

# Unit 4: Forces and Motion

Content Area: **Science**  
Course(s): **Science 6**  
Time Period: **January**  
Length: **25 Days**  
Status: **Published**

## Unit Summary

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How can we predict the motion of an object?

Students use system and system models and stability and change to understanding ideas related to why some objects will keep moving and why objects fall to the ground. Students apply Newton's third law of motion to related forces to explain the motion of objects. Students also apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of system and system models and stability and change provide a framework for understanding the disciplinary core ideas. Students demonstrate proficiency in asking questions, planning and carrying out investigations, designing solutions,

engaging in argument from evidence, developing and using models, and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-PS2-1, MS-PS2-2, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, and MS-ETS1-4.

## Standards

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SCI.6-8.MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
SCI.6-8.MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
SCI.6-8.MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
SCI.6-8.MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
SCI.6-8.MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
SCI.6-8.MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

## **Student Learning Objectives**

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**SLO 1: Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.** \* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.](MS-PS2-1)

**SLO 2: Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.](MS-PS2-2)

**SLO 3: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** (MS-ETS1-1)

**SLO 4: Evaluate the competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** (MS-ETS1-2)

**SLO 5: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** (MS-ETS1-3)

**SLO 6: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.** (MS-ETS1-4)

## **Essential Questions/ Enduring Understandings**

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### **Essential Questions**

1. How can we predict the motion of an object?
2. Why are seat belts in cars so important?
3. How can we use Newton's three laws to design better means of protection for a cars (the egg car race)?

## **Enduring Understandings**

Students will understand and design a solution to protect when two objects collide.

Students will understand that when two objects collide it is a result of the two forces.

Students will understand that they must take into account the constraints of a problem when designing a solution.

Students will understand that they have to establish a criteria by which to judge proposed solutions.

Students will understand that they must analyze data from various tests to find the best characteristics when designing a solution.

Students will understand that it is important to continually redesign and improve their solutions.