BACKER BREAKS IT DOWN: ARC LENGTH, ANGULAR & LINEAR VELOCITY

Janie sits on a carousel 6 feet from the center.

==How far== has Janie travelled after three-quarters of one rotation?

Know: $r = 6$ feet & $\frac{3}{4}$ rotation

Need to find: arc length: $s = r\theta$ with θ in radians

$$\theta = \frac{3}{4} \text{ rotation } \times \frac{2\pi \text{ radians}}{\text{rotation}} = 1.5\pi \text{ radians}$$

$$s = r\theta = 6 \times 1.5\pi = 9\pi \approx 28.3 \text{ feet}$$

What is Janie's ==angular speed in radians per minute== if the carousel is moving at 5 revolutions per minute?

Know: $r = 6$ feet & $\omega = 5$ revolutions per minute

Need to find: angular speed, ω, in radians per minute

Convert revolutions into radians.

$$\omega = \frac{5 \text{ rev.}}{1 \text{ min.}} \times \frac{2\pi \text{ radians}}{1 \text{ rev.}} = 10\pi \text{ radians/minute}$$

What is Janie's ==linear speed in miles per hour==?

Know: $r = 6$ feet & $\omega = 10\pi$ radians/minute

Need to find: linear speed, v, in miles per hour; $v = r\omega$

Convert feet into miles AND minutes into hours.

$$v = r\omega = \left(6 \text{ feet} \times \frac{1 \text{ mile}}{5280 \text{ feet}} \right) \left(\frac{10\pi}{\text{min.}} \times \frac{60 \text{ min.}}{1 \text{ hour}} \right) = \frac{3600\pi}{5280} \approx 2.14 \text{ mph}$$

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1. The radius of a wheel rolling on the ground is 80 centimeters. If the wheel rotates through an angle of 60°, how many centimeters does it move?

2. Heather flashes a flashlight and turns in a circle in a constant speed. If Heather's flashlight completes one rotation (revolution) every 15 seconds, what is the angular speed of the light coming from the flashlight in radians per minute?

3. A wheel with a diameter of 10 inches rotates at a constant rate of 2 revolutions per second. Find the linear speed of the wheel in miles per hour.

4. Brie wants to jump on a moving carousel with a diameter of 50 feet and traveling at 3 revolutions per minute. How fast must Brie run to match the carousel's speed to jump on (in feet per second)? *Find linear speed.*