

1. Using **words** and a **picture**, how do you get the ball to speed up?

push the ball in the direction of its motion - a push is needed to change the speed of the ball

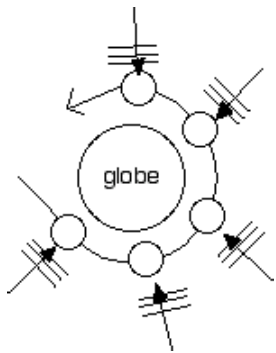
----->///o-->            /// is the broom, o is the ball

2. Using **words** and a **picture**, how do you get the ball to slow down?

push the ball opposite its direction of motion - a push is needed to change the speed of the ball

o--> \\\<-----            \\\ is the broom, o is the ball

3. Using **words** and a **picture**, how do you get the ball to go in a circle?

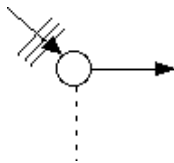


push the ball toward the center of the circle; keep the broom on the outside of the circle

The ball would go in a tangent to the circle if you did not keep pushing it into a curved path.

The ball "wants" to go in a straight line.

4. Using **words** and a **picture**, how do you get the ball to make a sharp right turn?



push on the ball at an angle that will slow the ball's forward motion and give the ball motion to the right.

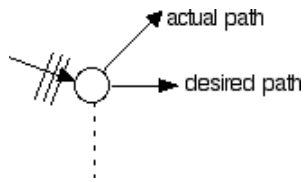
5. Describe the motion (speed and path) of the ball in the "no-touch" zone.

the ball travels at a constant velocity in a straight line (described in Newton's first law)

It is important to note that the ball does not slow down appreciably, and nothing is pushing on it in order to make it go! The moving ball tends to stay in motion unless the broom or friction with the floor (which is very small) slows it down.

You can also introduce forces here. The ball is pulled to the floor by gravity and the floor pushes back up on the ball so that the forces are balanced. Only when forces on an object are unbalanced do objects speed up or slow down.

6. If you don't begin slowing the ball soon enough for a turn, describe the path the ball "wants" to take using **words** and a **picture**.



the ball swings wide of the turn

the ball would rather go in a straight line path

conclude the lab with Newton's first law of motion

An object at rest stays at rest and an object in motion stays in motion at constant speed in a straight line **unless** it experiences an unbalanced force.