

# Logbook

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

Invention Category: \_\_\_\_\_

Inventors:	Name	Grade
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	_____	_____
	_____	_____
	_____	_____

School: \_\_\_\_\_

State/Province: \_\_\_\_\_



## Introduction

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Sometimes math and science don't seem useful for everyday life. Maybe you've asked your teacher, "Why do I need to learn this?!" In fact, math and science are simply tools to help you solve problems. Everyday life is full of challenges, which means we all need to solve problems. The goal of this project is to teach you how. Whether or not you decide to become a mathematician, scientist, or engineer, the problem solving skills you will learn from this project can be used almost anywhere. So have fun, be creative, and enjoy this opportunity to learn about STEM by making inventions!

## About the Logbook

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Fun hands-on project? Cool! So why do I need this big document? The Logbook will be your record of how you create your invention. It will have all your ideas, your designs, and what you tried. Your team will fill it out together as you do the project, so it won't be too much all at once.

The finished Logbook will be the proof of what you did. It is important to take neat, careful notes for each step so that other people (or your future self) can read it easily. If you decide to patent the invention, this can also serve as the record of your work in case there are questions about your claim to the ideas.

At the end of the project, you will present on your invention. The Logbook will help you prepare for this so you know what to talk about. Then at the end, you will submit the Logbook for grading.

## Project Guidelines

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### Requirements:

- The teacher must sign off on the project and design before the prototype is built.
- The final design and solution must be completely original or sufficiently different that it can be considered a true innovation and not a copy of existing inventions/products.  
*See the Solution section of the Logbook for more information (pg. 14-15).*
- All group members must sign the originality statement promising that the design ideas in the Logbook follow the originality requirements.
- The invention prototype does not need to be fully functional, but it should be able show how the final design would operate. If the group can create a functional or partially functional prototype, they should do so.
- If the invention cannot be demonstrated at the final presentation due to size constraints or other considerations, a video must be made demonstrating its use.
- For all presentations, each group will need a Tri-Fold board explaining the project, the signed and completed Logbook, and the prototype. Some or all of these items can be used in the verbal presentation but regardless, they need to be available to show people afterwards.  
*See the Presentation Guidelines handout for more information.*

### Restrictions:

- Animals may not be brought to the final presentation at the invention event. If the design is for animals or uses animals in any way, you must find a way to demonstrate its function without the animal present.
- Inventions may not use wall outlet electricity (110V or higher) unless you are only using unmodified consumer products such as a fan or smartphone charger.  
Battery operated devices are acceptable as long as they use common low voltage batteries (i.e. no car batteries, etc.).
- Inventions may not use any flames or heat sources (lighters, matches, candles, fireworks, heating elements, etc.) or any combustible liquids.
- Inventions may not use biohazards or other dangerous materials.
- Inventions may not be or make use of any weapons such as guns, knives, explosives, stun guns, pepper spray, or blunt weapons.

*If you have any questions about the project guidelines or feel that the project deserves an exception to the above Requirements & Restrictions, the teacher may contact us at [stemconnect@andrews.edu](mailto:stemconnect@andrews.edu).*

## Statement of Originality

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We promise that the ideas and designs in this Logbook are our own.  
(all team members must sign)

**Name**

**Signature**

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**Date:**

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## Teacher's Signature

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I approve of the invention that my students created/will create and agree that it meets the Project Guidelines for safe and acceptable projects.

**Teacher's Name**

**Signature**

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**Date:**

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## Important Terms

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Learn the following words and what they mean for this project.

**Science** – The study of the world to learn how and why it works

**Invention** – A new solution or device to solve a problem

**Inventor** – A person who solves a problem by creating an invention

**Engineer** – A person who uses science to create things that solve problems

**Engineering Design Process** – The steps engineers use to find solutions

**Original** – Unlike anything else, unique

**Research** – To study and learn about something

**Requirement** – Something that must be done or completed

**Design** – A detailed plan for how something will work and what it will look like

**Prototype** – A model of the design to prove that it works

**Improve** – Change something in a way that makes it better

**Testing** – Experiments to see how well something works

**Teamwork** – Working with other people

## Engineering Design Process

The Engineering Design Process will help you create your invention.

These are the steps engineers follow to make the products we use every day.





## Find a Problem

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Make a list of problems or challenges that you can solve with an invention.  
Come up with as many ideas as you can.

1. What problems can you find in your home, school, church, or community?

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2. Ask your parents, grandparents, friends, or teachers if they have a problem.

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3. Do your pets have any problems?

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4. What things are hard for you or others to do?

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5. What problems can you find in nature (animals, plants, or the environment)?

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## Describe the Problem

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Now you need to describe your problem. Read the example and answer the questions. Write down everything you know about the problem. Give as many details as you can.

**Example:**

Suppose your little brother keeps falling off his bike. You could start by saying, “My little brother keeps falling off his bike”, but you need more than that. You should also give his age, how tall he is, how heavy he is, how long he’s been riding, if he uses training wheels, where he’s riding, how fast he goes, how he falls, how he gets hurt, etc.

1. What is the problem?

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2. Where is the problem?

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3. What do you need to solve or fix about it?

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4. Why is it important to solve this problem?

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## Describe the Problem

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5. List the other important details about the problem.

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6. Draw a picture of the problem.





## Research the Problem

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Research helps you find information about the problem.

Use books, websites, videos, surveys, interviews, etc. to answer the following questions.

Include the source where you found the answers.

1. Who or what has this problem?

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**Source:**

2. What inventions or products already solve this problem?

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**Source:**

3. How could the problem be solved better or differently?

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**Source:**





## Solution Requirements

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Now you need to list the requirements for your solution.

These are the things your invention must fulfill to solve the problem.

### **Example (continued from page 8):**

For the little brother falling off his bike, you might list requirements such as...

- It must protect my brother from serious injury
- It must reduce his falls
- It must be easy to use
- If it attaches to the bike, it must be easy to remove
- It must work with any normal bicycle

Other things you should consider are size, weight, strength, time, cost, etc.

Answer the following questions about the invention you will make.

1. How big or small must the invention be?

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2. How heavy or light must the invention be?

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3. How strong does the invention need to be?

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## Solution Requirements

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4. How much time do you have to make the invention?

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5. How much money can you use to make the invention?

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6. Now, write down the other requirements your invention will have.  
These are requirements for your invention that others may not have.

**Tip:** It may help to look at similar products to see what they did.

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## Find Solutions

Think of ways you might solve your problem.

Write down every idea. Even the weird ideas might help.

Describe each solution and draw a picture of it. The checkboxes are for later.

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Meets Requirements? ☐

Safe & Acceptable? ☐

Time & Resources? ☐

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Meets Requirements? ☐

Safe & Acceptable? ☐

Time & Resources? ☐





## Choose the Best Solution

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Answer the questions for each idea to help you choose the best solution.

Check the boxes below each idea if you can answer yes.

You may need to change or combine ideas. Add the new idea to your list if you do that.

1. Does it **meet all your requirements** from pages 11-12?
2. Is it **safe and acceptable**? Check the Restrictions on page 3.
3. Do you have enough **time and resources** to make this solution?

Choose the solution that answered yes to all three questions.

If more than one idea passed, you may need to just pick one or combine ideas.

Which solution did you choose?

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Now, you need to find out if your idea is **original** or if someone else already made it.

### Example (continued from page 11):

With the little brother and his bike, you couldn't just invent a padded box for his head or small pillows for his knees because helmets and knee pads already exist.

You would need to find a new solution or make a better helmet and pads.

Search for products that are similar to your solution.

- Internet
  - Search for **keywords** that describe your solution.
  - Search for your problem and look for similar solutions.
- Stores
  - Search for similar products at online stores such as [Amazon.com](https://www.amazon.com), [BestBuy.com](https://www.bestbuy.com), [Target.com](https://www.target.com), or [Walmart.com](https://www.walmart.com).
  - Look for similar products when you go shopping with your parents.
- Books
  - Find books about your topic at a library or book store.





## Similar Products

1. What is the product called?

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2. How is your solution similar to it?

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3. How is your solution different from it?

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**Draw a picture of the product.**

1. What is the product called?

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2. How is your solution similar to it?

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3. How is your solution different from it?

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**Draw a picture of the product.**





## Design the Prototype

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**Your teacher must sign off on your solution before you continue (page 4).**

Draw your invention design and describe how it will work. Add as many details as you can. Number the design version (#1, #2, #3, etc.) and write the date.

**Tip:** It might help to try building things as you create the design.

Design Version #	Date:







## Design the Prototype

<b>Design Version #</b>	<b>Date:</b>
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1. How will your invention work? Consider moving parts, power sources, etc.

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2. What materials will you use to build it?

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3. What tools or help will you need to build it? Will you need a large space to build?

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4. Are there any other details you should include?

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## Build the Prototype

Take notes about your prototype as you build it. Describe any challenges you have or things you learn. Include the design version and today's date.

	<b>Design Version #</b>
	<b>Date:</b>
	<b>Design Version #</b>
	<b>Date:</b>
	<b>Design Version #</b>
	<b>Date:</b>





## Test the Prototype

Test the prototype to see how well it works. Then answer the questions below. Include the design version, test number (#1, #2, #3, etc.), and today's date.

Design Version #	Test #	Date:
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1. Describe your test. What did you try?

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2. What were the results? Include any numbers or graphs from your test.

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## Test the Prototype

Design Version #	Test #	Date:
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3. Did it work as you expected?

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4. Does it meet all your requirements?

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5. Does it solve the original problem?

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6. Do you need to change or improve the design? (materials, how you built it, etc.)

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If your prototype doesn't work, don't worry! Engineers don't usually get it right the first time either. They keep fixing and improving their design until it works.

If you need to change your design,

1. Add a new Design the Prototype page.
2. Give it a new version number (design version #2, design version #3, etc.)
3. Design, build, test, and repeat until your invention works!



## Conclusion

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1. Did your invention solve the original problem? Explain.

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2. What was the biggest challenge you faced when making your invention?

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3. What changes or improvements could you make to your invention in the future?

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4. What impact did your invention have or could it have in the future?

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5. What spiritual lesson did you learn from this project? Does it connect with any Bible stories, characters, or lessons? How can you apply it to your lives?

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## Communicate the Solution

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For the last step, you need to explain and demonstrate the invention to your teacher, classmates, and judges. Present it well so your hard work can be appreciated!

### Steps to prepare for your presentation:

#### 1. Name your Invention

Come up with a fun and creative name that describes your invention.

Write the name on the cover page of the Logbook and use it in your presentation.

#### 2. Select an Invention Category

Select the category that best describes your invention.

Write it on the Logbook cover below the invention name.

*See the Invention Categories handout for more information.*

#### 3. Make a Tri-Fold Presentation Board

Layout and decorate a presentation board to describe your invention and the steps you took to create it. Include pictures/drawings of your invention.

*See the Presentation Guidelines handout for more information.*

#### 4. Plan and Present a Verbal Presentation

Stand up front and tell the audience about your invention.

You will explain the same information you put on the tri-fold board.

If possible, show them how your prototype works.

*See the Presentation Guidelines handout for more information.*



## Sources

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Name/Title: \_\_\_\_\_

Source Location: \_\_\_\_\_

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