

8.2 UNIT 2 SECOND QUARTER

UNIT 2: MOTION

II. UNIT 2: Motion

Time:

Approximate Dates:

a. Unit Introduction:

During this unit, students will be introduced to basic concepts about motion. Students will describe the motion of an object based on an object's position, direction, and speed.

b. Standards:

1. C22 Calculate the average speed of a moving object and illustrate the motion of objects in graphs of distance over time.
2. C23 Describe the qualitative relationships among force, mass, and changes in motion.
3. C24 Describe the forces acting on an object moving in a circular path.
4. CINQ1 Identify questions that can be answered through scientific investigation.
5. CINQ7 Identify and present relationships between variables in appropriate graphs.

CT State Grade Level Expectations (Draft)

GRADE-LEVEL CONCEPT 1: ♦ The motion of an object can be described by its position, direction of motion and speed.

GRADE-LEVEL EXPECTATIONS:

1. An object is said to be in motion when its position changes in relation to a point of reference.
2. The speed of an object's motion can be described as a change in position over a change in time, and is measured in units such as meters per second or miles per hour.
3. Most objects do not move at a constant speed for very long (for example, cars driving through traffic). Average speed takes into account all the different speeds traveled. Average speed is calculated by dividing the total distance traveled by the change in time, regardless of any changes in motion or direction during its travel.
4. Motion of objects can be represented on a position time line graph, with position as the vertical ("y") axis and time as the horizontal ("x") axis. Constant speed is represented by a straight, diagonal line. The steepness (slope) of the motion line indicates speed, and the direction of the slant of the motion line indicates direction of motion. A straight horizontal line indicates an object at rest.

GRADE-LEVEL CONCEPT 2: ◆ An unbalanced force acting on an object changes its speed and/or direction of motion.

GRADE-LEVEL EXPECTATIONS:

1. In order for an object to change its motion, a push/pull (force) must be applied over a distance.
2. Forces can act between objects that are in direct contact, or they can act over a distance. There are forces of attraction, such as gravity or magnetism, and forces of resistance, such as friction and drag (air resistance). Forces are measured in newtons or pounds using scales.
3. Forces can act simultaneously on an object from all directions with different strengths (magnitudes). When the magnitude and direction of all the forces acting on an object are combined, or added together, the total force (net force) determines the object's motion. Forces in opposite directions are subtracted; forces in the same direction are added.
4. If the strength of all the forces acting on an object from one direction is equivalent to the strength of the forces from the opposite direction, then the forces cancel each other out, and are said to be balanced. Balanced forces keep an object moving with the same speed and direction, including keeping it at rest.
5. If the net force acting on an object is not zero, then the forces are said to be unbalanced, and the object's speed or direction will change, changing its motion (acceleration). Acceleration is any change in motion, and occurs when something speeds up, slows down or changes direction. On a position time graph, this would be indicated by a change in the steepness of the motion line, or by a curved line.
6. The greater the unbalanced force on an object, the greater its change in motion (acceleration). The greater the mass of an object, the greater the force needed to change its acceleration. Given the same amount of force, an object with a greater mass will change acceleration less. The total net force acting on an object can be determined by measuring its mass and change in motion (acceleration).

GRADE-LEVEL CONCEPT 3: ◆ Objects moving in circles must experience force acting towards the center.

GRADE-LEVEL EXPECTATIONS:

1. Some objects continuously change direction without changing speed, causing them to move in a circular path. Circular motion is caused by a constant unbalanced force that is constantly changing direction and pulling towards the center. If there were no force pulling the object toward the center, it would continue to move in a straight line in the direction it was moving before the force was removed.

SCIENTIFIC LITERACY TERMINOLOGY: Motion, point of reference, speed, constant speed, average speed, position-time graph, slope, force, friction, gravity, inertia, mass, acceleration, balanced/unbalanced forces, net force, circular motion

c. Essential Questions:

1. When is an object in motion?
2. How do you know an object's speed and velocity?
3. How can you graph motion?
4. What are Newton's Laws of motion?

d. Essential Concepts:

1. An object is said to be in motion when its position changes in relation to a point of reference.
2. The meter is the SI unit of length.
3. The speed of an object can be determined by dividing the distance the object traveled by the time it took to travel that distance.
4. The velocity of an object is described by its speed and direction.
5. A distance versus time graph can be used to analyze the motion of an object.
6. Acceleration is defined as a change in an object's speed or its direction.
7. Inertia is an object's tendency to resist a change in its motion. Inertia is Newton's first law of motion.
8. Force depends on an object's mass and its acceleration. This is Newton's second law of motion.
9. When an object exerts a force on another object, the second object exerts a force on the first object of equal strength but in opposite direction. This is Newton's third law of motion.
10. Newton's second law can be applied to a force causing an object to move in a circular path, but it is not a separate force. It is simply a known force – tension, friction, gravity – causing the circular motion.

e. Essential Skills:

1. To identify and present relationships between variables using appropriate graphs.

f. Vocabulary:

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|----------------------------------|----------------------------------|
| 1. Motion | 10. Friction |
| 2. Reference Point | 11. Gravity |
| 3. International System of Units | 12. Tension |
| 4. Meter | 13. Compression |
| 5. Distance | 14. Direction |
| 6. Speed | 15. Mass |
| 7. Velocity | 16. Inertia |
| 8. Acceleration | 17. Newton (N) |
| 9. Force | 18. Newton's First Law of Motion |

19. Newton's Second Law of Motion

20. Newton's Third Law of Motion

g. Suggested Labs and Activities

1. [Penny Drop](#)
2. [Crash Test Gummies](#)
[Balloon Rockets](#)

Reading For Information: [Isaac Newton](#)

Significant Task: [Shipping and Sliding \(Guided\)](#)

CMT Task ShippingAndSliding [Teacher](#), [Student](#), [Rubric](#)

[Sample Unit Assessment](#)

[Sample Quarter 2 District Assessment, Score Rubric](#)