Chapter 7

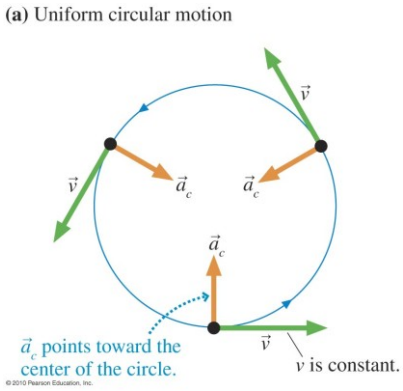
Rotational Motion

Take Home

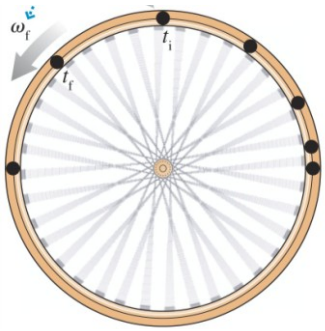
The take home portion of Exam 2 is posted and due Monday at the beginning of class.

Reading quiz Friday!

Turn in your Monday problem work for credit

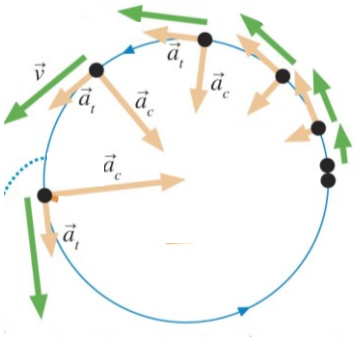


Angular acceleration



Draw what you think velocity, and centripetal acceleration will look like at several points if there's angular acceleration (assume speeding up)

Add what you think would represent the acceleration caused by the increasing rate of rotation.



Which symbol is which?

ω is?

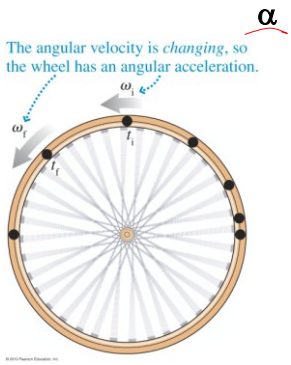
a. Velocity
b. Angular velocity
c. Centripetal acceleration
d. Angular acceleration
e. Tangential acceleration.

Which symbol is which?

a_c is?

a. Velocity
b. Angular velocity
c. Centripetal acceleration
d. Angular acceleration
e. Tangential acceleration.

Angular acceleration



$\alpha = \Delta\omega/\Delta t$

$a = \Delta v/\Delta t$

a_t

$a_t = \alpha r$

Which symbol is which?

α is?

a. Velocity
b. Angular velocity
c. Centripetal acceleration
d. Angular acceleration
e. Tangential acceleration.

Which symbol is which?

a_t is?

a. Velocity
b. Angular velocity
c. Centripetal acceleration
d. Angular acceleration
e. Tangential acceleration.

A ball on the end of a string swings in a horizontal circle once every second. State whether the **magnitude** of each of the following quantities is
A. zero,
B. constant (but not zero), or
C. changing.

Velocity
Angular velocity
Centripetal acceleration
Angular acceleration
Tangential acceleration.

A ball on the end of a string swings in a horizontal circle once every second. State whether the magnitude of **Velocity** is

A. zero,
B. constant (but not zero), or
C. changing.

A ball on the end of a string swings in a horizontal circle once every second. State whether the magnitude of **Angular Velocity** is

A. zero,
B. constant (but not zero), or
C. changing.

A ball on the end of a string swings in a horizontal circle once every second. State whether the magnitude of **Centripetal Acceleration** is

A. zero,
B. constant (but not zero), or
C. changing.

A ball on the end of a string swings in a horizontal circle once every second. State whether the magnitude of **Angular Acceleration** is

A. zero,
B. constant (but not zero), or
C. changing.

A ball on the end of a string swings in a horizontal circle once every second. State whether the magnitude of **Tangential Acceleration** is

A. zero,
B. constant (but not zero), or
C. changing.

Linear	**Angular**
Δx – displacement	$\Delta\theta$ - angular displacement
v – velocity	ω – angular velocity (omega)
$v = \Delta x/\Delta t$	$\omega = \Delta\theta/\Delta t$
——— $v = \omega r$ ———	
	$a_c = v^2/r = \omega^2 r$
$F = ma$	$F = ma = m\ v^2/r = m\ \omega^2 r$

Linear	**Angular**
Δx – displacement	$\Delta\theta$ - angular displacement
v – velocity	ω – angular velocity (omega)
$v = \Delta x/\Delta t$	$\omega = \Delta\theta/\Delta t$
——— $v = \omega r$ ———	
	$a_c = v^2/r = \omega^2 r$
$F = ma$	$F = ma = m\ v^2/r = m\ \omega^2 r$
$a = \Delta v/\Delta t$	$\alpha = \Delta\omega/\Delta t$
——— $a_t = \alpha r$ ———	

Rotational Kinematics

Linear motion	**Circular Motion**
$x_f = x_i + v_{xi}\Delta t + \frac{1}{2} a_x(\Delta t)^2$	$\theta_f = \theta_i + \omega_i\Delta t + \frac{1}{2} \alpha(\Delta t)^2$
$v_{xf} = v_{xi} + a_x \Delta t$	$\omega_f = \omega_i + \alpha \Delta t$
$v_{xf}^2 = v_{xi}^2 + 2a_x (\Delta x)$	$\omega_f^2 = \omega_i^2 + 2\alpha (\Delta\theta)$

Can apply linear to circular motion.

How can you use the equations on the left to analyze circular motion?

Problem

Your roommate spins his bicycle wheel to test the fit after repairing the tire. It is rotating at 600 rpm after the initial push. If the push takes ½ a second,

a) what was the angular acceleration applied?
b) How many rotations did it complete while accelerating?