



LAW OF INERTIA



What you should know:

1. What inertia is and the relationship between inertia and mass.
2. What Newton's 1st Law states.
3. Real-world examples of inertia in action (ex: tablecloth example, ball in cart example)

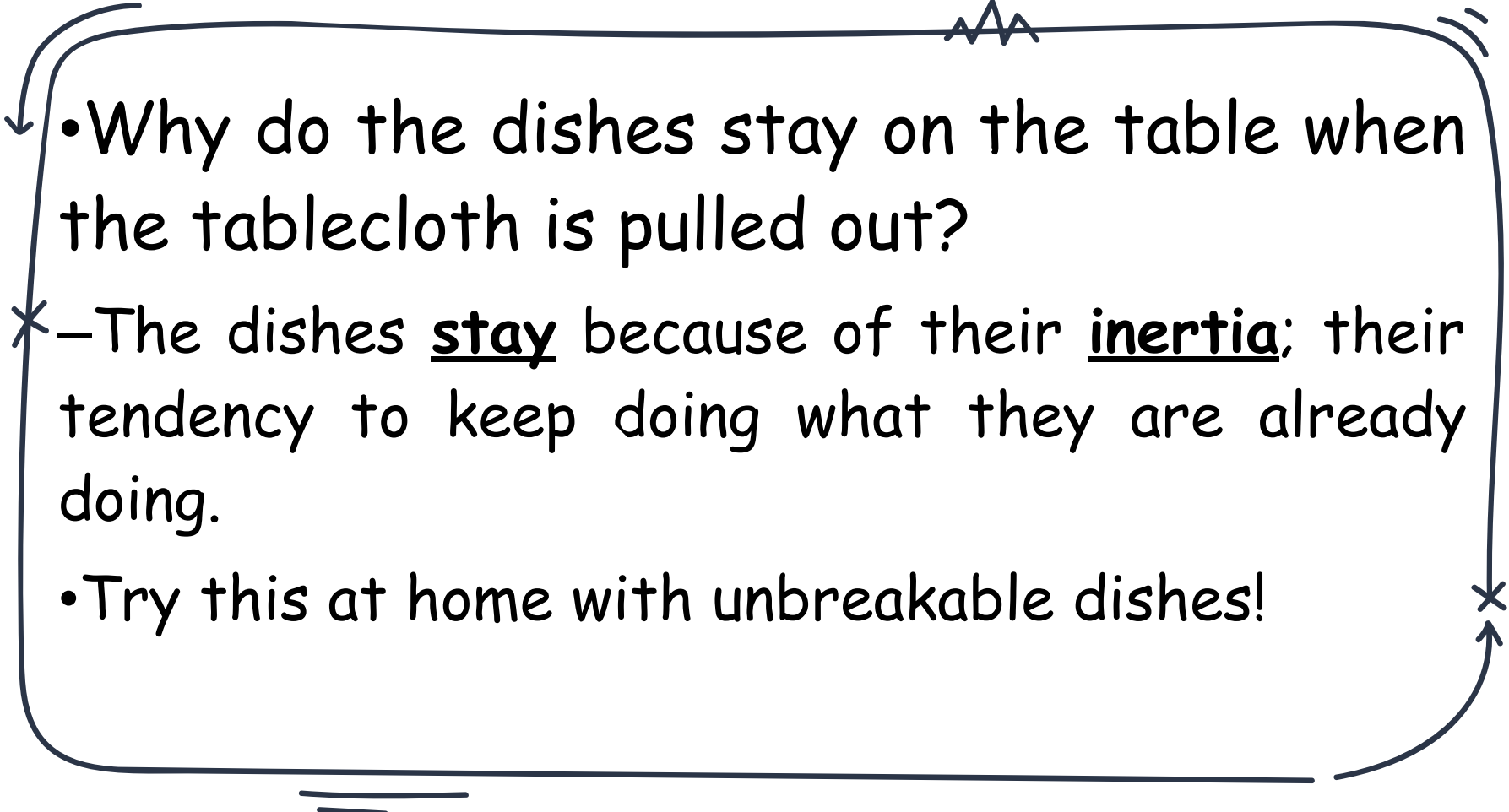
You should know

4. What happens when an object going on a circular path because of an outside force, has that outside force taken away (rock on a string example)

If Newton's First Law of Motion is called the Law of Inertia, we must first define Inertia...

Inertia is the tendency of object to keep doing what they are doing. If an object is resting, it will tend to keep resting. If an object is moving, it will tend to keep moving. This property is called inertia.



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- Why do the dishes stay on the table when the tablecloth is pulled out?
 - * - The dishes stay because of their inertia; their tendency to keep doing what they are already doing.
 - Try this at home with unbreakable dishes!



Mass & Inertia

- x Mass is the amount of matter in an object.
- x The more mass an object has, the more inertia the object has.
- x Bigger, more massive objects are harder to start and stop because they have more mass and therefore more inertia.



Which vehicle has more inertia?



A Weighty Problem

Example: If you spend most Sunday afternoons at rest on the sofa, watching football and consuming large quantities of food. What effect does this practice have upon your inertia? Explain.

Your inertia will most definitely increase. Your mass will increase because of this practice and if mass increases, then inertia increases.



Newton's 1st Law of Motion (also called the Law of Inertia)

An object in motion tends to stay in motion and an object at rest tends to stay at rest, unless the object is acted upon by an outside force.

The law also says that when an object is moving, it tends to **remain moving along a straight-line path** unless acted on by an outside force.



Newton's First Law of Motion



An object at rest
will remain at rest...

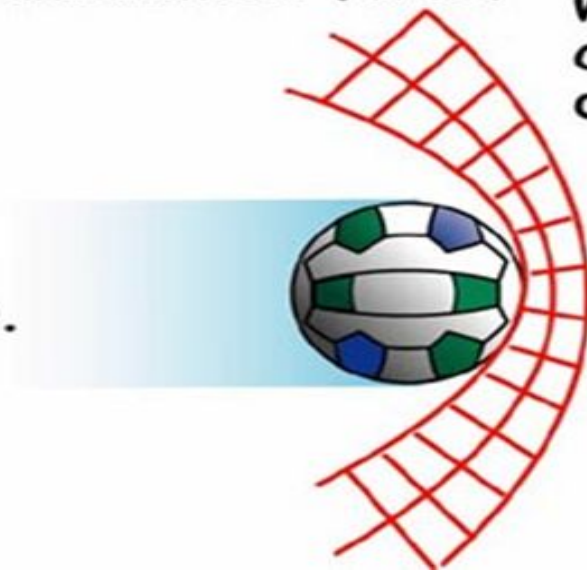


Unless acted on by
an unbalanced force.



An object in motion
will continue with
constant speed and
direction,...

... Unless acted on by
an unbalanced force.



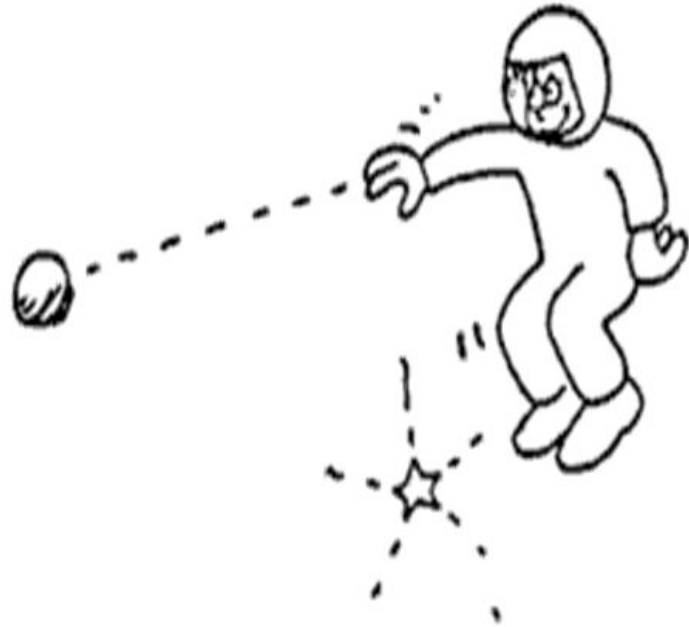
Law of Inertia Example

One of the most common places people feel the First Law is in a fast moving vehicle, such as a car or a bus, that comes to a stop. An **outside force** stops the vehicle, but the **passengers**, who have been moving at a high speed, are **not stopped** and **continue to move** at the same speed.



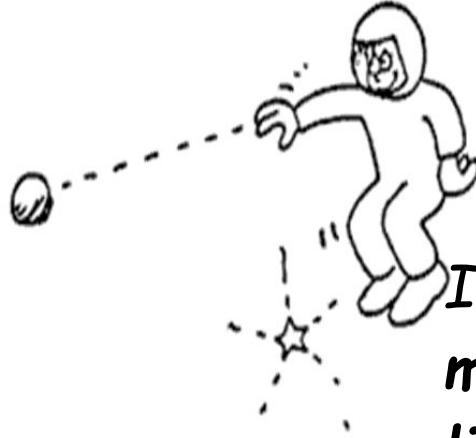
Law of Inertia example

An astronaut
in space
throws a
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Law of Inertia example

An astronaut
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*It will continue to
move in a straight
line at a constant
speed (until an
outside force acts on
it).*

Law of Inertia example

Think of a ball in a cart. When you jerk the cart forward, what does the ball do?



Law of Inertia example

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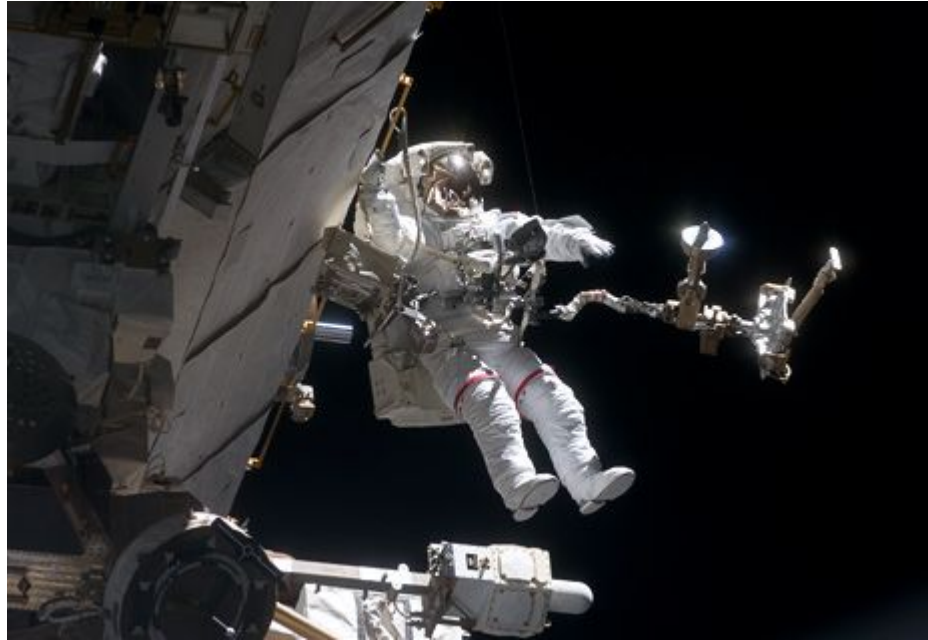


The ball will hit the back of the cart.
Why?

The ball's inertia will keep it at rest while the cart moves under it.

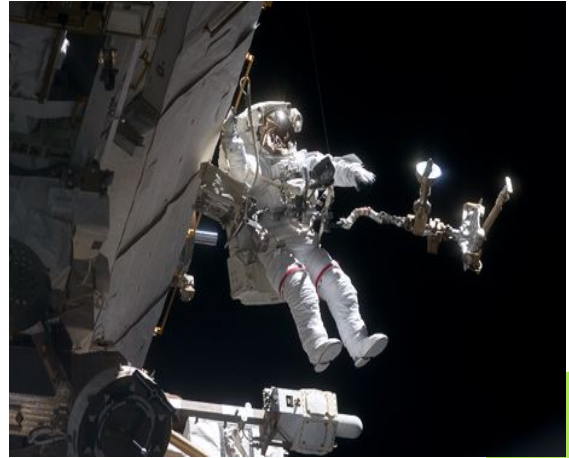
Is a force required?

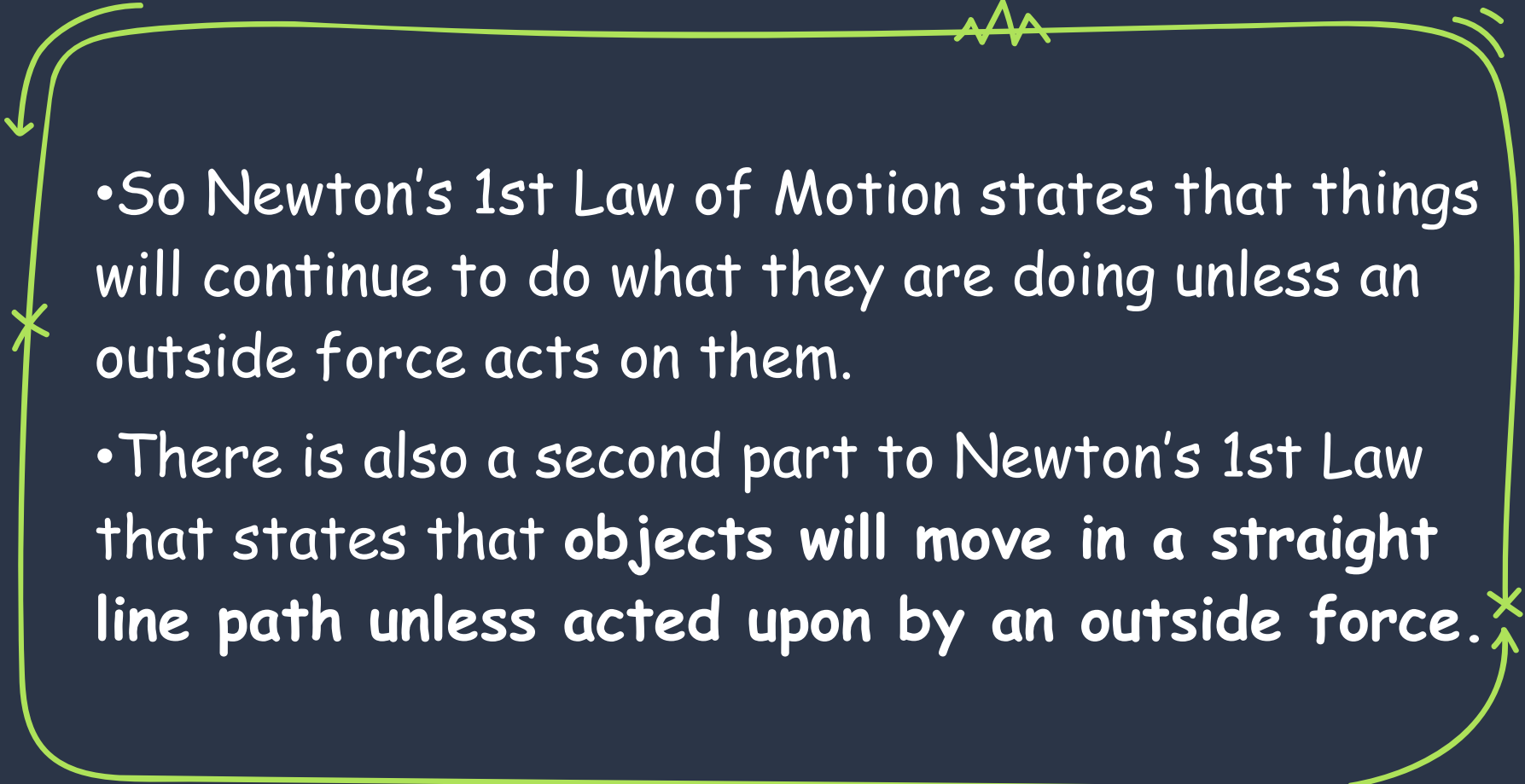
If you were in a weightless environment in space, would it require a force to set an object in motion?



Is a force required?

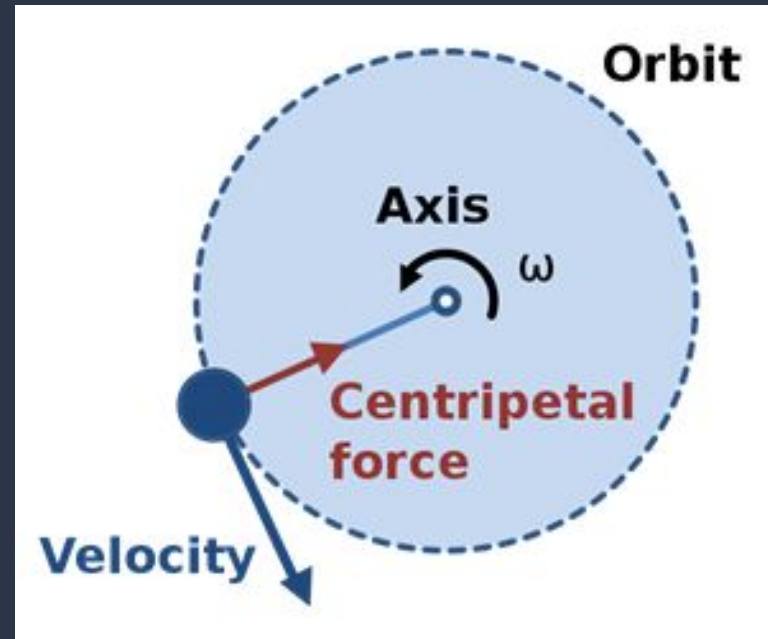
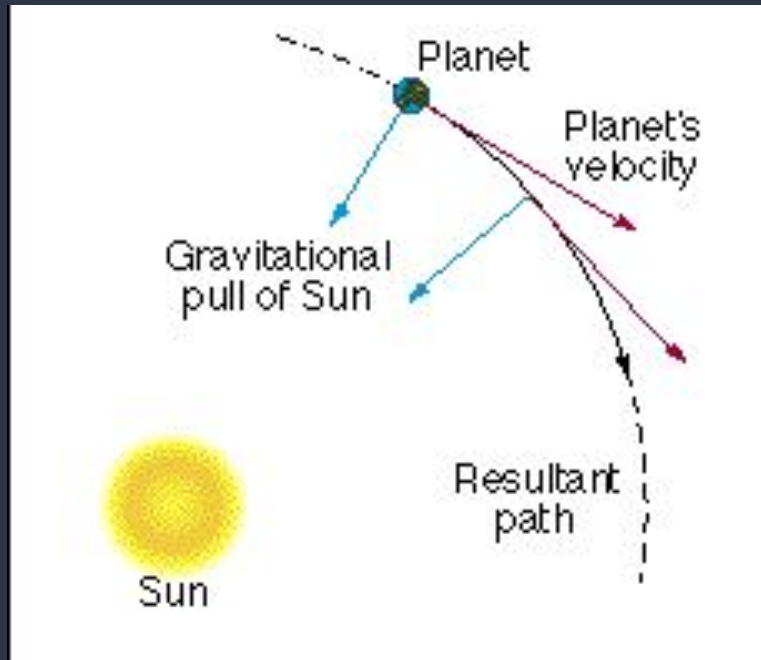
Yes, because even in outer space, an object has mass and therefore it has **inertia**. If an object has inertia then the object is going to resist changes in its motion. A **force must be applied to set the object in motion, even in space.**



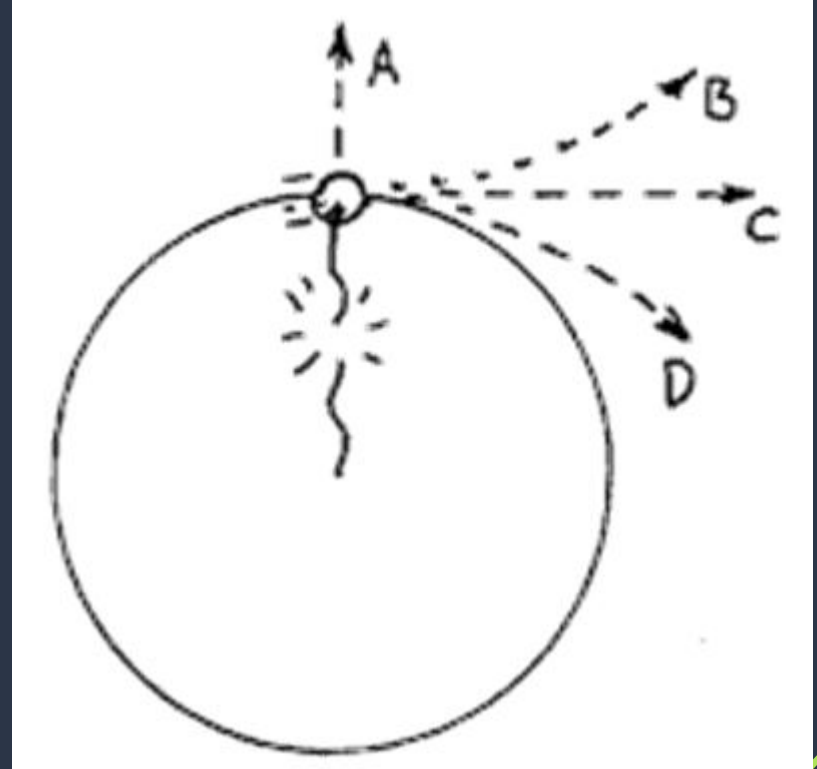


• So Newton's 1st Law of Motion states that things will continue to do what they are doing unless an outside force acts on them.

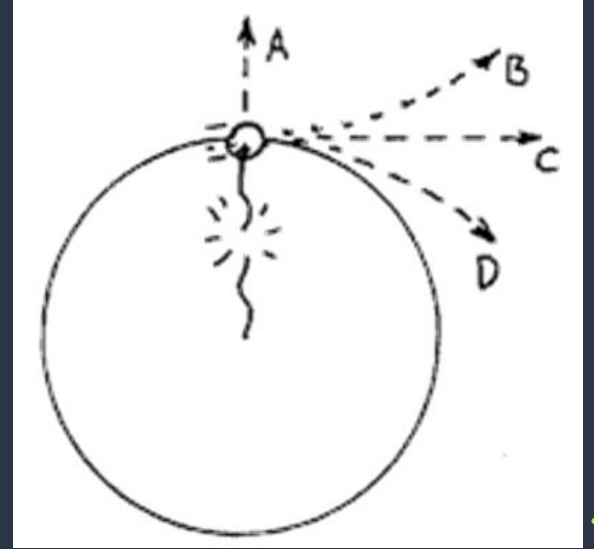
• There is also a second part to Newton's 1st Law that states that objects will move in a straight line path unless acted upon by an outside force.



A rock is being whirled at the end of a string in a clockwise direction. If the string breaks, the path of the rock is what?
A? B? C? D?



It will follow an "inertial path" so it will follow path "C". Once the rock leaves the string, there are no unbalanced forces to affect its motion. It will continue in straight line path until another force acts on it.



Check your understanding

1. When dishes remain on a table when you yank the tablecloth away, you are illustrating the law of _____.
2. What is inertia?
3. Put Newton's 1st Law into your own words.
4. As mass increases, what happens to inertia?
5. If gravity between the Sun and the Earth suddenly vanished, Earth would continue moving
 - A. in a curved path
 - B. an outward spiral
 - C. an inward spiral path
 - D. in a straight-line





Reference

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