Forces and Motion

When you ride a bike, your foot *pushes* against the pedal. The push makes the wheels of the bike move.

When you drop something, it is *pulled* to the ground by *Gravity*.

A **PUSH** or a **PULL** is a **FORCE**. So, a *force* *is a push or pull in a particular direction*.

Football is a game of forces and motion. There are plenty of pushes and Pulls in the game. There’s lot of motion too. **Motion** is any change in an object’s position. They know how to use forces and motion to play their very best.

It takes force to throw a ball. It takes force to hit a ball, And it takes force to stop a ball. The muscles pull on the bones to move your body.

Skateboarding is a game of constant battle against **Friction** as we have to keep adding pushing force to overcome the force of **Friction**

Forces cause birds to glide through the air. They also cause planes to fly.

Forces affect how objects move. They may cause **motion**; they may also slow, **stop**, or change the direction of motion of an object that is already moving.
The unit of force is a **newton**, named for the scientist Sir Isaac Newton who spent much of his life studying force and motion.

Forces are everywhere, but not all forces cause an object to change its motion. Forces have both size and direction. For example, a small force pushing against a very large and heavy object may not cause it to move. The large, heavy object has a lot of matter and thus has a large mass. The more massive an object is, the more the object resists any change in its motion.

Isaac Newton defined **inertia** as the tendency of a resting object to remain at rest or an object in motion to remain in motion. The amount of inertia an object has depends upon the object’s mass and object’s velocity.

In order to make an object move, a force must be applied to overcome its inertia. In order to stop a moving object, a force must also be applied.

Seat belts act as a resistant force to overcome the inertia of people’s bodies when the moving car they are riding in comes to an abrupt stop. Without a seatbelt, inertia keeps the bodies of the passengers moving forward at the same speed the car is traveling before it stops, which could result in injuries caused by the passengers hitting the windshield.

The combination of all forces acting on an object is called the **net force**. **Balanced forces** do not cause a change in an object’s motion. **Unbalanced forces** cause a change in the speed or direction of the motion of an object, which is also known as **acceleration**.

"The net force applied to the object equals the **mass** of the object multiplied by the amount of its **acceleration**.

\[ F = ma \]

Do you remember the wind gently blowing on the soccer ball? The force acting on the ball was very small because the mass of air was very small. Small masses generally exert small forces, which generally result in small accelerations (changes in motion).
ACTIVITY-1  Forces and Motion
Use Forces and Motion and the word bank to complete the concept map:

Word Bank: Forces, change in motion, pushes, balanced, acceleration, unbalanced, newton, change in speed, no change in motion, change in direction, and pulls.

ACTIVITY-2  A Few Words about Force and Motion
Fill in the blanks in the sentences below using the bold words in the reading assignment “Forces and Motion”:

1). ___________ is a force that pulls things towards the earth.

2). A ________ or a ________ can set a still object in motion.

3). A push or pull against an object in motion can ______ it.

4). The tendency of something to keep moving or stay at rest unless a greater force stops or moves it is called ________________.

5). Force must be applied to put something into ________ or to stop it from Moving.

6). Resultant force or ___________ is the sum of all forces acting on an object.
7). A _________ is a push or a pull.

8) Force acting on an object is equal to _________ multiplied by the amount of acceleration

**ACTIVITY-3**

Use the Venn Diagram to compare balanced and unbalanced forces.

**Balanced Force**  **Unbalanced Force**

1. The forces shown above are **PUSHING / PULLING** forces.
2. The forces shown above are **WORKING TOGETHER / OPPOSITE FORCES**.
3. The forces are **EQUAL / NOT EQUAL**.
4. The forces **DO / DO NOT** balance each other.
5. The resultant force is **1000 N TO THE RIGHT / 1000 N TO THE LEFT / ZERO**.
6. There **IS / IS NO** motion.
1. The forces are **EQUAL** / **NOT EQUAL**.
2. The forces **DO** / **DO NOT** balance each other.
3. The stronger force is pulling to the **RIGHT** / **LEFT**.
4. The weaker force is pulling to the **RIGHT** / **LEFT**.
5. Motion is to the **RIGHT** / **LEFT**.

**ACTIVITY-3**

1. State whether the picture shown is **Balanced** or **Unbalanced Force**

1. ____________________  

2. ____________________  

3. ____________________  

4. ____________________
2. Calculate the Net Force in each of the Force diagrams

1. Net Force = ______________

3. Net Force = ______________
**ACTIVITY-4**

1- **Match the correct word with the description**

1. Force  
   A. It is a force which pulls object towards Earth

2. Balanced Force  
   B. Tendency of object to remain in rest or state or motion

3. Unbalanced Force  
   C. Unit of Force

4. Gravity  
   D. Formula to calculate force

5. Inertia  
   E. It is a push or pull in certain direction

6. Newton  
   F. These forces results in no motion or zero acceleration

7. $F=ma$  
   G. These forces results in acceleration

2- **Apply the formula :** $F = m \times a$ or $a = F / m$ to **Solve the below problems**

*force = mass $\times$ acceleration*  
*acceleration = Force $\div$ mass*

1. What is the force acting on a 3 kg mass if the acceleration is 5 m/s$^2$?

2. What is the force acting on a 10 kg mass if the acceleration is 3 m/s$^2$?

3. What is the acceleration if the force acting on a 5 kg mass is 20 N?