

24 Decorations for New Year's Eve

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Project: MATH+ School Activities



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Challenge

Christmas elf Annelie would like to craft some decorations for her New Year's Eve party. Since she is both mathematically interested and a talented craftswoman, Annelie has constructed a crescent moon from two circles (see Figure 1), which she wants to saw out and paint: the larger circle l is the incircle of a square $ABCD$ with side length 1. The smaller circle s is the incircle of the triangle MBC , where M is the midpoint of the line segment \overline{AD} .

In her workshop, Annelie has enough wood for the task. She only has to get the special fairy dust paint from ELFZON.NP, the fair E-commerce company at the North Pole. Since the fairy dust paint is quite expensive, Annelie wants to buy only as much of it as she really needs. To do this, she calculates the area of the crescent very precisely.

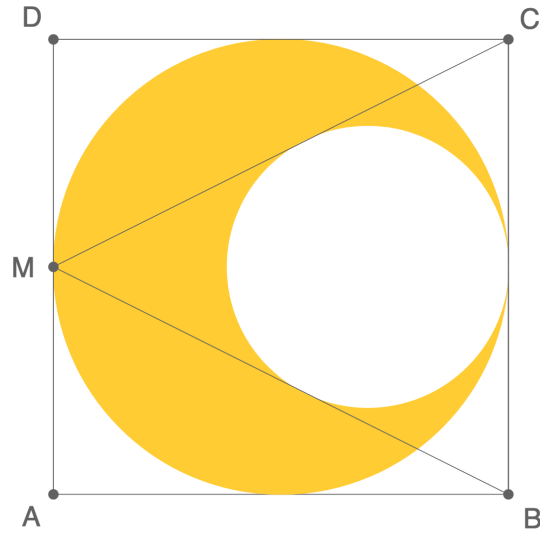


Figure 1: The crescent constructed by Annelie.

Let

- r_s and A_s be the radius and area of the smaller circle s and
- r_l and A_l be the radius and area of the larger circle b .

What is the second decimal place of $\frac{r_s}{r_l} + \frac{A_s}{A_l}$?

Possible answers:

1. 1
2. 2
3. 3
4. 4
5. 5
6. 6
7. 7
8. 8
9. 9
10. 0