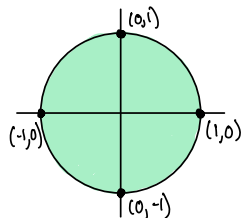


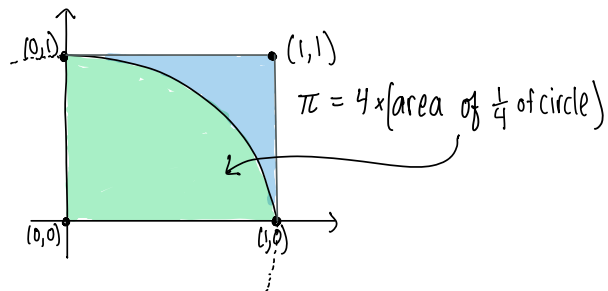
MONTE CARLO

$$A = \pi r^2$$

In a unit circle, $r=1$. So, $A=\pi$.



Let's focus on one quadrant

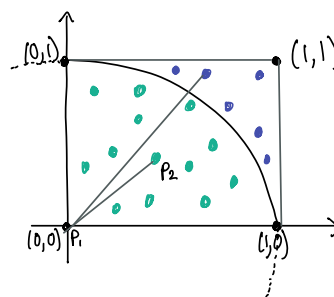


How to approximate area?

- Randomly pick a point $p=(x,y)$ in the quadrant
 $0 \leq x \leq 1$
 $0 \leq y \leq 1$

• Approximate area of $\frac{1}{4}$ of circle is:

$$\frac{\# \text{ of points in circle}}{\# \text{ of all points}}$$



A point $p=(x,y)$ is in the circle if the distance to $(0,0)$ is ≤ 1

A point $p=(x,y)$ is outside the circle if the distance to $(0,0)$ is > 1

Recall Euclidean distance between points $p_1=(x_1, y_1)$ and $p_2=(x_2, y_2)$ is defined as:

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

To compute distance to the origin, where $p_2=(0,0)$, we have:

$$\sqrt{x_1^2 + y_1^2}$$