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Warm-Up | Gravity

Lesson Question

Lesson Goals

Describe Newton's law of universal _____.

Identify and describe the _____ that affect the gravitational _____ between two objects.

Explain the concept of _____.

Describe how gravity affects _____ motion.

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Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

	the force that one massive object exerts to attract another object to it; expressed as the weight of an object
	the law that says that any two objects in the universe are attracted to each other and that the force of attraction between the two objects is affected by the masses of the two objects and the distance between the two objects
	a relationship between variables in which an increase (or decrease) in one variable causes an increase (or decrease) in the other variable
	a relationship between variables in which an increase in one variable causes a decrease in the other variable, or a decrease in one variable causes an increase in the other

Forces

- _____ is a push or a pull on an object.
  - _____ force: a finger pushing a button on a keyboard
  - _____ force: a compass needle pointing north

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Gravity on Earth

- _____ is an _____ force between objects.
  - Gravity is a _____ force.
  - Gravity can be _____ in newtons (N).
    - A _____ is the amount of force needed to _____ a 1 kg mass, 1 meter in 1 second every second.

Gravity Determines Weight

- All matter has _____.
- The pull of gravity on a mass (*m*) gives an object _____ (*W*).
  - Weight is just the _____ due to gravity.
- On Earth, gravity pulls all objects toward it with an acceleration of _____ m/s^2 (*g*).
- An object's weight is determined by multiplying its _____ by the _____ due to gravity.
  - It is measured in _____ (N).

$$W = mg$$

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Weight of a Box: Example

What is the weight of a box that has a mass of 20 kg?

- Given:
  - ☐ = 20 kg
  - ☐ = 9.8 m/s^2
- Unknown: *W*
- Equation to use: ☐

Write the solution.

- *W* = (20 kg) (9.8 m/s^2)
- *W* = ☐ N

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Universal Law of Gravitation

- Newton's [ ]:
  - Any two objects in the universe are [ ] to each other by a force called [ ].
  - The gravitational force between objects is affected by two [ ]:
    - [ ]
    - [ ]

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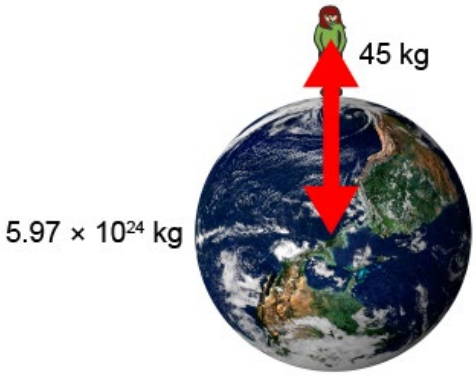
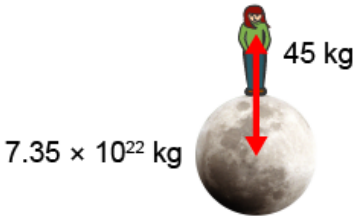
Effect of Mass of Objects on Gravity

- If the [ ] of any of the objects increases, the gravitational force between the objects increases. The force of gravity is [ ] to the mass of the objects.

Circle the pair that has the greatest gravitational force between them.





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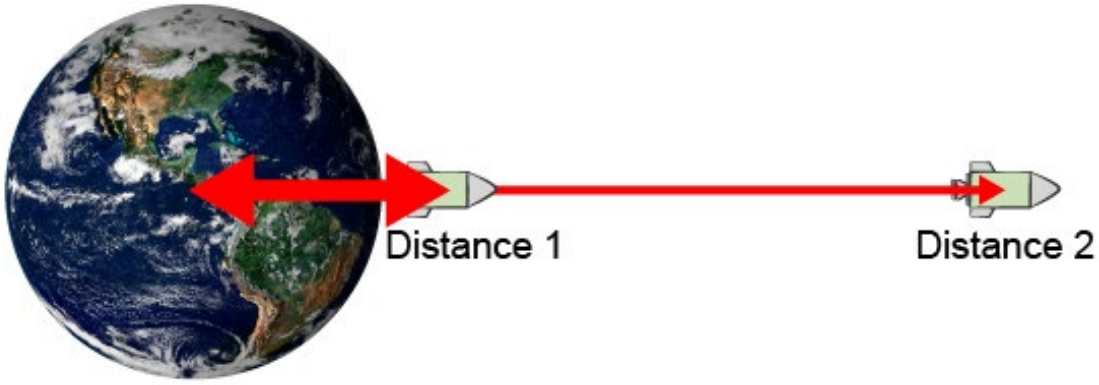
Effect of Distance on Gravity

- If the [ ] between the objects decreases, the gravitational force between the objects increases. The force of gravity is [ ] to the distance between the objects.

Circle the distance at which gravitational force is greatest.



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Words to Know

	the fastest speed a falling object can reach; occurs when air resistance becomes equal to the force due to gravity
	a space that contains no matter (even air)
	a state in which the only force acting on an object is the force of gravity
	the curved motion that results from the combination of an object's horizontal inertia and the gravitational force pulling the object downward

Velocity and Acceleration

- [ ] is the distance traveled by an object per unit of time in a specific direction.
- [ ] is the rate of change of velocity.
  - Change in [ ]
  - Change in [ ]

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Forces That Affect Falling Bodies

- There are two [ ] that can act on a falling body.
  - [ ]
  - Air [ ]
    - The force caused by air particles pushing an object in an [ ] direction to the motion of the object

Terminal Velocity

- When the force of gravity and the force of air resistance are [ ], the acceleration is [ ].
  - The falling object reaches its [ ], the fastest speed a falling object can reach.

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Free Fall

- With [ ] resistance due to the presence of an atmosphere, objects with less [ ] will fall faster.
  - Gravity [ ] air resistance
- With no air resistance, as in a [ ], all objects will fall at the same rate. Vacuum is space that contains no matter.
  - [ ] only
- When the only force acting on a falling body is gravity, it is called [ ].
  - Acceleration due to gravity: [ ]

Circle the object that has the greatest air resistance.



Ground

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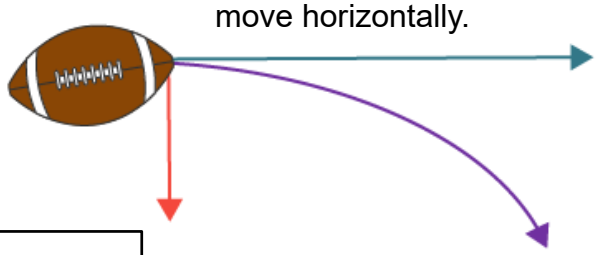
Projectile Motion

- Gravity can cause a thrown object to move in a _____, downward path.
  - This type of motion is called _____.

Components of Projectile Motion

- _____ motion
- _____ motion

_____ causes the ball to move horizontally.



_____ causes the ball to move vertically.

The result is a _____ path.

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Gravity in Our Universe

- Gravity keeps the planets in their orbits around the Sun.

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Lesson Question

What is gravity and how does it influence objects?

Answer

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Review: Key Concepts

- Gravity is an attractive, noncontact force that acts at a _____.
- The _____ says that there is an _____ force between two objects in the universe.
  - The amount of attraction between the objects is influenced by _____ and _____.
- _____ is a state in which the only force acting on a falling object is the force of _____.
- _____ is a downward, curved motion that is caused by the force of gravity acting on a _____ object.

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Use this space to write any questions or thoughts about this lesson.

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