Rotational Motion

1. Mark the ones that depend on radius (radius dependent).

    A) ____ ω C) ____ v_t E) ____ τ G) ___ θ
   B) ____ I   D) ____ α F) ____ s

2. Mark the ones that do not depend on radius (radius independent).

    A) ____ ω C) ____ v_t E) ____ τ G) ___ θ
    B) ____ I   D) ____ α F) ____ s

3. Use the graphic of the rotating platform at the right to answer the following .
    Answer: I (Inside wheels); O (outside wheels); N (neither or both).
    A) ____ Which has the greatest radius?
    B) ____ Which have the fastest tangential speed?
    C) ____ If it comes to rest, which have the fastest angular acceleration?
    D) ____ Which travels the least arc length?
    E) ____ Which has the smallest radius?
    F) ____ Which have the fastest angular speed?
    G) ____ As it starts rotating, which has the slowest tangential acceleration?
    H) ____ Which have the slowest tangential speed?
    I) ____ Which travel the greatest angular displacement?
    J) ____ Which have the slowest angular velocity?
    K) ____ When it slows, which have the greatest tangential acceleration?
    L) ___ Which travel the largest arc length?
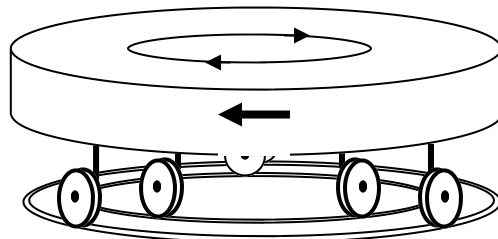
A platform turning clockwise.

4. A) Convert 3 revolutions to radians.   B) Convert 20 rpm (rev per min) to rad/sec.

*The following two columns are designed to help you see the correlations between linear and rotational quantities and equations. Remember that **all angles in the equations must be in radians!** Calculate out all numbers (don't leave as fractions).*

5. A car travels 240 meters in 12 seconds. Find the velocity of the car.	9. A wheel rotates 2 revolutions in 3 seconds. Find the angular velocity of the wheel.
6. A car going 300 m/s slows to 100 m/s in 10 seconds. Find the acceleration of the car.	10. A wheel spinning 8 rad/sec slows to 2 rad/sec in 3 seconds. Find the angular acceleration of the wheel.
7. A car going 20 m/s stops in 80 meters. How long did it take to stop?	11. A wheel turning 3 rev per second stops in 6 revolutions. How long did it take to stop?
8. A box sliding down a hill going 3 m/s accelerates at 2 m/s². How fast is going after 4 seconds?	12. A wheel turning 2 rad/sec accelerates at 3 rad/sec². How fast is it spinning after 5 seconds?

Rotational Motion 1

13. On a moving windshield wiper are two bugs at positions A and B (as shown at the right).
    A) If the windshield wiper travels 100° from side-to-side, how far does Bug A travel from one side to the other (arc length)?
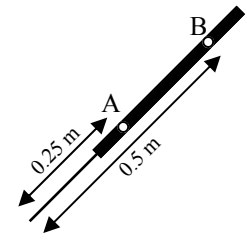
    B) How far does Bug B travel one side to the other?

    C) If it takes 1.2 seconds for the wiper to go side-to-side, find the angular speed of Bug A.

    D) Find the angular speed of Bug B.

    E) Find the tangential speed of Bug A.

    F) Find the tangential speed of Bug B.

14. A car turns a corner going 8 m/s. If the corner has a radius of 30 meters,
    A) Find the centripetal acceleration of the car.

    B) If the car is 1200 kg, find the centripetal force necessary to turn the corner.

    C) What gives the centripetal force to the car?

15. Why does a hollow cylinder roll to the bottom of a hill slower than a solid cylinder of equal radius and mass?
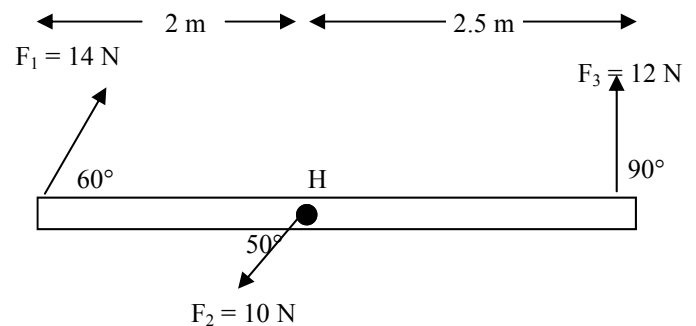
16. A) Find τ from F_1 (τ_1).

    B) Find τ_2.

    C) Find τ_3.

    D) Find the net torque.

    E) If $I = 6$ kgm^2 for the lever, find its angular acceleration.

17. An ice skater is spinning on the ice with their hands close to their body.
    A) What happens if they spread their arms out?

    B) Why?