Name _____

Rotation angle = $\Delta\theta = \frac{\Delta s}{r}$ where Δs is arc length along circle, $\Delta\theta$ measured in radians

2π radians = 1 revolution = 360°

Angular Velocity = "omega" = $\omega = \frac{\Delta\theta}{\Delta t}$ measured in radians/s

Relation between linear velocity (v) and angular velocity (ω): $v = \omega r$ or $\omega = \frac{v}{r}$

1. Is it possible for an object moving at a constant speed to be accelerating? **A**:No, **B**:Yes

   Can an object with a constant velocity be accelerating? **A**:No, **B**:Yes

2. What is π radians in revolutions?

3. How many radians are in 3 revolutions?

4. How many revolutions are in 100 radians?

5. If a bike tire spins 5 revolutions every minute, what is its angular speed in radians/second?

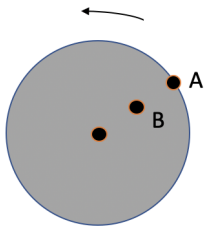
6. Points A and B are on a spinning disk. **A**, **B**, **C**: Both the same

   (a) Which point moves through a greater distance after a certain amount of time: Δs?

   (b) Which point turns through a greater angle, $\Delta\theta$?

   (c) Which point has the greater linear (tangential) speed, v?

   (d) Which point has the greater angular speed, ω?

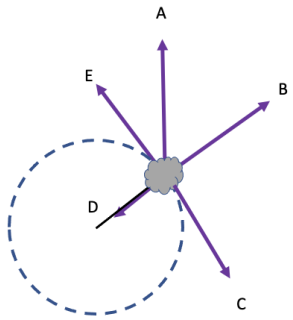


7. Suppose your tires have a radius of 0.3m and you go on a trip across the country for 8000km. How many times did your tires spin on that trip, i.e. how many revolutions did they make?

8. If you traveled an average speed of 32m/s on the trip, at what average angular speed were your tires rotating, in rad/s?

Centripetal acceleration: $a_c = \frac{v^2}{r} = \omega^2 r$, always points towards the center of the circle
Centripetal Force: $F_c = ma_c = m\frac{v^2}{r}$, the name for **any** net force (possibly a combination of forces) that point toward the center of a circle
Note that a force that points away from the center of the circle is a negative centripetal force

1. A stone attached to a rope swings in a circle at a constant speed. The circle represents the path of the rock looking down from above. Which of the vectors could represent the velocity of the stone?
   A, **B**, **C**, **D**, **E**, **?**: Multiple vectors
   Which could represent the acceleration?
   What force plays the role of the centripetal force on the rock? **A**: Weight of the rock, **B**: Normal Force, **C**: Tension in the rope
   If the rock has a mass of $2.5kg$ and moves at a speed of $2m/s$, and the rope is $0.5m$ long, what is the tension in the rope?



2. Find the centripetal acceleration a_c for a car following a curve of radius $500m$ at a speed of $29m/s$. (65mph). Express it in terms of g.

   What is the centripetal force keeping the car on the road? **A**:Weight, **B**:Normal Force, **C**: Static Friction, **D**:Kinetic Friction

3. Why are banked curves used in car racing and on highway exits?

4. Similar to the problem above, there is a maximum speed with which you can drive your car over a (round) bump without flying off the bump. In this case, draw the forces acting on the car at the top of the bump. If you just lose contact with the road, the Normal force is zero. What force, then, acts as the centripetal force? **A**: Weight, **B**: Normal Force: **C**: Normal Force - Weight, **D**: Weight - Normal Force, **E**: Friction

   If you don't travel that fast, what force(s) act as the centripetal force? **A**: Weight, **B**: Normal Force: **C**: Normal Force - Weight, **D**: Weight - Normal Force, **E**: Friction