<table>
<thead>
<tr>
<th>Lesson: NASA’s <em>Space Based Astronomy</em> Unit 1: The Atmospheric Filter</th>
<th>Science Content Standards:</th>
</tr>
</thead>
</table>
| **Grade 4:** |  ● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents  
  ● develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move  
  ● develop a model communicating that light reflected from objects into the eye allows objects to be seen |
| **Grades 9-12:** |  ● use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media  
  ● communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy |

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<tr>
<th>Lesson: NASA’s <em>Space Based Astronomy</em> Unit 2: The Electromagnetic Spectrum</th>
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| **Grade 4:** |  ● make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents  
  ● develop a model communicating that light reflected from objects into the eye allows objects to be seen |
| **Grade 5:** |  ● use evidence or models to support the claim that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth |
| **Grades 6-8:** |  ● use mathematical representations to describe a simple model for waves that includes how the |
amplitude and wavelength of a wave is related to the energy in a wave. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

**Grades 9-12:**
- Use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media.
- Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
- Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

**Mathematics Theme Groups (adjustable by grade):**
- Measurement
- Connections
- Data analysis, statistics, and probability
- Patterns, functions, and algebra
- Geometry and spatial sense

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NASA’s *Space Based Astronomy*
Unit 3: Collecting Electromagnetic Radiation

**Science Content Standards:**

**Grade 4:**
- Make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents.
- Develop a model communicating that light reflected from objects into the eye allows objects to be seen.
- Generate and compare multiple solutions that use patterns to transfer information.

**Grades 6-8:**
- Use mathematical representations to describe a simple model for waves that includes how the amplitude and wavelength of a wave is related to the energy in a wave. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

**Grades 9-12:**
NASA’s *Space Based Astronomy*

**Unit 4: Down to Earth**

**Science Content Standards:**

**Grade 4:**
- make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents
- use mathematical representations to support a claim regarding relationships among the frequency, amplitude, wavelength, and speed of waves traveling in various media
- communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy

**Mathematics theme groups (adjustable by grade):**
- Number & operation
- Patterns, function, & algebra
- Measurement
- Data analysis, statistics, & probability
- Communication
- Connections
- Representations

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**How Light Moves**

**Science Content Standards:**

**Grade 4:**
- make observations to provide evidence of transfer of energy from place to place by sound, light, heat, and electric currents

**Grade 5:**
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<th>Build a Spectroscope</th>
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<th>Discovering Color with a Prism</th>
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<td><strong>NASA’s Electromagnetic Math</strong></td>
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**Mathematical theme groups:**  
*note: a detailed topic matrix is available on page 8 of the instructional guide*

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<th><strong>Grades 6-8:</strong></th>
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<tr>
<td>● work flexibly with fractions, decimals, and percents to solve problems;</td>
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<tr>
<td>● understand and use ratios and proportions to represent quantitative relationships;</td>
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</tr>
<tr>
<td>● develop an understanding of large numbers and recognize and appropriately use exponential, scientific, and calculator notation;</td>
<td></td>
</tr>
<tr>
<td>● understand the meaning and effects of arithmetic operations with fractions, decimals, and integers;</td>
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</tr>
<tr>
<td>● develop, analyze, and explain methods for solving problems involving proportions, such as scaling and finding equivalent ratios.</td>
<td></td>
</tr>
<tr>
<td>● represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic rules;</td>
<td></td>
</tr>
<tr>
<td>● model and solve contextualized problems using various representations, such as graphs, tables, and equations.</td>
<td></td>
</tr>
<tr>
<td>● use graphs to analyze the nature of changes in quantities in linear relationships.</td>
<td></td>
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<tr>
<td>● understand both metric and customary systems of measurement;</td>
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<tr>
<td>● understand relationships among units and convert from one unit to another within the same system;</td>
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</table>
### Grades 9-12:

- judge the reasonableness of numerical computations and their results.
- generalize patterns using explicitly defined and recursively defined functions;
- analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior;
- understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions;
- draw reasonable conclusions about a situation being modeled.