

## Appendix: STEM Standards and Practices

### Next Generation Science Standards (NGSS)

<https://www.nextgenscience.org/>

Alignment of Activities With NGSS Disciplinary Core Ideas				
Motion and Stability (MS) Standard	Design a Foam Rocket With Stabilizing Fins	Track the Altitude of a Rocket	Build a Multistage Balloon Rocket	Optimize a Water Rocket Engine
<b>Forces and Interactions</b>				
MS-PS2-2	✓		✓	✓
<b>Engineering Design</b>				
MS-ETS1-1	✓		✓	✓
MS-ETS1-2				✓
MS-ETS1-3	✓		✓	✓
MS-ETS1-4	✓		✓	✓

Alignment of Activities With NGSS Crosscutting Concepts				
Concept	Design a Foam Rocket With Stabilizing Fins	Track the Altitude of a Rocket	Build a Multistage Balloon Rocket	Optimize a Water Rocket Engine
Patterns				
Cause and Effect	✓		✓	✓
Scale, Proportion, and Quantity				
System and System Models	✓		✓	✓
Energy and Matter			✓	✓
Structure and Function	✓			
Stability and Change				
Interdependence of Science, Engineering, and Technology	✓	✓	✓	✓
Influence of Engineering, Technology, and Science on Society and the Natural World				

## Propulsion With the Space Launch System

### NGSS Science and Engineering Practices

<https://ngss.nsta.org/PracticesFull.aspx>

Alignment of Activities With NGSS Science and Engineering Practices				
Practice	Design a Foam Rocket With Stabilizing Fins	Track the Altitude of a Rocket	Build a Multistage Balloon Rocket	Optimize a Water Rocket Engine
Asking Questions and Defining Problems	✓		✓	✓
Developing and Using Models	✓		✓	✓
Planning and Carrying Out Investigations			✓	✓
Analyzing and Interpreting Data	✓	✓		✓
Using Mathematics and Computational Thinking	✓	✓	✓	✓
Constructing Explanations and Designing Solutions	✓		✓	✓
Engaging in Argument From Evidence				
Obtaining, Evaluating, and Communicating Information		✓		✓

### International Society for Technology in Education (ISTE) Standards for Students

<https://www.iste.org/standards/for-students>

Alignment of Activities With ISTE Standards for Students				
Standard	Design a Foam Rocket With Stabilizing Fins	Track the Altitude of a Rocket	Build a Multistage Balloon Rocket	Optimize a Water Rocket Engine
Knowledge Constructor				
3d	✓	✓		✓
Innovative Designer				
4a			✓	
4c	✓		✓	
4d				
Computational Thinker				
5c		✓	✓	
Global Collaborator				
7c	✓	✓	✓	✓

## Common Core State Standards (CCSS) for Mathematics

<http://www.corestandards.org/Math/>

Alignment of Activities With CCSS Grade Level Content Standards by Domain				
Standard	Design a Foam Rocket With Stabilizing Fins	Track the Altitude of a Rocket	Build a Multistage Balloon Rocket	Optimize a Water Rocket Engine
<b>6th Grade</b>				
CCSS.MATH.CONTENT.6.NS.B.3		✓		
CCSS.MATH.CONTENT.6.SP.B.5			✓	✓
<b>7th Grade</b>				
CCSS.MATH.CONTENT.7.NS.A.2		✓	✓	
CCSS.MATH.CONTENT.7.NS.A.3		✓	✓	

Alignment of Activities With CCSS Standards for Mathematical Practice				
Practice	Design a Foam Rocket With Stabilizing Fins	Track the Altitude of a Rocket	Build a Multistage Balloon Rocket	Optimize a Water Rocket Engine
CCSS.MATH.PRACTICE.MP1	✓		✓	✓
CCSS.MATH.PRACTICE.MP2				
CCSS.MATH.PRACTICE.MP3	✓		✓	✓
CCSS.MATH.PRACTICE.MP4		✓		
CCSS.MATH.PRACTICE.MP5	✓	✓	✓	✓
CCSS.MATH.PRACTICE.MP6		✓		
CCSS.MATH.PRACTICE.MP7				
CCSS.MATH.PRACTICE.MP8				

Back cover: Illustration depicting NASA's Space Launch System (SLS) in the Block 1 cargo configuration as it leaves Earth. The solid rocket boosters produce 75 percent of the thrust to launch the vehicle and then separate from the SLS rocket after being expended. (NASA)



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