

Topic: Linear and angular velocity**Question:** Find the angular speed.

What is the angular speed ω of a wheel that rotates at a constant rate and sweeps out an angle of 543π radians in 14.6 minutes?

Answer choices:

- A $\omega = 37.2$ radians per second
- B $\omega = 0.620$ radians per second
- C $\omega = 0.620\pi$ radians per second
- D $\omega = 1.83$ radians per second



Solution: C

Since the elapsed time t (14.6 minutes) is given in units of minutes and all the answers choices are given in units of radians per second (not radians per minute), we need to convert the elapsed time (14.6) minutes to seconds. Since there are 60 seconds in a minute, we'll use the conversion factor (60 sec)/(1 min).

$$t = 14.6 \text{ min}$$

$$t = (14.6 \text{ min})(1)$$

$$t = (14.6 \text{ min}) \left(\frac{60 \text{ sec}}{1 \text{ min}} \right)$$

$$t = [14.6(60)] \text{ sec}$$

$$t = 876 \text{ sec}$$

Now we're ready to compute the angular speed in radians per second:

$$\omega = \frac{\theta}{t}$$

$$\omega = \frac{(543\pi) \text{ rad}}{876 \text{ sec}}$$

$$\omega = \left(\frac{543}{876} \pi \right) \text{ radians per second}$$

$$\omega \approx 0.620\pi \text{ radians per second}$$



Topic: Linear and angular velocity**Question:** Find the angular speed.

If a disc is rotating at the constant rate of 94.9 revolutions per minute, what is its angular speed ω in units of radians per second?

Answer choices:

- A $\omega = 8.62$ radians per second
- B $\omega = 18.7\pi$ radians per second
- C $\omega = 3.16\pi$ radians per second
- D $\omega = 15.1$ radians per second



Solution: C

To convert from revolutions per minute to radians per second, we need to use the following facts: (a) There are 2π radians in a (full) revolution, and (b) there are 60 seconds in a minute.

$$\omega = 94.9 \frac{\text{rev}}{\text{min}}$$

$$\omega = \left(94.9 \frac{\text{rev}}{\text{min}} \right) (1)(1)$$

$$\omega = \left(94.9 \frac{\text{rev}}{\text{min}} \right) \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) \left(\frac{1 \text{ min}}{60 \text{ sec}} \right)$$

$$\omega = \left[\frac{94.9(2)}{60} \pi \right] \text{ radians per second}$$

$$\omega \approx 3.16\pi \text{ radians per second}$$

