//!!!
///((sin((((360/8128)/2)/128).degrad)*2)*(8128*128))/2
///pi aproximation (archimedean) via perfect numbers "polygons" 6,28,496,8128

////Chat GPT was used for making the bellow graph and extending the supercollider function above to a mathematical formula.

N (perfect number)	π approx	Error
6	3.0	1.416×10^{-1}
28	3.1416	7×10^{-6}
496	3.14159292	2.9×10^{-7}
8128	3.141592653589	$\sim 10^{-12}$

Perfect numbers (first four):

$$6, 28, 496, 8128$$

The formula:

$$\pi_{\text{approx}} = \frac{N \cdot s}{2}, \quad s = 2\sin\left(\frac{180°}{N}\right)$$
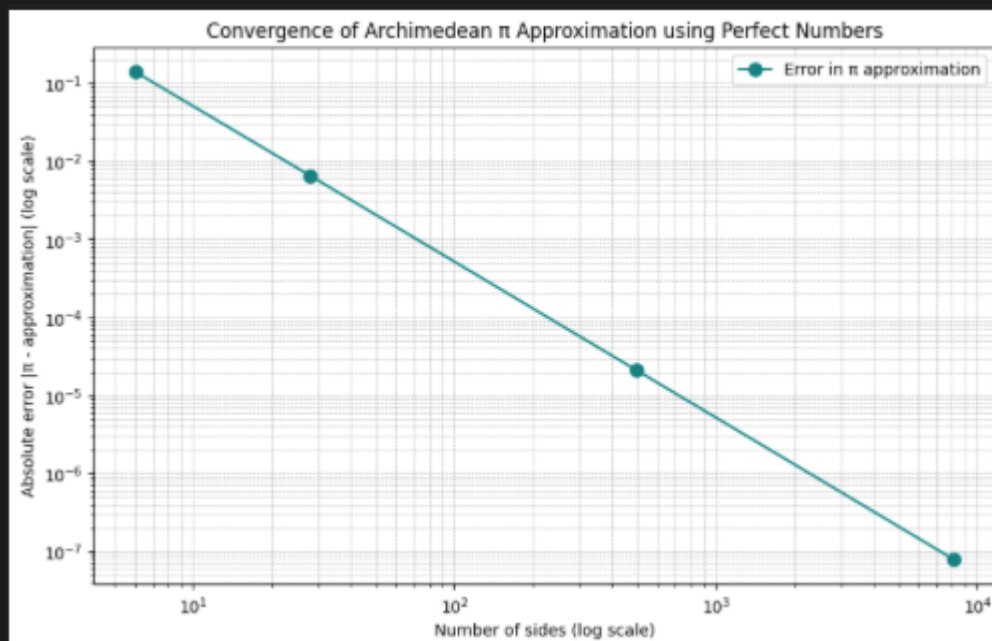
We'll compute each.

---

a) N = 6

$$s = 2\sin(180/6) = 2\sin(30°) = 1$$

$$\pi_{\text{approx}} = \frac{6 \cdot 1}{2} = 3.0$$

Error:

$$\pi - 3.0 \approx 0.1415927$$

Convergence of Archimedean π Approximation using Perfect Numbers

4️⃣ Error vs N graph

The error roughly follows a curve:

$$\epsilon_N \propto \frac{1}{N^2}$$

- Hexagon: $N = 6$ → error ~0.14
- 28-gon: $N = 28$ → error ~7×10^{-6}
- 496-gon: $N = 496$ → error ~3×10^{-7}
- 8128-gon: $N = 8128$ → error ~10^{-12}