4.1BHW Answers

Tuesday, September 26, 2017 12:08 PM

75. 6 revolutions per second

$$= \frac{6 \text{ revolutions}}{1 \text{ second}} \cdot \frac{2\pi \text{ radians}}{1 \text{ revolutions}} = \frac{12\pi \text{ radians}}{1 \text{ seconds}}$$

$$= 12\pi \text{ radians per second}$$

76. 20 revolutions per second

$$= \frac{20 \text{ revolutions}}{1 \text{ second}} \cdot \frac{2\pi \text{ radians}}{1 \text{ revolution}} = \frac{40\pi \text{ radians}}{1 \text{ second}}$$

$$= 40\pi \text{ radians per second}$$

90. The distance that the tip of the minute hand moves is given by its arc length, s. Since $s = r\theta$, we begin by finding r and θ. We are given that $r = 6$ inches. The minute hand moves from 12 to 4 o'clock, or $\frac{1}{3}$ of a complete revolution. The formula $s = r\theta$ can only be used when θ is expressed in radians. We must convert $\frac{1}{3}$ revolution to radians.

$$\frac{1}{3} \text{ revolution} = \frac{1}{3} \text{revolution} \cdot \frac{2\pi \text{ radians}}{1 \text{ revolution}}$$

$$= \frac{2\pi}{3} \text{ radians}$$

The distance the tip of the minute hand moves is

$$s = r\theta = (6 \text{ inches})\left(\frac{2\pi}{3}\right) = \frac{12\pi}{3} \text{ inches}$$

$$= 4\pi \text{ inches} \approx 12.57 \text{ inches.}$$

92. The distance that the wheel moves is given by $s = r\theta$. We are given that $r = 80$ centimeters and $\theta = 60°$. The formula $s = r\theta$ can only be used when θ is expressed in radians.

$$60° = 60° \cdot \frac{\pi \text{ radians}}{180°} = \frac{60\pi}{180} \text{ radians}$$

$$= \frac{\pi}{3} \text{ radians}$$

The length that the wheel moves is

$$s = r\theta = (80 \text{ centimeters})\left(\frac{\pi}{3}\right) = \frac{80\pi}{3} \text{ centimeters}$$

$$\approx 83.78 \text{ centimeters.}$$

97. Linear speed is given by $v = r\omega$. We are given that $\omega = \frac{\pi}{12}$ radians per hour and $r = 4000$ miles. Therefore,

$$v = r\omega = (4000 \text{ miles})\left(\frac{\pi}{12}\right)$$

$$= \frac{4000\pi}{12} \text{ miles per hour}$$

$$\approx 1047 \text{ miles per hour}$$

The linear speed is about 1047 miles per hour.

98. Linear speed is given by $v = r\omega$. We are given that $r = 25$ feet and the wheel rotates at 3 revolutions per minute. We need to convert 3 revolutions per minute to radians per minute.

3 revolutions per minute

$$= 3 \text{ revolutions per minute} \cdot \frac{2\pi \text{ radians}}{1 \text{ revolution}}$$

$$= 6\pi \text{ radians per minute}$$

$$v = r\omega = (25 \text{ feet})(6\pi) \approx 471 \text{ feet per minute}$$

The linear speed of the Ferris wheel is about 471 feet per minute.

99. Linear speed is given by $v = r\omega$. We are given that $r = 12$ feet and the wheel rotates at 20 revolutions per minute.

20 revolutions per minute

$$= 20 \text{ revolutions per minute} \cdot \frac{2\pi \text{ radians}}{1 \text{ revolution}}$$

$$= 40\pi \text{ radians per minute}$$

$$v = r\omega = (12 \text{ feet})(40\pi)$$

$$\approx 1508 \text{ feet per minute}$$

The linear speed of the wheel is about 1508 feet per minute.

100. Begin by converting 2.5 revolutions per minute to radians per minute.

2.5 revolutions per minute

$$= 2.5 \text{ revolutions per minute} \cdot \frac{2\pi \text{ radians}}{1 \text{ revolution}}$$

$$= 5\pi \text{ radians per minute}$$

The linear speed of the animals in the outer rows is

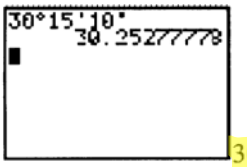
$$v = r\omega = (20 \text{ feet})(5\pi) \approx 100 \text{ feet per minute}$$

The linear speed of the animals in the inner rows is

$$v = r\omega = (10 \text{ feet})(5\pi) \approx 50 \text{ feet per minute}$$

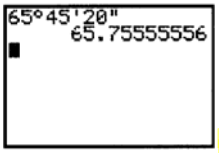
The difference is $100\pi - 50\pi = 50\pi$ feet per minute or about 157.08 feet per minute.

113.



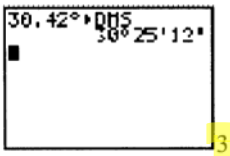
30.25°

114.



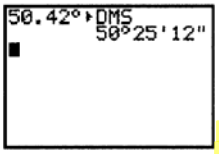
65.76°

115.



30° 25'12"

116.



50° 25' 12"

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