Design Brief: Scenario

You and your friends have found a large tree in your backyard that would be perfect for a treehouse. You ask your parents if they would be interested in helping you build one in the tree. They are open to the idea, but they would like for you and your friends to develop a small prototype of the treehouse before they agree to build a real one in the tree.

Design & Engineering Challenge

Design and engineer a custom treehouse in the ROK Blocks tree using only Rokenbok components.

Specifications

1. Teams can work in groups of up to four to complete this challenge.
2. Teams must work through all five steps of the Design & Engineering Process to develop a custom treehouse. Teams will track their progress in the Student Engineering Workbook.
3. Treehouse must be built using components in the ROK Blocks module.
4. Treehouse should be structurally stable and aesthetically appealing.
5. Sub-Challenge: Treehouse must include a ladder from the ground to the treehouse.
6. Sub-Challenge: Treehouse must include a trap door that can be opened and closed, and large enough for a Rokenbok worker to easily fit through. (Designing with empathy)
7. Sub-Challenge: Treehouse should include a roof system.
8. Sub-Challenge: With every building component costing $2, the treehouse cannot cost more than $120 to build. (Designing for cost)

Understanding a Design Brief

A design brief serves as the guiding document for a project. It includes the scenario, the specific challenge and sub-challenges, and the required design specifications. Read carefully through the design brief below to determine what needs to be designed and what specifications it must meet.
STEM Fundamentals inspires students to make real world connections while learning to apply design thinking. Students who may be missing critical STEM fluencies have an opportunity to develop these skills while learning concepts of structural and mechanical engineering. Through STEM Fundamentals, students shift their mindset from imagination to application.

A Progression of Learning

Students start with fundamentals like spatial reasoning, how to make things strong, and how to make things move. As students progress they build on these foundations to explore mechanical and structural engineering, computer aided design and 3D printing, remote and programmable robotics, and project-based integrated STEM challenges.

ROK Blocks Mobile STEM Lab

Each Mobile STEM Lab serves 4 students. The ROK Blocks Mobile STEM Lab is necessary to teach the following learning phases:

- Mentored Construction Play
- STEM Fundamentals

Students Experience and Practice:

- How to use the system, how to make things strong, and how makes things move
- Understanding dimension, ratio, and measurement
- Building confidence to learn about technology
- Discovering their inner designer and engineer
- How to follow the Design & Engineering Process to prototype, improve, and iterate designs
- Collaborative problem solving and teamwork
# STEM Fundamentals

## Detailed Unit Outline

### STEM Fundamentals 1

| 1. Introduction to ROK Blocks | • Get familiar with components (mats/lesson) & module organization | 1 Hour |
| 2. See Like a Designer, Think Like an Engineer | • Build a hammer, learn technical information, build a stronger hammer | 1 Hour |
| 3. Design Perspectives | • Designing for cost and empathy | 1 Hour |
| 4. Making Things Strong | • Learn about size, dimension & measurement | 1 Hour |
| 5. Making Things Move | • Learn how components can be used in different ways to make things strong | 1 Hour |
| | • Hinge, axle, wheel | 1 Hour |
| | • Gear train, exploring RPM's | 1 Hour |
| | • Push/pull rod, crane, catapult | 1 Hour |

**8 Hrs. Total**

### STEM Fundamentals 2

| 1. The Design & Engineering Process | • The Rokenbok Design & Engineering Process (understanding a design brief, identifying a challenge) | 1 Hour |
| | • Brainstorming ideas and solutions (trap doors, ladders, roof systems) | 1 Hour |
| | • Design & engineer a custom treehouse (building prototype, testing & improving, explaining) | 1 Hour |
| 2. ROK Creek Bridge | • Understanding bridge design (span, load, forces) | 1 Hour |
| | • Bridge building 1 (select a bridge design to build, analyze & present) | 1 Hour |
| | • Bridge building 2 (select a bridge design to build, analyze & present) | 1 Hour |
| | • Bridge building 3 (select a bridge design to build, analyze & present) | 1 Hour |
| | • Bridge building 4 (select a bridge design to build, analyze & present) | 1 Hour |
| | • ROK creek bridge challenge | 1 Hour |

**9 Hrs. Total**
Understanding a Design Brief
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Design Brief: Scenario
You and your friends have found a large tree in your backyard that would be perfect for a treehouse. You ask your parents if they would be interested in helping you build one in the tree. They are open to the idea, but they would like for you and your friends to develop a small prototype of the treehouse before they agree to build a real one in the tree.

Design & Engineering Challenge
Design and engineer a custom treehouse in the ROK Blocks tree using only Rokenbok components.

Specifications
The design must meet the following specifications:

1. Teams can work in groups of up to four to complete this challenge.

2. Teams must work through all five steps of the Design & Engineering Process to develop a custom treehouse. Teams will track their progress in the Student Engineering Workbook.

3. Treehouse must be built using components in the ROK Blocks module.

4. Treehouse should be structurally stable and aesthetically appealing.

5. **Sub-Challenge:** Treehouse must include a ladder from the ground to the treehouse.

6. **Sub-Challenge:** Treehouse must include a trap door that can be opened and closed, and large enough for a Rokenbok worker to easily fit through. *(Designing with empathy)*

7. **Sub-Challenge:** Treehouse should include a roof system.

8. **Sub-Challenge:** With every building component costing $2, the treehouse cannot cost more than $120 to build. *(Designing for cost)*