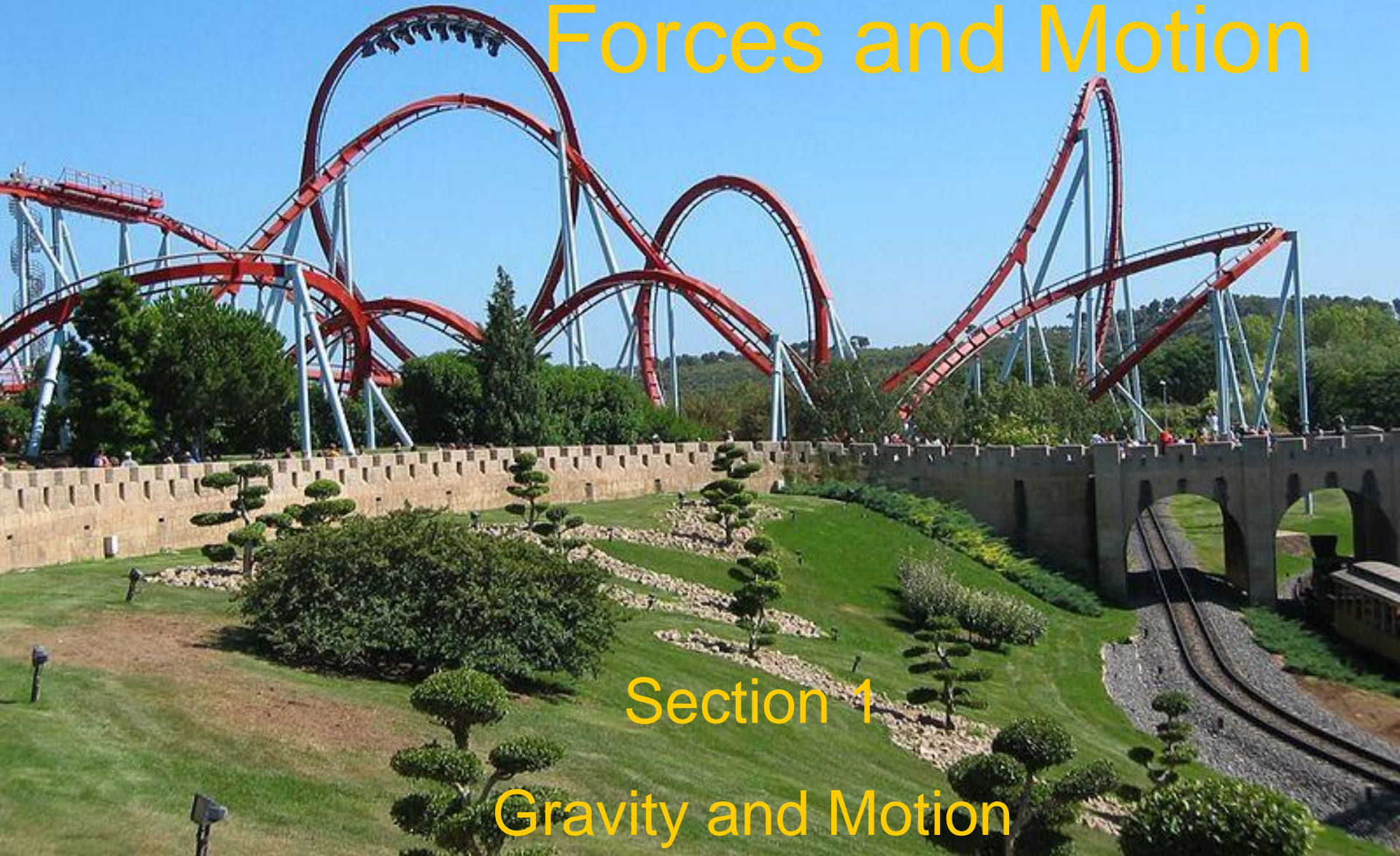


Chapter 6

Forces and Motion



Section 1

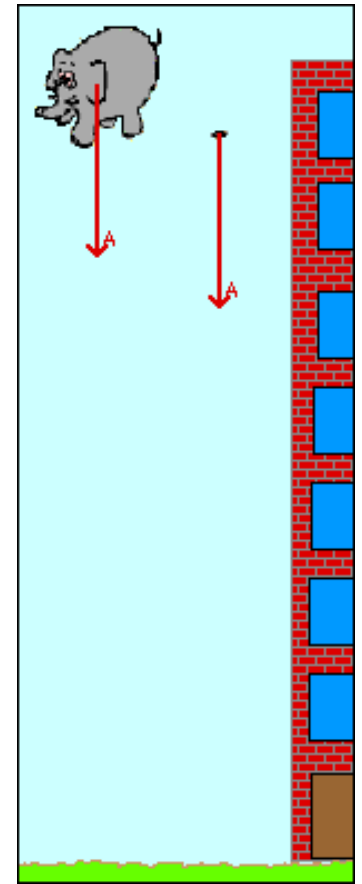
Gravity and Motion

Essential Questions for 6-1

- What are the effects of gravity and air resistance on falling objects? (6-1)
- Why are objects in orbit in free fall? (6-1)
- Why do they appear to be weightless? (6-1)
- How is projectile motion affected by gravity? (6-1)

Gravity and Falling Objects

- Objects fall to ground at the **same rate** because acceleration due to gravity is the same for ALL objects
- Why? Acceleration depends on both force and mass.
 - A heavier object experiences a greater gravitational force, BUT it is also harder to accelerate.
 - Galileo was a genius.



Acceleration and Velocity

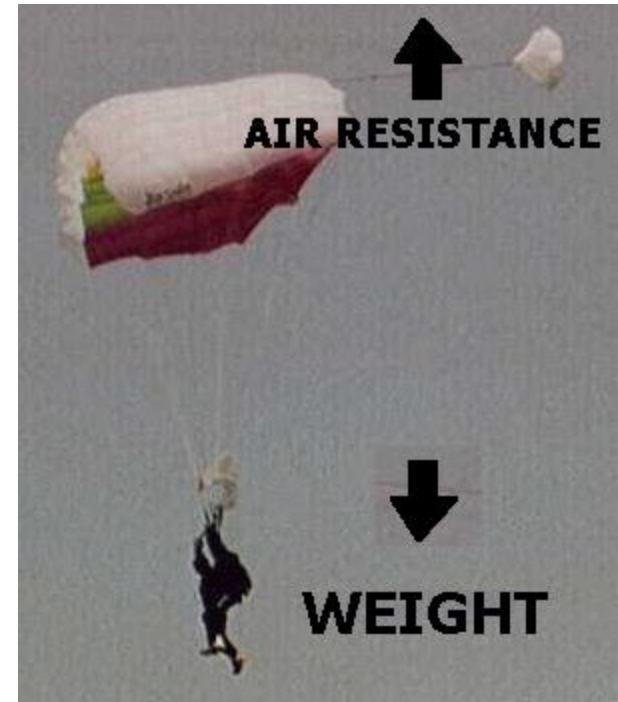
- Acceleration is the rate velocity changes over time. The acceleration of an object affected by gravity is **9.8 m/s**.
- Change in velocity of falling objects can be measured by the following equation:

$$\Delta v = g \times t$$

OR 9.8 m/s times the number of seconds an object falls...

Air Resistance

- Air resistance – the force that opposes the motion of objects through air
 - Amount of air resistance depends on the size, shape, and speed of the object



Terminal Velocity

- Terminal Velocity – when air resistance = gravity
 - 0 N or a balanced force!
 - It's the fastest an object will fall
 - It's also why rain drops don't kill you... think about it...



Free Fall

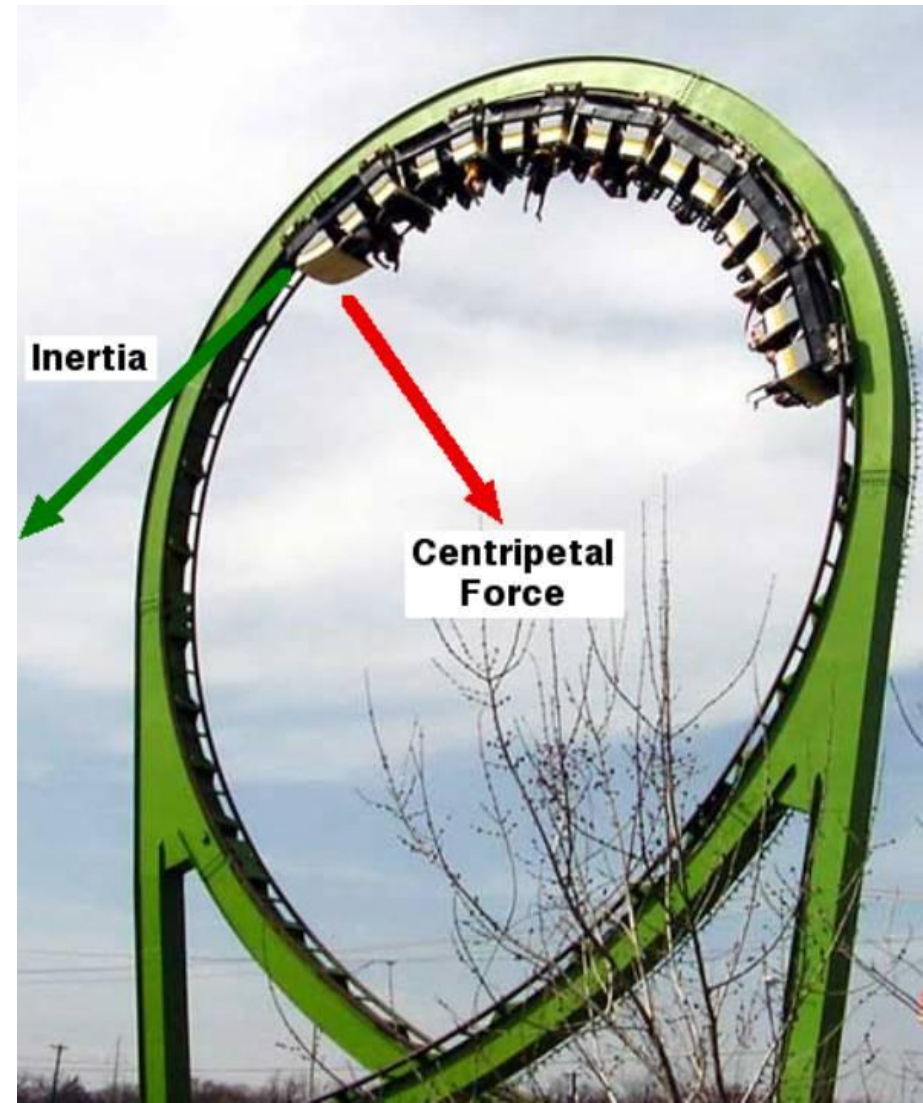
- Free fall - when gravity is the only force acting upon an object
 - Can only happen where there is NO air resistance: SPACE (or a vacuum)



- Orbiting objects are in free fall. Orbit is caused by two motions:
- Orbiting objects move forward, but are also in free fall – so are the astronauts

Orbiting and Centripetal Force

- Orbit is caused by two things that create an unbalanced force
 - Gravity provides centripetal force to the orbiting object
 - Centripetal force – the unbalanced force that causes an object to move in a circular path
 - Ex: planets around the sun or the moon around the Earth



Projectile Motion

- The curved path an object follows when it is thrown near the surface of the Earth
- Composed of horizontal motion and vertical motion
 - Horizontal motion (like throwing a ball) causes the object to go forward
 - Vertical motion (gravity) causes the object to fall
 - Together they create a curved path: BUT still hits the ground the same time as a dropped object
 - This is why you always have to aim above a target when trying to hit it...

An example of projectile motion

Figure 16

The pitcher gives the ball a horizontal motion. Gravity, however, is pulling the ball down. The combination of these two motions causes the ball to move in a curved path.

