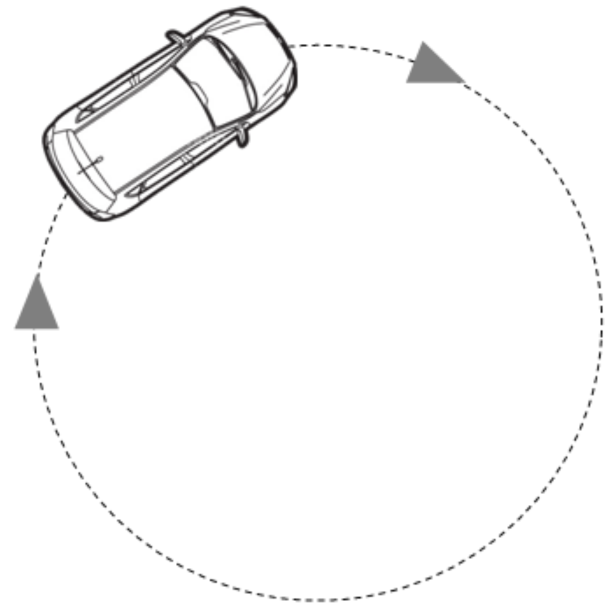
A car rounds a circle while maintaining a constant speed. At the instant shown below, is there an acceleration on the car as it rounds the curve?

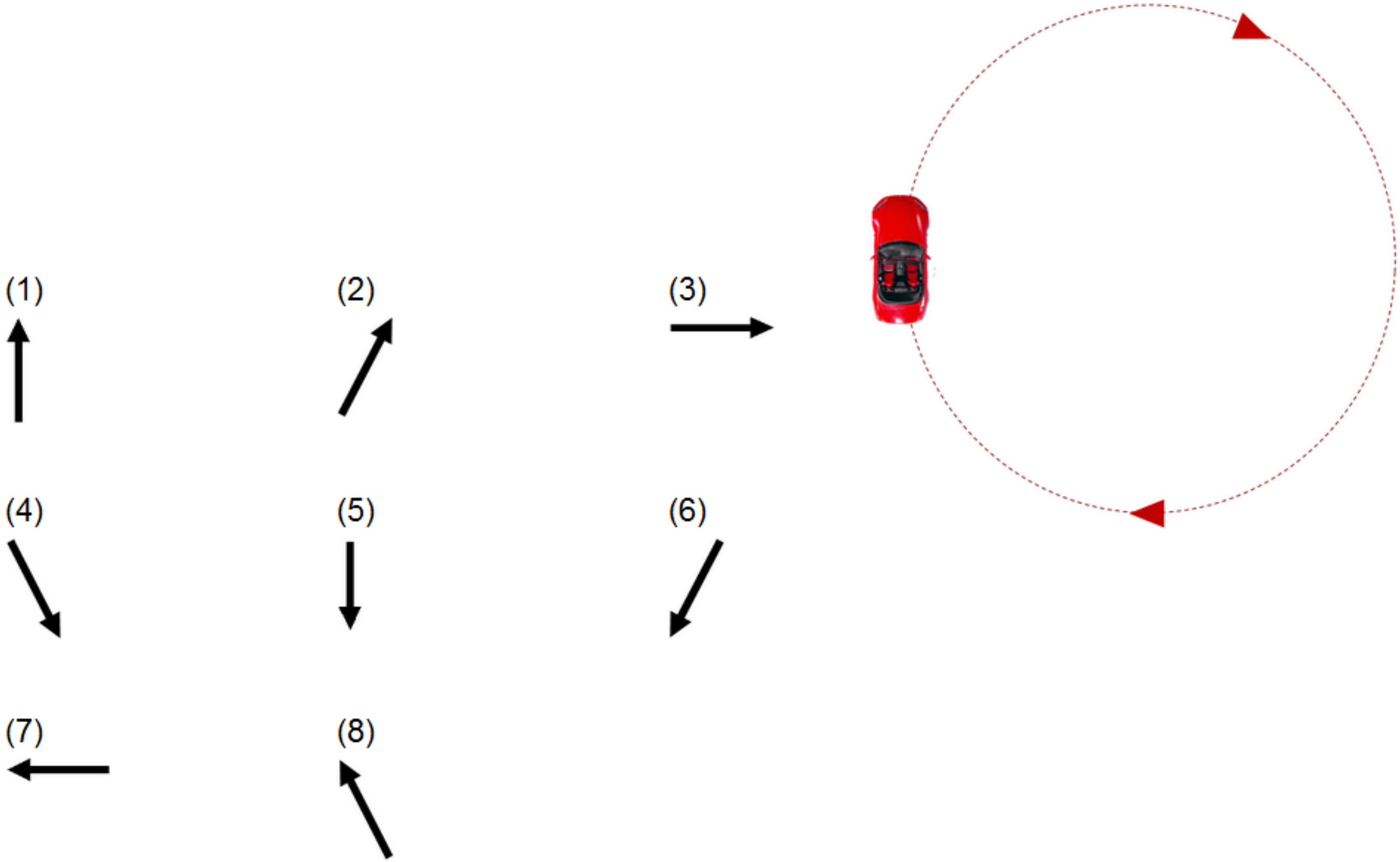


(1) No, because its speed is constant.

(2) Yes.

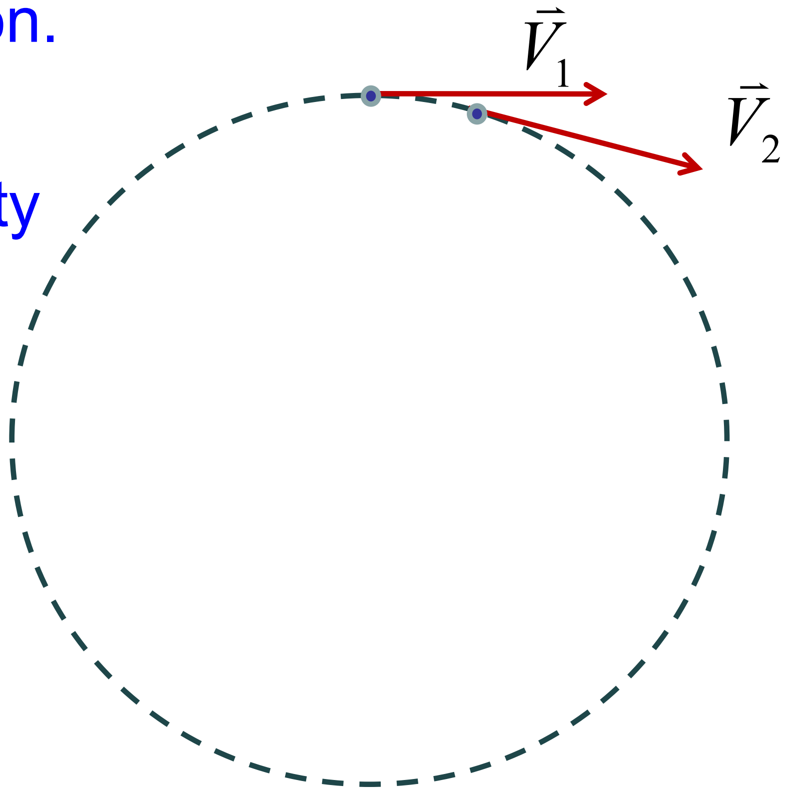
(3) Not enough information is given to answer this question.

A car rounds a circle while maintaining a constant speed. Which arrow represents the direction of the net force on the car as it rounds the curve at the instant shown in the figure?



How can you make an object move in a circle with a constant speed?

First, consider the velocity of the object moving in a uniform circular motion.

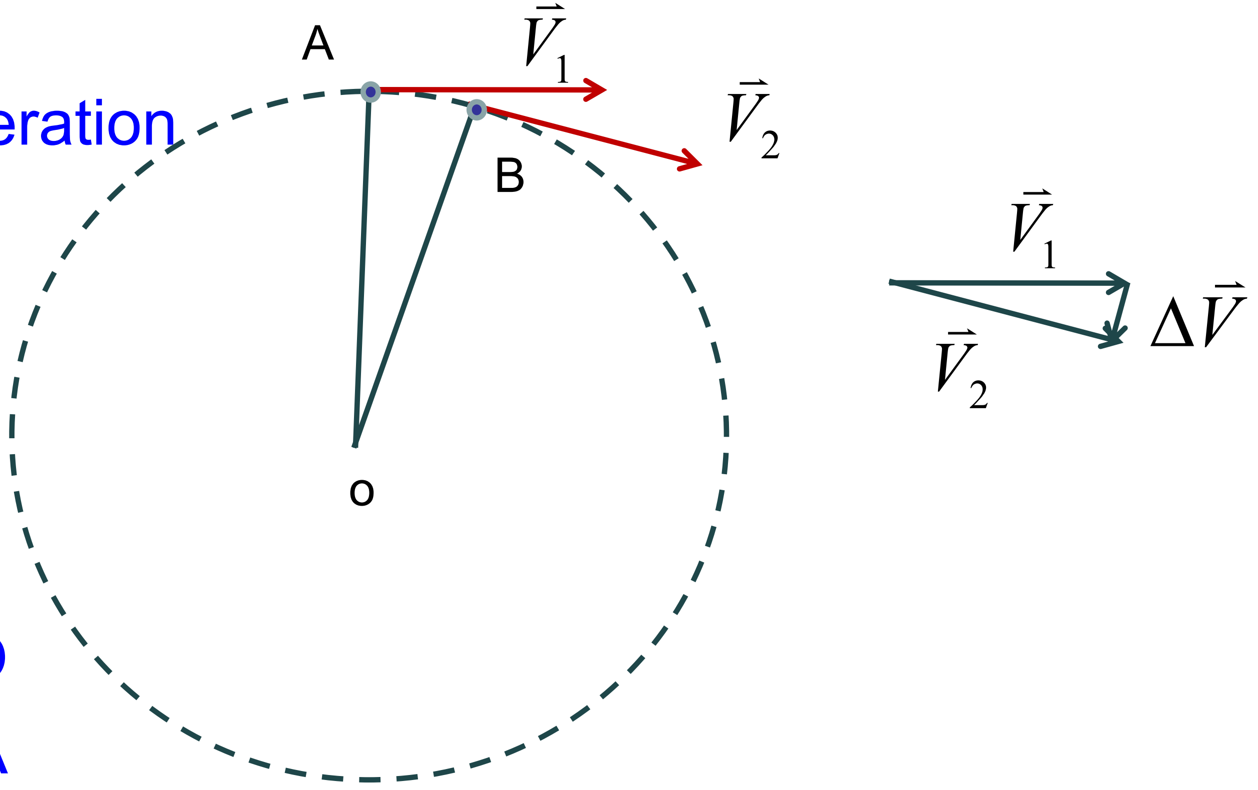


Does the velocity change?

How can you make an object move in a circle with a constant speed?

Now think about the change of velocity. Magnitude. Direction.

What is the acceleration at point A?



A. 0
B. >0 from A to O
C. >0 from O to A
D. Other – please specify

Magnitude doesn't change.

Direction changes.

$$\left|\Delta V\right| \approx V \cdot \theta \quad (when\ \theta\ is\ small)$$

$$V \cdot \Delta t \approx \theta \cdot r \quad (when\ \theta\ is\ small)$$

$$\theta \approx \frac{V \cdot \Delta t}{r}$$

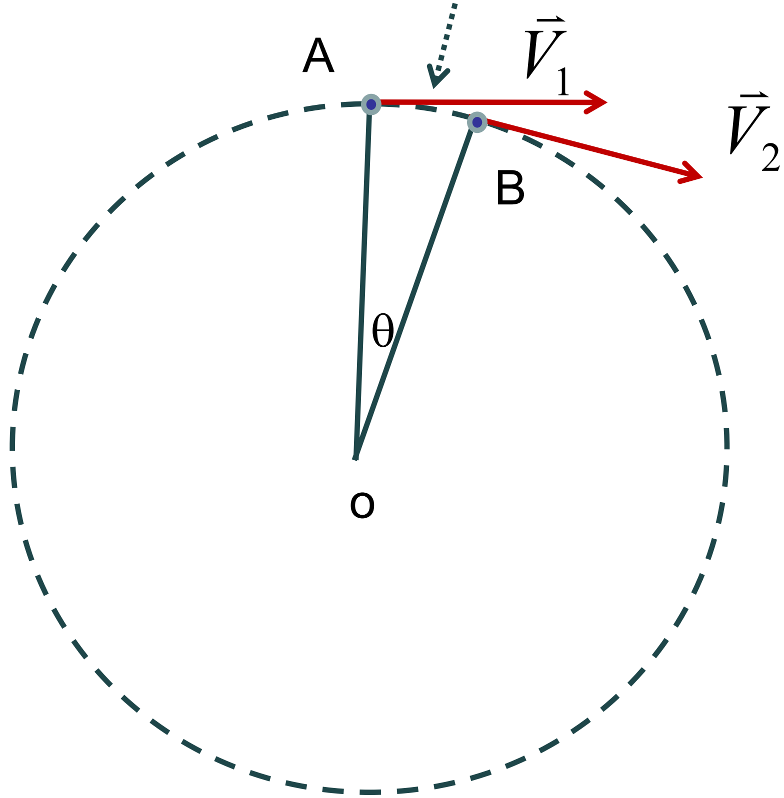
$$a\Delta t = \Delta V \approx V \cdot \theta$$

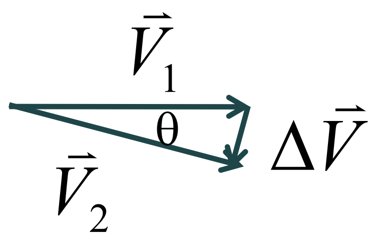
$$a = \frac{V \cdot \theta}{\Delta t}$$

$$a = \frac{V}{\Delta t} \cdot \frac{V \cdot \Delta t}{r}$$

$$a = \frac{V^2}{r}$$

$a_r = V^2/r$





[$\omega = d\theta/dt$, $r\omega = rd\theta/dt = d(r\theta)/dt) = ds/dt = V$]

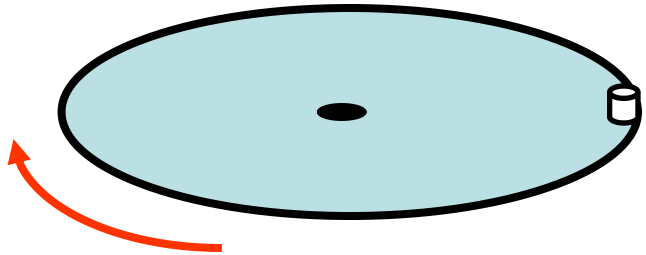
Any object moving with **uniform speed v** in a circle of radius r will experience an acceleration directed toward the center of that circle. The centripetal acceleration has a magnitude:

$$|\mathrm{a}| = \left(\frac{\mathrm{v}^2}{\mathrm{r}}\right)$$

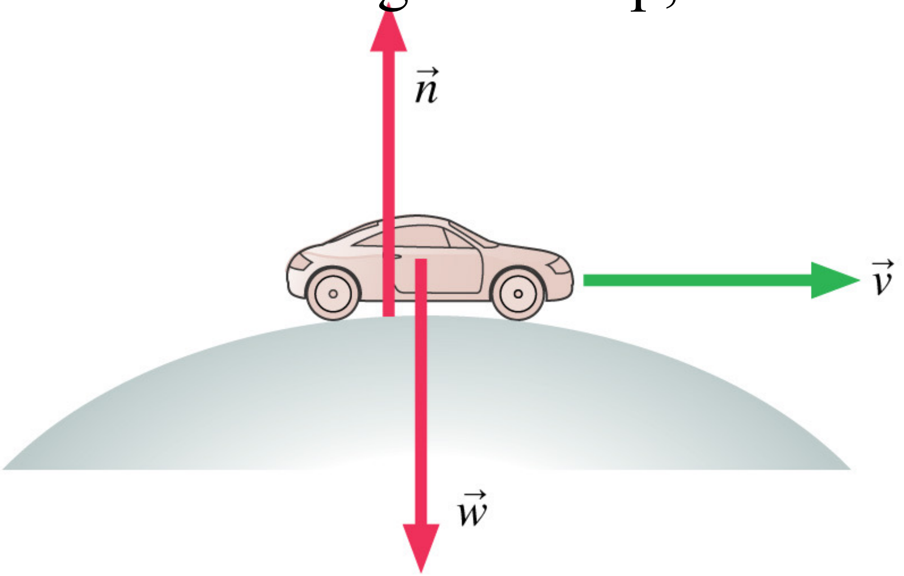
If the object has a mass m, to move in a circle of radius r with constant speed v it therefore must experience a net inward force of magnitude:

$$|F_{net}| = m\left(\frac{v^2}{r}\right)$$

A small block is put on a spin disk at R=2m.
μ_s=0.3   m=1.0 kg
What is the maximum linear speed that the block can experience without sliding away?

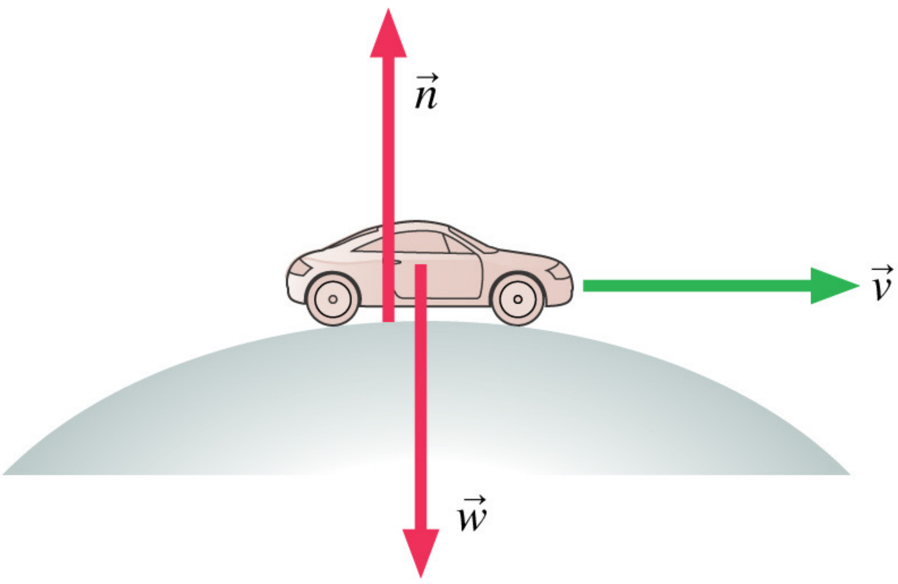


A car is rolling over the top of a hill at speed *v*. At this instant when the car is moving at the top,

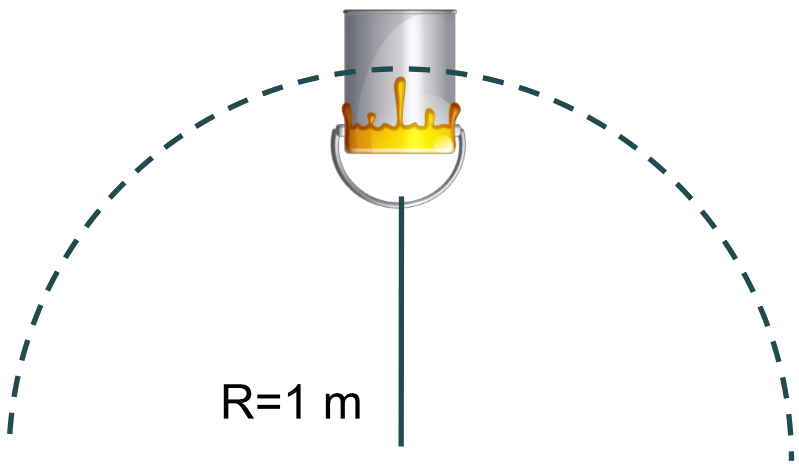


1. $N > w$.
2. $N = w$.
3. $N < w$.

The top of a hill can be approximated by a circle with 50 meter radius. What is the maximum speed at which a car will not become airborne when it passes over the top of the hill?



A bucket with 1 gallon of water in it is swung over your head with a speed V at the top.
What is the minimum value of V so that the water won't shower down on you?

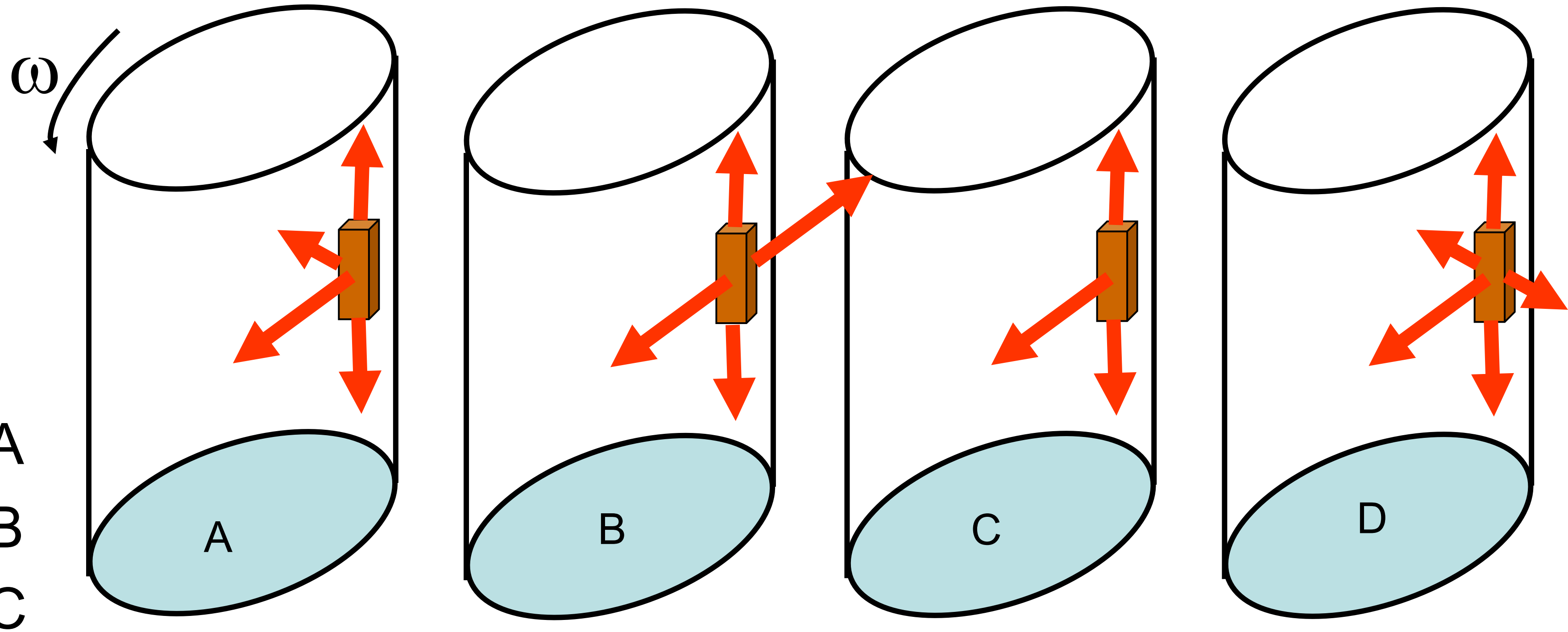


A roller coater car (m=1000kg) is traveling at a speed V at the top of the track which has a radius of 20 m.
What is the minimum value of that car so that it won't fall off the track (suppose there are no hooking structure that would hold the cart to the track).

If the car is traveling at 20 m/s at the top, what is the normal force from the track to the car?

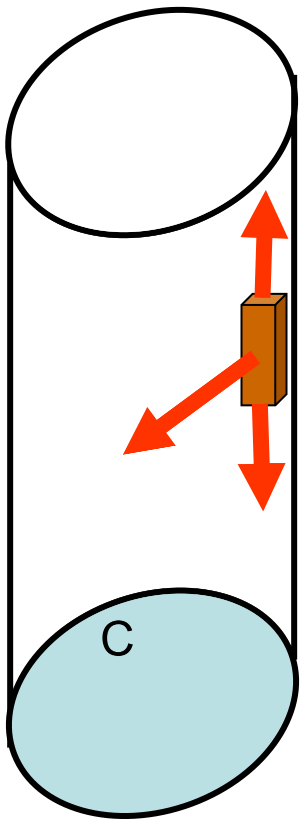
If the car is still traveling at 20 m/s at the bottom of the circular track (same R=20m), what is the normal force from the track to the car?

Bob the block is placed next to the cylindrical glass wall of an amusement park ride. The cylinder then begins spinning with a ***constant*** angular velocity, and spinning Bob remains stuck to the wall even when the floor drops away. The free-body diagram of all forces acting on Bob looks like:

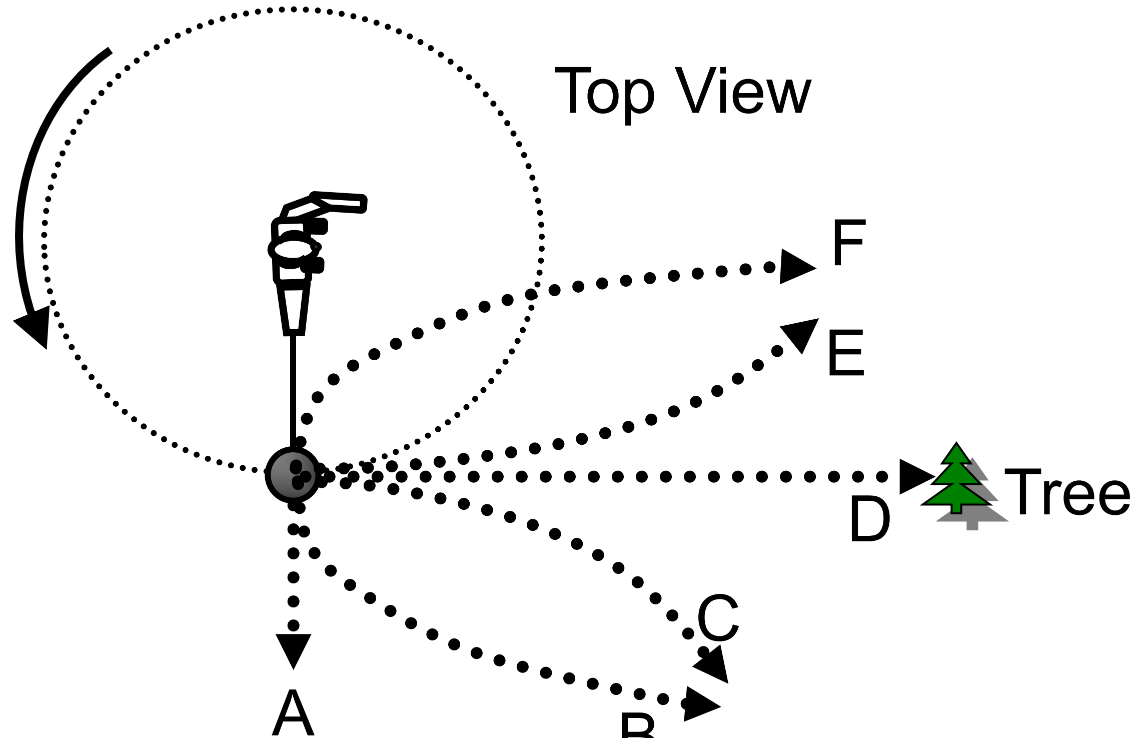


1. A
2. B
3. C
4. D
5. None of the above

If Bob's mass is 100 kg and the radius of the cylinder is 5 m. The static friction coefficient if 0.5.
What is the minimum linear speed that the cylindrical wall has to spin with Bob so that Bob will stay stuck on the wall?

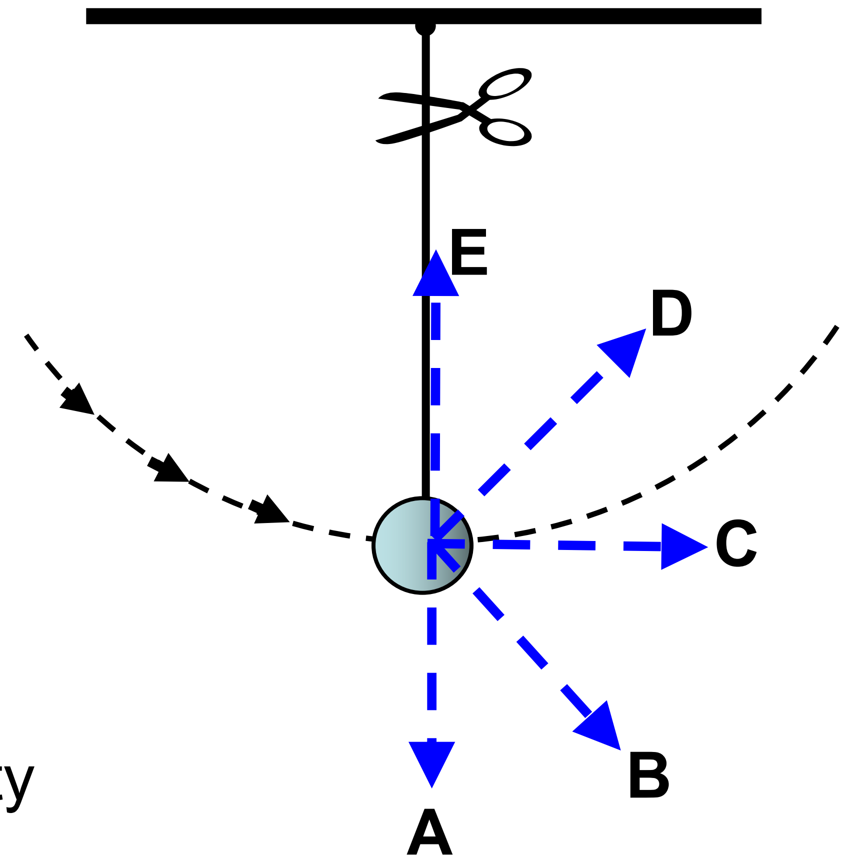


Bill whirls a ball attached to a string in a ***horizontal plane*** around his head. The string breaks exactly when the ball's velocity points in the direction of a tree trunk. Will the ball continue along path D and hit the tree, or along one of the other paths and miss the tree?



1. A
2. B
3. C
4. D
5. E
6. F

In a physics lab, a pendulum hung from the ceiling swings back and forth. Suddenly, the string breaks as the pendulum bob reaches its lowest point from the left. Which arrow best represents the direction of the pendulum bob's ***velocity*** immediately after the string breaks?



1. A
2. B
3. C
4. D
5. E
6. Zero velocity

In a physics lab, a pendulum hung from the ceiling swings back and forth. Suddenly, the string breaks as the pendulum bob reaches its lowest point from the left. Which path will the pendulum bob most likely take after the string breaks?

1. A
2. B
3. C
4. D
5. E
6. F