

PLOT SUMMARY:

The Chitin Champions, a band of hero insects, use their special abilities to help Ladybug rescue her larvae.

CAMOUFLAGED INSECT CHALLENGE:

Problem	Challenge	Criteria	Constraints
What problem will you solve?	What will you do?	What should the solution do to be successful?	What are the limits?
The insects need to camouflage themselves to hide from predators.	Design and build a camouflaged insect model.	<ul style="list-style-type: none"> The insect model should have the general body structure of an insect: three body parts, six legs, two antennae, wings (optional). The insect model should use camouflage to "disappear" against a specific background. 	<ul style="list-style-type: none"> Use only the materials given. The insect model must be between six inches and one foot long.

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 insects need to move a heavy dandelion stem out of the way.
Possible Challenge	<ul style="list-style-type: none"> Engineer a device to move heavy objects.
Problem	The insects need to find their way at night.
Possible Challenge	<ul style="list-style-type: none"> Design a flashlight, a lantern, or another way to see in the dark.
Problem	Firefly must send a code using a flashing light.
Possible Challenge	<ul style="list-style-type: none"> Create a code and send a message using light.
Problem	The insects need to rescue Ladybug's larvae from the island.
Possible Challenges	<ul style="list-style-type: none"> Build a bridge out of only one material. Engineer another way to get the larvae safely off the island.

MATERIALS:

Suggested: structural items such as craft sticks, straws, cardboard tubes, egg cartons; malleable materials such as fabric, felt, foil, and construction paper; craft items such as buttons, beads, pipe cleaners, clay, paint; connectors such as glue, tape, string, rubber bands

PREPARATION:

This is a creative project, so the more materials you can offer, the better. Students will be searching for interesting backgrounds against which to camouflage their insect models, so the more areas you can give them access to, the more choices they will have.

LESSON PLAN:

1. Have students read the passage and discuss the problems they identified. Use these questions as prompts:
 - What do you know about insects? What insects have you seen?
 - What are some of the challenges the insects encountered in this story?
 - How did the insects use their natural abilities to solve their problems?
2. Introduce the Camouflaged Insect Challenge by reading through the challenge pages together. Show students the available materials and review the criteria and constraints.
3. Explain to students that they will first consider some different backgrounds that their insect model can blend into. These don't need to be realistic, natural backgrounds; encourage students to have fun with this challenge and try some interesting backgrounds, like a colorful map or a soccer ball.
4. Encourage students to get creative with not only the color and pattern of their insect models, but also the body structures. Perhaps show students or have them research real-world examples like leaf hoppers that are shaped like thorns or orchid mantises that look like flowers.
5. Give students time to prepare, brainstorm, plan, and build their insect models. 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.
6. Have students evaluate their insect models by checking them against the criteria, then place their insect models against their chosen background and get feedback from peers. If possible, have them take photos of their camouflaged insects to evaluate how well they blend into their surroundings. Then they should revise and improve their designs.
7. When students have completed the challenge, have them place their insect models against their chosen backgrounds. Have the class hunt for the camouflaged insects. As each insect model is found, the creators should show and explain their models.
8. Have students fill out the reflection page.
9. 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: _____

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

INSECT QUEST

"Please," cried Ladybug, "you have to rescue my larvae! I thought they would be safe, but then it rained. They're stuck on a small island in the middle of a big puddle."

"Never fear, ma'am," said Grasshopper confidently. "The Chitin Champions are at your service." She introduced her crew: Hercules Beetle, Stink Bug, Moth, and Firefly. They were known throughout the land for using their special abilities to help others, and they made a great team.

"Now, where are your babies?" asked Grasshopper.

Ladybug pointed with one of her front legs and answered, "Across the lawn and through the woods."

Grasshopper led the party down the path that wound through the lawn. As they crawled and hopped along the path, they heard a loud cracking sound. "Everyone scuttle backwards!" called Grasshopper. A large dandelion fell across the path, blocking their way.

"Hey, Herc," called Grasshopper. "Is it true you can lift 100 times your body weight?"

"What do you think?" huffed Hercules with a smile. "I've got this." He slowly lifted the gigantic stem and pushed it off the side of the path as the other insects watched in awe.

As they emerged at the other side of the lawn, a shadow fell across the party. They looked up to see a lizard looming over them. It looked hungry. Some of the insects quickly and instinctively moved to camouflage themselves. Grasshopper pressed herself up against a green leaf, Moth flitted to the bark of a tree, Hercules Beetle stood next to some twigs, Firefly flew up into a nearby bush, and Stink Bug pressed itself flat against the dirt. "Nobody move," whispered Grasshopper. Poor, bright red Ladybug was left standing right in front of the lizard.

NAME: _____**DATE:** _____

INSECT QUEST

The lizard flicked its terrifying tongue in and out, testing the tastes in the air. This was too much for Stink Bug. “Ahhhh!” he cried. He turned around to run away, leaving a terrible smell behind him. The lizard took a whiff, shook its head, and lumbered off.

“You saved me, Stinky!” cried Ladybug.

“I guess I’m good for something.” Stinky smiled.

They continued walking all afternoon and into the evening. As it got dark, Firefly went to the front of the group and lit the way along the path. Moth flew ahead, navigating by moonlight and making clicking sounds to confuse any bats that came close enough to pose a danger.

Just before dawn, the party finally arrived at the puddle. Ladybug flew to the island to console her larvae as they waited for rescue. Grasshopper coordinated her crew. “Firefly, send out a message to call for reinforcements. Hercules, please clear an area here at the edge of the puddle. Moth, fly overhead and keep an eye out for trouble. And Stinky...well, be ready in case we need you.”

Firefly flew to the top of a bush and began to flash his signal. He could see other fireflies in the distance sending it on. Now all they had to do was wait.

Within minutes, they could hear the pounding of hundreds of feet. Help was on the way! The sound got louder and louder until the line of marching ants came into view. The lead ant marched up to the edge of the puddle. She stopped, and the ant behind her walked up onto her back. One by one, the ants climbed on one another, extending a living bridge of ants all the way to the island. They carried Ladybug and her larvae back across and set them safely on the dry ground. Then the ants marched off in the direction from which they had come. The Chitin Champions saluted the ants as they went.

“How can I ever thank you all?” asked Ladybug.

“No problem, ma’am,” said Grasshopper proudly. “All in a day’s work for the Chitin Champions!”

NAME: _____

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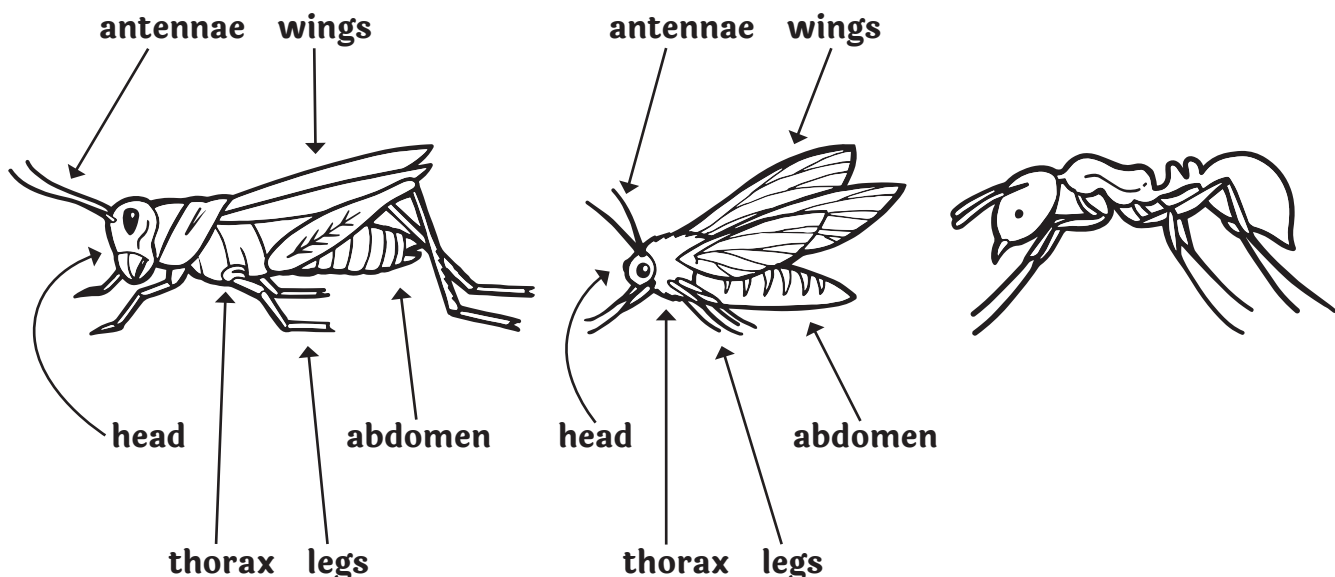
STEP 1: PREPARE FOR THE CHALLENGE

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?
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All insects have the same general body structure:

- Three body parts: head, thorax, abdomen
- Six legs attached to the thorax
- Two antennae
- Wings (two or four) attached to the thorax (not on all insects)

Directions: Label the body parts on the third insect.



NAME: _____

DATE: _____

STEP 2: BRAINSTORM, PLAN, AND BUILD

1. Search around you for backgrounds against which your insect model could be camouflaged. Choose three possible backgrounds and draw a sample of each here.

2. Brainstorm three design ideas for camouflaged insect models, one for each background. Your model should have all the body parts of a real insect. Keep in mind not just the color and pattern of your insect model, but its shape and features as well. Sketch and write your three ideas on the back of this page.
3. Think about which design might perform best in testing. Draw a star by the design you will execute. Why did you choose this idea?

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

5. Describe how your insect model will be camouflaged against your selected background.

6. Build your insect model according to your plan!

NAME: _____

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STEP 3: TEST, IMPROVE, AND SHARE

1. Check to see that your insect model meets each criteria and constraint:

- ☐ Three body parts: head, thorax, abdomen
- ☐ Six legs attached to the thorax
- ☐ Two antennae
- ☐ Wings (optional)
- ☐ Between six inches and one foot long

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

3. Put your insect model against your selected background. Ask friends to look for it. Was it hard for them to find it? Ask them for feedback on your camouflage. How can you use their ideas to make it better?

4. Keep redesigning until your insect model meets the criteria and is hard to spot!

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DATE: _____

STEP 4: REFLECT

1. What materials did you use to create the parts of your insect model to meet each criteria?

Three body parts (head, thorax, abdomen): _____

Six legs: _____

Two antennae: _____

Wings (optional): _____

2. How did you create your insect model to blend in with your selected background?

3. How did you improve your design?

4. What was the hardest part about this challenge?

5. What have you learned from this challenge?

