

# Newton's Laws

Name: \_\_\_\_\_

0 (E) – Student has not demonstrated understanding of the concept at any level.

1 (D-) – Beginning Skill: Student attempts to answer questions and can demonstrate understanding of the concept with the aid of the instructor.

2 (C-) – Basic Skill: Student completes some questions successfully without the aid of the instructor; student may have many calculation errors, and cannot demonstrate understanding of the concept in several types of situations.

3 (B-) – Proficient: Student answers majority of questions successfully and has only a few calculation errors; student can demonstrate understanding of the concept in a few different types of situations.

4 (A-) – Mastery: Student demonstrates strong understanding of the concept and answers all questions successfully or with only a few minor errors; student can demonstrate understanding in several different types of situations.

5 (A+) – Exceeds Expectations: Student demonstrates superior understanding of the concept; student can demonstrate understanding in all situations, and independently makes connections that extend the original concept.

	1	2	3	4	5	Dates of Assessments
1. NEWTON'S FIRST LAW	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
2. NEWTON'S SECOND LAW	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____
3. NEWTON'S THIRD LAW	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	_____

## The Standards Explained

**Newton's First Law** – (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.

Disciplinary Core Idea – The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change.

Disciplinary Core Idea – All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.

Crosscutting Concept – Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.

Common Core Math 6.NS.C.5 – Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

Common Core Math 7.EE.B.4 – Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

**Newton's Second Law** – (HS-PS2-1) Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

Science and Engineering Practice – Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.

Disciplinary Core Idea – Newton's second law accurately predicts changes in the motion of macroscopic objects.

Crosscutting Concept – Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

## Newton's Laws

Common Core Math HSN-Q.A.1 – Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Common Core Math HSA-SSE.B.3 – Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

Common Core Math HSA-CED.A.2 – Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Common Core ELA RST.11-12.1 – Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Common Core ELA WHST.9-12.9 – Draw evidence from informational texts to support analysis, reflection, and research.

**Newton's Third Law** – (MS-PS2-1) Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

Science and Engineering Practice – Apply scientific ideas or principles to design an object, tool, process, or system.

Disciplinary Core Idea – For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction.

Crosscutting Concept – Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems.

Common Core Math 7.EE.B.3 – Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Common Core ELA RST.11-12.1 – Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Common Core ELA WHST.9-12.7 – Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.