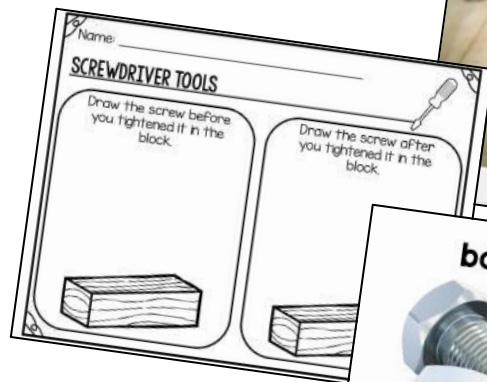


# Engineering Challenges



# Engineering Challenges

## Introduction

The centers in this unit are designed to encourage young learners to think like engineers by:

- **investigating cause and effect**
- **exploring simple machines**
- **planning and designing structures using tools**

### Engineering #1 Fix it!

The simple and safe activity helps young scientists explore electronics and how they work. Children assemble a flashlight and are delighted when it turns on!

**Learning Objectives:**

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.

**Recommended Supplies:**  
Flashlight - Purchase an inexpensive, regular flashlight. The best option for a flashlight is one that requires 2 batteries.

**Procedure:**

1. ...
2. ...
3. ...



### Engineering #2 Light it!

Set up this simple Christmas lights display at the science center and invite students to explore and discover how to turn on the Christmas lights.

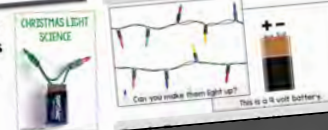
**Learning Objectives:**

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.

**Recommended Supplies:**  
String of Christmas lights  
- Insulated, non-LED lights  
scissors - for teacher use only  
9V batteries

**Procedure:**

1. ...
2. ...
3. ...



### Engineering #3 Nuts & Bolts

Young children love "tinkering". This simple investigation with nuts and bolts will help develop both problem-solving skills and fine motor coordination.

**Learning Objectives:**

- The student will identify a problem and develop a solution to it.
- The student will improve hand strength and fine motor coordination.

**Recommended Supplies:**  
bolts and nuts - a variety of large metal nuts and bolts (3/4 in, 1 in, and larger-work well). Alternatively, purchase a set of large toy nuts and bolts. (They are available in wood or plastic.)

**Procedure:**

1. ...
2. ...
3. ...



### Engineering #4 Unlock it!

Children are naturally curious and drawn toward tinkering. Padlocks and keys provide an enticing opportunity to "unlock" a problem.

**Learning Objectives:**

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.

**Recommended Supplies:**  
padlocks with keys - These are often inexpensive and available with back-to-school supplies.

**Procedure:**

1. ...
2. ...
3. ...



### Engineering #5 Which lid fits?

Experimenting with tools, simple machines, and engineering does not have to be complicated. Set up this collection of jars and lids and let children explore.

**Learning Objectives:**

- The student will identify a problem and develop a solution to it.
- The student will strengthen hand muscles and fine motor coordination.

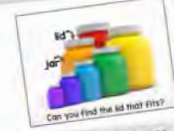
**Recommended Supplies:**  
A collection of jars and lids - Collect clean, plastic jars and lids or ask families to save them and donate them to the classroom. (Jelly, BBQ, spaghetti sauce, round glassware containers, orange juice jugs, and fruit jars all work well.)

**Procedure:**

1. Display the open jars and lids.
2. Challenge the students: "Can you find the lid that fits?"
3. Provide the students with plenty of time to tinker, test, and problem-solve at the science center.
4. Like the other engineering centers in this unit, this activity provides a satisfying self-checking solution.

**Book Recommendations:**  
*Who Stole the Cookies from the Cookie Jar?* by Jan Manning  
*Jelly Like the Jelly Jar* by Brenda Swann  
*Bread and Jam for Frances* by Russell Hoban

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



### Engineering #6 Screwdrivers

Engineering in preschool involves learning about tools and how they are used. Provide young learners with an opportunity to explore screwdrivers at this center.

**Learning Objectives:**

- The student will demonstrate explain the safe and appropriate use of tools and materials.
- The student will design, build, and test theories through their play.

**Recommended Supplies:**


- screwdrivers - both flat head and crosshead
- screws
- block of craft foam or balsa wood

**Procedure:**

1. Set up a tinkering construction area for your preschoolers.
2. Provide a variety of large screws, as well as 2 types of screwdrivers.
3. Invite the students to screw the screws into the craft foam (or wood block). Ask them how they could get the screws out? Allow plenty of time for exploration.

**Book Recommendations:**  
*Fix It!* by George Birkel  
*Whose Tools?* by Toni Blystone

**Safety:** Supervise children closely. Use your best judgment in determining its appropriateness with your age group.



### Engineering #7 Wheels & Axles

Young children use their understanding of ramps, force, motion, tools and engineering to design a vehicle that will roll. This is a great simple machine challenge for the end of the year!

**Learning Objectives:**

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.

**Recommended Supplies:**


- axles - pencils, thin markers, drinking straws, and/or dowel rods
- wheels - empty spools, round plastic containers (with holes in the middle), balloons, cylinder blocks, and/or washers
- small wooden blocks
- tape

**Procedure:**

1. Provide a variety of supplies. Then, offer this challenge to the students: "Can you build a car that will roll?"
2. Allow students the opportunity to tinker with the wheels and axles. Encourage them to test their inventions and make changes as necessary over the course of time.

**Book Recommendations:**  
*If I Built a Car* by Chris Van Dusen  
*Build, Dogs, Build A Tail* by James Horvath

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



# Engineering #1

## Fix it!

This simple and safe activity helps young scientists explore electronics and how they work. Children assemble a flashlight and are delighted when it turns on!

### Recommended Supplies:

**flashlight** – Purchase an inexpensive, regular flashlight. The best option for a flashlight is one that requires 2 batteries.

**batteries**

### Procedure:

1. Disassemble a flashlight and place it in the science center.
2. Pose this question to the students, “Can you fix it?”
3. Children will be naturally curious and will work on assembling the flashlight like a puzzle until it turns on.



### Learning Objectives:

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.



### Book Recommendations:

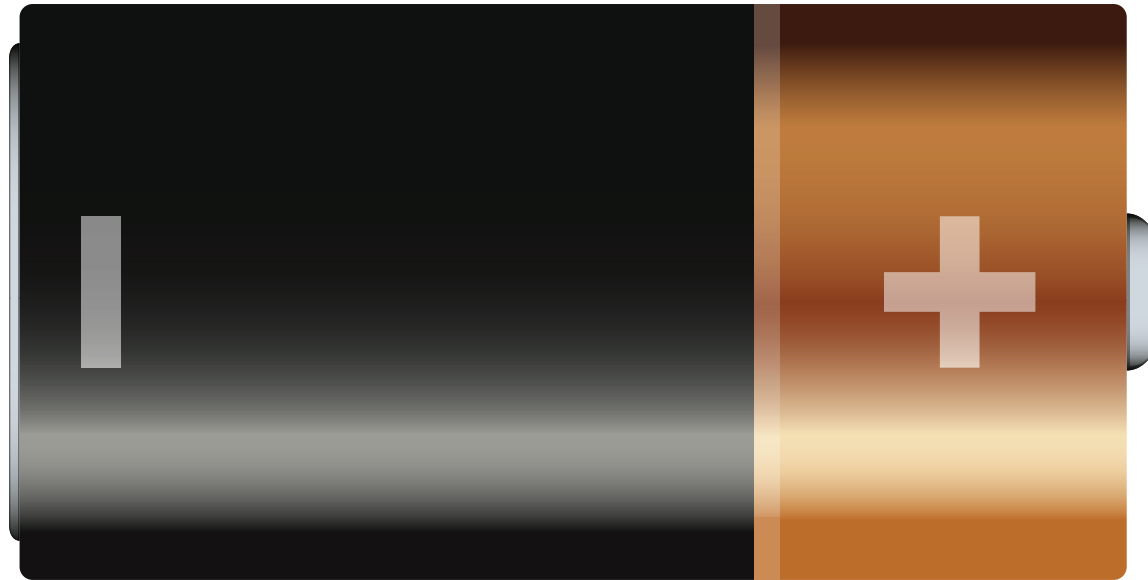
*Fix-It Duck* by Jez Alborough

*Flashlight* by Lizi Boyd

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.

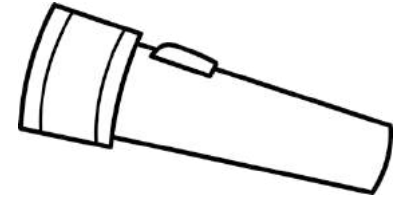


**Can you fix the flashlight?**



**A battery has a positive and a negative end.**

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



# CAN YOU FIX IT?

---

Fix the flashlight and draw the parts.

# Engineering #2

## Light it!

Set up this simple Christmas lights display at the science center and invite students to explore and discover how to turn on the Christmas lights.

### Recommended Supplies:

#### String of Christmas lights

– Inexpensive, non-LED lights

**scissors** – for teacher use only

**9V batteries**

### Procedure:

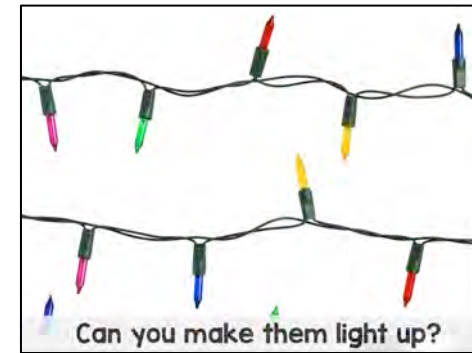
Before Children Arrive:

1. Take a string of Christmas lights and cut the green wire so there are just 2 connected lights.
2. Cut off a little of the plastic wire casing so that the wires are exposed (only 1 cm or less).
3. Discard the plug and the excess lights.
4. Place the 2 lights and the battery at the science center. Let the kids explore and figure out how to make the lights work. (One wire must touch each battery prong.)



### Learning Objectives:

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.



### Book Recommendations:

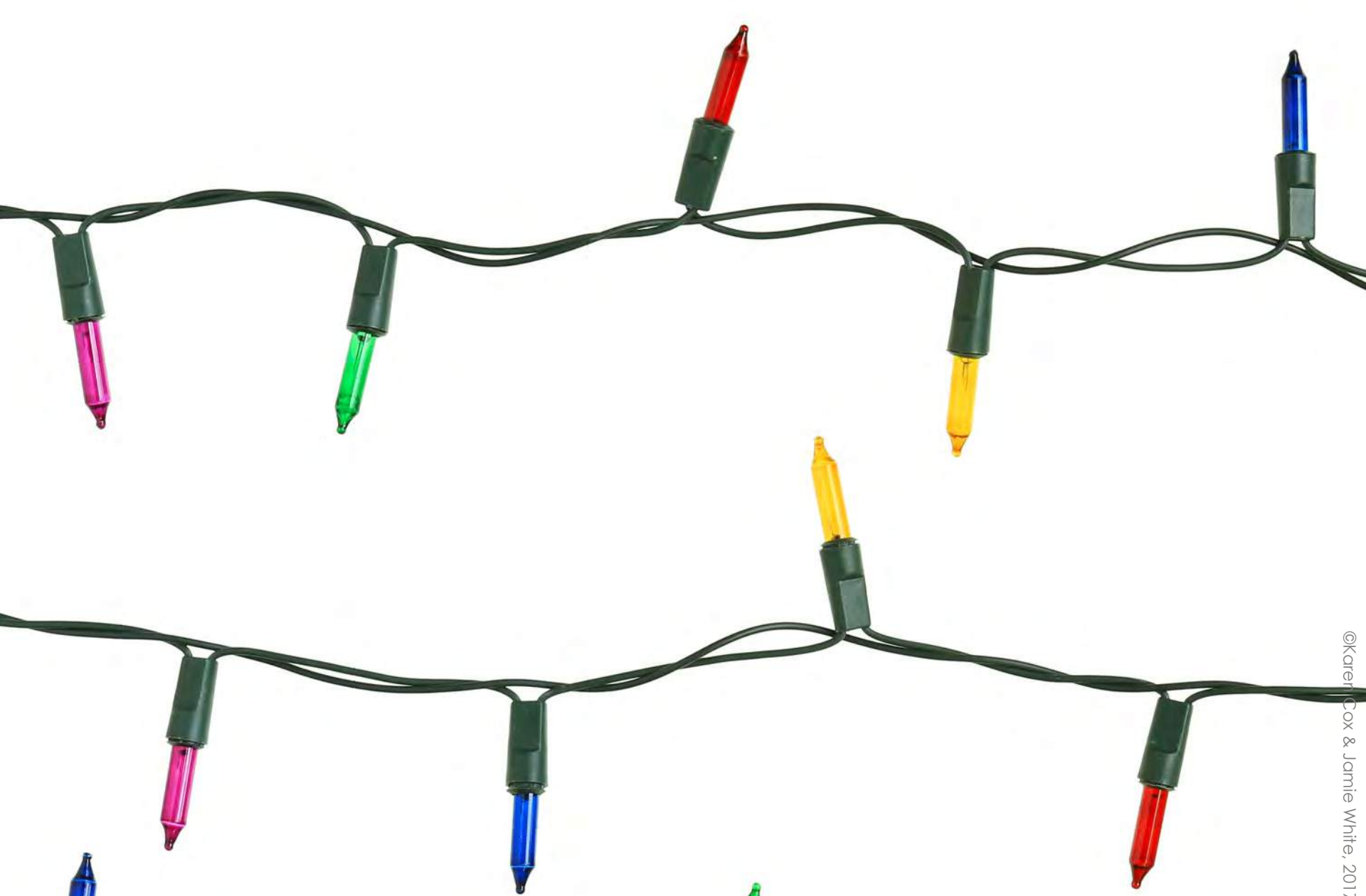
*The Littlest Christmas Tree* by R.A. Herman

*Light the Lights!* by Margaret Moorman

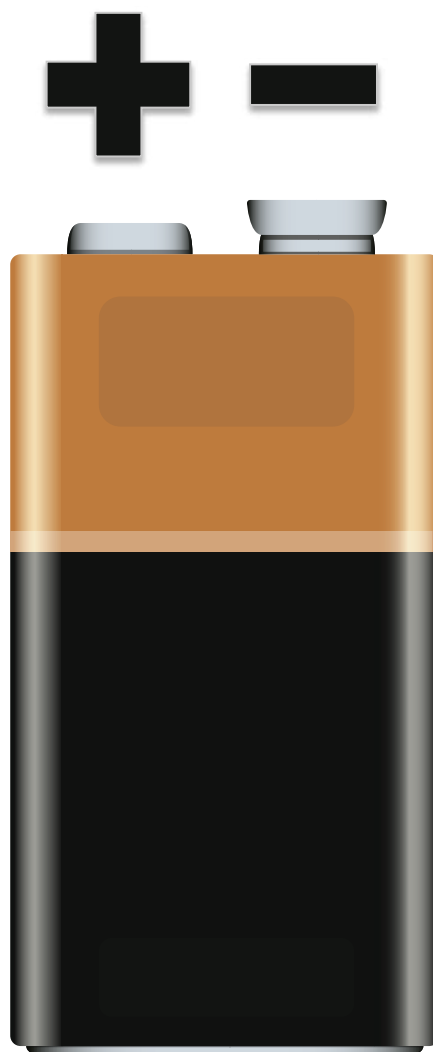
*Rocky: The Rockefeller Christmas Tree* by Jennie

Nicassio

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



**Can you make them light up?**



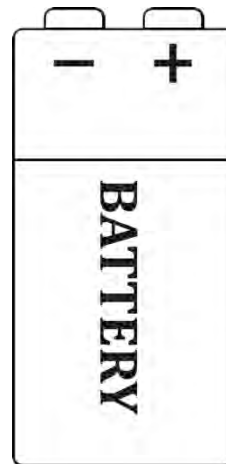
**This is a 9 volt battery.**

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



# LIGHT IT

Use the battery to light up the lights.  
Draw what you saw.



# Engineering #3

## Nuts & Bolts

Young children love “tinkering”. This simple investigation with nuts and bolts will help develop both problem-solving skills and fine motor coordination.

### Recommended Supplies:

**bolts and nuts** – a variety of large metal nuts and bolts (3/4 in, 1 in, and larger work well)

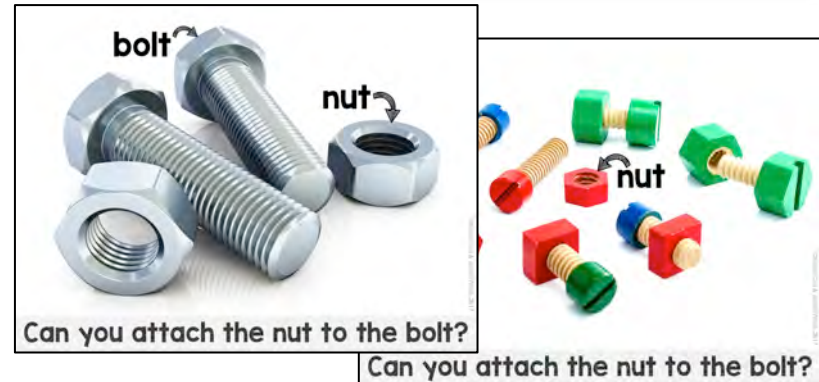
Alternatively, purchase a set of large toy nuts and bolts. (They are available in wood or plastic.)

### Procedure:

1. Display a few large nuts and bolts at the science center.
2. Challenge the students figure out which ones fit together.

### Learning Objectives:

- The student will identify a problem and develop a solution to it.
- The student will improve hand strength and fine motor coordination.



### Book Recommendations:

*The Toolbox* by Anne Rockwell

*Tool Book* by Gail Gibbons

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.

**bolt**



**nut**

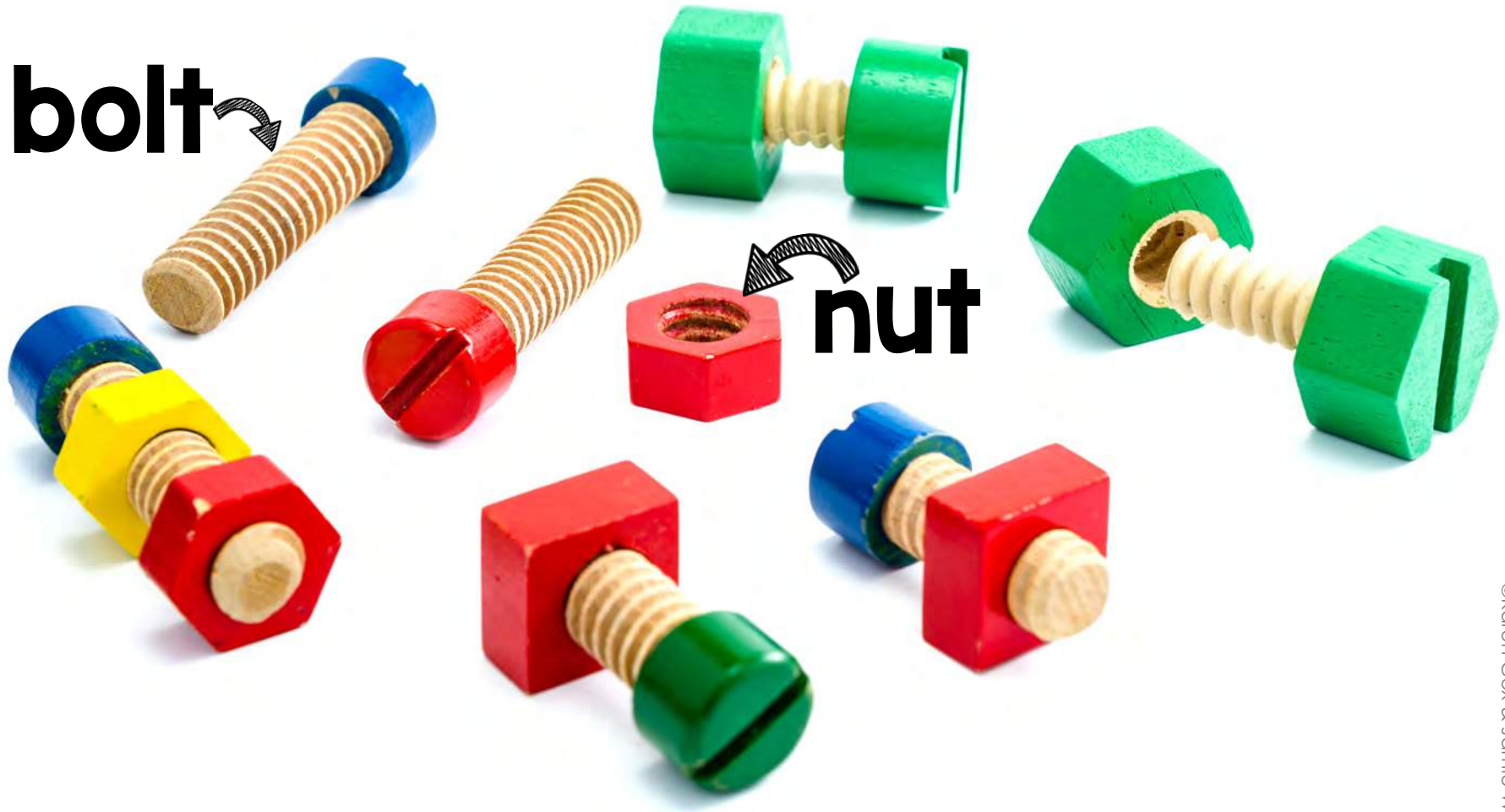


**Can you attach the nut to the bolt?**

**bolt**



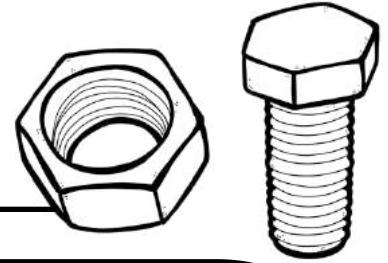
**nut**



**Can you attach the nut to the bolt?**

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

# NUTS & BOLTS



Put the nuts and bolts together. Draw what you saw.

# Engineering #4

## Unlock it!

Children are naturally curious and drawn toward tinkering. Padlocks and keys provide an enticing opportunity to “unlock” a problem.

### Recommended Supplies:

**padlocks with keys** – These are often inexpensive and available with back-to-school supplies.

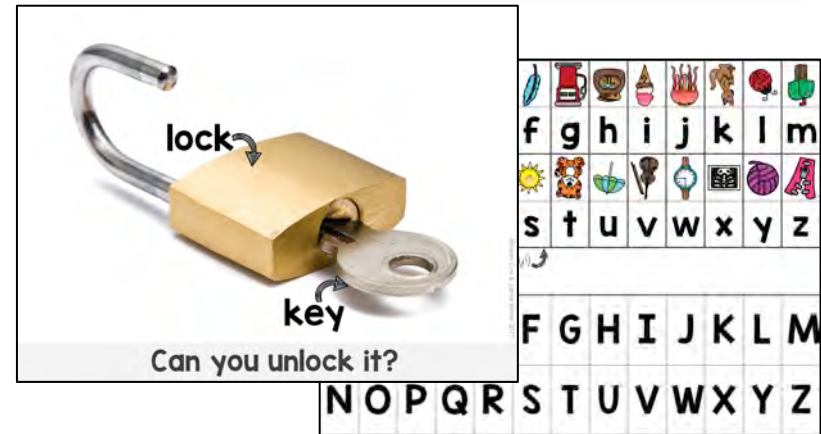
If desired, program the locks and keys with the alphabet and matching pictures (attached). Place a letter on the lock, and the lower case letter and/or picture on the key. You can tape them on or attach with a small key ring.

### Procedure:

1. Display the locks (locked) and keys.
2. Pose this question to the students: “Can you unlock it?”
3. Allow students time to tinker with the keys and solve the problem.

### Learning Objectives:

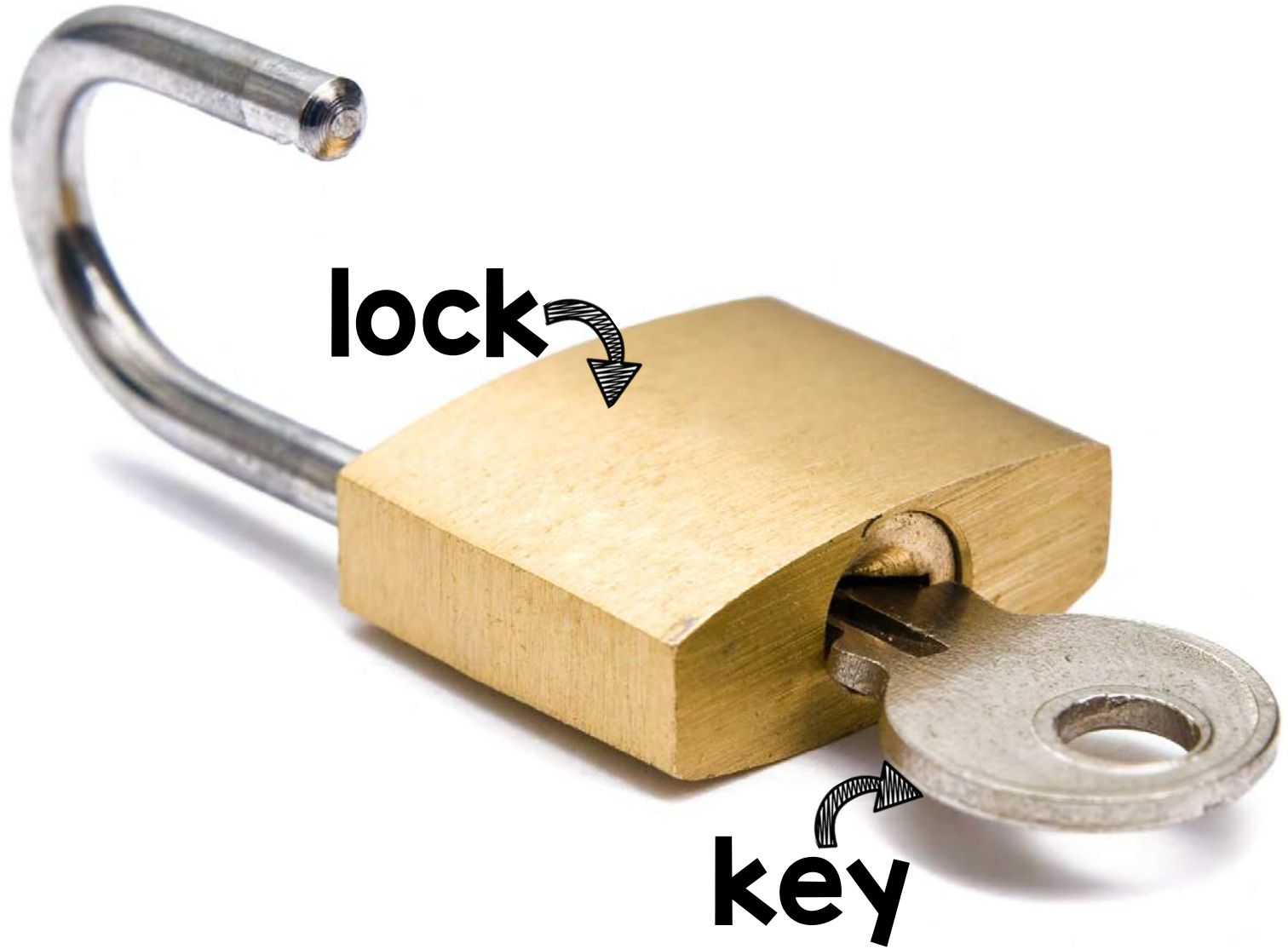
- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.



### Book Recommendation:

*The Little Golden Key* by Roberto Aliaga

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



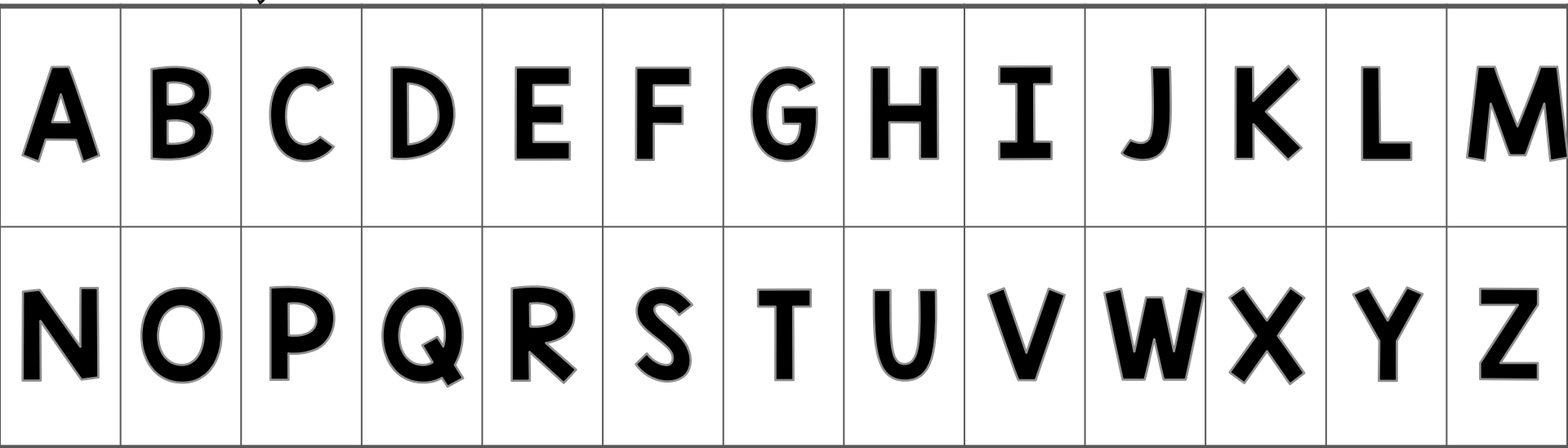
**Can you unlock it?**



Key Tags (Fold these over on the key!) ↷

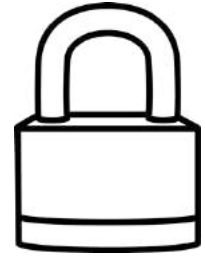
Lock Labels ↶

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

# UNLOCK IT



Use keys to unlock the locks.  
Draw one of the locks with its matching key.

# Engineering #5

## Which lid fits?

Experimenting with tools, simple machines, and engineering does not have to be complicated! Set up this collection of jars and lids and let children explore.

### Recommended Supplies:

#### A collection of jars and lids -

Collect clean, plastic jars and lids or ask families to save them and donate them to the classroom. (Jelly jars, spaghetti sauce, round gladware containers, orange juice jugs, and fruit jars all work well.

### Procedure:

1. Display the open jars and lids.
2. Challenge the students: "Can you find the lid that fits?"
3. Provide the students with plenty of time to tinker, test, and problem-solve at the science center.
4. Like the other engineering centers in this unit, this activity provides a satisfying self-checking solution.

### Learning Objectives:

- The student will identify a problem and develop a solution to it.
- The student will strengthen hand muscles and fine motor coordination.



### Book Recommendations:

*Who Stole the Cookies from the Cookie Jar?* by Jan Manning  
*Joyful Jake the Jelly Jar* by Brenda Swain  
*Bread and Jam for Frances* by Russell Hoban

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



**Can you find the lid that fits?**

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

## WHICH LID FITS?



Match the lids to the containers.  
Draw one of the containers with its matching lid.

# Engineering #6

## Screwdrivers

Engineering in preschool involves learning about tools and how they are used. Provide young learners with an opportunity to explore screwdrivers at this center.

### Recommended Supplies:

- **screwdrivers** - both flat head and crosshead
- **screws**
- block of **craft foam** or balsa wood

### Procedure:

1. Set up a tinkering construction area for your preschoolers.
2. Provide a variety of large screws, as well as 2 types of screwdrivers.
3. Invite the students to screw the screws into the craft foam (or wood block). Ask them how they could get the screws out? Allow plenty of time for exploration.

### Learning Objectives:

- The student will demonstrate and explain the safe and proper use of tools and materials.
- The student will develop hand-eye coordination and strength.



### Book Recommendations:

*Fix It!* by George Birkett

*Whose Tools?* by Toni Buzzeo

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



**Builders use lots of tools.**



**Can you tighten the screw?**

**screwdriver**



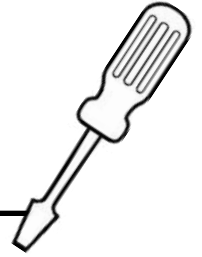
**screws**



**Which screwdriver will work?**

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

# SCREWDRIVER TOOLS



Draw the screw before  
you tightened it in the  
block.



Draw the screw after  
you tightened it in the  
block.



# Engineering #7

## Wheels & Axles

Young children use their understanding of ramps, force, motion, tools and engineering to design a vehicle that will roll. This is a great simple machine challenge for the end of the year!

### Recommended Supplies:

**axles** – pencils, thin markers, drinking straws, and/or dowel rods

**wheels** – empty spools, round plastic counters (with holes in the middle), cheerios, cylinder blocks, and/or washers

small wooden blocks

tape

### Procedure:

1. Provide a variety of supplies. Then, offer this challenge to the students: “Can you build a car that will roll?”
2. Allow students the opportunity to tinker with the wheels and axels. Encourage them to test their inventions and make changes as necessary over the course of time.

### Learning Objectives:

- The student will identify a problem and develop a solution to it.
- The student will design, build, and test theories through their play.



Carts have a wheel and a



What makes the skateboard roll?

### Book Recommendations:

*If I Built a Car* by Chris Van Dusen  
*Build, Dogs, Build: A Tall Tail* by James Horvath

**Safety:** Supervise children closely at this center. Use your best judgment in determining its appropriateness with your age group.



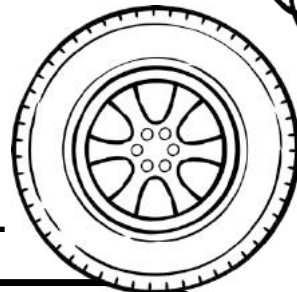
**What makes the skateboard roll?**



**Carts have a wheel and an axle.**

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

# WHEELS AND AXLES



Draw the machine you built with wheels and axles.

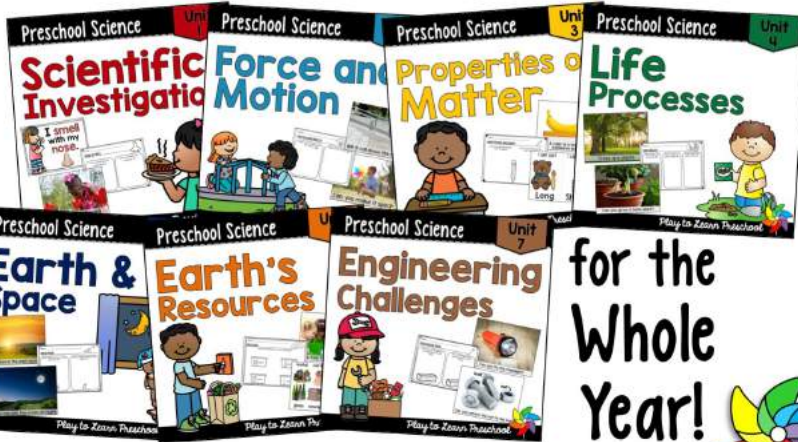
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