Polly Gone

Level E

Catherine said to Rebecca, "I need to draw an octagon, and I want it to be accurate."

Rebecca replied, "I have an easy way to draw an octagon. Start with a large square. Find the midpoint of each side. Now draw a line segment from each midpoint to the two opposite vertices. In the center of the drawing, an octagon will be formed."

"That's a great method, Rebecca, but I want to make my octagon a certain size. How big do I need to make the original square in terms of area to get an octagon of a certain area?" Catherine asked.

Please help Catherine and Rebecca determine the relationship between the area of the square and the area of the octagon that can be created from it. Explain your reasoning.

"After you have drawn your octagon, you will see that it comes out as a beautiful regular octagon," Rebecca exclaimed. "Well, it may be beautiful, but I don't think it is regular," challenged Catherine.

Who is right? Determine your answer using mathematics.