



## **Motion Mania Standards**

### **Kindergarten**

#### **Physical Sciences**

##### Forces and Motion

4. Explore that things can be made to move in many different ways such as straight, zigzag, up and down, round and round, back and forth, or fast and slow.
5. Investigate ways to change how something is moving (e.g., push, pull.)

### **Grade One**

#### **Physical Sciences**

##### Forces and Motion

6. Investigate a variety of ways to make things move and what causes them to change speed, direction, and/or stop.

### **Grade Two**

#### **Scientific Inquiry**

##### Doing Scientific Inquiry

1. Ask "how can I/we" questions.
2. Ask "how do you know" questions (not "why" questions) in appropriate situations and attempt to give reasonable answers when others ask questions.
3. Explore and pursue student-generated "how" questions.

### **Grade Three**

#### **Physical Sciences**

##### Forces and Motion

1. Describe an objects position by locating it relative to another object or the background.
2. Describe an objects motion by tracing and measuring its position over time.
4. Predict the changes when an object experiences a force (e.g., a push or pull, weight, and friction.)

### **Grade Eight**

#### **Physical Sciences**

##### Forces and Motion

1. Describe how the change in the position (motion) of an object is always judged and described in comparison to a reference point.
2. Explain that motion describes the change in the position of an object (characterized by a speed and direction) as time changes.

3. Explain that an unbalanced force acting on an object changes that object's speed and/or direction.

## **Grade Nine**

### **Physical Sciences**

#### Forces and Motion

21. Demonstrate that motion is a measurable quantity that depends on the observers' frame of reference and describe the object's motion in terms of position, velocity, acceleration, and time.
22. Demonstrate that any object does not accelerate (remains at rest or maintains a constant speed and direction of motion) unless an unbalanced(net) force acts on it.
23. Explain the change in motion (acceleration) of an object. Demonstrate that the acceleration is proportional to the net force acting on the object and inversely proportional to the mass of the object. ( $F_{\text{net}}=ma$ . Note that weight is the gravitational force on an object.)
24. Demonstrate that whenever one object exerts a force on another, an equal amount of force is exerted back on the first object.
25. Demonstrate the ways in which frictional forces constrain the motion of objects (e.g., a car traveling around a curve, a block on an inclined plane, a person running, an airplane in flight.)

## **Grade Twelve**

### **Physical Sciences**

#### Forces and Motion

5. Use and apply the laws of motion to analyze, describe, and predict the effects of forces on the motions of objects mathematically.