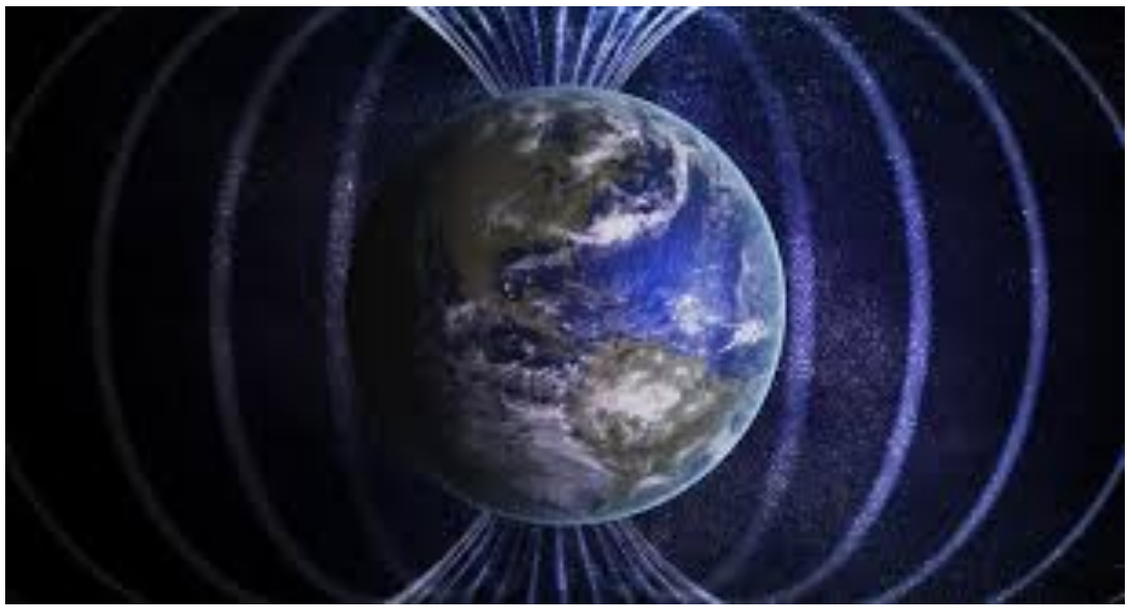
Fun Physics Fact of the Day

Magnetic field strength is measured in Tesla (T) or gauss (G).

The strength of the earth's magnetic field is 0.5 G.

The strength of a horseshoe magnet is 200 G.



Another projectile motion problem

An artillery shell is launched with an initial speed of 130 m/s at an angle of 35° above the horizontal. Ten seconds later, the shell hits its target on an elevated bluff.

How tall is the bluff?

What is the impact speed?

What is the angle of impact? (measured from the vertical)

Another projectile motion problem

An artillery shell is launched with an initial speed of 130 m/s at an angle of 35° above the horizontal. Ten seconds later, the shell hits its target on an elevated bluff.

How tall is the bluff?

746 m

What is the impact speed?

What is the angle of impact? (measured from the vertical)

Another projectile motion problem

An artillery shell is launched with an initial speed of 130 m/s at an angle of 35° above the horizontal. Ten seconds later, the shell hits its target on an elevated bluff.

How tall is the bluff?

746 m

What is the impact speed?

109 m/s

What is the angle of impact? (measured from the vertical)

Another projectile motion problem

An artillery shell is launched with an initial speed of 130 m/s at an angle of 35° above the horizontal. Ten seconds later, the shell hits its target on an elevated bluff.

How tall is the bluff?

746 m

What is the impact speed?

109 m/s

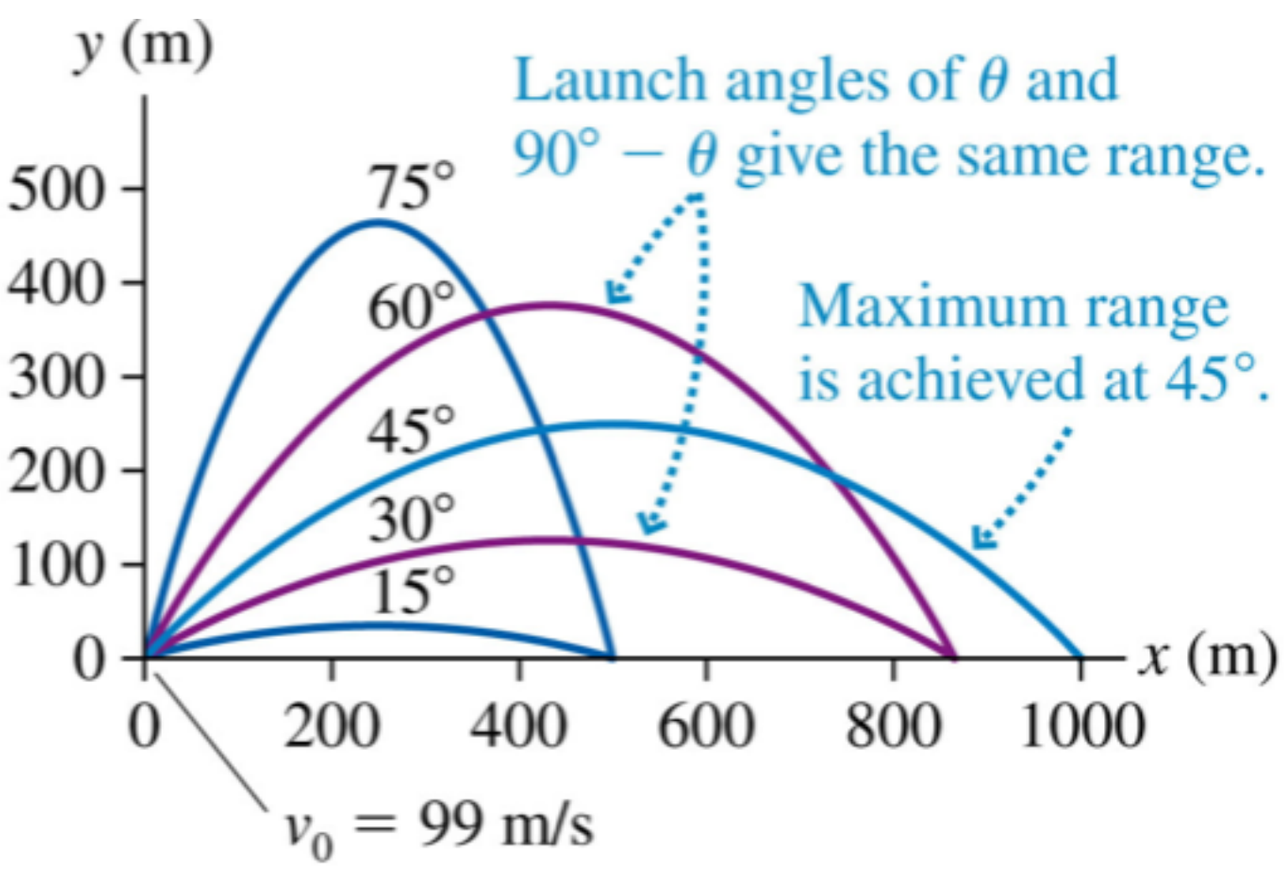
What is the angle of impact? (measured from the vertical)

78°

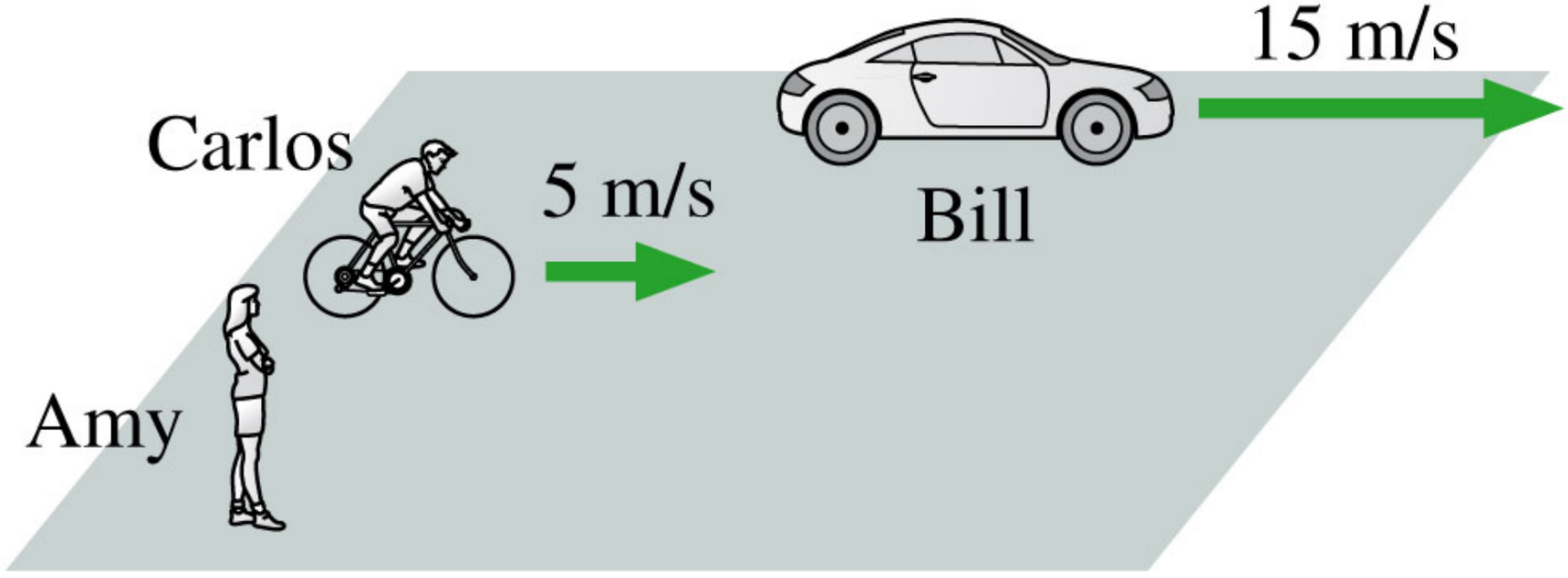
Range of projectile

$$R = \frac{v_0^2 \sin(2\theta)}{g}$$

When the initial height is the same as the final height.



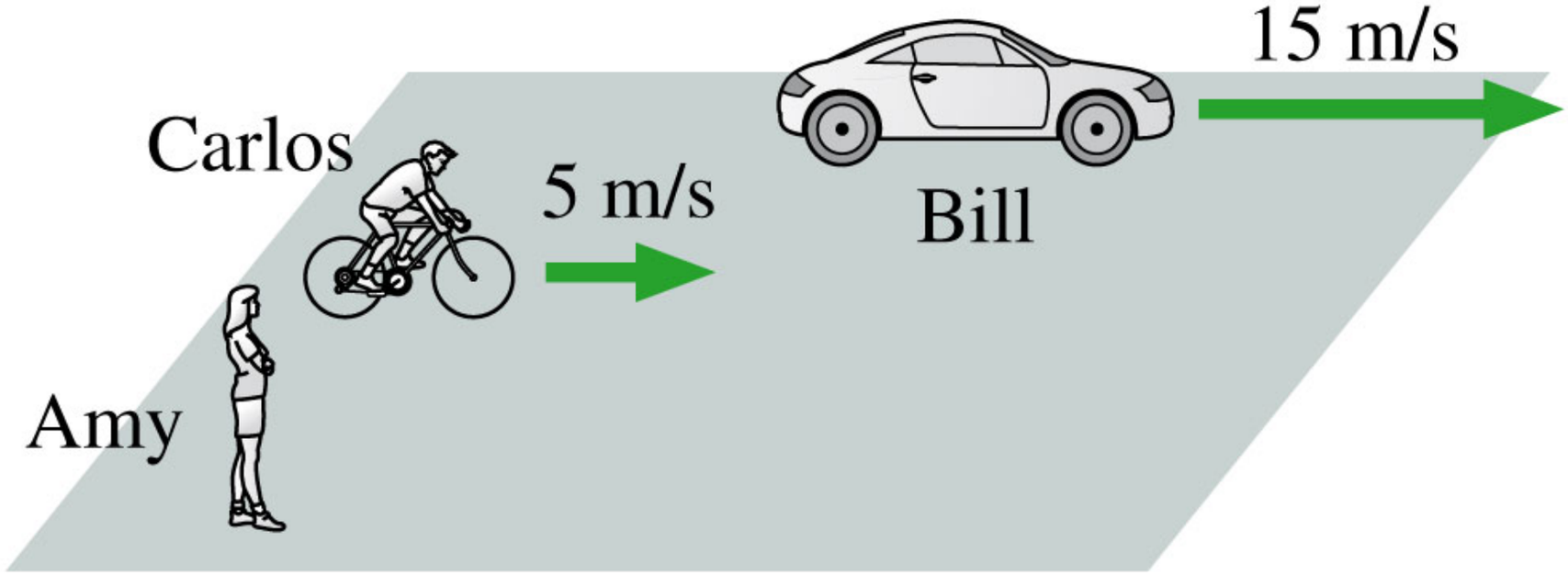
Relative Motion **Question #10**



What is Carlos's speed as measured by Bill (v_{CB})?

a)+15 m/s
b) - 15 m/s
c) +10 m/s
d) +5 m/s
e) -10 m/s

Relative Motion **Question #11**



What is Amy's speed as measured by Bill (v_{AB})?

a)+15 m/s
b) - 10 m/s
c) +10 m/s
d) -15 m/s
e) +5 m/s

Reference Frames **Question #12**

$$\vec{v}_{CB} = \vec{v}_{CA} + \vec{v}_{AB}$$

What is C's velocity (red car) as measured by B (green car)?

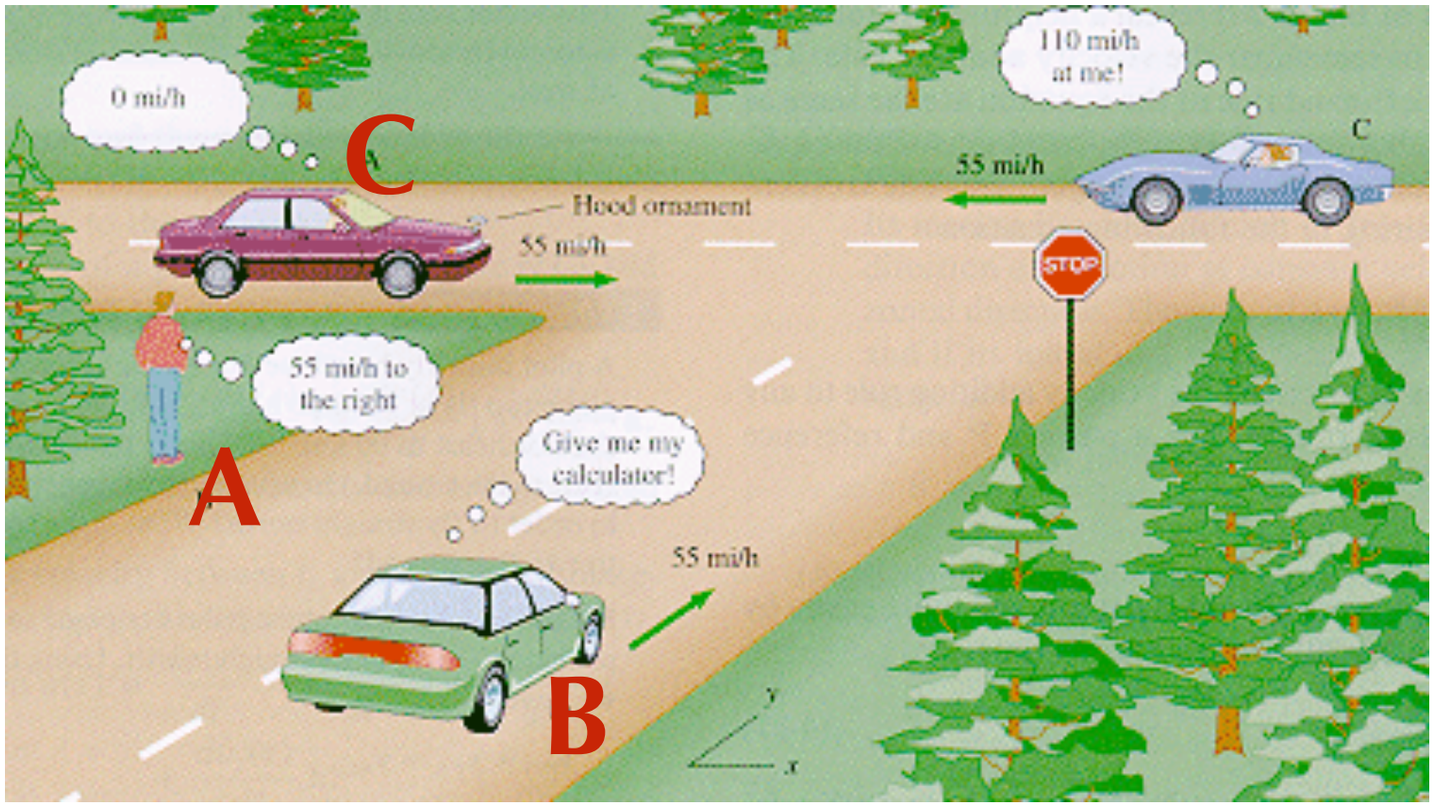
a) $(-55\ \hat{i} - 55\ \hat{j})$ mph

b) $(-55\ \hat{i} + 55\ \hat{j})$ mph

c)

d) $(55\ \hat{i} + 55\ \hat{j})$ mph

e) $(55\ \hat{i} - 55\ \hat{j})$ mph



Relative motion applet

Circular Motion **Question #13**

What is the meaning of the word period (T)?

a) The time it takes for an object to turn through **<u>one full radian</u>**.
b) The time it takes for an object to make **<u>one full revolution.</u>**
c) .
d) The time it takes to travel through 90 degrees.
e) The distance a particle travels during one full revolution.

Angular Velocity

ωuestion #14

b)

$$\omega = \frac{1}{T} \text{ revs/min}$$

$$\omega = \frac{2\pi}{T} \text{ rads/min}$$

a)

c)

$$\omega = \frac{T}{2\pi} \text{ revs/min}$$

d) a) and b) are both correct

e) a) and c) are both correct.

Angular Velocity ω Question #14

If the ferris wheel makes one full revolution in T minutes, which expression below is a correct?

b)

$$\omega = \frac{1}{T} \text{ revs/min}$$

$$\omega = \frac{2\pi}{T} \text{ rads/min}$$

a)

c)

$$\omega = \frac{T}{2\pi} \text{ revs/min}$$

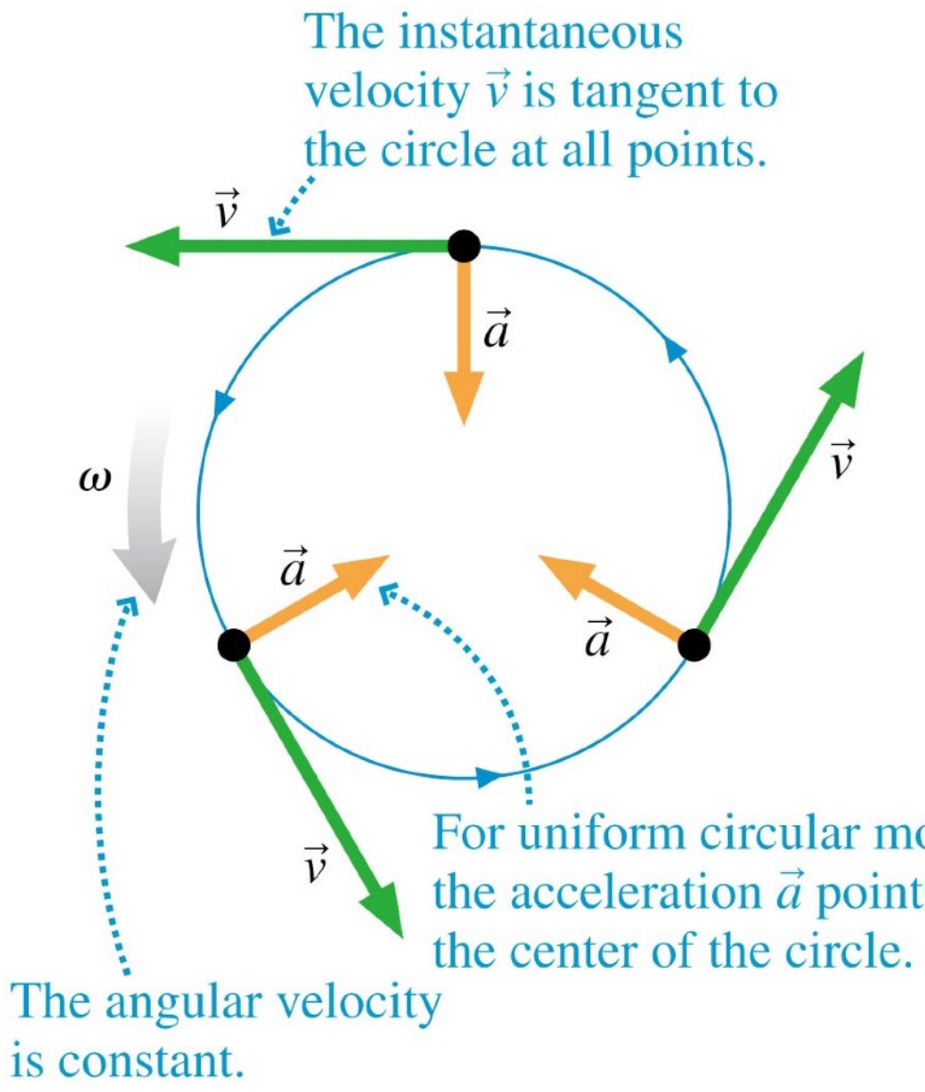
d) a) and b) are both correct

e) a) and c) are both correct.

Tangential Velocity

Question #15

a) 0.0628 meters/min
b) 6.28 meters/sec
c) 62.8 meters/sec
d) 0.0628 meters/ sec
e) a) and b) are both correct.

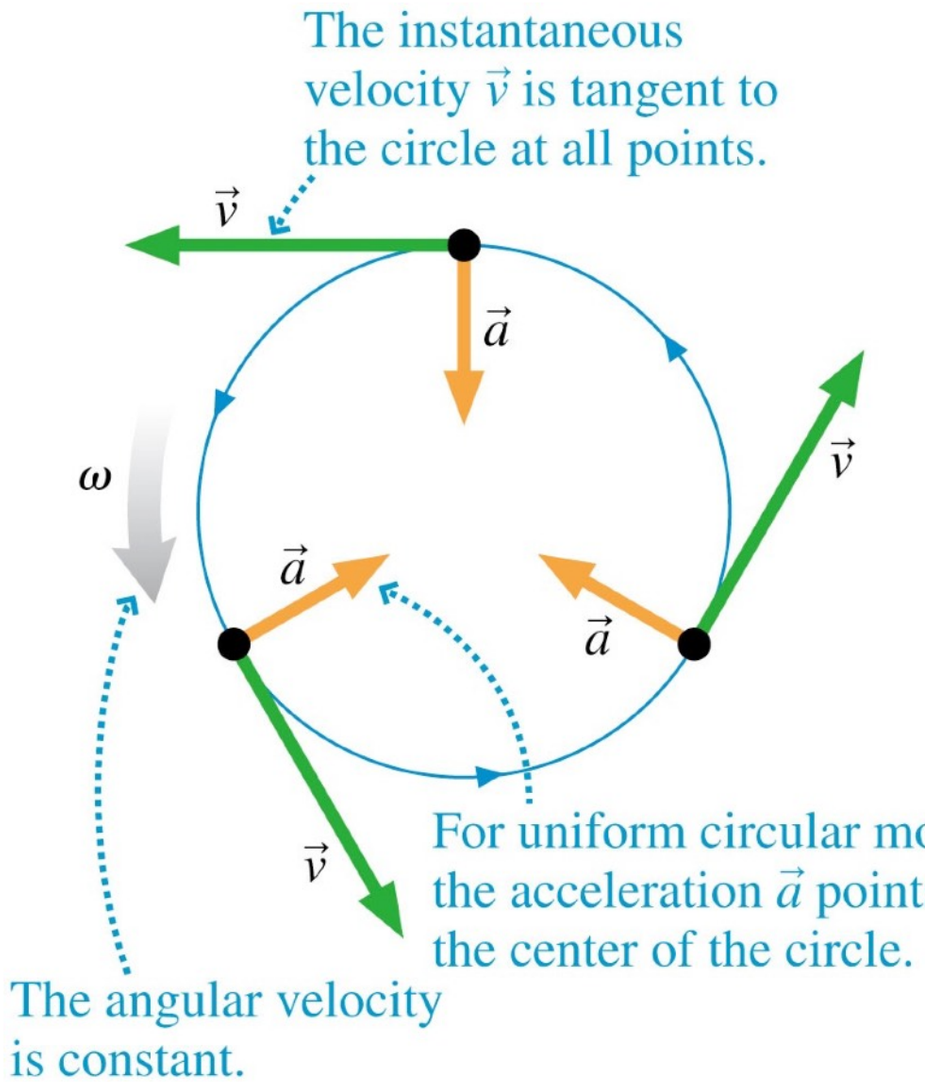


Tangential Velocity

Question #15

A wheel is spinning with a period of 10 sec. What is the speed of point on the wheel, 10 cm away?

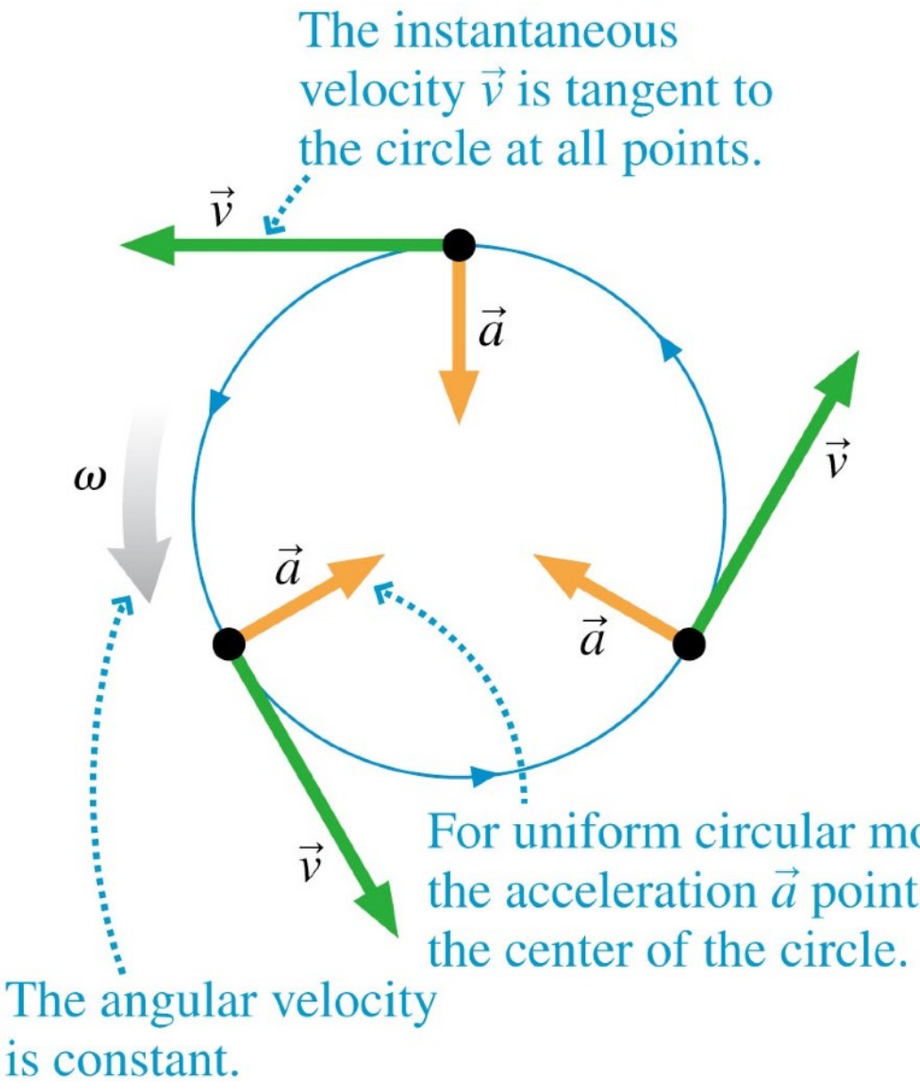
a) 0.0628 meters/min
b) 6.28 meters/sec
c) 62.8 meters/sec
d) 0.0628 meters/ sec
e) a) and b) are both correct.



Tangential Velocity

Question #16

a) 50 meters/min
b) 314 meters/min
c) d) and e) are both correct.
d) 0.0524 meters/ s
e) 3.14 meters/min

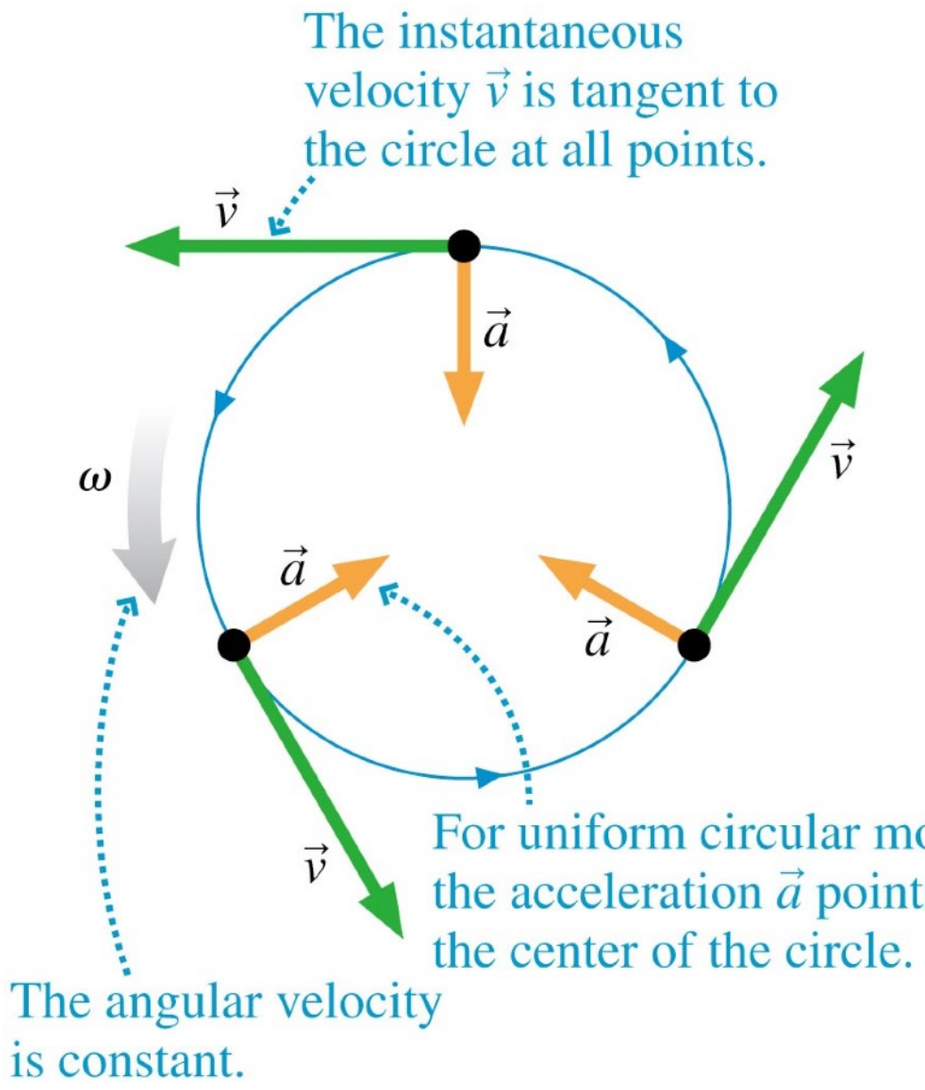


Tangential Velocity

Question #16

A wheel is spinning at a rate of 5 rpm. What is the speed of a point on the wheel, 10 cm away?

a) 50 meters/min
b) 314 meters/min
c) d) and e) are both correct.
d) 0.0524 meters/ s
e) 3.14 meters/min



After setting this wheel in motion you measure that it takes 10 s to make 15 revolutions. Find the tangential velocity v_t of a point on the rim, the angular velocity ω and the period T.

Question #17

v_t

a) 1.89 meters/sec
b) 0.13 meters/sec
c) 1.89 meters/min
d) 0.13 meters/ sec
e) b) and c) are both correct.

Question #18

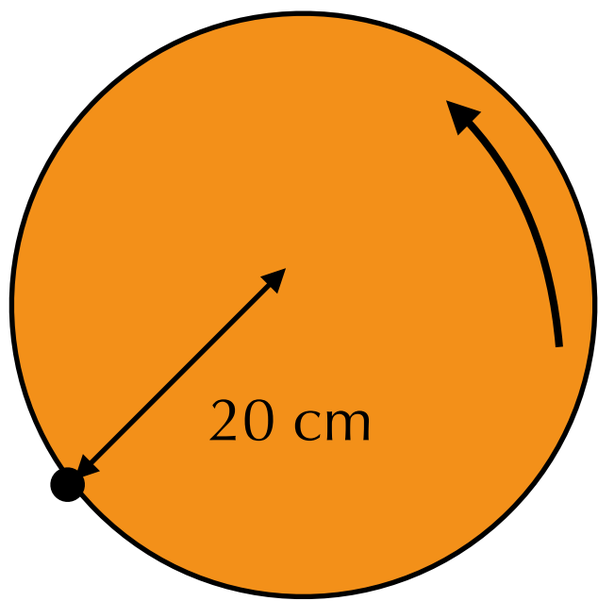
ω

a) 0.63 rads/min
b) 0.63 rads/sec
c) 9.42 rads/sec
d) 9.42 rads/ min
e) a) and d) are both correct.

Question #19

T

a) 0.667 min
b) 0.667 s
c) 1.5 s
d) 1.5 min
e) a) and b) are both correc



Angular	Tangential
θ	s
ω	v_t
α	a_t

Angular		Tangential
θ	rads revs degrees	s
ω		v_t
α		a_t

Angular		Tangential
θ	rads revs degrees	s
ω	$\frac{\text{rads}}{\text{s}}$ $\frac{\text{revs}}{\text{s}}$ $\frac{\text{degrees}}{\text{s}}$	v_t
α		a_t

Angular			Tangential
θ	rads	revs degrees	s
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$ $\frac{\text{degrees}}{\text{s}}$	v_t
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$ $\frac{\text{degrees}}{\text{s}^2}$	a_t

Angular			Tangential		
θ	rads	revs	degrees	s	m	cm	km
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$	$\frac{\text{degrees}}{\text{s}}$	v_t			
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$	$\frac{\text{degrees}}{\text{s}^2}$	a_t			

Angular			Tangential		
θ	rads	revs degrees	s	m	cm km
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$ $\frac{\text{degrees}}{\text{s}}$	v_t	m/s	cm/s km/s
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$ $\frac{\text{degrees}}{\text{s}^2}$	a_t		

Angular			Tangential		
θ	rads	revs	degrees	s	m	cm	km
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$	$\frac{\text{degrees}}{\text{s}}$	v_t	m/s	cm/s	km/s
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$	$\frac{\text{degrees}}{\text{s}^2}$	a_t	m/s^2	km/s^2	cm/s^2

Angular			Tangential		
θ	rads	revs	degrees	s	m	cm	km
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$	$\frac{\text{degrees}}{\text{s}}$	v_t	m/s	cm/s	km/s
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$	$\frac{\text{degrees}}{\text{s}^2}$	a_t	m/s^2	km/s^2	cm/s^2

How would you convert degrees/s^2 to m/s^2?

Angular			Tangential		
θ	rads	revs	degrees	s	m	cm	km
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$	$\frac{\text{degrees}}{\text{s}}$	v_t	m/s	cm/s	km/s
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$	$\frac{\text{degrees}}{\text{s}^2}$	a_t	m/s^2	km/s^2	cm/s^2

How would you convert degrees/s^2 to m/s^2?

How would you convert revs/s to m/s?

Angular			Tangential		
θ	rads	revs	degrees	s	m	cm	km
ω	$\frac{\text{rads}}{\text{s}}$	$\frac{\text{revs}}{\text{s}}$	$\frac{\text{degrees}}{\text{s}}$	v_t	m/s	cm/s	km/s
α	$\frac{\text{rads}}{\text{s}^2}$	$\frac{\text{revs}}{\text{s}^2}$	$\frac{\text{degrees}}{\text{s}^2}$	a_t	m/s^2	km/s^2	cm/s^2

How would you convert degrees/s^2 to m/s^2?

How would you convert revs/s to m/s?

$$s = \theta r$$

$$v_t = \omega r$$

$$a_t = \alpha r$$

Question #20

This is the angular velocity graph of a wheel. How many revolutions does the wheel make in 4s?

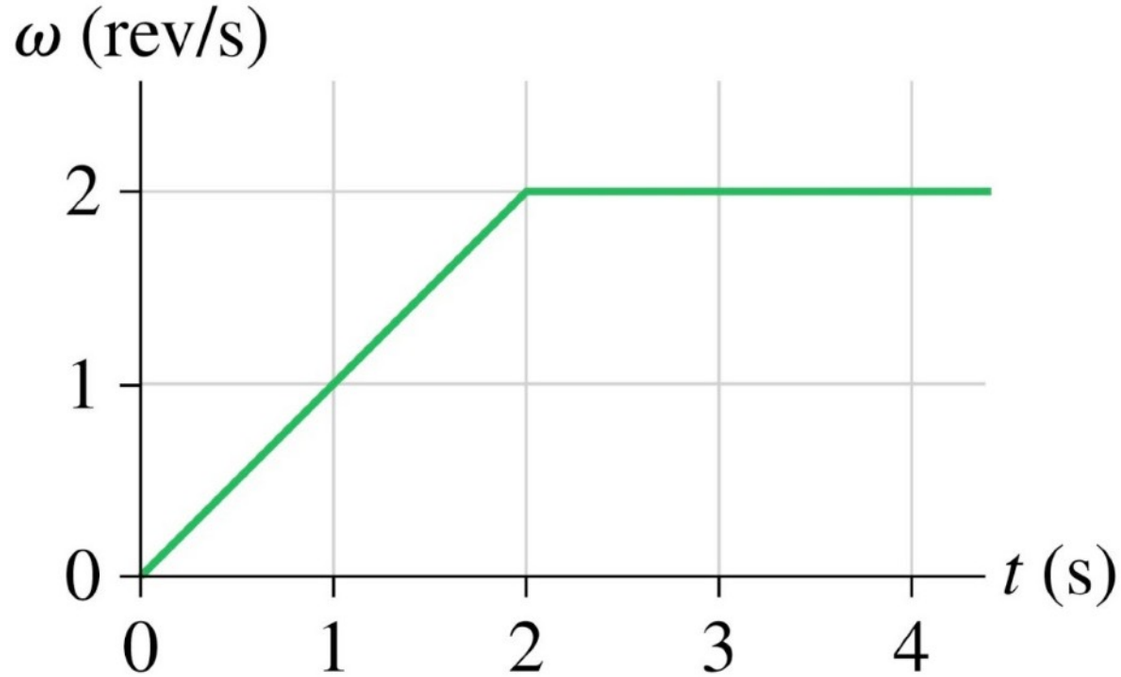
a) 1

b) 8

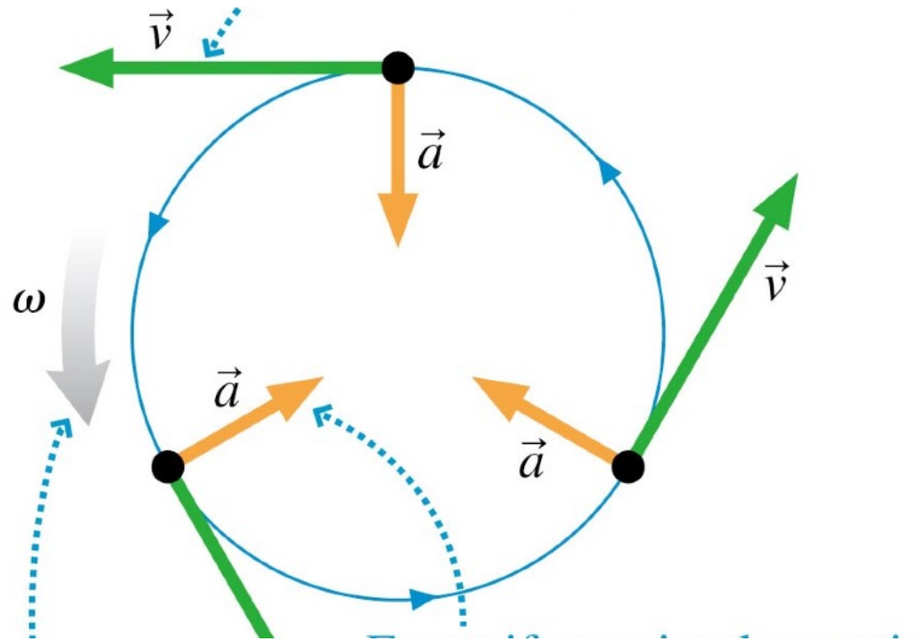
c) 2

d) 4

e) 6

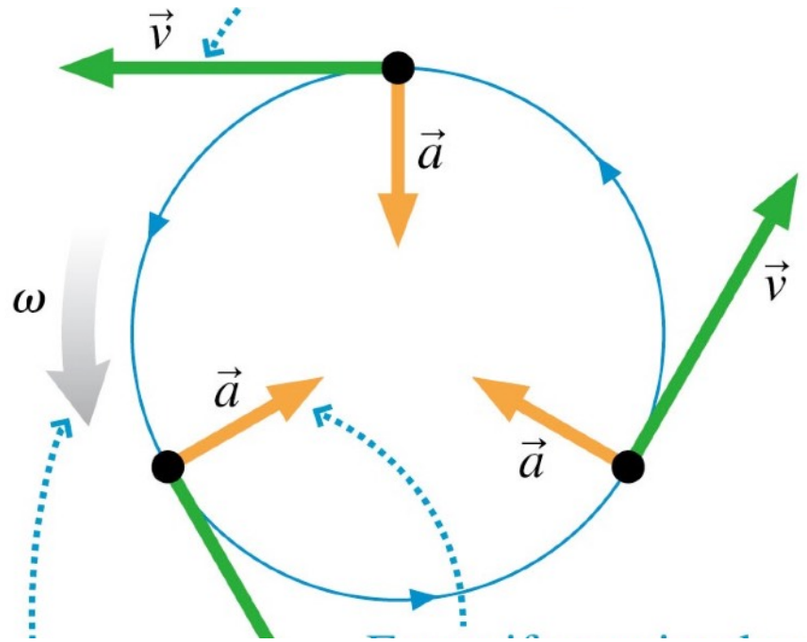


Centripetal Acceleration



Human centrifuge

Centripetal Acceleration

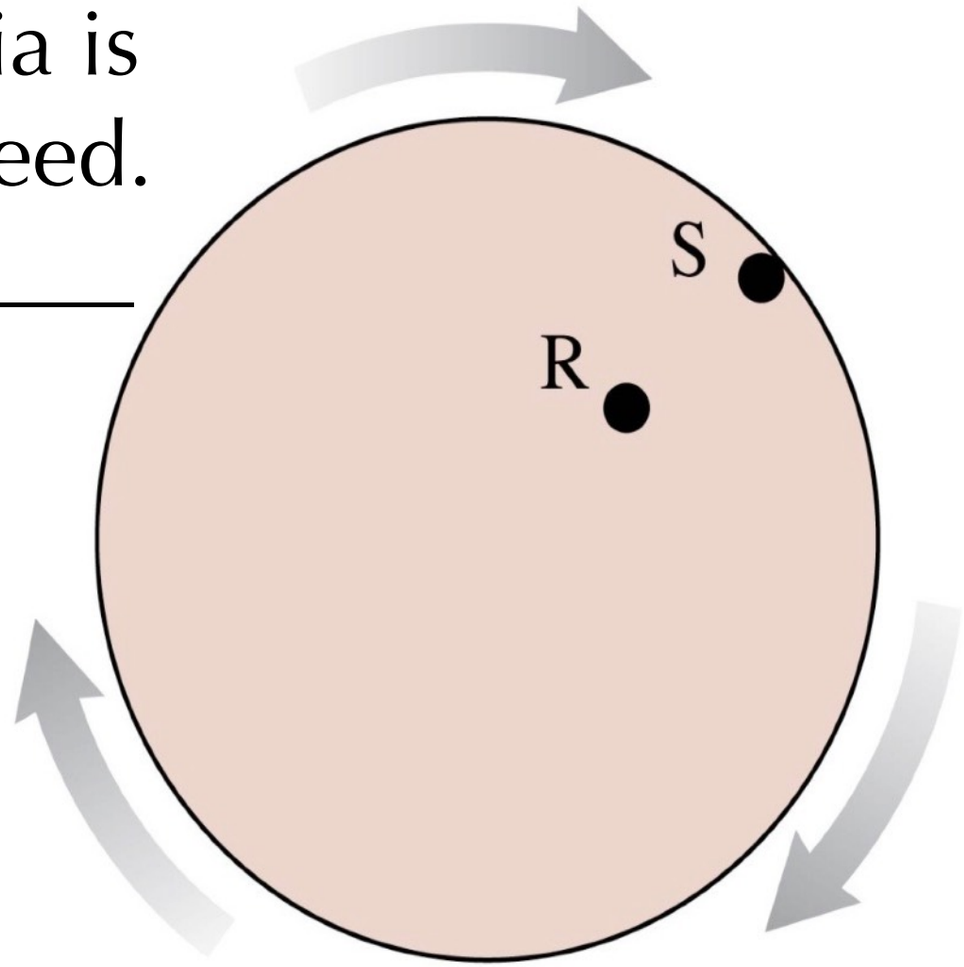


Human centrifuge

$$\vec{a} = \frac{v^2}{r} \text{ toward center of circle}$$

Question #21

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's angular velocity is _____ that of Rasheed.



a) the same as

b) four times

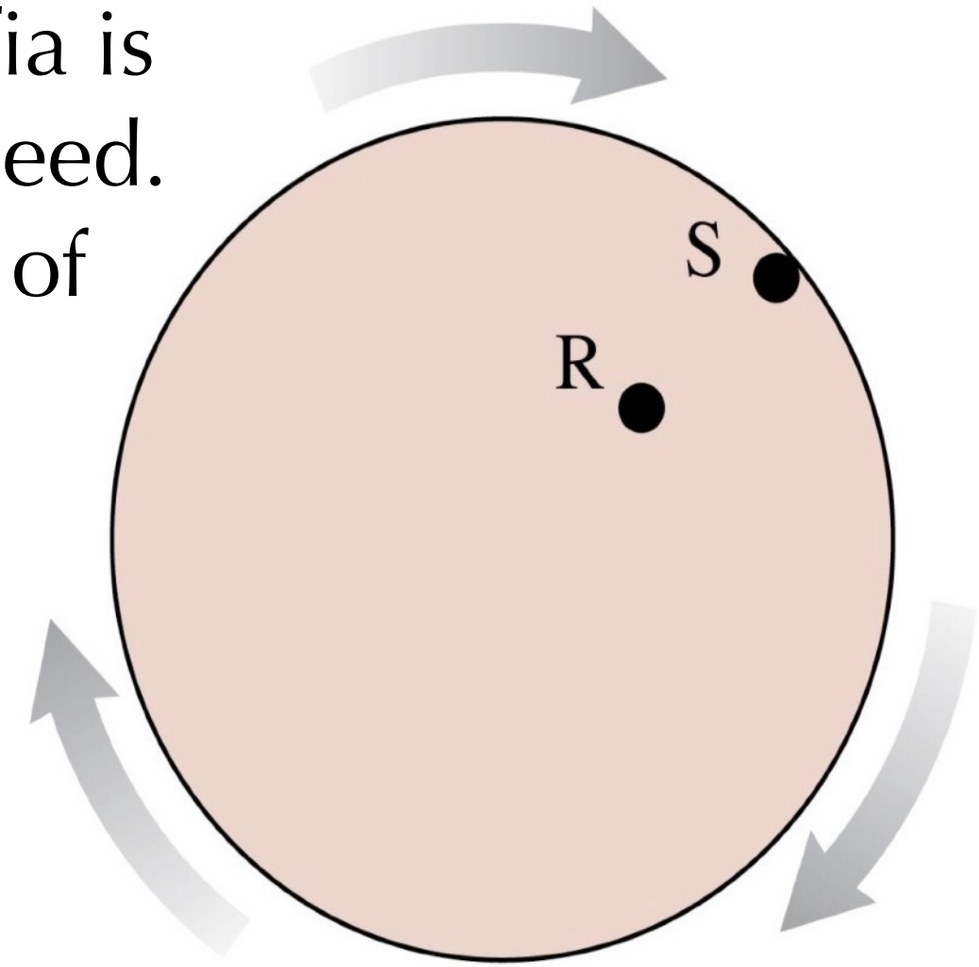
c) twice

d) half

e) We can't say

Question #22

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's speed is _____ that of Rasheed.



a) half

b) the same as

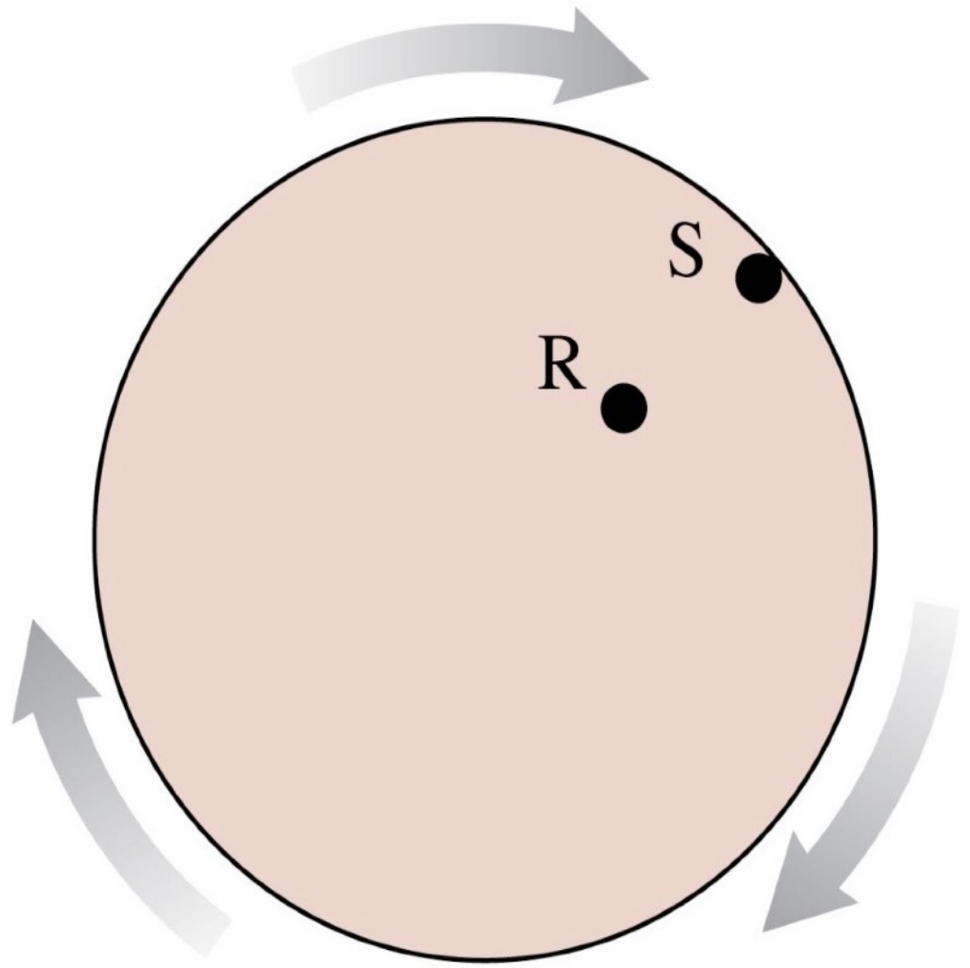
c) twice

d) four times

e) We can't say

Question #23

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's acceleration is _____ that of Rasheed.



a) half

b) the same as

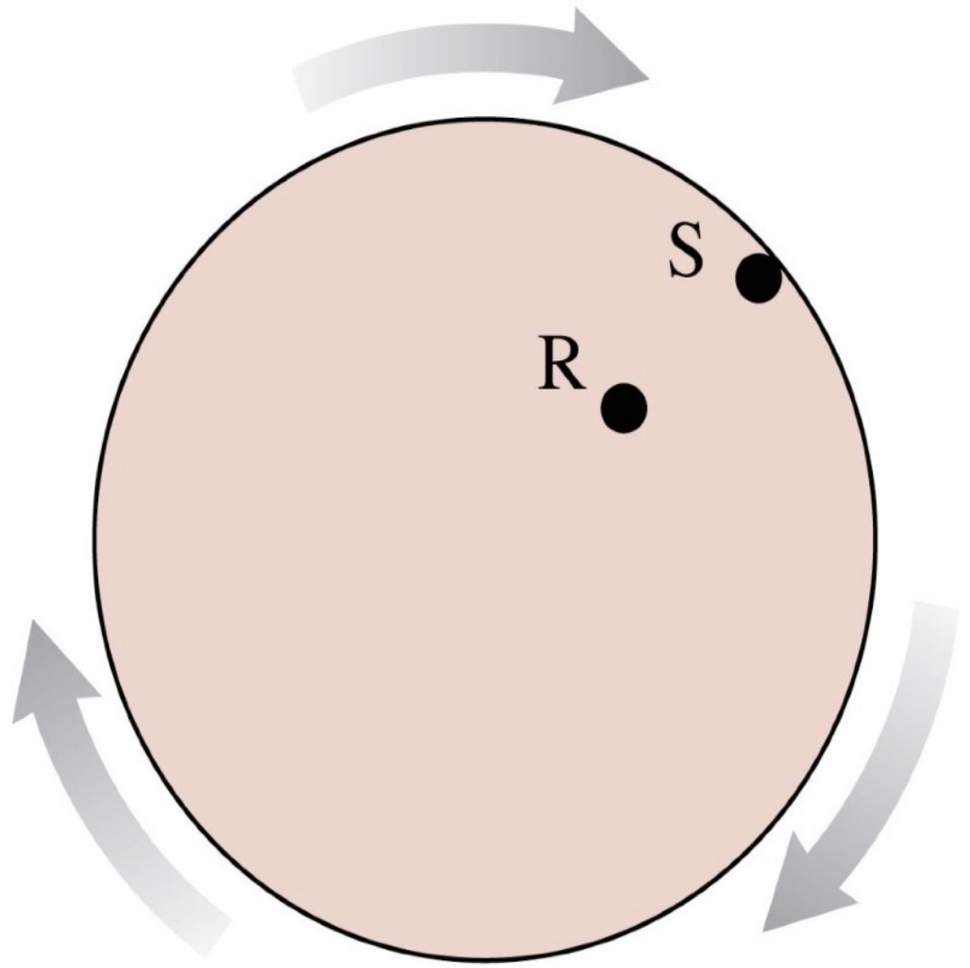
c) We can't say

d) four times

e) twice

Quiz

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's acceleration is _____ that of Rasheed.



a) half

b) the same as

c) We can't say

d) four times

e) twice

Centripetal acceleration $a = \frac{v^2}{r} = \omega^2 r$