

## Learning Scenario Template

<b>Title</b>	Pulleys
<b>Subject</b>	Engineering
<b>Grade Level</b>	10-12 years old students
<b>Duration</b>	About 60-90 minutes
<b>Objective(s)</b>	Students should understand the use of a fixed pulley and a rope. If it is possible to move a large load that is impossible to lift with their hands. To observe if it provides mechanical advantage and to what extent. Also, to use pulleys connected by a belt and observe if the mechanical advantage increases or decreases depending on the combination.
<b>Pedagogical Methods</b>	<ul style="list-style-type: none"><li>• Problem-based learning</li><li>• Inquiry-based learning</li><li>• Project-based learning</li><li>• Collaborative learning</li><li>• Reflection and lateral thinking</li></ul>

<b>Structure</b>	<ul style="list-style-type: none"><li>• <b>Introduction</b></li><li>• <b>Identifying the problem – Planning a solution</b></li><li>• <b>Mechanical Advantage</b></li><li>• <b>Real-world Examples</b></li><li>• <b>Completion</b></li><li>• <b>Links</b> (extra activities can be used for independent practice)</li></ul>
<b>Materials/Resources</b>	<ul style="list-style-type: none"><li>• Student activity sheet</li><li>• Pulley assembly instruction sheet or relevant auxiliary video presenting the assembly steps for each case.</li><li>• Student evaluation rubric.</li><li>• Self-assessment rubric.</li><li>• 9686 LEGO Simple Machines Set for each student group</li><li>• Laptop</li></ul>
<b>Pre-requisites</b>	Students should know simple machines (especially wheel and axle) as well as what force, load and effort are.

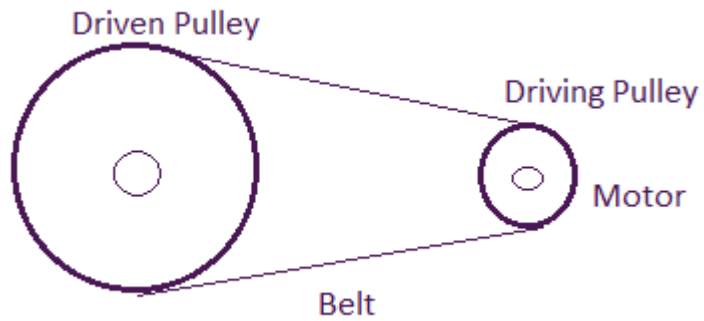
## Activities & Procedures

1. Build a pulley and test it. (15-20 minutes)

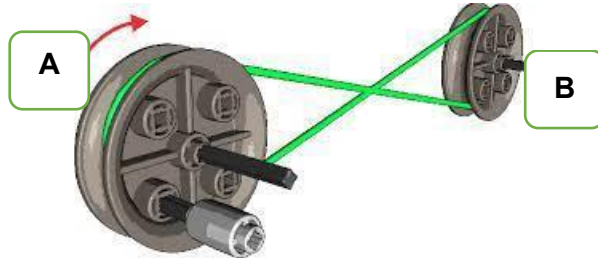
<https://education.lego.com/en-us/lessons/advancing-with-spm/pulley#connect>

Use the C instructions.

C1 p. 18, C2 p. 19, C3 p. 20, C4 p. 21, C5 p. 22 -23, C6 p. 24-25, C7 p. 26-27, C8 p. 28-31, C9 p. 32-35, C10 p. 36



## Assessment/Evaluation

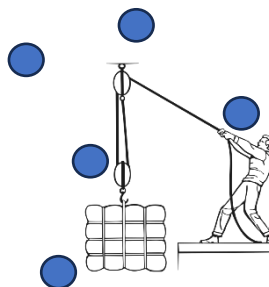


A-----

B-----

Match the following words with the corresponding points on the pulley:

- Load
- Effort
- Rope
- Fixed point
- Pulley

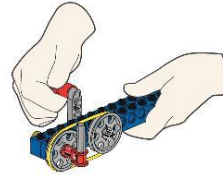


**Extensions/Modifications**

Speed: -----

Direction: -----

Mechanical Advantage: -----

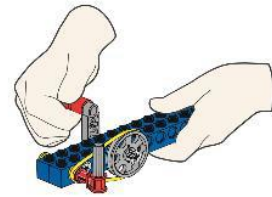


C1-Driving pulley equal to driven pulley

Speed: -----

Direction: -----

Mechanical Advantage: -----

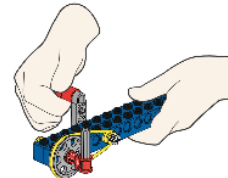


C2-Driving pulley large - Driven pulley small

Speed: -----

Direction: -----

Mechanical Advantage: -----

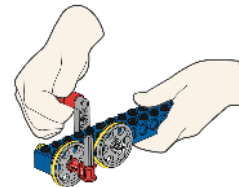


C3-Driving pulley small - Driven pulley large

Speed: -----








Direction: -----

Mechanical Advantage: -----



C4-----

<https://le-www-live-s.legocdn.com/sc/media/lessons/advancing-with-spm/pdfs/mechanical-advantage-pulley-a2ffbe951f14dec5e4b841ff91f5687c.pdf>

<p><b>Additional Notes</b></p>	<p><b>Completion</b> (5-10) minutes</p> <p>Discussion on the usefulness of pulleys and how much easier they make our lives.</p> <p style="text-align: center;"><b>Examples of pulleys</b></p> <ul style="list-style-type: none"> <li>● Using a pulley to lift water from a well </li> <li>● Elevator </li> <li>● Window curtains </li> <li>● Cranes </li> <li>● Fishing rod </li> <li>● Pulleys on a sailing boat </li> <li>● Flagpoles </li> </ul>
<p><b>Attachments/Links</b></p>	<ul style="list-style-type: none"> <li>● <a href="https://education.lego.com/en-us/lessons/advancing-with-spm/pulley#contemplate">https://education.lego.com/en-us/lessons/advancing-with-spm/pulley#contemplate</a></li> <li>● <a href="https://www.teachengineering.org/populartopics/pulleys">https://www.teachengineering.org/populartopics/pulleys</a></li> <li>● <a href="https://inventorsof tomorrow.com/2016/09/26/pulleys-2/">https://inventorsof tomorrow.com/2016/09/26/pulleys-2/</a></li> <li>● <a href="https://education.lego.com/v3/assets/blt293eea581807678a/blt80330bcae38535ec/5ebaea3a7d09e53fc83dd86a/pulley-student-worksheet.pdf">https://education.lego.com/v3/assets/blt293eea581807678a/blt80330bcae38535ec/5ebaea3a7d09e53fc83dd86a/pulley-student-worksheet.pdf</a></li> <li>● What is a Pulley? - Simple Machines   Science for Kids   Educational Videos by Mocomi</li> <li>● <a href="https://youtu.be/LiBcur1aqcg">https://youtu.be/LiBcur1aqcg</a></li> </ul>