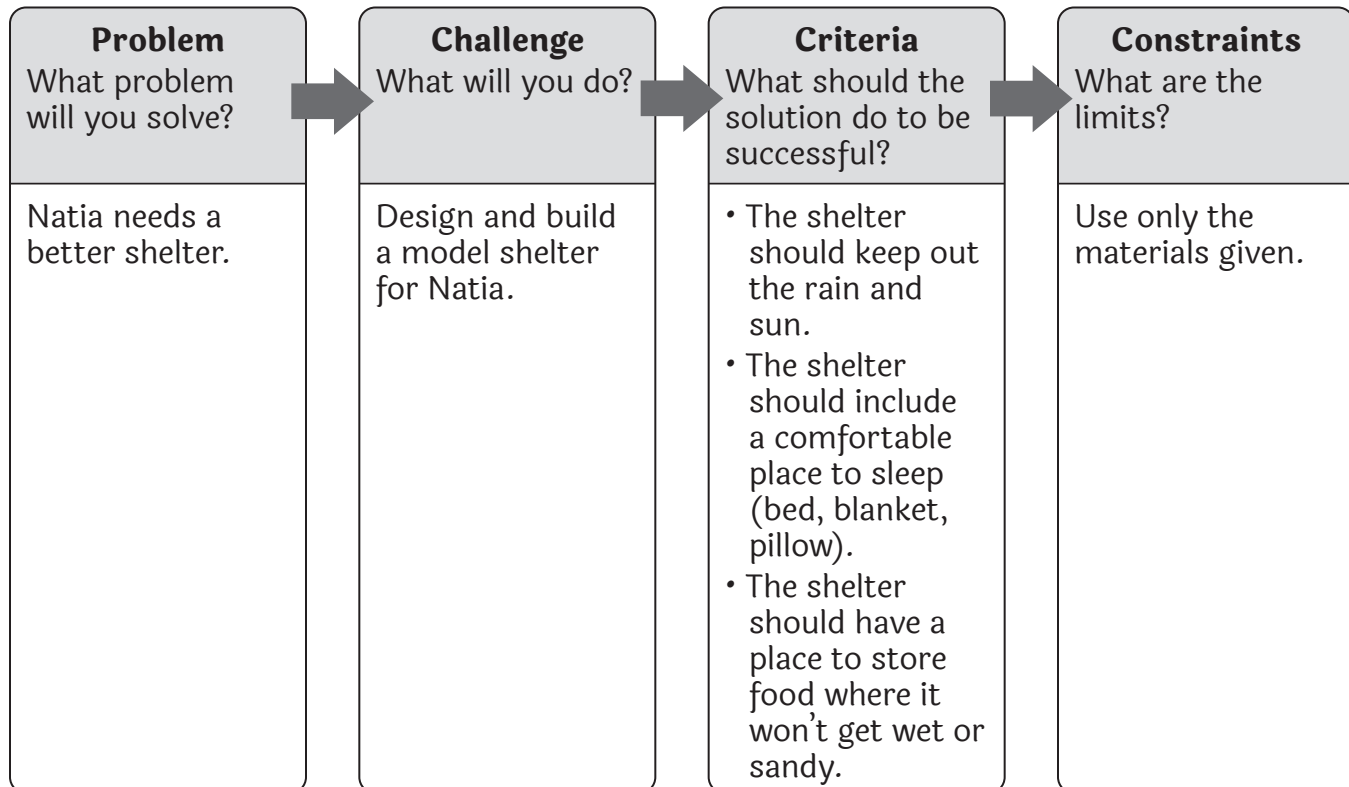


PLOT SUMMARY:

Natia, who is stranded on a tropical beach, works to survive.

MODEL SHELTER CHALLENGE:



OTHER POSSIBLE PROBLEMS AND CHALLENGES:

Students can use the *Universal Challenge Pages* (pages 104–107) to create solutions to any of the problems below or problems they identify themselves.

Problem	Natia needs food.
Possible Challenges	- Design a reliable way to catch fish. - Design a way to reach and pick fruit high in a tree.

Problem	Natia caught some crabs, but she has no way to cook them.
Possible Challenge	Design a solar cooker.

Problem	Natia needs more fresh water.
Possible Challenge	Design a way to catch and store rainwater.

MATERIALS:

Suggested: a wide selection of natural materials such as sticks, leaves, stems, and rocks in a variety of sizes and shapes

PREPARATION:

The difficulty of this challenge depends on the materials available. Ideally, offer only natural materials. If necessary, substitute materials such as straws and craft sticks for natural sticks. Do not include tape or staplers—challenge students to use natural materials such as leaves and stems as connectors. If you want to make the challenge slightly easier, provide string. While students will not be testing their designs in this project, you will need a space for them to display their model shelters so that everyone can examine them and give feedback.

LESSON PLAN:

1. Have students read the passage and discuss the problems they identified. Use these questions as prompts:
 - Where do you think Natia is? How do you think she got there?
 - How do you think you would feel if you were stranded alone?
 - What challenges does Natia have? Did she solve any of them? How?
2. Introduce the Model Shelter Challenge by reading through the challenge pages together. Explain to students that they will be creating a model of a shelter. A *model* is a small copy of something, like a model airplane or a model of the human heart. Let students know that for this challenge they won't be testing their designs. They will design and build their model shelter to meet three criteria, or requirements.
3. Show students the available materials and review the criteria and constraint. Give them time to think about the materials and complete the tasks for Step 1 (page 20). This will help them think through their materials choices.
4. Give students time to prepare, brainstorm, plan, and build their model shelters. Let them know that as long as they meet the criteria, they can add any extra features they want to their shelters, such as chairs, a table, or flags and decorations. Circulate to observe and answer questions as students work on their solutions. Remind them to use the challenge pages to guide them as they work through the engineering design process.
5. Have students evaluate their model shelters by checking them against the criteria. Allow time for students to share their solutions with the class and get feedback from peers. Then they should revise and improve their designs.
6. When students have completed the challenge, have them show and explain their model shelters to the class. Then have them fill out the reflection page.
7. If time, allow students to choose their own problem and testing setup and use the *Universal Challenge Pages* (pages 104–107) to complete their challenge.

NAME: _____

DATE: _____

Directions: Read the passage and underline the problems the character has to face. Write and/or sketch your ideas for solutions in the margins.

STRANDED

Natia stood perfectly still in the ankle-deep water. She didn't dare move a muscle. Slowly, the fish began to swim out from their hiding places under the rocks. When one of the bigger fish came close enough, she struck as fast as lightning. Her sharpened stick narrowly missed, and the fish disappeared. "Looks like seaweed for dinner again," she thought. She stepped carefully over the sharp rocks that formed the tide pools and headed back to the beach. Too bad her shoes had floated away when she didn't pay attention to how high the tide was getting.

She walked up the beach and flopped down under her lean-to, exhausted. As huge raindrops started to fall, she was thankful that she had added extra leaves to the roof. She cracked a coconut against a rock and set both halves out to catch some water. Watching the rain, she thought about how she could capture more of the water to use later. While it rained, she worked on building her crab trap.

When it got dark, Natia stretched out on the sand floor of the lean-to. She had piled up some leaves to make a pillow, but she had to keep gathering them back together. To keep warm, she buried her body a little way under the sand.

The rain finally stopped early the next morning. Natia was feeling brave—and hungry—so she ventured farther away from the beach and into the rain forest. She saw some parrots eating small, red fruits high up in a tree. The birds were very messy eaters! Natia picked up a piece of fruit that the birds dropped and tasted it. It was very sweet! She gathered up the uneaten fruits she could find on the ground and carried them back to her lean-to. She ate about a third of them and set the rest aside for later.

NAME: _____

DATE: _____

STRANDED

She spent the afternoon setting her crab trap and gathering seaweed at the tide pools. The sun beat down mercilessly. She was lucky that her T-shirt and shorts were holding up well, with just a few small rips and holes. It was just a shame she didn't have a hat. When she checked the crab trap, she was delighted to find two good-sized crabs! Then she realized that she didn't have a way to cook them. Raw crab did not sound good. So she let them go back into the tide pools.

After a dinner of sandy fruit and seaweed, she turned her attention to rescue. Building a raft was not an option because she didn't have any tools. A message in a bottle wouldn't work because she didn't have a bottle. She knew if she could write SOS in huge letters on the beach, there was a chance a passing ship or plane would see it. But what could she use to make the letters? Leaves would probably blow away. Rocks would work, but she didn't see enough on the beach to make the letters very big. Maybe there were more rocks farther into the rain forest. As she drifted off to sleep, Natia made a mental note to go rock hunting in the morning.



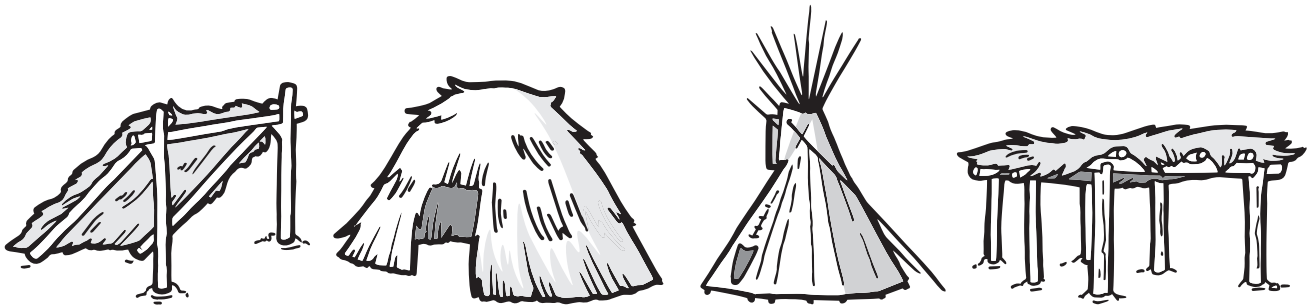
NAME: _____

DATE: _____

STEP 1: PREPARE FOR THE CHALLENGE

Problem What problem will you solve?	Challenge What will you do?	Criteria What should the solution do to be successful?	Constraints What are the limits?
Natia needs a better shelter.	Design and build a model shelter for Natia.	- The shelter should keep out the rain and sun. - The shelter should include a comfortable place to sleep (bed, blanket, pillow). - The shelter should have a place to store food where it won't get wet or sandy.	Use only the materials given.

1. Shelters can be built many different ways. Below are some examples of simple shelters. Think about what Natia's shelter needs to do and what shape might work best to meet the criteria. Could you combine ideas or create a new shape? Sketch ideas on the back of this page.



Lean-to

Thatched Dome Hut

Teepee

Ramada

2. Because Natia is stranded without tools, she will have to put her shelter together without nails, screws, or bolts. Think about ways to use the available materials to keep the structural pieces of the shelter attached to one another so it doesn't fall down.

NAME: _____

DATE: _____

STEP 2: BRAINSTORM, PLAN, AND BUILD

1. Brainstorm design ideas to meet the criteria and constraint. Sketch and write at least three ideas for each criteria.

Keeps out the rain and sun	Includes a comfortable place to sleep (bed, blanket, pillow)	Has a place to store food where it won't get wet or sandy

2. Think about which ideas might work best. Circle the idea you will use for each criteria. Why did you choose these ideas?

3. Combine your ideas and draw a diagram of your model shelter design here. Once you have met the criteria, you can add as many extra features as you want. Label all of the materials.



4. Build your model shelter!

NAME: _____

DATE: _____

STEP 3: TEST, IMPROVE, AND SHARE

1. Check to see that your model shelter meets each criteria:

- ☐ Keeps out rain and sun
- ☐ Has a comfortable place to sleep
- ☐ Has a place to store food

2. Does your model shelter meet all the criteria? If not, how could you improve it?

3. Share your model shelter with classmates. How can you use their ideas to make it better?

4. Keep redesigning until your model shelter meets the criteria!

NAME: _____

DATE: _____

STEP 4: REFLECT

1. How does your design meet each criteria?

Keeps out rain and sun: _____

Has a comfortable place to sleep: _____

Has a place to store food: _____

2. How did you improve your design?

3. What extra features did you add to your shelter?

4. What was the hardest part about this challenge?

5. What have you learned from this challenge?