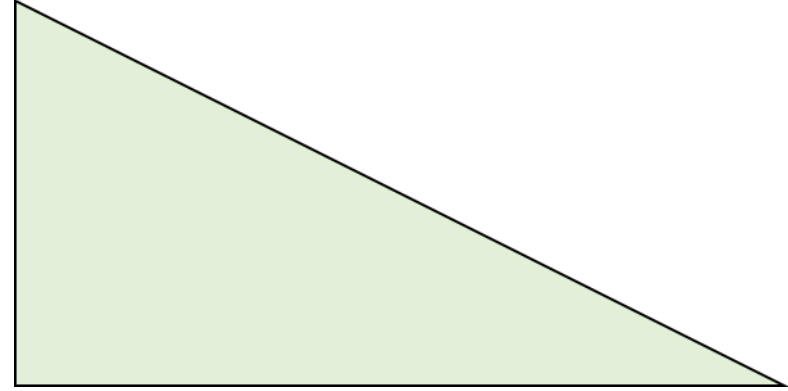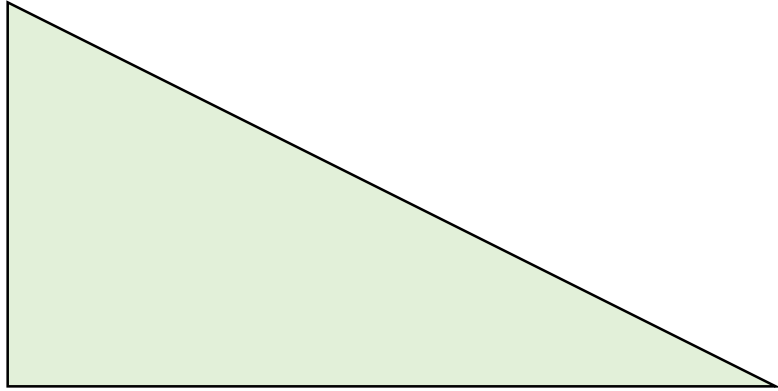
Law of Reflection

Use your protractor to find the incident paths or the reflected paths in the following situations.

Try to find some periodic paths on the following (right) triangular tables. Share your attempts and results with class and discuss why they work or might not work.

Altitudes and the Orthocenter

Draw an acute triangle in the following space (a triangle with three acute angles). Draw the three altitudes and discover (!) that they meet at a single point (this is called the orthocenter).

Altitudes and the Orthocenter – continued

Draw an **obtuse** triangle in the following space (a triangle with one obtuse angle). Draw the three altitudes. Do they meet at a single point?

Altitudes and the Orthocenter – continued

Try the previous activity again if you need more space. Or consider: what happens to right triangles?
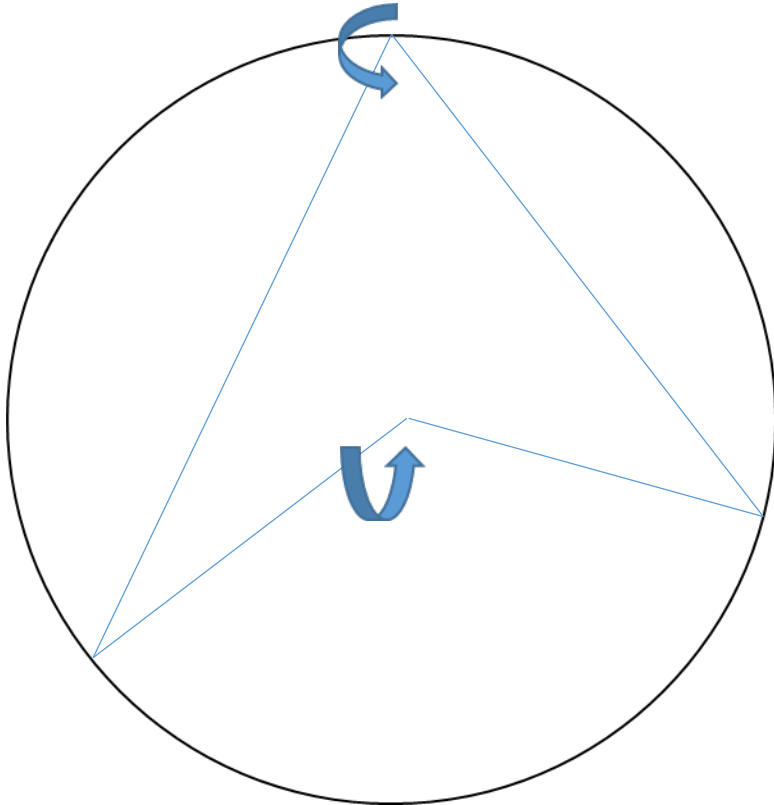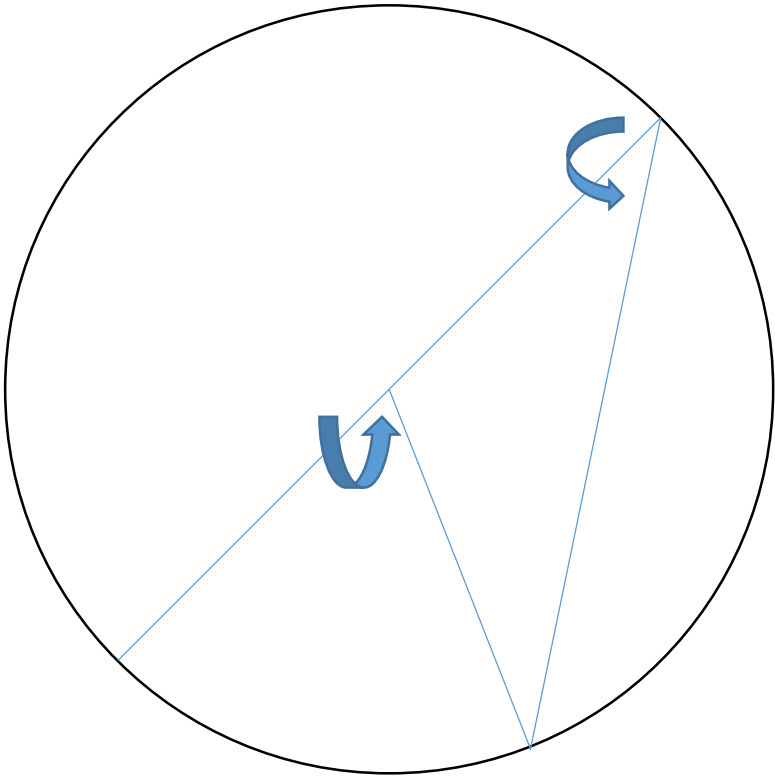
A Review of Planar Geometry

- Angle Sum Theorem: The sum of the measures of all three angles in any triangle is 180^0.

- Pythagorean Theorem: In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the right sides.

- Theorems for Congruent Triangles
  - SSS
  - SAS
  - ASA

- Isosceles Triangle Theorem: In a triangle, equal angles correspond to equal sides, and vice versa.
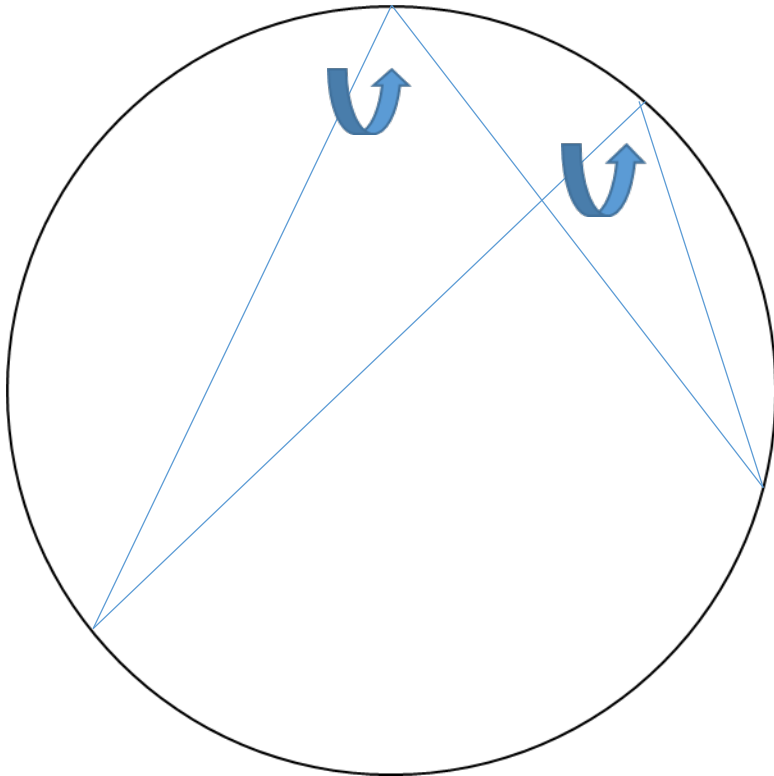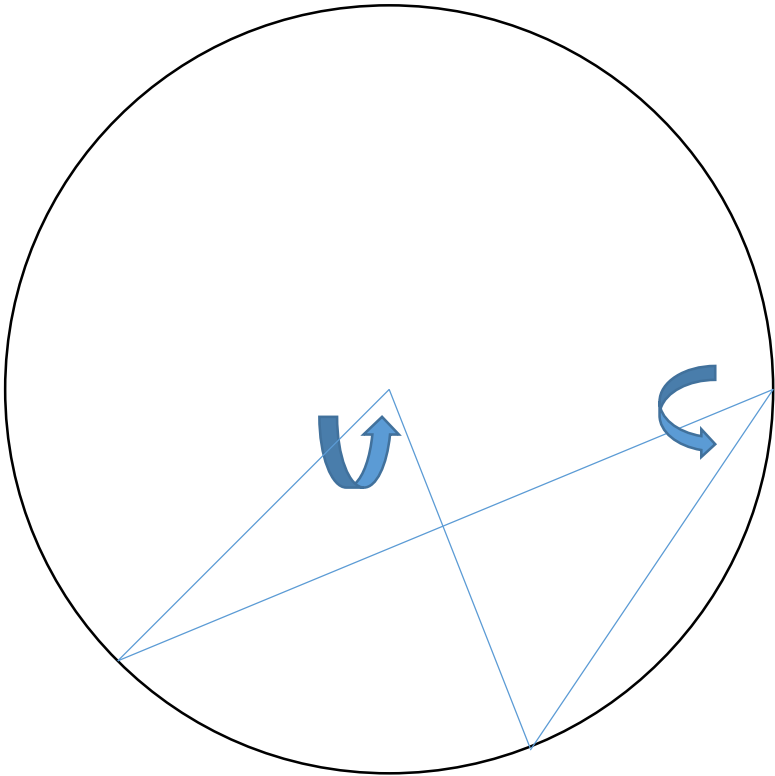
Proof!

Work with the class to prove that in a right triangle, the midpoint of the hypotenuse is of equal distance to all three vertices.
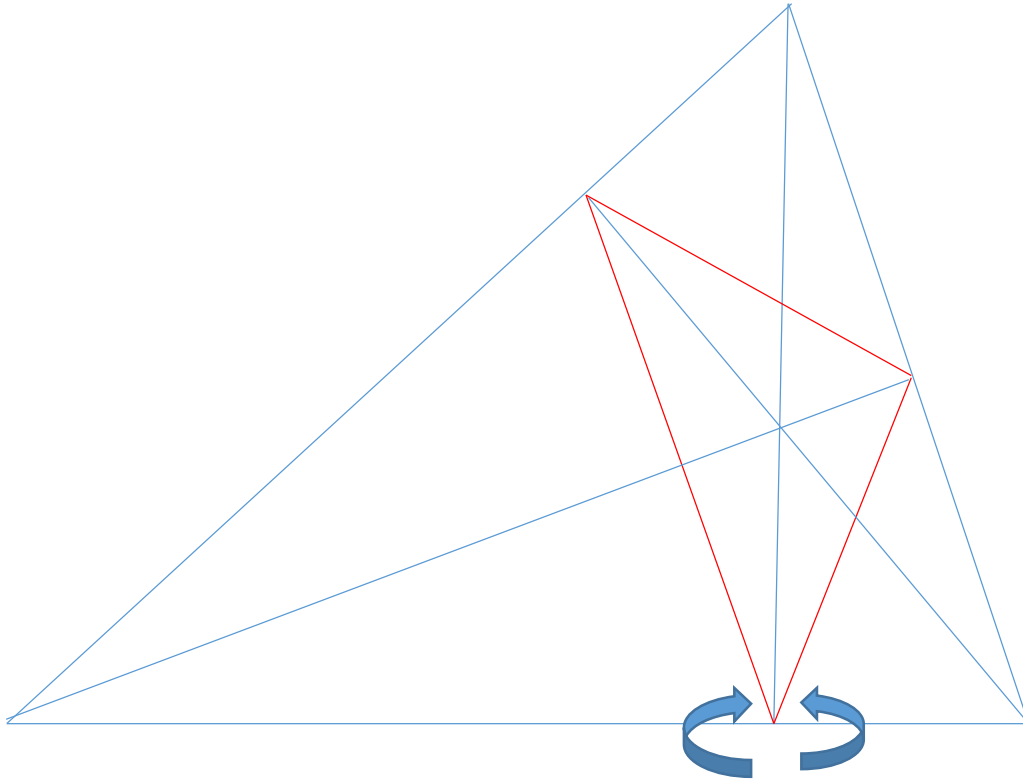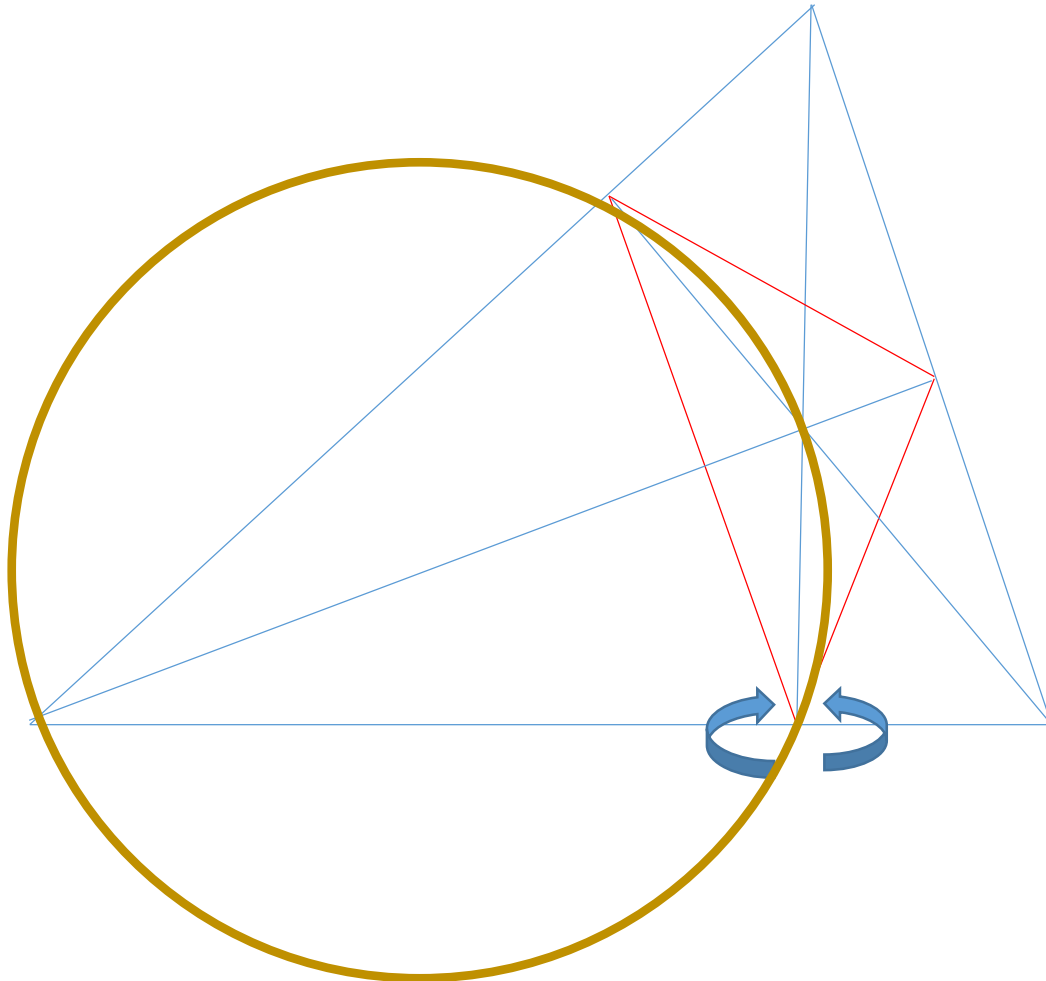
A Review of Planar Geometry with Circles
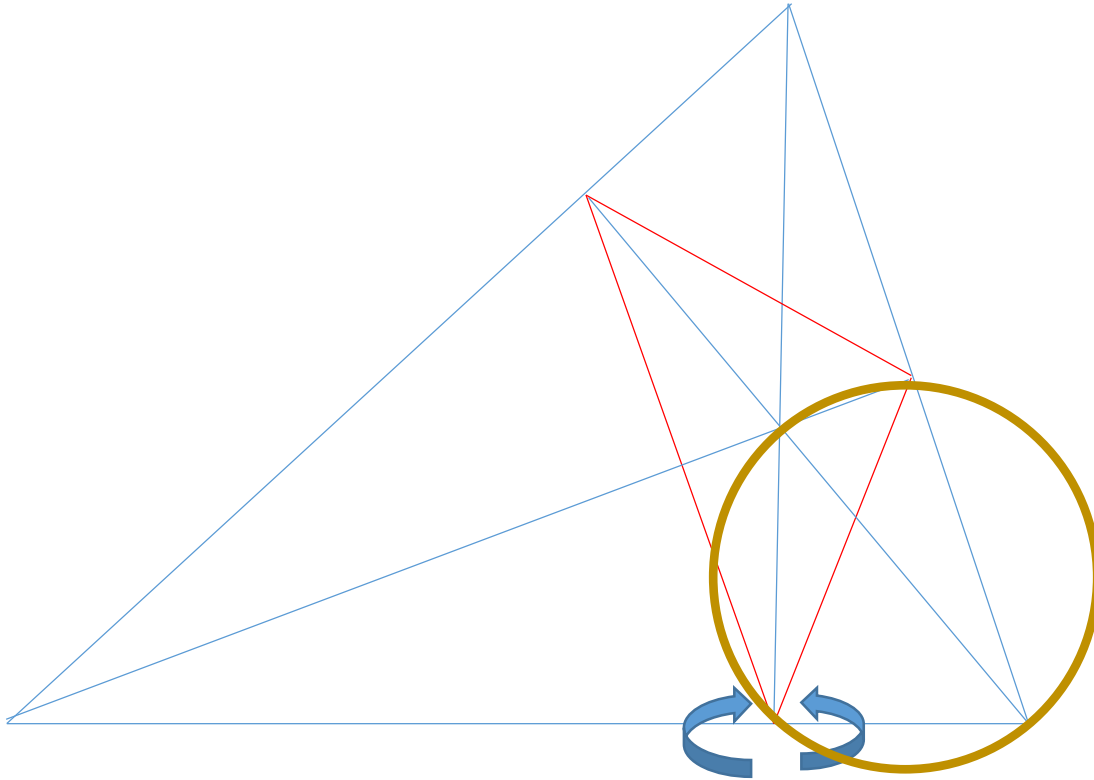
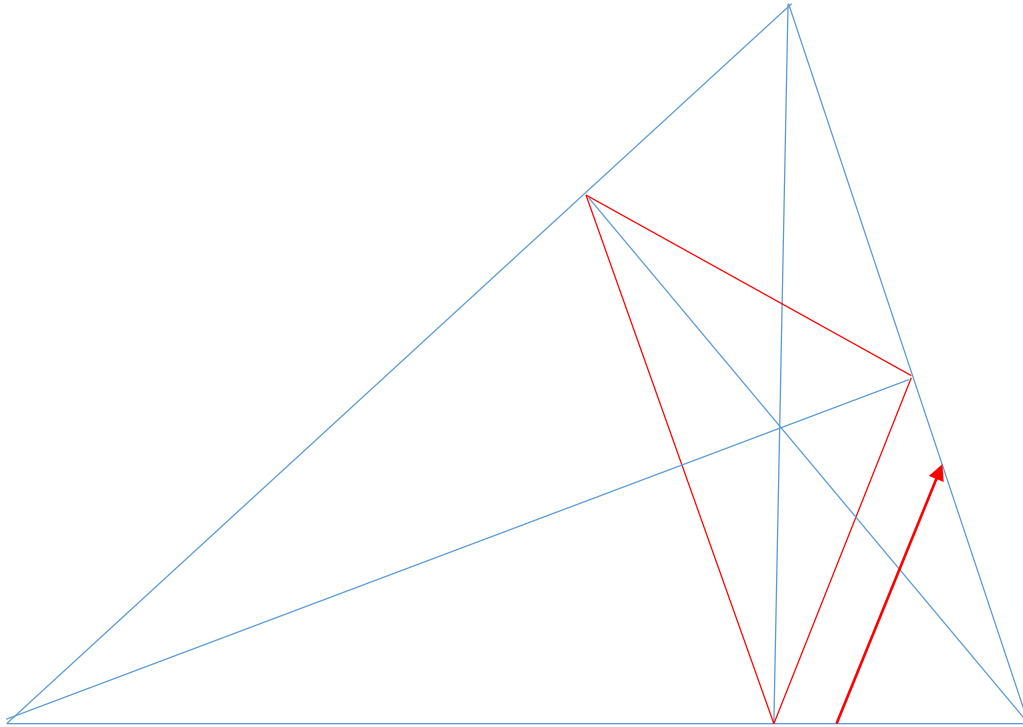# A Review of Planar Geometry with Circles

Fagnano's Path – the Orthic Triangle

Fagnano's Path – the Orthic Triangle

Fagnano's Path – the Orthic Triangle

Fagnano's Path – the Orthic Triangle

Fagnano's Path – the Orthic Triangle