Name Date Period Score /

General Physics Circular Motion & Rotation Small Group Review Sheet 11

1. Find the number of revolutions of a toy car wheel of diameter 0.25-m when the bike goes a distance of 3.0-m down the street.

2. A piece of string is used to swing a 0.25 kg toy plane in a horizontal circle. The string will break if its force of tension exceeds 50.0-N.
   a. If the plane is swung in a horizontal circle at the end of a 0.50 m cord, how fast can the ball move before the cord breaks?

   b. If the plane is to be swung with a speed of 15 m/s, what is the shortest length of cord that can be used?

3. Jet Li and Mike Tyson are having a fight at a construction site. They end up on opposite ends of ta 50.0 kg uniform steal beam hanging from a rope tied in the middle. Mike Tyson is 89.6 kg and 3.7 m from the fulcrum. Jet Li is 67.3 kg and crouches 4.2 m from the fulcrum. If neither of the men move from this position, determine the net torque on the beam.

3. A spool of thread has an average diameter of 2.6 cm. The spool releases thread as it spins at 35 rpm for 8.0 minutes. A.) What is the tangential velocity magnitude at a point on the rim of the spool? B.) Through what angle does the spool spin? C.) What length of thread is released?

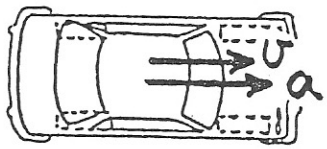
4. A 30. N force is applied to a 0.20 m long beam at its right end, at an angle of 65 degrees to the beam. Determine the torque caused about an axis perpendicular to the beam and through its left end.

Acceleration and Circular Motion

Newton's 2nd law, $a = F/m$, tells us that net force and its corresponding acceleration are always in the same direction. (Both force and acceleration are vector quantities). But force and acceleration are not always in the direction of velocity (another vector).

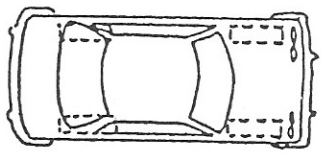
1. You're in a car at a traffic light. The light turns green and the driver "steps on the gas."
   a. Your body lurches (forward) (not at all) (backward).
   b. The car accelerates (forward) (not at all) (backward).
   c. The force on the car acts (forward) (not at all) (backward).

   The sketch shows the top view of the car. Note the directions of the velocity and acceleration vectors.



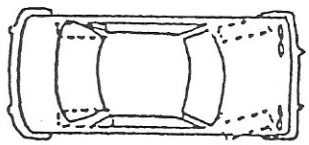
2. You're driving along and approach a stop sign. The driver steps on the brakes.
   a. Your body lurches (forward) (not at all) (backward).
   b. The car accelerates (forward) (not at all) (backward).
   c. The force on the car acts (forward) (not at all) (backward).

   The sketch shows the top view of the car. Draw vectors for velocity and acceleration.

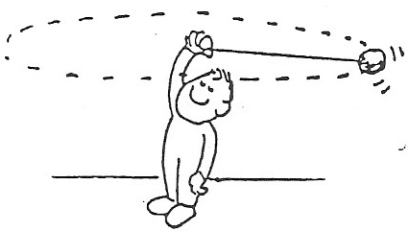


3. You continue driving, and round a sharp curve to the left at constant speed.
   a. Your body lurches (forward) (not at all) (backward).
   b. The direction of the car's acceleration is (inward) (not at all) (outward).
   c. The force on the car acts (inward) (not at all) (outward).

   Draw vectors for velocity and acceleration of the car.



4. In general, the directions of lurch and acceleration, and therefore the directions of lurch and force, are (the same) (not related) (opposite).



5. The whirling stone's direction of motion keeps changing.
   a. If it moves faster, its direction changes (faster) (slower).
   b. This indicates that as speed increases, acceleration (increases) (decreases) (stays the same).

6. Consider whirling the stone on a shorter string—that is, of smaller radius.
   a. For a given speed, the rate that the stone changes direction is (less) (more) (the same).
   b. This indicates that as the radius decreases, acceleration (increases) (decreases) (stays the same).

thanx to Jim Harper

Linear Angular Variable Analogs

Quantity or Description	Linear	Rotational (Angular)	Bridge
position			
displacement			
velocity	v	ω	$v = r\omega$
acceleration			
centripetal acceleration			
1st kinematic			
2nd kinematic	$\Delta x = v_i t + \frac{1}{2} a t^2$	$\Delta\theta = \omega_i t + \frac{1}{2} \alpha t^2$	NA
3rd kinematic			
Inertia			
Kinetic Energy			
The quantity that causes acceleration			
Newton's Second Law (acceleration format)			
Work			
Power			
Momentum (single particle)			
Momentum (system)			
Newton's Second Law (momentum format)			