

More Picture-Perfect **SCIENCE** Lessons



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Imaginative Inventions

Description

Learners explore the invention process by learning about inventions throughout history and how inventions fill needs or wants, by improving existing inventions, and by keeping a toy invention journal. They further their understandings of the risks and benefits of inventions by testing toys and comparing the fun rating and the safety rating of each toy.

Suggested Grade Levels: 2–4

Lesson Objectives Connecting to the Standards

Content Standard E: Science and Technology Abilities of Technological Design

- Identify a simple problem, and identify a specific task and solution related to the problem.
- Propose a solution to make something work better.
- Evaluate a product or design made by themselves or others.

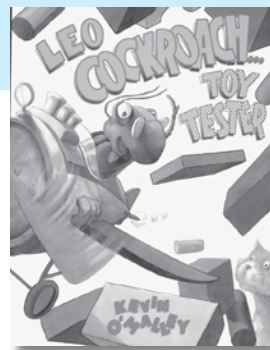
Content Standard E: Science and Technology Understanding About Science and Technology

- Understand that people have always had problems and invented tools and techniques to solve problems.
- Understand that trying to determine the effects of solutions helps people avoid some new problems.

Featured Picture Books



Title *Imaginative Inventions*
Author Charise Mericle Harper
Illustrator Charise Mericle Harper
Publisher Little, Brown
Year 2001
Genre Dual Purpose
Summary The who, what, where, when, and why of roller skates, potato chips, marbles, and pie told in rhyming verse.



Leo Cockroach, Toy Tester
 Kevin O'Malley
 Kevin O'Malley
 Walker
 1999
 Story
 Leo Cockroach, who secretly tests toys for the bug-hating president of a toy company, seeks a job with the competitor across the street and finds himself worse off than before.

Time Needed

This lesson will take several class periods. Suggested scheduling is as follows:

Day 1: **Engage** with *Imaginative Inventions* read aloud, and **Explore/Explain** with Improve an Invention.

Day 2: **Elaborate** with *Leo Cockroach*, *Toy Tester* read aloud and Toy Testing.

Day 3 and Beyond: **Evaluate** with Toy Invention Journal and Advertising Poster.

Materials

One standard Frisbee flying disc

One pie tin

Several “new and improved” versions of flying discs (or pictures of them) such as a foam flying disc, the Glow in the Dark Frisbee, or an Aerobie ring

Other examples of inventions from the book *Imaginative Inventions*, such as eyeglasses, high-heeled shoes, roller skates, flat-bottomed paper bags, marbles, and piggy banks

2 types of inexpensive simple toys to test (1 of each per student or pair), such as blow ball pipes, finger traps, jumping frogs

Fun Ratings overhead

Safety Ratings overhead

Student Pages

My Improved Invention

Toy Testing

My Toy Invention Journal

Inexpensive toys are available from

www.orientaltrading.com

and

WorldWise Sheridan

www.classroomgoodies.com

Background

The design process in technology is the parallel to inquiry in science. In scientific inquiry, students explore ideas and propose explanations about the natural world, whereas in technological design students identify a problem or need, design a solution, implement a solution, evaluate a product or design, and communicate the design process. In grades K–4, the standards suggest studying familiar inventions to determine function and to identify problems solved, materials used, and how well the product does what it is supposed to do. The purpose of this lesson is to encourage students’ creativity, imagination, and problem-solving skills with activities that focus on the technological design process.

In today’s fast-growing, highly competitive global marketplace, innovative thinking is more important than ever. Technology involves using science to solve problems or meet needs, and the understanding of technology can be developed by challenging students to design a solution to solve a problem or invent something to meet a need. Simply stated, inventors try to solve problems. They think about peoples’ *needs* and come up with a solution. Inventions don’t have to be entirely new ideas. Sometimes they can be add-ons or improvements to existing inventions. All inventions have *benefits* (good things that result from using them) and *risks* (possible hazards that may result from using them). Inventors must be sure the benefits of their inventions outweigh the risks.

Engage

Imaginative Inventions Read Aloud

Making Connections: Text to World

Show the cover of the book, *Imaginative Inventions*, and introduce the author and illustrator. Ask

- ? What is an invention? (Something that is made to meet a need or solve a problem.)
- ? What is the difference between an invention and a discovery? (An invention is something that is created; a discovery is something that is found for the first time. For example, Ben Franklin discovered that lightning is electrical current, but he invented the lightning rod.)
- ? What do inventors do? (They think about people's needs or problems and come up with solutions.)

Build connections to the author by reading the inside flap of the book about Charise Mericle Harper's favorite invention ("... muffins, which taste a lot like cake, but you get to eat them for breakfast!") Ask

- ? What do you think is the greatest thing ever invented? Turn and talk to a partner.

Inferring: Stop and Jot

Select several of the inventions in the book to read about. As you read each two-page spread, leave out the name of the invention and instead say "this invention." Have students make inferences about the identity of each invention using clues from the text and illustrations. They can stop and jot their guesses on sticky notes as you read. After reading each description, reveal the name of the invention and then have students identify the need or want that the invention filled.

Explore/ Explain

Improve an Invention

Explain that instead of coming up with completely new inventions, inventors often think of ways to make an old one better. A good example of this involves the improvements made to a very popular toy, the Frisbee. Make a T-chart with the words *benefit* and *risk* on the board. Discuss that all inventions can have both benefits (good results) and risks (bad results) for people and the environment. Ask the following questions, and write the students' responses on the T-chart:

- ? What are the possible benefits of a Frisbee? (Answers might include: You can have fun with it and get exercise using it.)
- ? What are the possible risks of a Frisbee? (Answers might include: You could get hurt if hit by a Frisbee, you could lose it outside, creating litter and making Frisbees in factories could cause pollution.)



Comparing flying toys

Explain that the original Frisbee had a serious risk: It was made of a very hard plastic that could really hurt if it hit you! Inventors improved upon this by making it from a softer material so the Frisbee was less risky to use. Demonstrate the evolution of Frisbee design by showing students a pie tin as well as several “new and improved” versions of flying discs such as lightweight foam versions, the Glow-in-the-Dark Frisbee, or an Aerobie ring. (You may want to take students outside to test some of the improved versions and compare them to the original.) Ask

- ❓ How are the new and improved Frisbees more fun or useful than the original?
- ❓ What are the benefits of the new and improved Frisbees?
- ❓ What are the possible risks of the new and improved Frisbees?

Explain that inventors try to improve products by increasing their benefits and reducing their risks.



Brainstorming ways to improve an invention

Now go back to *Imaginative Inventions* and write the names of the other inventions from the book on the board. Provide examples of several of these for students to look at, such as eyeglasses, high-heeled shoes, roller skates, flat-bottomed paper bags, and marbles. Have each student or group choose one of the inventions from the book and brainstorm ways that the invention could be improved upon.

Pass out the My Improved Invention student page. Have students select one of their ideas for improving an invention, draw a labeled picture of it, and give it a clever or descriptive name. They should also explain how their improved invention is more fun or more useful than the original and describe its risks and benefits. Student directions for the My Improved Invention page are as follows:

- 1 Which invention would you like to improve?
- 2 Draw and label your improved invention in the box below, and give it a new name.
- 3 How is your improved invention more fun or useful than the original?
- 4 What are the benefits of your improved invention?
- 5 What are the risks of your improved invention?

elaborate

Leo Cockroach, Toy Tester Read Aloud and Toy Testing

Introduce the author and illustrator of the book *Leo Cockroach, Toy Tester*. Kevin O'Malley first decided he wanted to illustrate children's books when he was in the fourth grade! He was in “time out” one day when he started reading *Where the Wild Things Are* by Maurice Sendak, and that book inspired him to write and illustrate humorous books for kids. (For more information on this author and illustrator, go to <http://mywebpages.comcast.net/komalley>.)



Thumbs down for “The Pointy Stick”

Inferring

Ask students to look at the cover and title of the book and make an inference.

- ? What do you think this book is about?
- ? Do you think toy testing is a real job? (Toy companies have to test their toys for safety. Many toy companies also give children toys to test and observe their reactions to them.)

Determining Importance

Before you begin reading the book, ask students to give a thumbs up for any toy in the book they think would be fun and safe and a thumbs down for any toy that they think would be boring or dangerous. Then read aloud *Leo Cockroach, Toy Tester*, making sure to read the name of each toy in the illustrations. After reading ask

- ? Why do companies need to test toys? (To see if the toys are both fun and safe.)

Discuss how most toys come with warning labels and/or directions for using the toy safely. Discuss the possible risks of various toys. For example, babies and young children often put things in their mouths. If a toy is too small, or contains small parts, it could be a choking hazard. If a toy is too sharp it could poke someone.

Then ask

- ? Would you like to be a toy tester?

Tell students that they are going to have a chance to be toy testers for Waddatoy Toys! Pass out the Toy Testing student page. On the board, write the name of one of the toys and label it “Toy A.” Write the name of the other toy on the board and label it “Toy B.” Give each student or pair of students both toys to test. They will be testing how much fun and how safe each toy is. Allow them several minutes of guided discovery with the toys. Then have them fill out the Toy Testing student page as shown:

1 Play with the toys! Then draw and label each toy below.

Toy A Drawing	Toy B Drawing
---------------	---------------

2 Give each toy a fun rating:

	Toy A			Toy B		
Fun	 not fun	 sort of fun	 very fun	 not fun	 sort of fun	 very fun

3 Give each toy a safety rating:

	Toy A			Toy B		
Safety	 not safe	 sort of safe	 very safe	 not safe	 sort of safe	 very safe

4 Which toy would you prefer to buy? Why?

Briefly compare the ratings students gave the toys. Point out that not everyone gave the toys the same ratings. Then ask

? Do you think companies use only one toy tester? (No. It is good to have more than one opinion about a toy.)

Overall Class Ratings

Discuss the idea that toy companies don't take just one person's opinion about a toy. They collect many people's opinions about a toy before making changes to the toy or before deciding to sell it in stores. Show students the Fun Ratings overhead. Point out the parts of the graph: the title, the x-axis label, the y-axis label, and the box with lines for summarizing the class ratings for Toy A and Toy B. Tell them that the graph will help them make a conclusion about the toy by showing everyone's ratings. Use a colored marker to color in the box for Toy A on the key. By a show of hands, count the number of "not fun" ratings and draw a bar using the color for Toy A. Repeat for the other two ratings.

using the color for Toy A. Then count the "sort of fun" and "very fun" ratings. Next, use a different-colored marker to color in the box for Toy B on the key. By a show of hands, count the number of "not fun" ratings and draw a bar using the color for Toy B. Repeat for the other two ratings.

Have students look carefully at all of the ratings on the graph. Have them come up with an overall class fun rating for Toy A by asking



Sample fun ratings whole-class graph



Testing a Blow Ball Pipe



Warning label for a Blow Ball Pipe

? Which fun rating did Toy A get most often?

Record that rating in the class rating box at the top of the graph. Then have students come up with an overall class fun rating for Toy B by asking

? Which fun rating did Toy B get most often?

Next, discuss what criteria students came up with to determine their safety ratings. See if students can locate a warning label on any of the toys or packaging, and discuss the possible risks of the toys. Then come up with an overall class safety rating for both toys using the Safety Rating overhead. Finally, ask students to compare the scores of both toys by comparing the class ratings. Ask

? Which toy scored higher for fun?

? Which toy scored higher for safety?

? Which toy would you prefer to buy? Why?

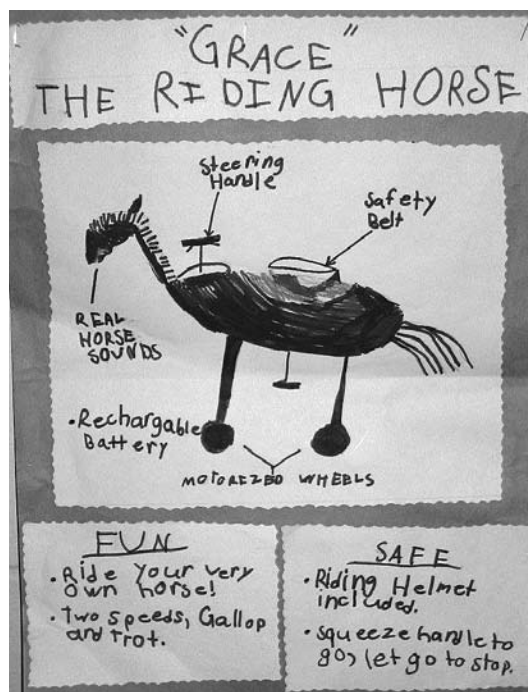
? How could you improve upon either of the toys?

portunity to be toy inventors. Pass out the My Toy Invention Journal to each student. Tell them that they will be working with an adult helper at home to invent a new toy or improve a toy that they already have or know about. The journal will help them brainstorm ideas and keep track

elaborate

Toy Invention Journal and Advertising Poster

Tell students that they are going to have the op-



Sample toy advertisement

of their invention process. You may want to have students actually build a prototype of the new or improved toy with an adult's help. The assignment concludes with a 3-2-1 poster advertising the new or improved toy. The poster should include:

- 3 points: A labeled drawing of the new or improved toy, including a creative name for the toy.
- 2 Points: Two reasons why people should buy

the toy.

- 1 Point: Directions for using the toy safely or a warning label.
- Extra Credit: A catchy slogan, a jingle, or a drawing of the toy's packaging.

You can use the rubric in the Toy Invention Journal to score completed posters and provide comments.

Inquiry Place

Have students brainstorm testable questions about toys, such as

- ❓ Which brand of toy car rolls the straightest? fastest?
- ❓ Does the size of a Frisbee affect how far it goes?
- ❓ Which brand of bubble solution makes the longest-lasting bubbles?

Then have students select a question to investigate as a class, or have groups of students vote on the question they want to investigate as a team. After they make their predictions, have them design an experiment to test their predictions. Students can present their findings at a poster session or gallery walk.

More Books to Read

Dodds, D.A. 2004. *Henry's amazing machine*. New York: Farrar, Straus, and Giroux.

Summary: From the time Henry is a baby he loves to put things together—wheels with rods, switches with levers, cranks with gears. By the age of 6, he's built an Amazing Machine that fills his entire room. By the time he's 10, the machine has taken over the entire house—and the yard. His parents are proud of Henry, but they're getting a little worried. They can't help wondering: What does it do?

Lionni, L. 1974. *Alexander and the wind-up mouse*. New York: Dragonfly Books.

Summary: Alexander the mouse finds a friend to end his loneliness—Willy the wind-up mouse. When Willy is about to be thrown away, Alexander makes a selfless decision and with the help of a magic lizard saves his friend.

McGough, R. 1997. *Until I met Dudley: How everyday things really work*. New York: Walker.

Summary: A young girl used to have fantastic ideas about how things work, but Dudley, a pencil-

wielding, bespectacled dog, tells her how it really is. This lively picture book explains the inner workings of mechanical objects such as vacuum cleaners, refrigerators, dishwashers, toasters, and garbage trucks.

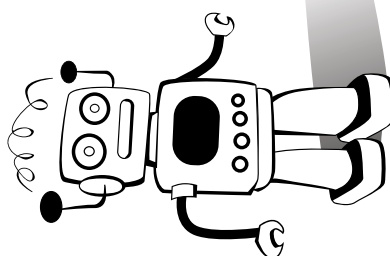
Taylor, B. 2003. *I wonder why zippers have teeth: And other questions about inventions*. New York: Kingfisher.

Summary: "What did people use before they had refrigerators?" and "Where do inventors get their ideas?" are some of the questions answered in this intriguing question-and-answer book about common household inventions.

Websites

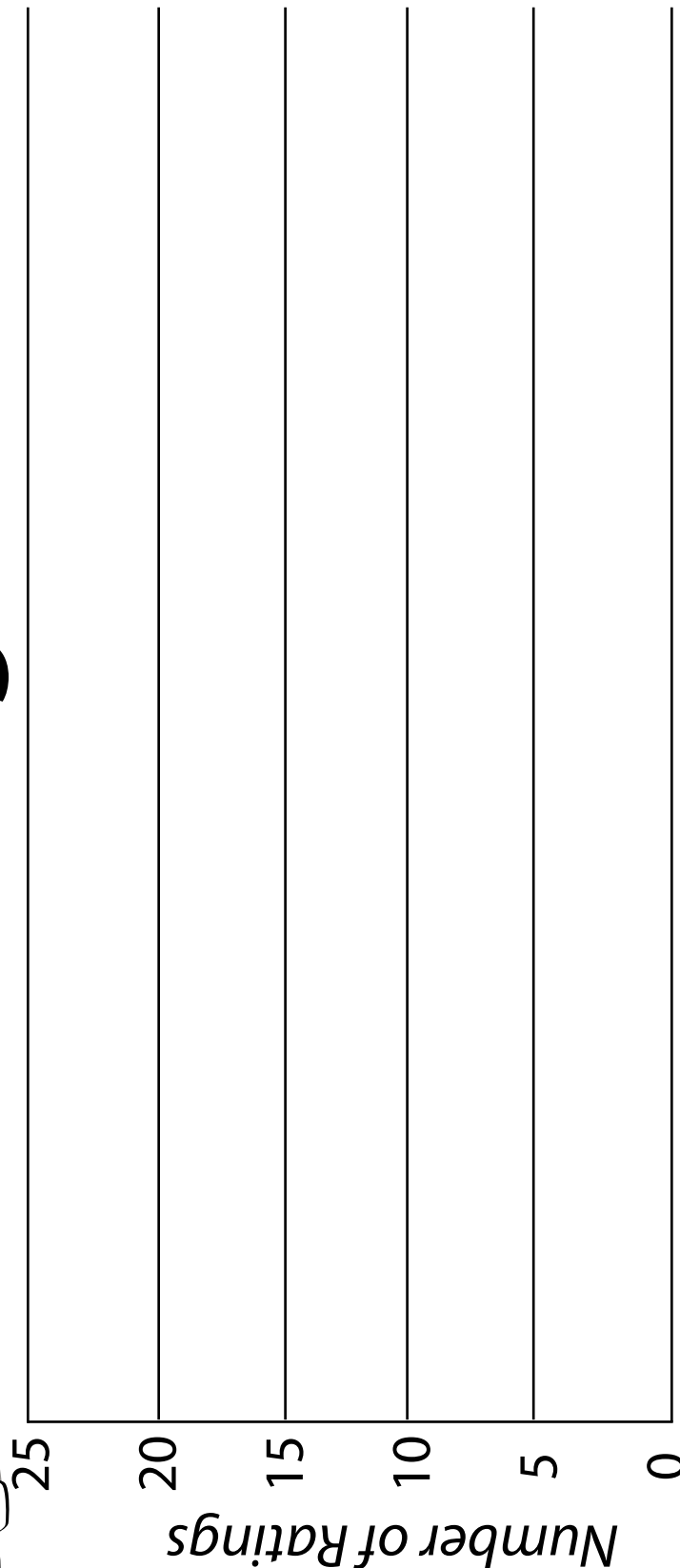
Houghton Mifflin Education Place Invention Convention
www.eduplace.com/science/invention/overview.html

The History Channel History of Toys and Games
www.historychannel.com/exhibits/toys



Fun Ratings

Toy A ☐ Class Rating: _____
Toy B ☐ Class Rating: _____



not fun

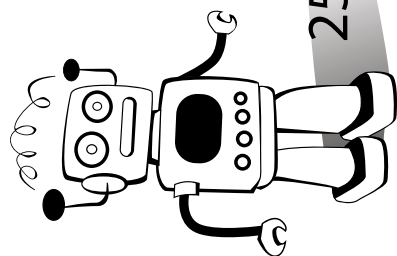


sort of fun



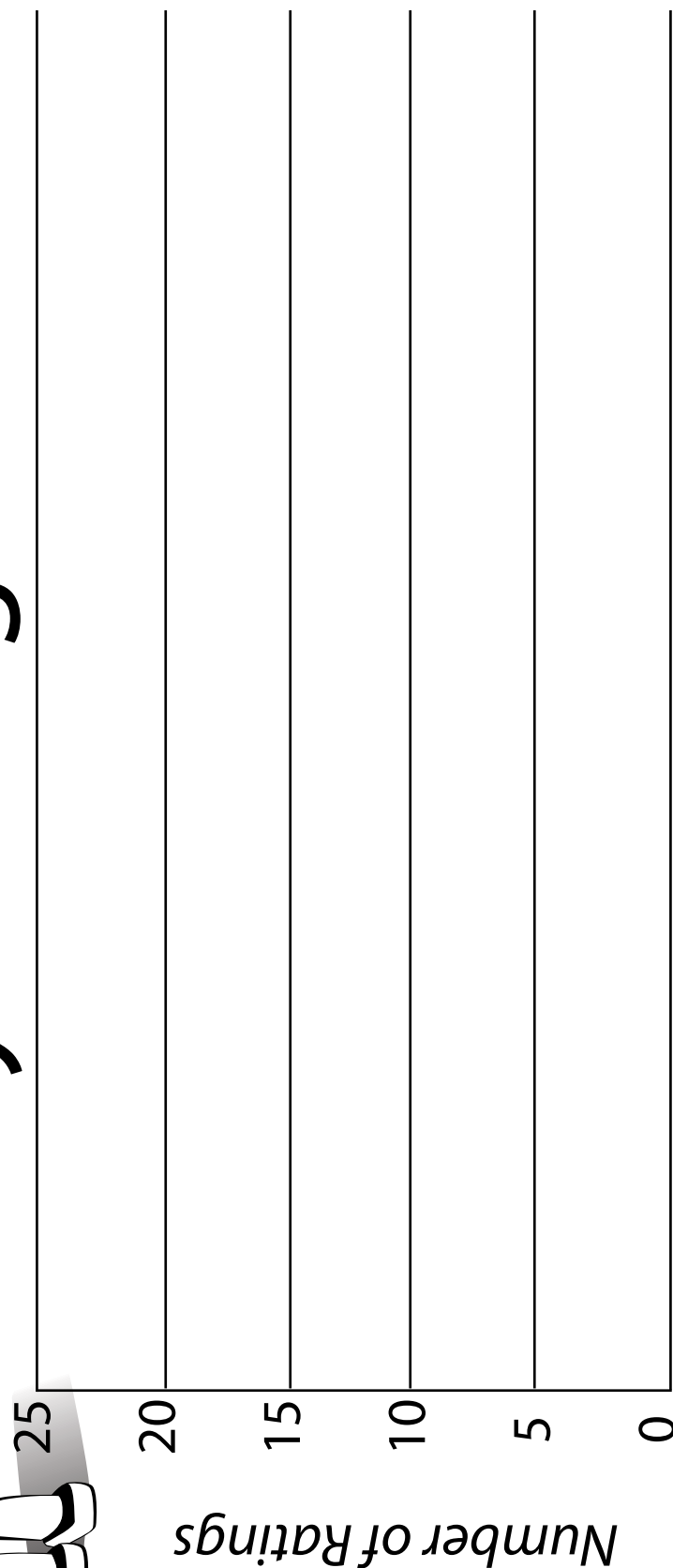
very fun

Ratings



Safety Ratings

Toy A ☐ Class Rating: _____
Toy B ☐ Class Rating: _____



not safe



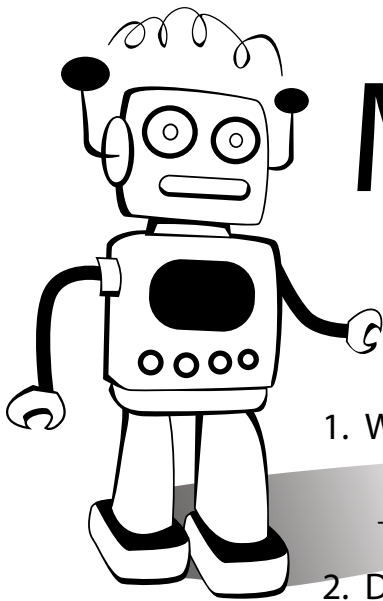
sort of safe



very safe

Ratings

Name: _____



My Improved Invention

1. Which invention would you like to improve? _____

2. Draw and label your improved invention in the box below and give it a new name.

Name of My Improved Invention: _____

3. How is your improved invention more fun or useful than the original?

4. What are the benefits of your improved invention?

5. What are the risks of your improved invention?

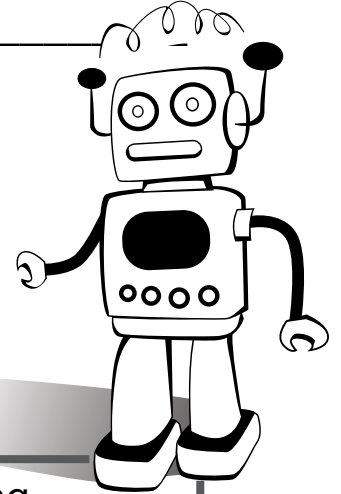
Name: _____

Toy Testing

You are a toy tester for Waddatoy Toys! Follow this procedure for each toy, and record your data below.

1. Play with the toys! Then draw and label each toy below.

Toy A Drawing	Toy B Drawing



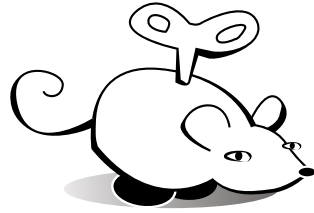
2. Give each toy a fun rating:

Toy A			Toy B		
					
not fun	sort of fun	very fun	not fun	sort of fun	very fun

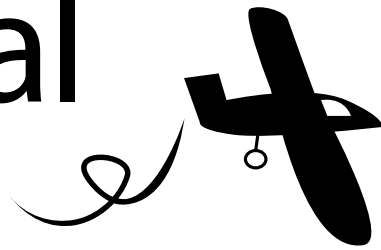
3. Give each toy a safety rating:

Toy A			Toy B		
					
not safe	sort of safe	very safe	not safe	sort of safe	very safe

4. Which toy would you prefer to buy? Why? _____

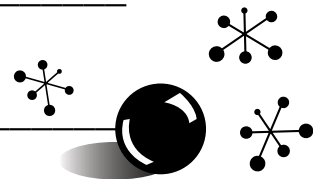


My Toy Invention Journal

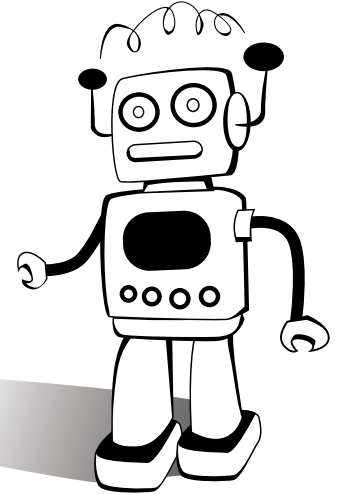


Inventor: _____

Adult Helper: _____



Brainstorming Page



Inventor

1 List some toys you like to play with:

_____	_____
_____	_____
_____	_____
_____	_____

Adult Helper

2 List some toys you liked to play with when you were a child:

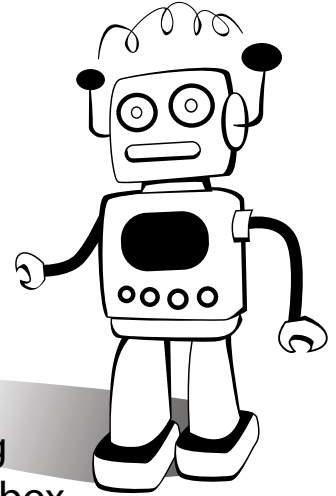
_____	_____
_____	_____
_____	_____
_____	_____

Inventor and Adult Helper

3 List some toys you think could be more fun or more safe if they were improved:

_____	_____
_____	_____
_____	_____
_____	_____

Inventing Page



Inventor and Adult Helper

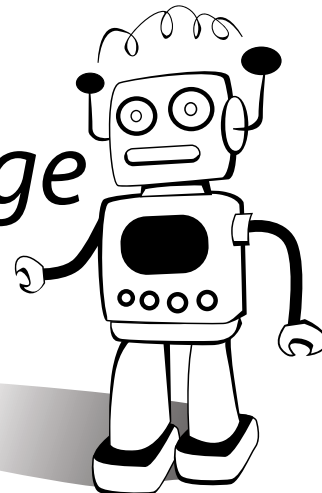
- 1** Invent a new toy, or choose one toy you are going to improve. Draw the new or improved toy in the box.

Name of Toy: _____

- 2 Fill out the T-chart to tell the benefits and risks of your new or improved toy.

Benefits	Risks

Advertising Poster Page



Make a 3-2-1 poster to advertise your new or improved toy. Your poster should include:

- 3 Points: A labeled drawing of the new or improved toy, including a creative name for the toy.

3 2 1 0

- 2 Points: Two reasons why people should buy the toy.

2 1 0

- 1 Point: Directions for using the toy safely or a warning label.

1 0

Extra Credit: A catchy slogan, a jingle, or a drawing of the toy's packaging.

1 0

Total Points _____/6

Comments: _____