\[ \theta = \left( \frac{\omega_0 + \omega}{2} \right) t \quad \omega = \omega_0 + \alpha t \quad \theta = \omega_0 t + \frac{1}{2} \alpha t^2 \quad \omega^2 = \omega_0^2 + 2 \alpha \theta \]

Please show your work to get full credit

1. A bicycle travels 141 m along a circular track of radius 30 m. What is the angular displacement in radians of the bicycle from its starting position?

(a) 1.0 rad
(b) 1.5 rad
(c) 3.0 rad
(d) 4.7 rad
(e) 9.4 rad

\[ \theta = \frac{s}{r} = \frac{141}{30} \text{ rad} \]
\[ = 4.7 \text{ rad} \]

2. A gymnast is performing a floor routine. In a tumbling run she spins through the air, increasing her angular velocity from 3.00 to 5.00 rev/s while rotating through one revolution. How much time does this maneuver take?

(a) 0.125 s
(b) 0.250 s
(c) 0.500 s
(d) 1.00 s
(e) none of the above

\[ \omega_0 = 3 \times 2\pi \text{ rad/s} = 6\pi \text{ rad/s} \]
\[ \omega = 5 \times 2\pi \text{ rad/s} = 10\pi \text{ rad/s} \]

\[ \theta = 2\pi \text{ rad} \]

\[ \theta = \frac{1}{2} (\omega_0 + \omega) t \]
\[ = \frac{2 \theta}{\omega_0 + \omega} = \frac{2 \times 2\pi}{16\pi} = 0.25 \text{ s} \]