

Supplies

Paracord



3mm paracord:
325 or 425
(Indoor model
building)

Sticks



(Indoor model
building)

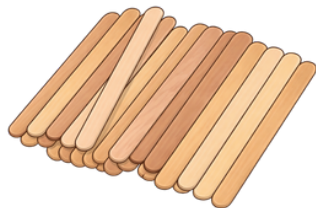
Poles



Measuring Tape

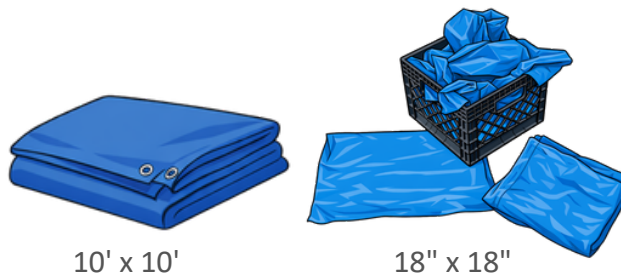


Popsicle Sticks



These are useful
for building
models of the Da
Vinci Bridge.

Tarps



10' x 10'

18" x 18"

Tarps provide the sleeping surface for bushcraft cots. Use small tarp pieces for models and full-sized tarps for outdoor builds. Inspect for tears and damaged attachment points before use.

Rope



Use suitable 12' rope segments. Reject damaged rope or unknown history. Retired climbing rope may be unsuitable for human-weight builds.

Supplies

From Model to Full-Sized

All of the lessons in this unit can be taught with smaller sticks and paracord (models) and larger poles and rope (full-sized project). If you can obtain sticks and paracord and poles and rope, you're ready to go.



Proportional Building Materials: "Fibonacci Sticks"

One way to extend this material is to challenge students to maintain consistent proportional ratios between their indoor model-building materials and their full-sized outdoor materials. There are many options to create proportional building materials. Just one option is to cut the indoor model building materials and outdoor building materials to the Fibonacci Sequence.

The Fibonacci sequence is a series of numbers in which each number is the sum of the two preceding ones, typically starting with 0 and 1. Here are the first 14 numbers in the sequence:

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233

0, 1, 0+1, 1+1, 1+2, 2+3, 3+5, 5+8, 8+13, 13+21, 21+34, 34+55, 55+89, 89+144

The Fibonacci sequence grows at an approximately constant rate, with each term approaching a multiple of the previous one defined by the Golden Ratio (about 1.618). This ratio appears in many natural and human-made patterns, such as the arrangement of leaves on a stem and the spiral patterns of shells.

Supplies

Creating building materials cut to the lengths of the Fibonacci sequence takes time, but it provides rich opportunities to integrate mathematics into students' experiential learning.



Outdoor Building Materials

233 cm

144 cm

89 cm

55 cm

34 cm

21 cm



Indoor Building Materials

Lesson 4: Swing

Summary

In this lesson, students apply previously learned lashings to design and build a functional swing. Rather than following a fixed design, students transfer knowledge from earlier structures and adapt it to solve a new problem involving movement and dynamic forces. Using the engineering design process, students work within specific criteria and constraints to build and test models, analyze performance, and refine their structures through iterative design. The addition of moving parts reinforces that stable human-weight structures require both strong lashings and thoughtful problem solving.



Standards and Objectives

Content Standards

Engineering, Technology, and Science. Define the criteria and constraints of a design problem. Evaluate competing design solutions. Analyze data from tests. Develop a model to generate data for iterative testing.

Lesson Objectives

- Students can tie a round lashing.
- Students can apply the engineering process, transferring knowledge from prior lessons to build a functional swing out of poles and ropes.

Social & Emotional Objectives

Adaptation. Students develop the ability to apply prior knowledge to new situations by recalling how they have solved problems before, recognizing connections between past and present challenges, and using those insights to adapt their thinking and approach to new learning experiences.

Supplies

Per Student

- Four 55 cm sticks
- One 21 cm stick
- At least two lengths of paracord, 5 ft. long

Per Group

- Four 233 cm poles
- One 89 cm pole
- At least two ropes, 12 ft. long

Per Class

Group ~ 5 min

Part 6. Group Formation and Supplies

Have students write the following in their *Adventure Journals*:

- Who will I work with?
- What is my role in the team?



Adventure Journal – “Lesson 4: Swing,” p. 13

Team & Supplies

Who is on my team?

What supplies will we need?

Teams of up to three students work best for this activity, as larger groups often leave some members without meaningful roles.

Encourage students to think ahead about the materials they will need for their full-sized build. Depending on how materials are managed in your classroom, direct students to gather supplies such as rope and poles.

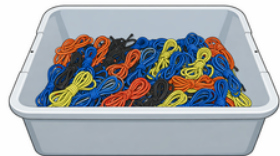


Supplies:

Model Supplies

Each team will need

- *Adventure Journals*
- Sticks (enough for a model)
- Paracord



Full-Sized Swing Supplies

Each team will need

- Rope (at least 12-feet long)
- Poles of various lengths

