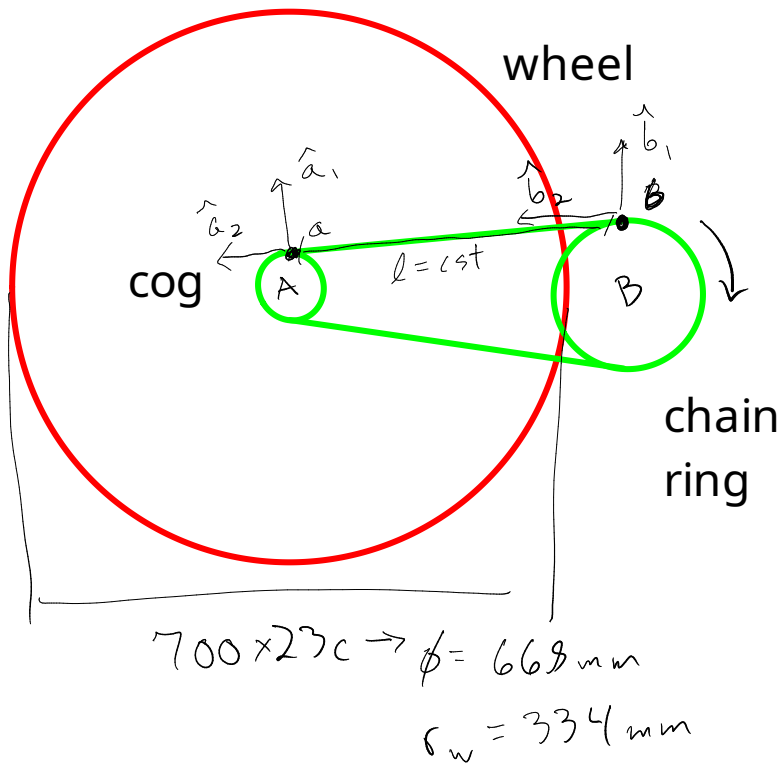
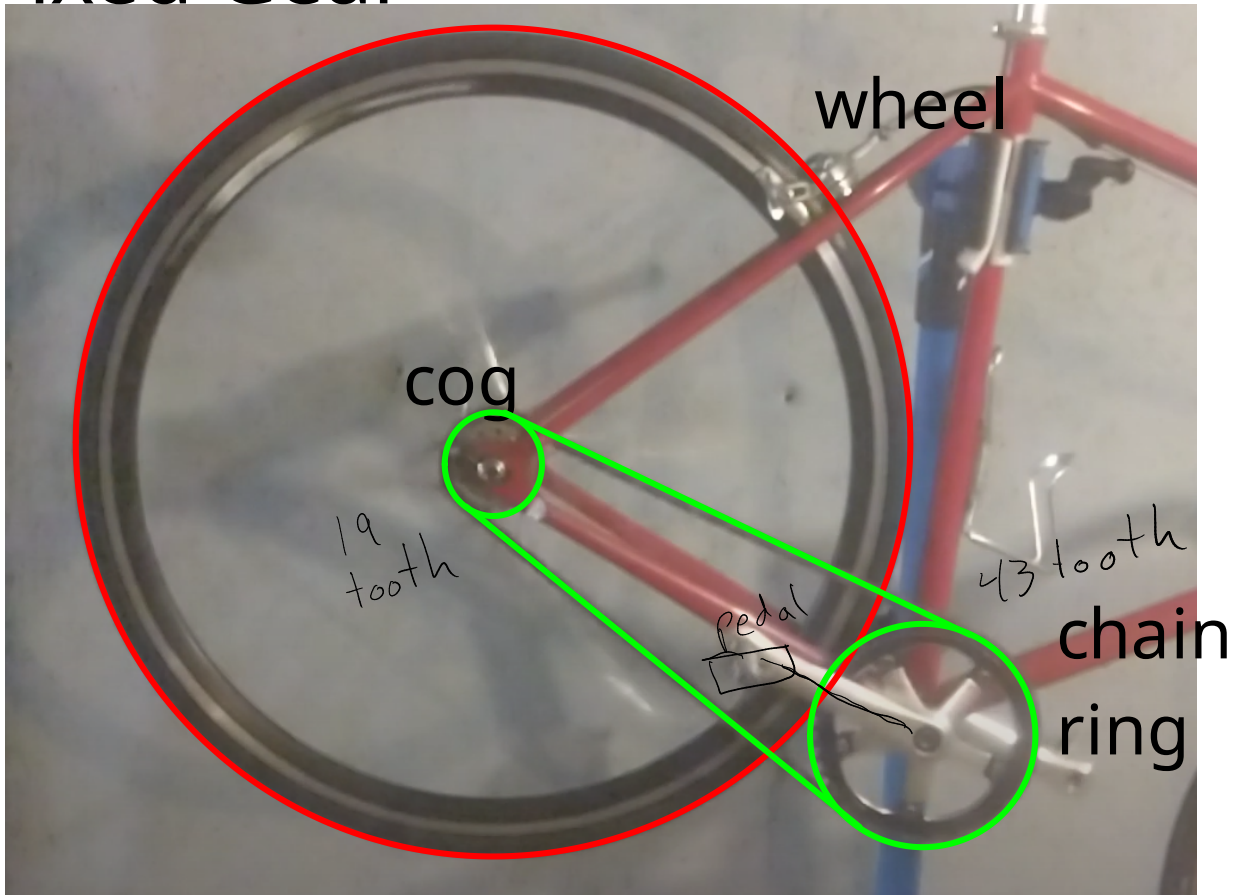


Bike Gear Kinematics: Fixed Gear



$$\omega_B = 60 \text{ rpm} = 1 \frac{\text{cycle}}{\text{s}} = 2\pi \text{ rad/s}$$

$$\vec{r}_a = r_a \hat{a}_1$$

$$\vec{r}_b = r_b \hat{b}_1$$

$$\vec{v}_{b/a} = 0$$

$$\vec{v}_a = -r_a \omega_A \hat{a}_2$$

$$\vec{v}_b = -r_b \omega_B \hat{b}_2$$

$$700 \times 23c \rightarrow \phi = 669 \text{ mm}$$

$$r_w = 334 \text{ mm}$$

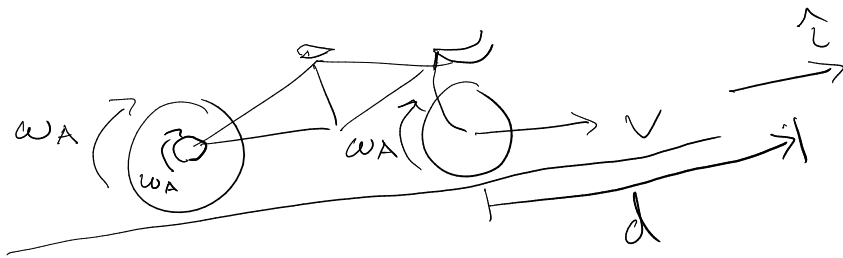
$$\vec{v}_B = \vec{v}_A + \vec{v}_{B/A}$$

$$r_A \omega_A = r_B \omega_B \implies 19 \frac{\text{tooth}}{2\pi r_A} \cdot r_A \omega_A = 43 \frac{\text{tooth}}{2\pi r_B} r_B \omega_B$$

$$\omega_A = \frac{43}{19} \omega_B$$

$$\omega_A = 2.26 \text{ (1 Hz)} = 2.26 \frac{\text{rot}}{\text{s}}$$

How fast am I riding??



$$d = r_{\text{wheel}} \cdot \Theta_{\text{wheel}}$$

$$v = r_{\text{wheel}} \cdot \omega_A$$

$$\vec{v} = (0.334 \text{ m}) (14.22 \frac{\text{rad}}{\text{s}}) \hat{i}$$

$$\vec{v} = 4.74 \frac{\text{m}}{\text{s}} \hat{i}$$

$$\vec{v} \approx 10.6 \text{ mph}$$

