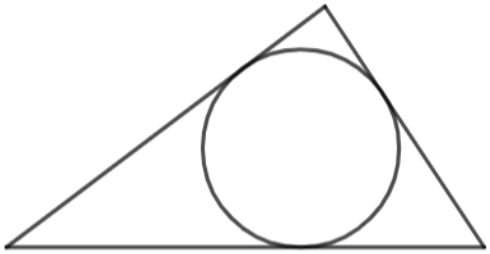
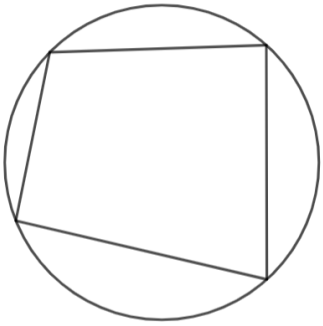
BOISE STATE UNIVERSITY

DEPARTMENT OF MATHEMATICS

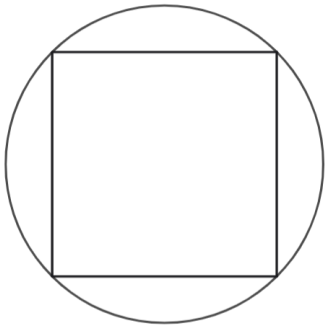
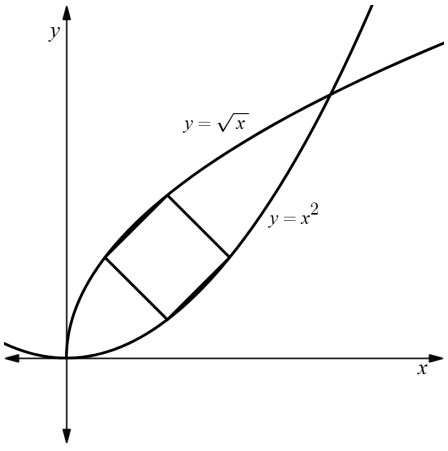
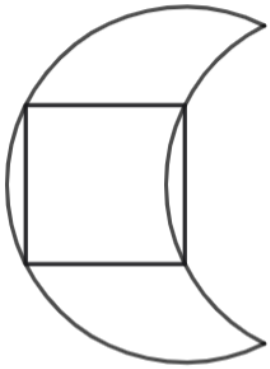
Problem of the Month **September 2026**

Inscribed Shapes

It is common to see shapes inscribed in one another, particularly we frequently see circles inscribed in polygons or polygons inscribed in circles, as shown in the images below:

A circle is inscribed in a triangle (or a triangle is circumscribed around a circle)	A quadrilateral is inscribed in a circle (or a circle is circumscribed around a quadrilateral)
 This inscribed circle has a special name: it is the incircle of the triangle	

For the purpose of this month's problem, we are going to focus on *squares* being inscribed in other shapes, like the examples shown below.

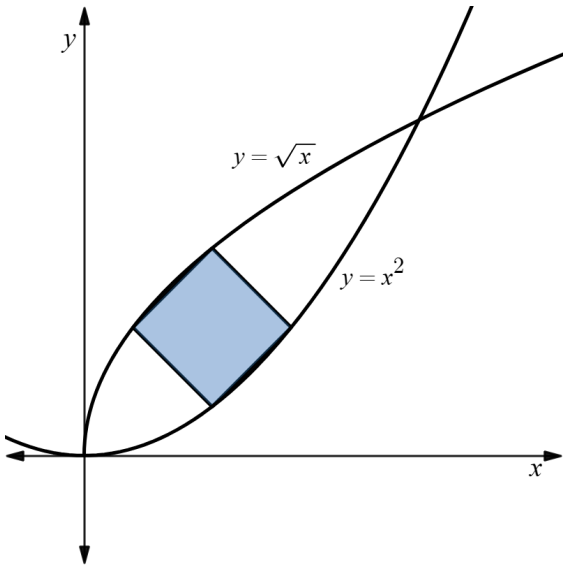
Square inscribed in a circle	Square inscribed in shape bounded by x^2 and $\sqrt{x}$	Square inscribed in a crescent moon-like shape
		

For the purposes of this problem, when we refer to a square being *inscribed* on another shape, we will only require that all four vertices of the square lie on the other shape.

Visit us at https://sites.google.com/boisestate.edu/problem-of-the-month

September Problem Statement

This month's problem was originally inspired by a post from @sonukg4india on X (formerly known as Twitter). So, we will start with the question that was posed there:



- What is the area of the inscribed square? (as shown in the image to the left, square colored blue for emphasis)

In addition to that original problem, here are some other questions to explore:

- Due to the rotational symmetry in a circle, there are infinitely many congruent squares that can be inscribed in a circle. Are there other squares that can be inscribed in the shape bounded by these functions? And if so will they be congruent to each other?

- Are there any squares that can be inscribed on the moon-like page from the previous page that lay entirely within the moon?

I look forward to seeing your explorations on this problem! While all of the questions above have answers, this month's problem is also closely related to an *unsolved* problem in mathematics, which I will share more about, in addition to solutions for this problem, next month!

How to participate

Have fun thinking about this problem and sharing it with your friends and family!

If you are excited about the work you've done, please share your solutions and creative problem solving with mathoutreach@boisestate.edu! Solutions can be created digitally (e.g. sharing a Desmos graph you created with an emailed explanation), or they can be done on paper or in other physical formats and sent via pictures or a scanned PDF. If you are a student, please include your grade, your school, and the name of your math teacher. The most creative and clear solutions sent in before the end of the month will win prizes and shoutouts!