Flipping Physics Lecture Notes:

Defining Pi for Physics

Common student answers to the question, "What is π?"

- A number
- 3
- 3.1
- 3.14
- ~3.14159265358979323846264338327950288419716939937510582097494459230781640628 6
- An irrational number
- Something good to eat

By definition pi is the ratio of a circle's circumference to its diameter:

- $\pi = \frac{C}{D} = 3.14159...$
- Which we can rearrange $\Rightarrow C = \pi D = \pi\left(2r\right) \Rightarrow C = 2\pi r$ to get the equation for circumference
- The equation for circumference is just a restatement of the definition of π

Frisbee example: $\pi = \frac{C}{D} = \frac{86.9cm}{27.5cm} = 3.16 \approx 3.14159...$

The units for π are …

- $\pi = \frac{C}{D} \Rightarrow \frac{meters}{meters} = 1$
  - In other words π has no units, it is dimensionless
  - We give this ratio a specific name, it is called *radians*
- $\frac{C}{D} = \pi \ radians$
- π is in radians and radians are dimensionless.
- π radians represent the ratio of the circumference to the diameter of every circle.
- Radians are a placeholder and we will use this fact repeatedly in physics.

$1 \ revolution = 360° = 2\pi \ radians$

- Know this!!
- Note: $1 \ revolution \neq 2 \ radians$
  - For some reason students often simply leave the π out, don't be *that* student.

Abbreviations:

- r = radius
- rad = radians
  - do ***NOT*** use r for radians, r is for radius, rad is for radians.
  - $s = r\Delta\theta = \left(1.5m\right)\left(2\pi r\right)$ leads to r confusion, $s = r\Delta\theta = \left(1.5m\right)\left(2\pi \, \mathrm{rad}\right)$ does not.