

# Safe Cycling



**Unit 3**  
Fun in  
Action



## Lesson Plan

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Smithsonian

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## Answer Key: Safe Cycling

### page 10—Magnificent Main Ideas

Answers will vary. Here is an example:

**The book is mostly about:** bike safety

**Chapter Title:** Dress for Safety

**Main Idea:** It is important to use the right gear when cycling to protect yourself from getting hurt.

**Detail:** A helmet protects a rider's head.

**Detail:** Pads protect riders' knees and elbows.

### page 11—Great Gear

Opinions will vary and should be supported with at least two reasons.

### page 17—Safe Cycling Quiz

- A
- C
- B
- D
5. Answers may include some or all of the following: Bike lanes are created to keep bikes away from vehicles; Some towns have lowered the speed limit near bikers; Some cities have made streets just for bikes.

# Safe Cycling

## Materials

- ▶ *Safe Cycling* books
- ▶ copies of student activity sheets (pages 9–19)
- ▶ **STEAM Challenge materials include but are not limited to the following:**
  - ✓ cardboard pieces
  - ✓ duct tape
  - ✓ foam pool noodles or pieces of foam
  - ✓ glue
  - ✓ melons (one per group)
  - ✓ plastic bags
  - ✓ scissors
  - ✓ tissue paper



## Learning Objectives

- ▶ **Reading:** Identify the main topic of a multi-paragraph text as well as the focus of specific paragraphs within the text.
- ▶ **Writing:** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words to connect opinion and reasons, and provide a concluding statement or section.
- ▶ **Speaking and Listening:** Participate in collaborative conversations with diverse partners about grade-appropriate topics and texts with peers and adults in small and larger groups.
- ▶ **Engineering:** Define an engineering problem, design and evaluate solutions, and optimize a design based on test results.

## Phenomena

Brakes slow and stop objects in motion. Some materials absorb impact. Some materials reflect light.

## Lesson Timeline

Day 1	Day 2	Day 3	Day 4	Days 5–10
<b>Introductory and Before Reading Activities</b> (page 4)	<b>During Reading Activities</b> (page 5)		<b>After Reading Activities</b> (page 5)	<b>STEAM Challenge and Assessments</b> (pages 6–8)
Define the STEAM Challenge, and practice identifying the main idea.	Research bike safety, identify the main ideas of a text, and brainstorm design solutions.		Write opinion pieces on the most important safety gear for cyclists.	Design, build, test, improve, reflect on, and share new cycling helmets. Complete the assessments.



# Safe Cycling (cont.)

## STEAM Vocabulary

absorb

gear

impact

reflective

treads

### Introductory Activity

#### Define the Problem

1. Ask each student to imagine they are going on a bike ride. Invite volunteers to make suggestions of what they need to do to prepare themselves to ride (put on shoes, a helmet, sunglasses, etc.), and have students pretend to do each action. Repeat this activity, this time having students suggest what they need to do to ride the bike. You may choose to have students remain seated or stand as they mime the actions of riding a bike.
2. Distribute the *Safe Cycling* books to students. Reveal the STEAM Challenge by reading aloud pages 28–29 of the book.
  - Display the Interactiv-eBook for a more digitally enhanced introduction to the challenge.
3. Distribute *Make a Plan* (page 9) to students. Have them summarize the challenge. Summaries should include constraints and criteria.
  - **Support** students with the following sentence frame to help them summarize:  
Create a \_\_\_\_\_ that can \_\_\_\_\_ using \_\_\_\_\_.

**Note:** You may wish to distribute all student activity sheets as one packet. They will be used throughout the STEAM Challenge.

### Before Reading

1. Write the vocabulary words on the board. Explain the meaning of each word. Show students pictures related to the words (pictures from the book may be used), or use the words in sentences that provide context for the meanings of the words.
2. Write the following related words on the board: *protect, clothing, crash, shiny, and tires*. Ask students which words relate to each vocabulary word. Accept any grouping as long as students can provide logical explanations.
3. Tell students that nonfiction authors often present main ideas at the beginning of a book, section, or paragraph. They support these ideas with details. Explain that each chapter supports the main idea or topic of the book and smaller sections and paragraphs in each chapter support the main idea of that chapter.
  - **Challenge** students to create mind maps showing the relationships between the main idea or topic of a book and the chapters and paragraphs within that book.
4. Explain to students that the main idea or topic of a book is often the title of the book. Read aloud the title—*Safe Cycling*. Then, turn to the table of contents and read aloud each chapter title. Ask students to make predictions with partners about how each chapter will support the topic.



# Safe Cycling (cont.)

## During Reading

### Research and Brainstorm

1. Distribute the *Safe Cycling* books to students. Do a choral read of the book, asking different groups of students to read each page (everyone wearing red, everyone with a pet, everyone with an older sibling, etc.). Stop after each page, and discuss the main idea of chapters and paragraphs. Point out how the first chapter introduces the main idea of the book, the first paragraph or page of each chapter introduces the main idea of that chapter, and the first sentence in most paragraphs introduces the main idea of the paragraph.
  - Display the Interactiv-eBook for a more digitally enhanced reading experience. You may wish to have students annotate the PDFs as you read.
  - Play the audio recording as students follow along to serve as a model of fluent reading. This may be done in small groups or at a listening station. The recording will help **English language learners** practice fluency and aid in comprehension.
2. Distribute *Magnificent Main Ideas* (page 10) to students. Have students read the book in pairs and complete the activity sheet. Remind them that they may choose which chapter to write the main idea and details for in the graphic organizer.
  - To **support** students, provide them with the main idea of a chapter to start with and have them write the details. (See answer key on page 2 of this lesson plan.)
3. As a group, brainstorm ideas for their designs. Have students record ideas for their designs on their *Make a Plan* activity sheets.

## After Reading

1. Review the definitions of the vocabulary words. Then, have students complete the sentence stems below. Students' sentences should demonstrate an understanding of the words' meanings.
  - If you fall, pads will absorb \_\_\_\_\_. (*the impact of hitting the ground*)
  - \_\_\_\_\_ are examples of gear that helps keep cyclists safe. (*Helmets*)
  - The \_\_\_\_\_ are hard to protect from the impact of a fall. (*outside of pads*)
  - \_\_\_\_\_ are made of reflective fabric. (*Safety vests*)
  - Tire treads keep the bike from \_\_\_\_\_. (*slipping and sliding*)
2. Tell students that experts are often asked to write articles for magazines that focus on certain topics, such as biking. Ask them to imagine that they have been asked to write articles for a biking magazine about safety gear. Tell students that they will each decide which piece of gear is the most important and write an article explaining why.
3. Distribute *Great Gear* (page 11) to students. Have them use their graphic organizers to plan their articles. Then, have students share their plans with partners.
  - **Support** students with the following sentence frame for their opinion statements: *I think \_\_\_\_\_ is the most important \_\_\_\_\_.*
4. Have students write their articles on separate sheets of paper. Ask them to draw pictures to support their articles.



# Safe Cycling (cont.)

## Prep

- ▶ Review all designs prior to building.
- ▶ Prepare all materials for the STEAM Challenge.

## STEAM Challenge

### Design and Build

1. As a group, discuss the following questions to connect the reading to the STEAM Challenge:
  - ▶ *What types of gear do cyclists use to keep them safe?* Discuss with students how cyclists use different gear to protect different parts of their bodies. Helmets are used to protect their heads, and pads are used to protect elbows and lower parts of the body.
  - ▶ *What types of materials are used on the insides and outsides of helmets?* Have students recall that the insides of helmets are made with soft foam and the outsides are made with hard materials.
2. Distribute previously completed activity sheets. Review the STEAM Challenge on pages 28–29 together. List materials on the board, and discuss with students how each material might be helpful in creating their helmets.
3. Ask students to independently sketch and label two designs on their *Make a Plan* activity sheets.
4. Organize students into teams. Distribute one copy of *Team Designs* (page 12) to each team. Ask teams to have members share their designs. Then, have each team choose, sketch, and label a team design. (Team designs must be submitted for teacher approval before building begins.)
5. Explain to students that when they build their models, they must follow their design plans. Reassure them they will have the opportunity to change and improve their designs after they present them. Review classroom expectations for working with materials. Then, give teams time to build models.
  - ▶ Challenge students by adding constraints or criteria (e.g., drop the melon from 2 meters (6 feet) off the ground).
  - ▶ Digitally record students' processes to share at a later date with students and parents.
6. Distribute *Think about It* (page 13) to each student. Explain that reflection is an important part of the engineering design process. Read aloud numbers 1 and 2 on the activity sheet, and have students write their responses. Ask volunteers to share.

# Safe Cycling (cont.)

## Prep

- ▶ Review all designs prior to building.
- ▶ Prepare all materials for the STEAM Challenge.

## STEAM Challenge

### Test and Improve

1. As a group, discuss the following questions to connect the reading to the STEAM Challenge:
  - ▶ What are some *bike features that have improved over time*? Guide students to the idea that adding brakes and tires with special tread have made bikes safer. Brakes allow cyclists to stop quickly, and tires with tread patterns help to grip the road or gravel better.
  - ▶ What types of materials or fabrics are used to help cyclists be seen both in the daytime and nighttime? Discuss as a group that reflective material is used to create vests for cyclists. The reflective material contains many small beads that allow the material to “shine” so that wearers may stay safe when they are cycling.
2. Gather teams for testing. Explain that teams will offer feedback after the test. Use *Friendly Feedback* (page 14) to review best practices for giving feedback.
3. Distribute *Protect Your Melon Test Results* (page 15), and ask students to record results for each team. Allow time for teams to present and explain their designs and test their helmets. Have teams measure 1 m (3 ft.) high and drop their melons one at a time. A successful helmet will keep the melon completely protected, without any bumps, bruises, or cracks. Ask volunteers to give friendly feedback after each test.
4. Provide time for teams to brainstorm ways to improve their designs based on test results and feedback. Refer students back to their *Team Designs* activity sheets. Ask them to sketch their improved designs and explain any changes. Have students submit improved designs for approval before making changes.
  - ▶ **Challenge** successful teams with additional constraints or criteria for the second design (e.g., the helmet must stay on when a person shakes their head).
5. Have teams gather materials to improve their designs. Then, have them make their improvements and retest their helmets.
6. Have students complete numbers 3 and 4 on their *Think about It* activity sheets.



# Safe Cycling (cont.)

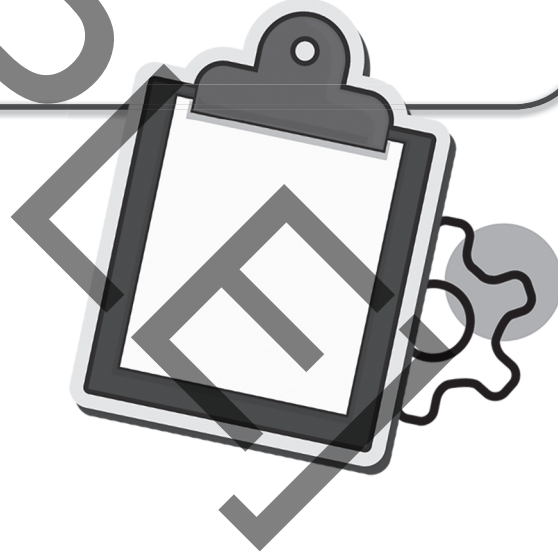
## STEAM Challenge

### Reflect and Share

1. Gather students in the meeting area, and tell them that they will be reflecting on their STEAM experience by doing something called a 3-2-1 with partners. They will each share three things they learned from their experiences, two questions they still have, and one new material they would want to use to improve their helmet designs.
2. Have students answer question 5 on their *Think about It* activity sheets.
3. Distribute *Engineering Design Process* (page 16), and review how students used each step to complete the challenge. Have them annotate the infographic with details specific to this challenge.
4. Read “Career Advice” on page 32 of the book. Ask students to brainstorm other tips for a career designing safety gear.

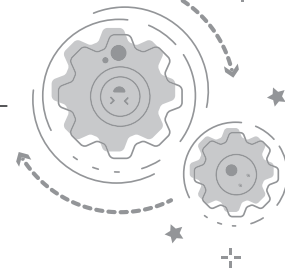
### Assessment Activities

1. Have students complete a short posttest, *Safe Cycling Quiz* (page 17), to assess this lesson’s reading objective.
  - ▶ Students may use the Interactiv-eBook activities in the Digital Resources for assessment purposes (optional).
2. Have students complete *Teamwork Rubric* (page 18) and *Engineering Design Process Checklist* (page 19) to reflect on and evaluate their work and collaboration skills.
3. Have students complete the Read and Respond questions from the book.
  - ▶ Possible answers to the questions can be found in the Digital Resources ([cycling\\_reproducibles.pdf](#)).



Name: \_\_\_\_\_

Date: \_\_\_\_\_



# Make a Plan

**Directions:** Summarize the challenge. Brainstorm ideas, and sketch two designs. Circle your favorite.

**Challenge:** \_\_\_\_\_

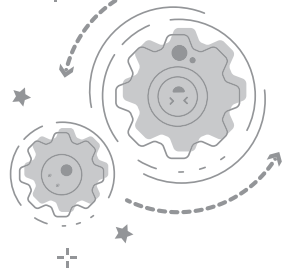
\_\_\_\_\_

\_\_\_\_\_

**Brainstorm**

**Design 1**

**Design 2**



Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Magnificent Main Ideas

**Directions:** Write two or three words to tell what the book is mostly about. Choose one chapter from the book. Write the title, main idea, and two details.

The book is mostly about: \_\_\_\_\_.

**Chapter Title**

**Main Idea**

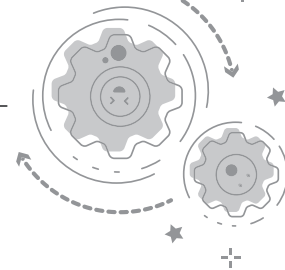
**Detail**

**Detail**



Name: \_\_\_\_\_

Date: \_\_\_\_\_



# Great Gear

**Directions:** Plan and write an article for a magazine explaining cycling gear. Tell which piece of cycling gear you think is most important. State your opinion, and write two reasons to support it. Then, write a conclusion.

**Opinion**

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**Reason 1**

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**Reason 2**

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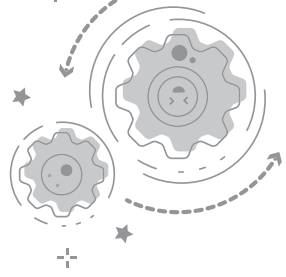
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**Restated Opinion**

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Team Members: \_\_\_\_\_

Date: \_\_\_\_\_

## Team Designs

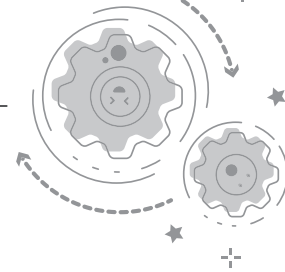
**Directions:** Sketch your team's design in the first box. Sketch your team's improved design in the second box. Label each design with materials needed and the purpose of each part.

Design 1

Design 2

Name: \_\_\_\_\_

Date: \_\_\_\_\_



# Think about It

1. It was (hard/easy) to create one team design because \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

2. I helped my team by \_\_\_\_\_

\_\_\_\_\_

3. Our design (failed/passed) the test because \_\_\_\_\_

\_\_\_\_\_

To improve our design, we \_\_\_\_\_

\_\_\_\_\_

4. Our improved design (worked/did not work). I know this because \_\_\_\_\_

\_\_\_\_\_

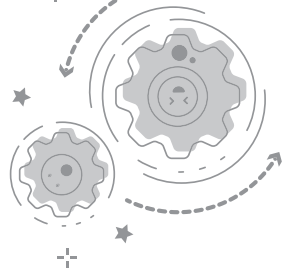
5. During this challenge, I learned \_\_\_\_\_

\_\_\_\_\_

My favorite part was \_\_\_\_\_

\_\_\_\_\_





Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Friendly Feedback

**Directions:** Feedback from others can help people improve their work. Use these sentence stems to give feedback to your peers.

## Clarify

Can you explain \_\_\_\_\_?

Why did you choose to \_\_\_\_\_?

How did you \_\_\_\_\_?

## Warm Feedback

I like \_\_\_\_\_ because \_\_\_\_\_.

It is interesting that \_\_\_\_\_.

\_\_\_\_\_ is a good idea because \_\_\_\_\_.

## Cool Feedback

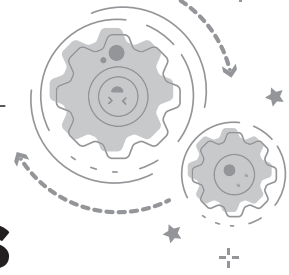
Have you thought about \_\_\_\_\_?

I wonder if \_\_\_\_\_.

You might want to try \_\_\_\_\_.

Name: \_\_\_\_\_

Date: \_\_\_\_\_



# Protect Your Melon Test Results

**Directions:** Write the materials each team used. Mark the results of each team's test by circling yes or no. Then, answer the questions.

Team	Materials Used	Did the helmet protect the melon?
		yes/no
		yes/no
		yes/no
		yes/no
		yes/no

Which design protected the melon the best? Why do you think it worked so well?

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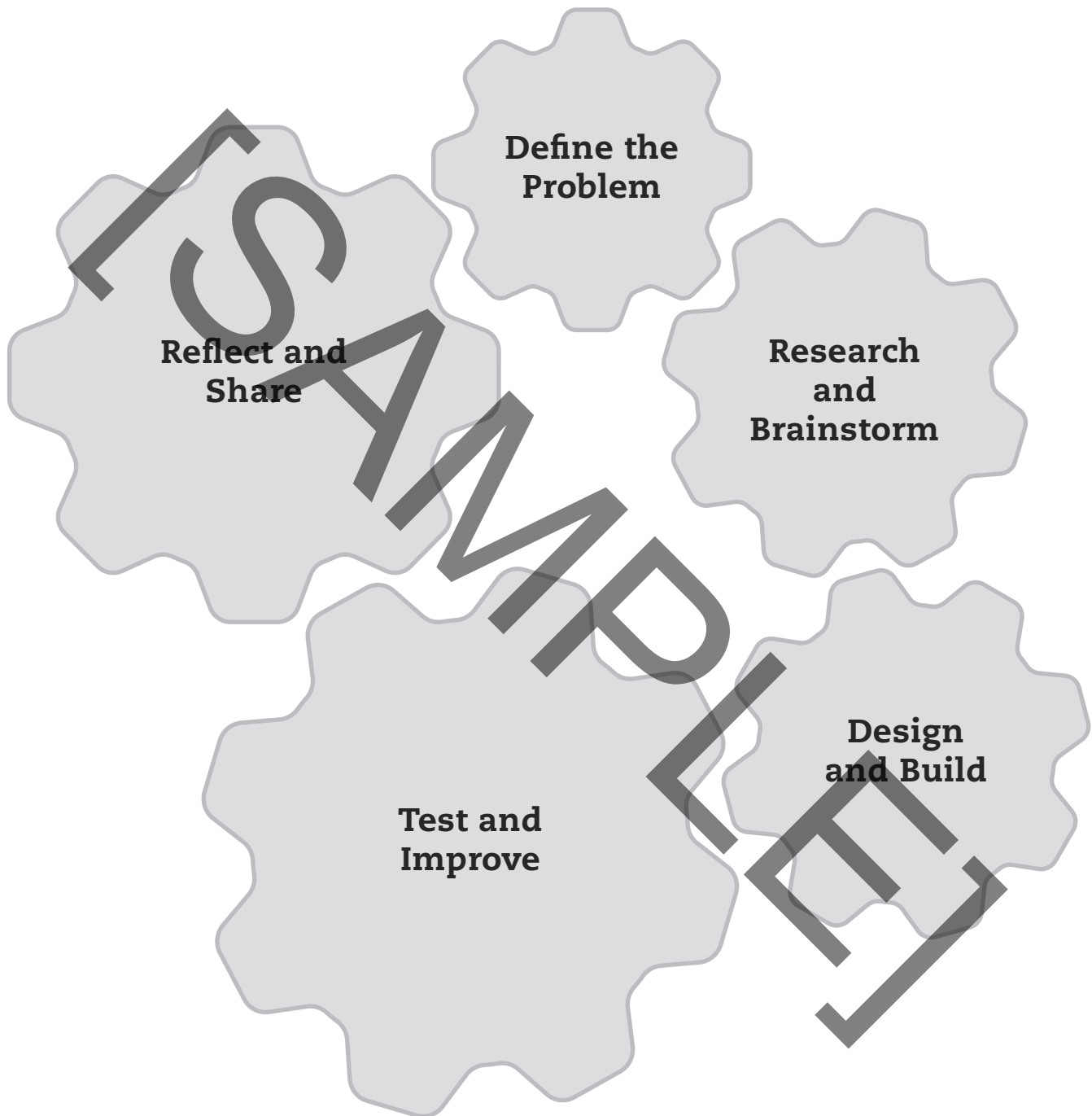
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How will you use these results to help you improve your design?

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# Engineering Design Process





## Safe Cycling Quiz

**Directions:** Read each question. Fill in the bubble for the best answer. Answer the last question in complete sentences.

1. What is the main idea of the book?

- (A) Engineers are making biking safer.
- (B) Bikers use bike lanes.
- (C) Helmets protect bikers' heads from impact.
- (D) Bikers are not allowed on roads with cars.

3. Three of the following statements are details that support a main idea. Which statement is the main idea?

- (A) Vests have reflective materials.
- (B) Bikers wear gloves and vests to stay safe.
- (C) Bike gloves are thin and stretchy.
- (D) Biker wear gloves to protect their hands.

2. Which two bike features does the author say help keep bikers safe?

- (A) spokes and chains
- (B) gears and frames
- (C) brakes and tires
- (D) pedals and handlebars

4. The biker could be seen at night because his vest was \_\_\_\_\_.

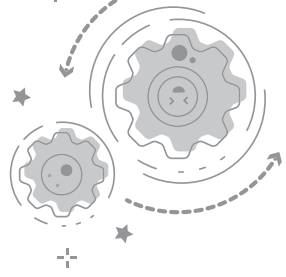
- (A) glossy
- (B) balanced
- (C) stretchy
- (D) reflective

5. What are some ways engineers are making roads safer?

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Teamwork Rubric

**Directions:** Think about how you worked in your team. Score each item on a scale of 4 to 1.

4 = Always    3 = Often    2 = Sometimes    1 = Never

I listened to people on my team.	4	3	2	1
I helped people on my team.	4	3	2	1
I shared ideas with people on my team.	4	3	2	1
We made choices as a team.	4	3	2	1
<b>Total</b>				

What is one thing your team did well? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What could your team do better next time? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_

Date: \_\_\_\_\_



# Engineering Design Process Checklist

**Directions:** Check the boxes to show that you did each step.

## Define the Problem

- ☐ I understood and explained the problem in my own words.

## Research and Brainstorm

- ☐ I used research to help me brainstorm solutions.

## Design and Build

- ☐ I planned and made a model.
- ☐ I thought like a mathematician or an engineer.

## Test and Improve

- ☐ I used criteria to evaluate designs.
- ☐ I improved designs based on test results.
- ☐ I thought like a mathematician or an engineer.

## Reflect and Share

- ☐ I shared my results and reflected on my work.



# STEAM CHALLENGE

## Research and Brainstorm

What are the different parts of a helmet? How do they work together to protect a bike rider's head?



## Design and Build

Sketch a plan for your helmet. Label the parts. What purpose will each part serve? What materials will work best? Build the model.



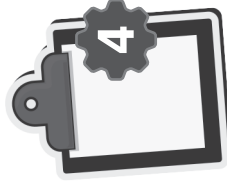
## Test and Improve

Place your helmet on the melon. Drop the melon 1 m (3 ft.). Did your helmet keep the melon safe? How can you improve it? Improve your design, and try again.



## Reflect and Share

What other materials might keep your melon safe? How might your design change if you had to drop the melon from 3 m (10 ft.) off the ground?



## Define the Problem

Bike riders need to stay safe while they ride. A company has asked you to build a model of a new bicycle helmet.

**Constraints:** You may only use cardboard, duct tape, glue, foam pool noodles, tissue paper, and plastic bags.



**Criteria:** Your helmet must fit and protect a honeydew melon when dropped from a height of 1 m (3 ft.).

