

## **Motion and Design: Goals and Assessment Strategies**

<b>Concepts</b>	
<b>Goals</b>	<b>Assessment Strategies</b>
<p>A force is any push or pull on an object. An unbalanced force is needed to make a resting object move, to bring a moving object to rest, or to change the direction of a moving object. Lessons 1, 3–8, 10–12, 14–17</p>	<p>Lessons 1, 5, 9, 12, 14, 16–17, and Additional Assessments 1–2</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Student self-assessments</li> </ul>
<p>A force can change the speed of an object. Greater forces can change the speed of an object faster than smaller forces. Lessons 1, 3, 5, 7, 12, 14–17</p>	<p>Lessons 1, 5, 9, 12, 14, 16–17, and Additional Assessments 1–2</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Student self-assessments</li> </ul>
<p>Friction is a force that occurs when two surfaces rub together. Friction opposes motion. Lessons 3, 7–10, 12, 14–16</p>	<p>Lessons 1, 9, 12, 14, 16–17, and Additional Assessments 1–3</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>
<p>If the same force is applied to a lighter vehicle and a heavier vehicle, the speed of the lighter vehicle will change more than the speed of the heavier vehicle. Lessons 4–5, 10, 12, 14–16</p>	<p>Lessons 5, 9, 14, 16, and Additional Assessments 1–2</p> <ul style="list-style-type: none"> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Student self-assessments</li> </ul>
<p>Energy can be stored in a rubber band and released to turn an axle or spin a propeller to make a vehicle move. Lessons 6–16</p>	<p>Lessons 9, 12, 14, 16, and Additional Assessments 1–2</p> <ul style="list-style-type: none"> <li>▪ Post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>
<p>A spinning propeller exerts a force that pushes air back and moves a vehicle forward. Lessons 11–16</p>	<p>Lessons 12, 14, 16, and Additional Assessments 1–3</p> <ul style="list-style-type: none"> <li>▪ Post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>

Goals	Assessment Strategies
<p>Friction must be considered when a vehicle is being designed. Lessons 1, 5, 8–12, 14–17</p>	<p>Lessons 1, 9, 12, 14, 16–17, and Additional Assessments 1–4</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>
<p>Air resistance is a force that can slow the speed of a moving vehicle. Lessons 9–10, 14–16</p>	<p>Lessons 9, 12, 14, 16, and Additional Assessments 1–4</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>
<p>Design requirements specify how a vehicle or other product must perform. Lessons 5–6, 9, 14–16</p>	<p>Lessons 1, 5, 14, 16–17, and Additional Assessments 2–3</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> </ul>
<p>Cost is often an important consideration in designing a product. Lessons 13–16</p>	<p>Lessons 14, 16, and Additional Assessment 3</p> <ul style="list-style-type: none"> <li>▪ Class discussions and lists</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Building vehicles</li> </ul>
<p>Engineers develop, modify, and improve designs to meet specific requirements. Lessons 1–2, 5, 8–9, 11–17</p>	<p>Lessons 1–2, 5, 9, 12, 14, 16–17, and Additional Assessments 1–3</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>

Skills	
Goals	Assessment Strategies
<p>Designing, building, testing, and modifying vehicles to meet design requirements. Lessons 1–2, 5, 8–9, 11–17</p>	<p>Lessons 1–2, 5, 9, 12, 14, 16–17, and Additional Assessments 1–3</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessments</li> </ul>
<p>Building vehicles from technical two- and three-view drawings. Lessons 2, 11, 14–16</p>	<p>Lessons 2, 12, 14, 16</p> <ul style="list-style-type: none"> <li>▪ Student drawings</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> </ul>
<p>Recording vehicle designs through drawing. Lessons 2, 5, 9, 14–16</p>	<p>Lessons 2, 5, 9, 12, 14, 16, and Additional Assessment 4</p> <ul style="list-style-type: none"> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Teacher observations</li> </ul>
<p>Observing how an object moves and describing its motion and changes in motion. Lessons 1, 3–8, 10, 12–17</p>	<p>Lessons 1, 5, 12, 14, 16–17, and Additional Assessments 2–3</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> </ul>
<p>Measuring the time it takes a vehicle to move a given distance. Lessons 1, 4–5, 14–17</p>	<p>Lessons 1, 5, 14, 16–17, and Additional Assessment 2</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> </ul>
<p>Collecting and recording data and analyzing it to determine representative values. Lessons 4–5, 7, 10, 14–16</p>	<p>Lessons 1, 5, 14, 16–17, and Additional Assessment 2</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> </ul>
<p>Predicting the effect of an applied force on how a vehicle moves. Lessons 1, 3–5, 7–10, 12, 14–17</p>	<p>Lessons 1, 5, 12, 14, 16–17, and Additional Assessments 1–2</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> </ul>
<p>Recording and comparing distances a vehicle travels under various conditions. Lessons 1, 7, 12, 14–17</p>	<p>Lessons 1, 12, 14, 16–17, and Additional Assessment 2</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Oral presentations</li> </ul>

<b>Goals</b>	<b>Assessment Strategies</b>
Designing a vehicle that is propelled by stored energy. Lessons 6–16	Lessons 9, 12, 14, 16, and Additional Assessments 2, 4 <ul style="list-style-type: none"> <li>▪ Post-unit assessments</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> </ul>
Solving design problems using previously collected data. Lessons 5, 10, 14–16	Lessons 5, 9, 14, 16, and Additional Assessment 2 <ul style="list-style-type: none"> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> </ul>
Communicating results of an investigation through record sheets, written observations, drawings, and class discussions. Lessons 1–10, 12–17	Lessons 1–2, 5, 9, 12, 14, 16–17, and Additional Assessments 2–4 <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Student self-assessment</li> </ul>

<b>Attitudes</b>	
<b>Goals</b>	<b>Assessment Strategies</b>
Recognizing the role that technological design plays in daily problem solving. Lessons 1–2, 5–6, 8–17	Lessons 1–2, 5, 9, 12, 14, 16–17, and Additional Assessments 1–4 <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessment</li> </ul>
Appreciating how science can be used to solve practical problems. Lessons 1–2, 5–6, 8–17	Lessons 1–2, 5, 9, 12, 14, 16–17, and Additional Assessments 1–4 <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Student drawings</li> <li>▪ Oral presentations</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessment</li> </ul>

*Motion and Design: Goals and Assessment Strategies, Skills (continued)*

<b>Goals</b>	<b>Assessment Strategies</b>
<p>Recognizing the importance of repeating trials to gain valid test results. Lessons 3–5, 7, 10, 14–16</p>	<p>Lessons 1, 5, 14, 16–17, and Additional Assessments 2, 4</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Class discussions and lists</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Teacher observations</li> </ul>
<p>Valuing the application of test results to future investigations. Lessons 1, 3–5, 7, 9–10, 14–15, 17</p>	<p>Lessons 1, 5, 9, 14, 16–17, and Additional Assessments 2, 4</p> <ul style="list-style-type: none"> <li>▪ Pre- and post-unit assessments</li> <li>▪ Student investigations</li> <li>▪ Record sheets</li> <li>▪ Teacher observations</li> <li>▪ Building vehicles</li> <li>▪ Student self-assessment</li> </ul>