

Grade Example:

Practice: 82%

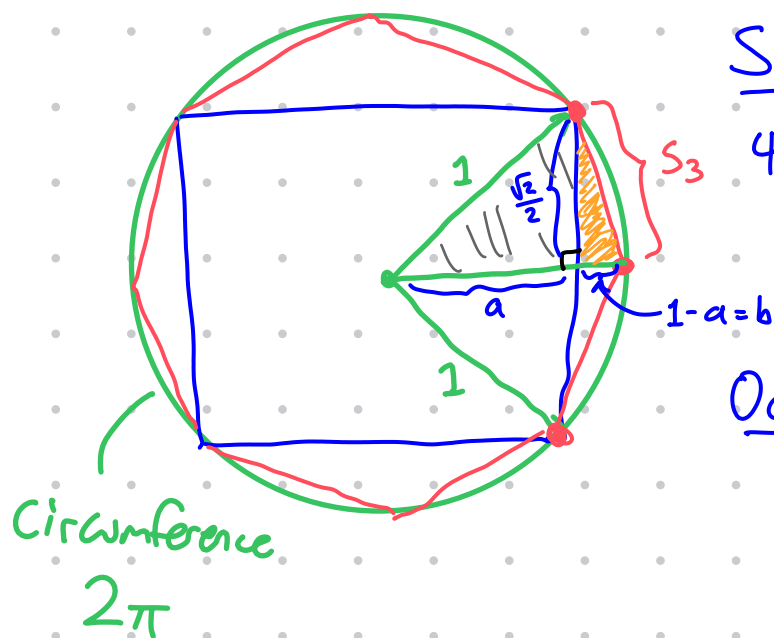
Projects: 3E, 2M

Final: E

Challenge: 2M

B  
A  
A  
B } B+

## ARCHIMEDES' METHOD



Square: side length:  $s_2 = \sqrt{2}$   
 $4 = 2^2$ -gon

approx:  $\pi_2^i = \frac{4\sqrt{2}}{2} \approx 2.828\dots$

Octagon: find side length  
 $2^3$ -gon

$$a = \sqrt{1^2 - \left(\frac{\sqrt{2}}{2}\right)^2} = \frac{1}{\sqrt{2}}$$

$$b = 1 - a = 1 - \frac{1}{\sqrt{2}}$$

$$\begin{aligned} s_3 &= \sqrt{b^2 + \left(\frac{\sqrt{2}}{2}\right)^2} \\ &= \sqrt{\left(1 - \frac{1}{\sqrt{2}}\right)^2 + \left(\frac{\sqrt{2}}{2}\right)^2} \\ &= \sqrt{2 - \sqrt{2}} \end{aligned}$$

So approx of  $\pi$ :

$$\begin{aligned} \pi_3^i &= \frac{8s_3}{2} = 4\sqrt{2 - \sqrt{2}} \\ &\approx 3.06\dots \end{aligned}$$