PLOT SUMMARY:

Martina, Simon, and Lea build a not-so-spooky haunted Halloween maze for the neighborhood kids.

MOVING PROP 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?
Martina, Simon, and Lea want to include moving props in their haunted maze.	Design and build a prop that moves.	The prop should move in one of these ways: pop up, fly, or crawl.	• Use only the materials given. • Props cannot be permanently attached to the walls, ceiling, or floor. • Props must use kid power; no batteries or electricity.

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	The kids want to build a maze in the garage.
Possible Challenge	• Build a model of a maze that isn't attached to the walls or floor.

Problem	Simon wants fog to blow through the maze.
Possible Challenge	• Design a fan to blow fog along the ground.

Problem	The kids need more fun things for the maze.
Possible Challenge	• Design and build fun props or scary items for the haunted maze.

MATERIALS:

Suggested: yarn, string, and fishing line; round items such as cardboard tubes, cans, or spools to make pulleys; long items to make levers such as rulers and yardsticks, dowels, or lumber scraps; cardboard, foam board, fabric, paint to make props

PREPARATION:

If possible, provide students with a means to record their tests on video and watch them. This will allow them to see more clearly where they need to make improvements.

LESSON PLAN:

1. Have students read the passage and discuss the problems they identified. Use these questions as prompts:
   - Have you ever been to a haunted house, a corn maze, or a fall festival? What did you do there? What did you think of it?
   - What kinds of things did the kids in this story want to make or build for their maze? What kinds of moving things did they build?
2. Introduce the Moving Prop Challenge by reading through the challenge pages together. Let students know that their prop doesn't have to be for Halloween or fall. Their prop can be for an event with any theme they like. For example, they could build a pop-up clown for a carnival, a flying reindeer for a holiday event, or a crawling caterpillar for a spring festival.
3. Talk with students about their choices in how to make their prop move: pop up, fly, and crawl. Let them know that their prop will be human powered, meaning they will have to provide a way to push or pull to make it move (it won't have batteries or use electricity). Ask them to think of things that move through pushes and pulls. Some examples: jack-in-the-boxes pop up because they are pushed up by a spring; stomp rockets pop up when they are pushed by moving air; drying clothes can "fly" when you pull on a pulley clothesline. Here are some ideas for solving this challenge:
   - Pop up: step on a long lever to pop a prop up; pull a prop up with fishing line and a pulley
   - Fly: use gravity to pull a prop down a zip line made of fishing line; use pulleys and fishing line to fly a prop across the room
   - Crawl: pull a prop along the ground with string or fishing line; put a prop on wheels and push it with a long handle
4. Show students the available materials and review the criteria and constraints. Give them time to prepare, brainstorm, plan, and build their moving props. 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, direct them to a space with enough room for them to test their moving prop safely.
5. Have students share their solutions with the class and get feedback from peers, then revise their designs and test again.
6. When students have completed the challenge, have them demonstrate and explain their moving props 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 characters have to face. Write and/or sketch your ideas for solutions in the margins.

HAPPY HAUNTS

Martina, Simon, and Lea walked slowly home from school on a chilly fall Friday. Red and orange leaves drifted down around them.

Lea sighed. "Halloween isn't going to be any fun this year," she grumped.

"I know what you mean," answered Simon. "We're too old to get dressed up and go trick-or-treating, but I really want to do something."

"Come on, y'all," Martina said. "Halloween has always been my favorite holiday. I'm not going to let the fact that we are 'too old' ruin it."

"Well, what can we do?" asked Lea.

"Maybe we can help the younger kids have fun," said Martina. "Why don't we make a haunted maze for the neighborhood?!"

"Let's do it!" agreed Lea and Simon.

"Planning meeting at my house!" shouted Martina.

At Martina's, they talked about things they remembered from past haunted houses and scary mazes.

"We definitely need some ghosts," suggested Simon.

"What could we use to make them? Hmmm. I think my mom has some old sheets we could use," said Lea.

"Ghosts...check," said Martina, as she added it to the list. "Plain old sheet ghosts might be boring, though. I think we should make the ghosts fly around!" said Martina.

As they talked, they added more and more ideas to their list. The biggest project would be the maze that trick-or-treaters would walk through. Martina wanted to have spooky things pop up suddenly to make everyone jump. Lea wanted spiders that "crawl" across creepy webs. Simon thought they should get a fog machine and blow the fog through the maze. They would light up the maze with glowing eyes and plenty of jack-o'-lanterns.

NAME: _____ DATE: _____

HAPPY HAUNTS

"I remember that haunted hayride at the farm last year," said Lea. "There were a lot of actors in super creepy makeup and costumes, and they jumped out and scared people. Should we have people in costumes jumping out?"

"Well, this is for younger kids," said Martina, "and we don't want to scare them too much. Maybe we could ask some of our friends to dress up in Halloween costumes that aren't too scary."

"My friend Julio did some great makeup for his little brothers and sisters last Halloween," said Simon. "I'll text him and ask if he can help."

Lea laughed. "Guess we'll be dressing up for Halloween after all!"

"Hold on," said Simon. "Where exactly are we going to build this haunted maze?"

Martina ran to her dad. "Would it be okay if we build it in our garage? Pleeeease?" All three teens looked at him expectantly.

"Well," he said, "if you don't attach anything to the walls or floor, I guess it could work. And I'll tell you what: I'll supply the candy for you to pass out at the end of the maze."

The kids thanked Mr. Rosales and gave one another high fives.

All weekend, Martina, Lea, and Simon worked. As the word got out, their crew grew. By Saturday afternoon, there were over a dozen teens building and decorating the spooky maze. On Halloween night, the weather was just right—chilly with a slight breeze to rustle the leaves. Signs around the neighborhood pointed trick-or-treaters to the Happy Haunts Maze. They soon had a line of eager children waiting. Small groups of excited kids made their way past flying ghosts, pop-up scares, and crawling spiders. The air filled with screams and giggles. The three teens couldn't have been prouder.

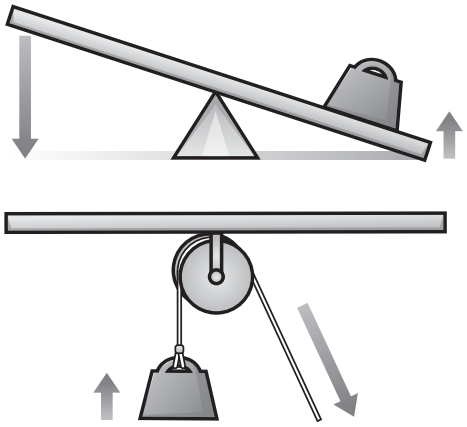
NAME: _____ DATE: _____

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?
Martina, Simon, and Lea want to include moving props in their haunted maze.	Design and build a prop that moves.	The prop should move in one of these ways: pop up, fly, or crawl.	• Use only the materials given. • Props cannot be permanently attached to the walls, ceiling, or floor. • Props must use kid power; no batteries or electricity.

There are two ways to make something move: push and pull.

- When you **push** something, you move it away from you. For example, you can push a baby stroller or push a button. When you kick or throw a ball, you are pushing it. You can push down on one end of a lever to make the other end go up.
- When you **pull** something, you move it closer to you. You can pull a zipper up or down, pull on your socks, or pull a wagon. You can pull things using a pulley and string.



- Some things you can both push and pull, like a door, a drawer, or a friend on a swing. When you write, you push and pull your pencil.

Directions: Think about different ways you could use pushes and pulls to make your prop move in each way. List as many as you can think of in each category.

Pop Up	Fly	Crawl

NAME: _____ DATE: _____

STEP 2: BRAINSTORM, PLAN, AND BUILD

1. Brainstorm design ideas for moving props you can build that will meet the criteria and constraints. Think about how you can use pushes and pulls to make them move. 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 moving prop will work.

_____

_____

_____

5. Build your moving prop!

NAME: _____ DATE: _____

STEP 3: TEST, IMPROVE, AND SHARE

1. Test your moving prop. Did it move in the way you planned? If not, what do you think went wrong?

2. How could you improve your design?

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

4. Keep testing and improving until your moving prop works!

NAME: _____ DATE: _____

STEP 4: REFLECT

1. How does your prop move?

2. How did it work the first time you tested it?

3. How did you improve your design?

4. What was the hardest part about this challenge?

5. What have you learned from this challenge?