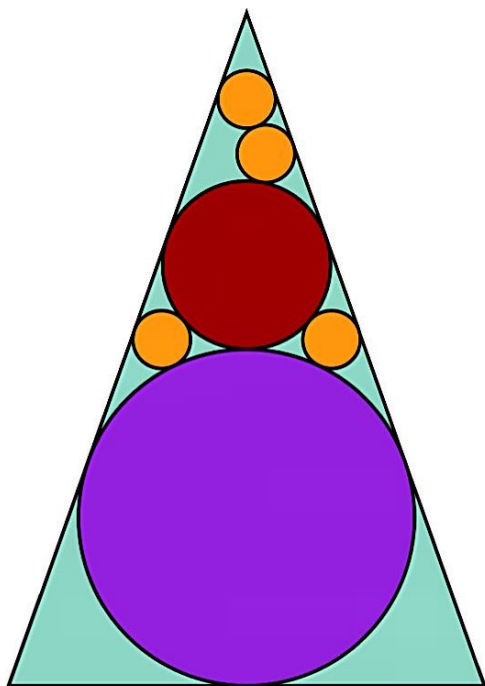
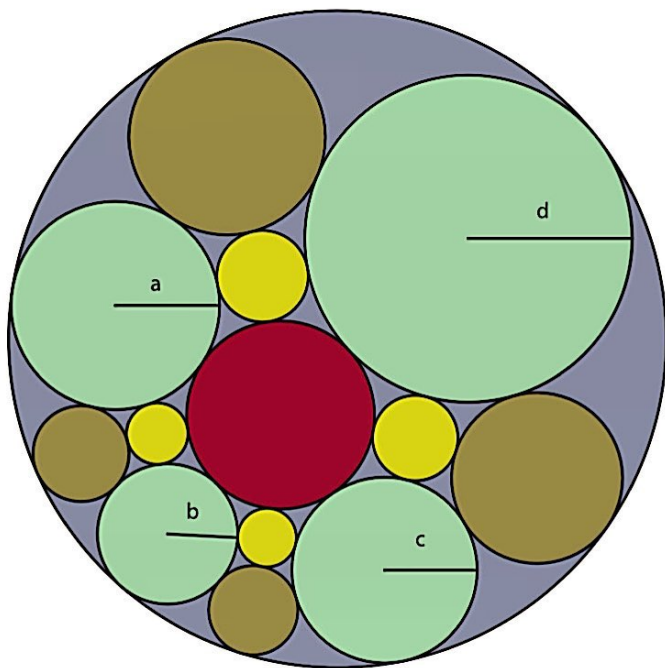


**Figure 1** Circles and Square

**Problem 1** In **Figure 1**, there are circles of three different sizes inscribed within a square, touching each other whenever they can. Show that the radius of the smallest circles is equal to one half of the radius of the mid-sized circles.

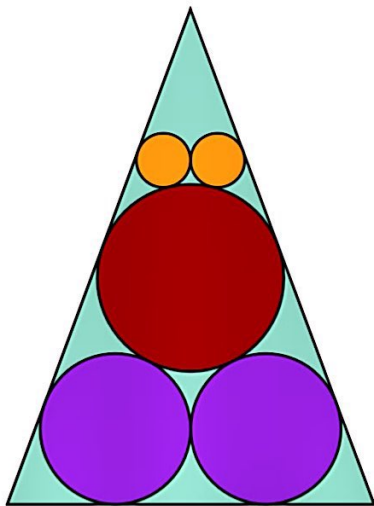


**Figure 3** Circle Problem 2



**Figure 4** Circle Problem 3

You can use all standard facts from Euclidean geometry, and your knowledge of hyperbolic geometry.



**Figure 2** Circle Problem 1

**Problem 5** A triangle contains five circles as shown in **Figure 2**. The two top circles have radius 9, the two bottom circles radius 25. What is the radius of the middle circle? Explain your answer.

**Problem 6** Six circles are inscribed a triangle as shown in **Figure 3**. The three small circles have the same size, the middle circle has radius 1. What is the radius of the large circle? Explain your answer.

**Problem 7** Circles are arranged as shown in **Figure 4**, with the letters indicating radii. Show that  $1/a + 1/c = 1/b + 1/d$ . Explain your answer. This is not quite as hard as it looks...