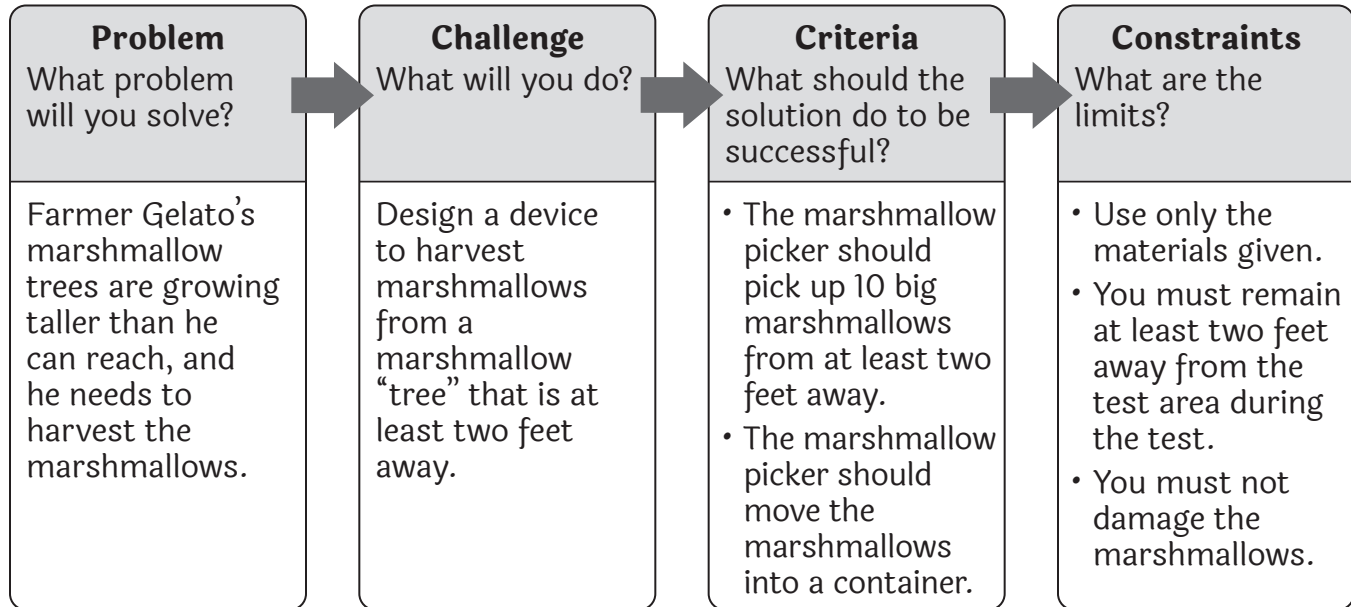


PLOT SUMMARY:

Farmer Gelato and his dog, Caramelo, do chores around their unusual farm where they grow sprinkle bushes, marshmallow trees, and strawberry cows.

MARSHMALLOW PICKER 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	It takes a lot of time and energy for Farmer Gelato to care for his crops.
Possible Challenges	<ul style="list-style-type: none"> Create a system to carry water to the fields. Make a device to dig rows in the soil. Build something to help plant sprinkles and cover them with soil.
Problem	Crows are eating the crops.
Possible Challenges	<ul style="list-style-type: none"> Build something to alert the farmer when the crows are in the fields. Create an automatic device or system to scare the crows away.
Problem	Feeding the cows is hard work and takes a long time.
Possible Challenge	<ul style="list-style-type: none"> Create a device or system to move hay from the hayloft to the hay racks.

MATERIALS:

Required: large marshmallows, masking or painter’s tape, bucket or other container for marshmallows

Suggested: structural items such as rulers, wooden skewers, straws, cardboard tubes, coat hangers, plastic cutlery; containers such as milk and egg cartons, plastic bottles, paper or plastic cups, bowls, plates; foldable materials such as index cards and paper; connectors such as paper fasteners (brads), rubber bands, string, tape

PREPARATION:

Set up a table or desk for testing. Use masking or painter’s tape to mark out a rectangle that is approximately 2 feet by 3 feet. To make it a bit more fun, you could tape an outline of a tree in the space. Scatter 10 large marshmallows within this space. Place a line of tape on the floor two feet from the table—students must stand behind this line while testing. Set a bucket or other container on the line for students to drop harvested marshmallows into.

LESSON PLAN:

1. Have students read the passage and discuss the problems they identified. Use these questions as prompts:
 - What do you know about farms and farming?
 - What did Farmer Gelato need to do in his fields? How did he accomplish these tasks?
 - What is Farmer Gelato growing in his orchard? What task is he trying to accomplish? What will he need to do with these trees in the future?
2. Introduce the Marshmallow Picker Challenge by reading through the challenge pages together. Show students the available materials and review the criteria and constraints. Explain to students that since they don’t have access to marshmallow trees, they will be “picking” the marshmallows off a table.
3. Give students time to prepare, brainstorm, plan, and build their marshmallow pickers. 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. When they are ready for testing, observe to ensure fair and equal testing conditions for each student or team. Note: Students will realize pretty quickly that their marshmallow pickers need to be *longer* than two feet to reach the marshmallows! Expect lots of test-and-improve cycles.
4. Have students share their solutions with the class and get feedback from peers, then revise their designs and test again.
5. When students have completed the challenge, have them demonstrate and explain their marshmallow pickers for the class. Then have them fill out the reflection page.
6. 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 faces. Write and/or sketch your ideas for solutions in the margins.

SUNDAE FARMER

Farmer Gelato rises with the sun, as he has a full day of work ahead of him. He'll need a lot of energy, so he eats a hearty breakfast of chocolate-chip pancakes with butterscotch syrup, and strawberry milk. Then he brushes his teeth, puts on some sunscreen, and pulls on his boots. As he steps out of the farmhouse, he looks around at his farm with great pride and smiles. He puts on his hat, grabs his shovel, and heads for the fields. His old dog, Caramelo, trots after him.

Farmer Gelato is pleased with the progress of his crops so far—they look healthy and happy. The jelly-bean bushes are already starting to sprout, and the chocolate-chip vines are beginning to spread across the soil. Farmer Gelato carries bucket after bucket of water from the tap outside the barn to the fields and pours water around each plant. "You're no help," he says to Caramelo, who is lying in the shade of a licorice vine.

Today, Farmer Gelato must plant a new crop. First, he must till the soil and dig five long rows from one end of the field to the other. As he digs the rows with his shovel, he gets hot and wipes the sweat from his brow. Next, he needs to plant the seeds for the new crop. As he walks along each row, he drops in a sprinkle every two feet and covers it delicately with soil. Then he carries more buckets of water from the barn and carefully waters each newly planted sprinkle. He knows that with sunshine, water, and care, the sprinkle bushes will grow large and healthy, and in the fall, he will harvest a rainbow of sprinkles.

As Farmer Gelato is admiring his work he hears, "Caw! Caw!" behind him. He whips around and sees a flock of crows descending on the chocolate-chip vines. "Shoo! Shoo!" he yells as he runs toward the crows, his arms waving frantically. Caramelo runs alongside, barking. As the crows fly away from the field, Farmer Gelato knows they will come back. Last year, they ate so many chocolate chips that he worried there wouldn't be any left to harvest!

NAME: _____

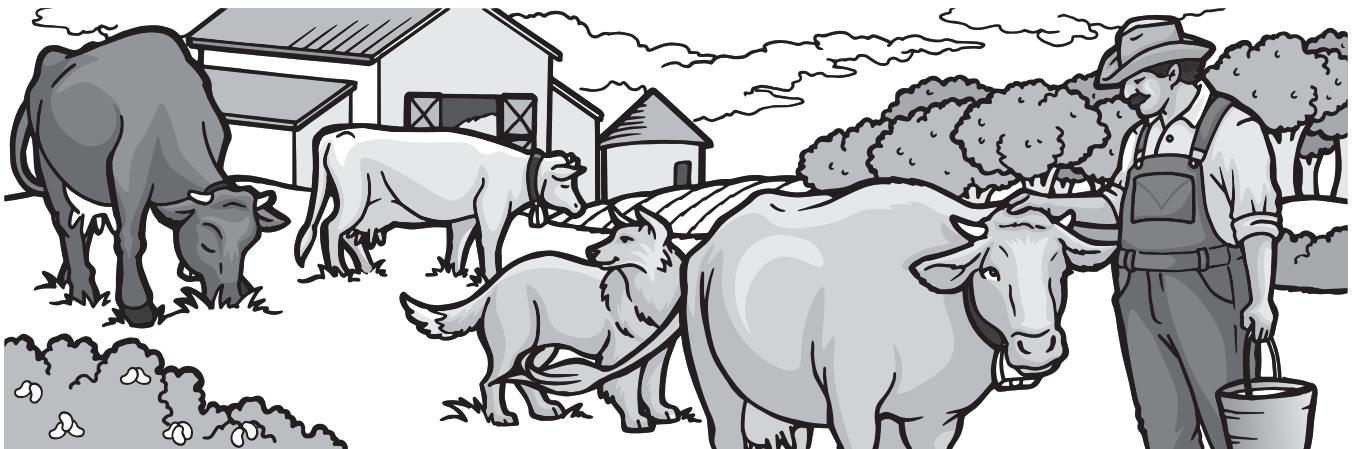
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SUNDAE FARMER

With the planting finished, Farmer Gelato can turn his attention to his orchards. He shades his eyes from the sun as he looks up to see the new, white marshmallow buds starting to form at the tip of each branch. He sets his tallest ladder against the trunk of a tree and climbs up with his pruning shears. As he cuts back some branches to make more room for others, he notices that the trees have grown taller, and he can't quite reach all the branches.

Next, Caramelo helps the farmer bring the cows in from the pasture. Well, "helps" isn't exactly the right word. She stands in one spot and barks at them as they go by. In the barn, Farmer Gelato directs the cows into their stalls as they moo softly. To feed the cows, he must climb a rickety ladder into the hayloft, up high in the barn rafters, and throw down bales of hay. Then he uses a pitchfork to break up each bale and toss some hay over a stall fence and into a hay rack. By the time he has fed all of the cows, he is exhausted and ready to sit down. He grabs his milking stool and brings it to the first cow. "How are you today, Presa?" he coos as he pets her soft, pink hide. As Caramelo lazes nearby, Farmer Gelato gently milks each cow. He is careful to use different buckets for the chocolate, vanilla, and strawberry milk.

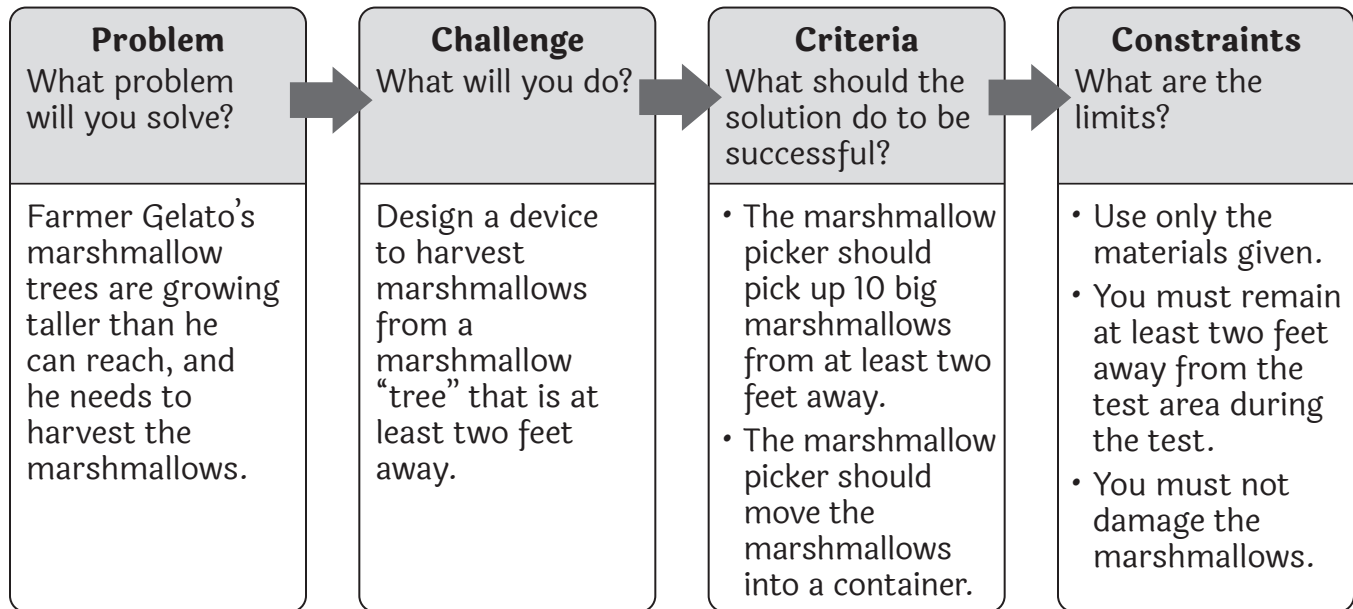
As the sun sinks beyond the horizon and the clouds take on the color of cotton candy, Farmer Gelato walks slowly back to his farmhouse. As he wearily climbs the front steps, he turns to gaze contentedly over his fields, groves, and pastures. He is happy to be a sundae farmer.



NAME: _____

DATE: _____

STEP 1: PREPARE FOR THE CHALLENGE



Directions: Your marshmallow picker prototype will need to do two things:

1. Reach the marshmallows from at least two feet away from the testing surface.
2. Pick up marshmallows and move them to the container.

You will also use some materials to connect the parts of your marshmallow picker. Look over the available materials. Think about which materials you might use to accomplish each task. Sort the available materials by task, below. Some materials may work in more than one category.

Reach the table	Pick up marshmallows and move them to the container	Connect parts

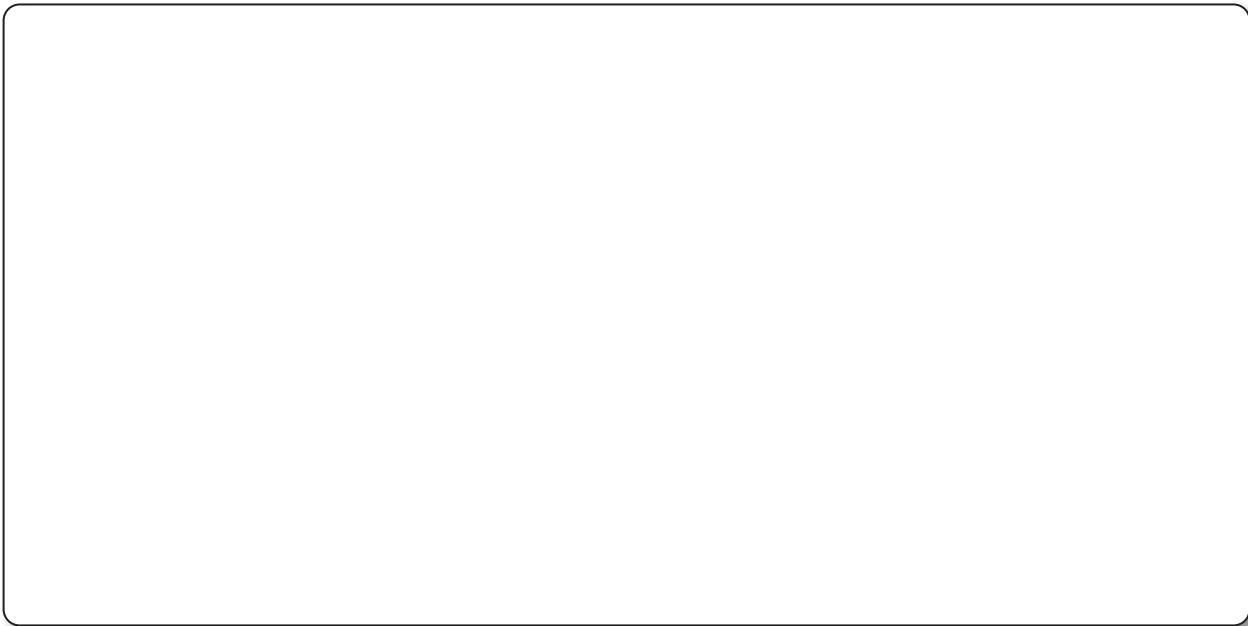
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STEP 2: BRAINSTORM, PLAN, AND BUILD

1. Brainstorm design ideas for marshmallow pickers you can build that will meet the criteria and constraints. Sketch and write at least three ideas on the back of this page.
2. Think about which design might perform best in testing. Draw a star by the design you will build. Why did you choose this idea?

3. Draw a diagram of your design here. Label all of the materials.



4. Describe how your picker will pick up marshmallows and put them into a container.

5. Build your marshmallow picker according to your plan!

NAME: _____

DATE: _____

STEP 3: TEST, IMPROVE, AND SHARE

1. Test your marshmallow picker at the testing station. Were you able to reach and pick up all 10 marshmallows? If not, how could you improve your design?

2. Could you use your marshmallow picker to put the marshmallows into the container? If not, how could you improve it?

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

4. Keep redesigning until your marshmallow picker meets the criteria!

NAME: _____

DATE: _____

STEP 4: REFLECT

1. How does your design reach and pick up marshmallows?

2. How does your design put the marshmallows into the container?

3. How did you improve your design?

4. What was the hardest part about this challenge?

5. What have you learned from this challenge?
