# Apollonius’ Problem: How many circles can you draw which are tangent to 3 given circles?

# GeoGebra Investigation

This investigation is based on the ancient Greek Apollonius Problem: Can you draw a circle that just touches three given circles? ‘Just touching’ in geometry is called tangency. In this activity, you will use GeoGebra to explore this problem by eye, using a slider to control the radius of your test circle.

## Step 1 – Draw three circles

1. Open GeoGebra Geometry (https://www.geogebra.org/geometry).
2. Use the 'Circle with Center and Radius' tool to draw three (non-overlapping) circles of different sizes.
3. Label them C₁, C₂, and C₃.

## Step 2 – Make a test circle with a slider

1. Create a slider (call it r) for the radius.
 - Click Slider tool → set min = 0, max = 20 (or larger if needed).
2. Choose a point P where you think the center of your tangent circle might go.
3. Use the 'Circle with Center and Radius' tool:
 - Center = P
 - Radius = r (type 'r' instead of a number).
4. Now, as you move the slider, the circle around P grows or shrinks.

## Step 3 – Try to get tangency

• Adjust the slider r and move point P until the circle just touches all three given circles.
• This is your 'solution circle'.
• Try moving point P to different places – can you find more than one tangent circle?

## Step 4 – Reflection Questions

1. Can you always find a tangent circle?
2. How many different tangent circles are possible?
3. Can you prove your answer to Question 2 to be correct?