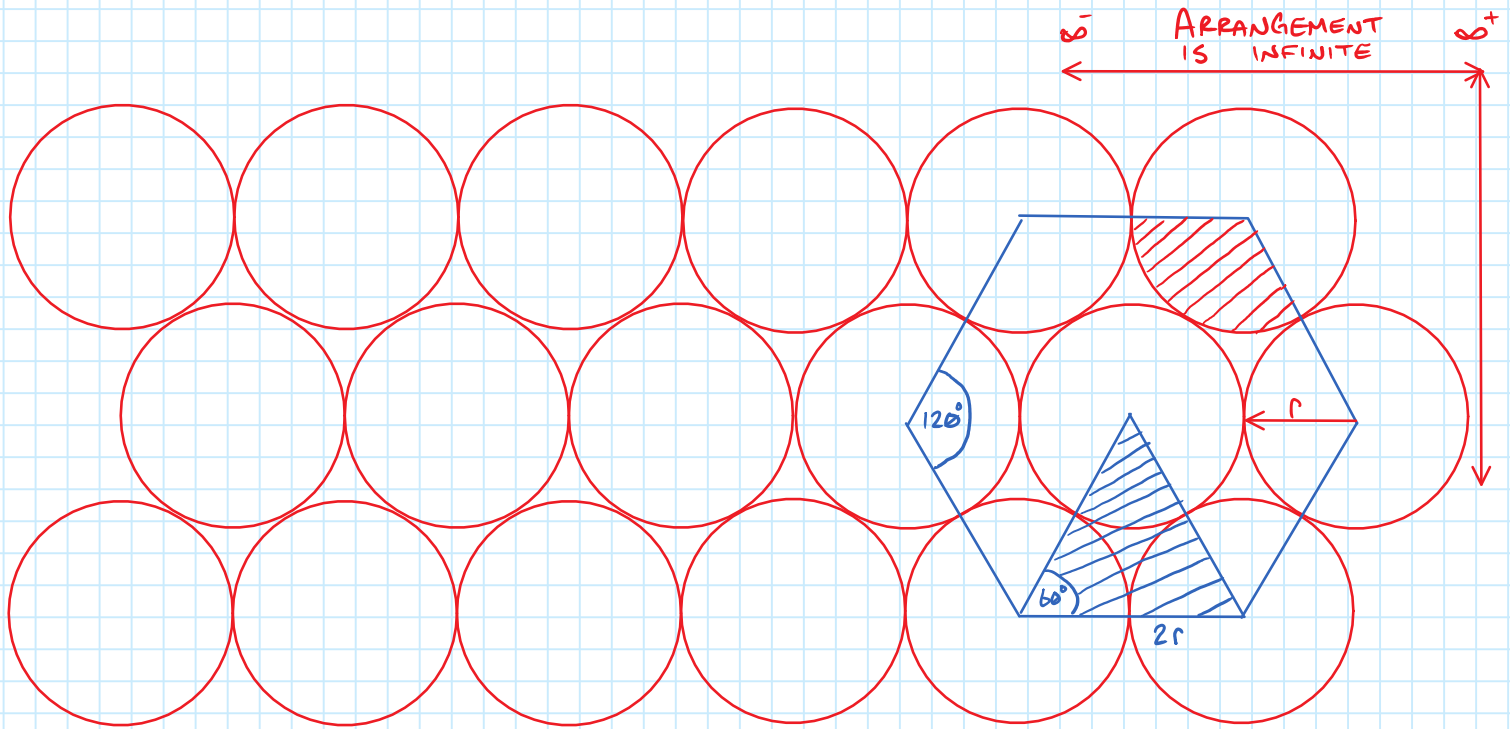


CIRCLE PACKING ANALYSIS



TO INVESTIGATE THE EFFICIENCY OF CIRCLE PACKING, WE DEFINE A RADIALLY-SYMMETRICAL AREA IN BLUE.

LET η EQUAL THE RATIO OF UTILIZED SPACE VS. UNUTILIZED SPACE.

$$\eta = \frac{\text{AREA (CIRCLE)} + 6 \times \text{AREA}(\frac{1}{3} \text{ CIRCLE})}{6 \times \text{AREA (EQUALATERAL TRIANGLE)}} = \frac{3 \times \text{AREA (CIRCLE)}}{6 \times \text{AREA (TRIANGLE)}}$$

$$\eta = \frac{1}{2} \cdot \frac{\pi r^2}{\frac{\sqrt{3}}{4} (2r)^2} = \frac{2}{\sqrt{3}} \cdot \frac{\pi}{4} = \left(\frac{\pi}{2\sqrt{3}} \right) \approx 0.9069$$

NOTE: THIS ONLY HOLDS TRUE WHEN THE ARRANGEMENT OF CIRCLES EXTENDS INFINITELY AND IS COMPOSED OF CIRCLES OF EQUAL SIZE.