

MOTION AND MATTER—*Investigation 3, Part 1*

Investigation 3:
Engineering

Part 1:
***From Here
to There***



Teacher
Notes

Complete Teacher Notes



Investigation 3, Part 1

Engineering



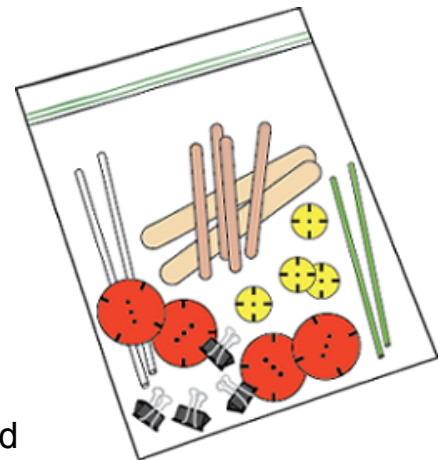
What do engineers do?



You will work with a partner to create a cart that will roll from here to there.

The **criterion** for this project is that the cart must be able to roll from a starting place to another place when given a small push or pull.

The **constraints** are that you only have 30 minutes to design and construct your cart and you can only use the materials in the bag, plus scissors, tape, and index cards.



Time



Teacher
Notes

IG pg. 176, Steps 1–3

Investigation 3, Part 1

Solve a Design Problem



Many of you have constructed wheel-and-axle systems like you did in previous investigations, but the cart slides instead of rolls.

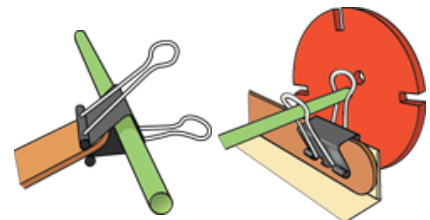
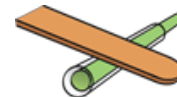
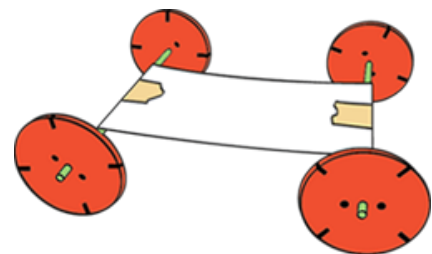
An **engineer** acknowledges design problems and looks for a **solution**.

What do you have in your zip bag of materials that might help solve this problem?

What will allow the axle to rotate freely?



A part in a machine that supports or guides a rotating part is called a **bearing**.



IG pg. 176–177, Steps 4–6

Investigation 3, Part 1

Vocabulary Review



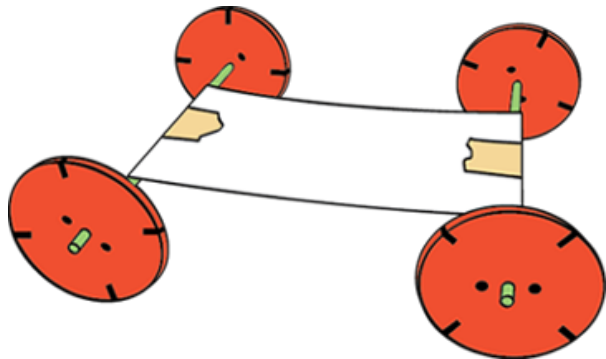
IG pg. 177, Step 7

Investigation 3, Part 1

Focus Question



- What are some important features of a cart that will roll from here to there?



IG pg. 178, Steps 8–9 and 11

Investigation 3, Part 1

Clean Up!



- Take your carts apart. You can keep usable subassemblies together.
- Put all materials in the labeled bags.
- Write your names on a scrap of paper and place in the bag.
- Return the labeled bags, tape, and scissors to the materials station.



Teacher
Notes

IG pg. 178, Step 10

Reading in Science Resources



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Wrap-Up/Warm-Up

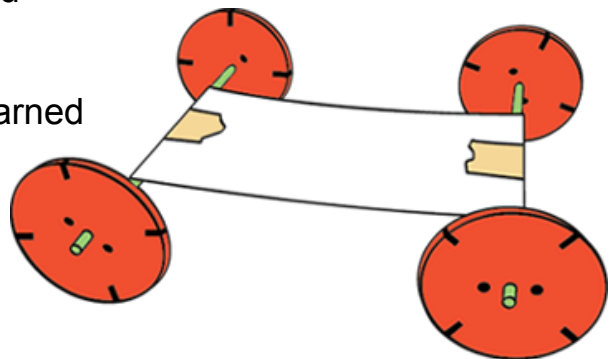


➤ What are some important features of a cart that will roll from here to there?



Pair up with a partner to

- share and compare your drawings of your cart;
- share problems and solutions you encountered;
- share an interesting thing you learned about being an engineer.



IG pg. 180, Step 18

Investigation 3, Part 1

Motion and Matter

Developed at



**THE LAWRENCE
HALL OF SCIENCE**
UNIVERSITY OF CALIFORNIA, BERKELEY

Published and Distributed by



Delta Education

P.O. Box 3000
80 Northwest Boulevard
Nashua, NH 03063-4067
1-800-258-1302



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FOSS Program Overview



MOTION AND MATTER—*Investigation 3, Part 1*

Investigation 3: Engineering

Part 1: From Here to There



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IWB Click the FOSS logo to access FOSSweb.



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Notes

Complete Teacher Notes



Investigation 3, Part 1

Engineering



What do engineers



Motion and Matter, IG pg 176, Steps 1–3



Ask students if they know what engineers do. Record some of their responses. Start with the first bullet and add additional bullets as needed. Guide the discussion to bring forward the idea that engineers are people who use scientific knowledge, mathematics, and creative thinking to solve problems or meet specific challenges.

IWB Click the arrow to reveal the engineering challenge.

Have students pick up two sets of materials for their group and begin building.

IWB You can use the *Pen Tool* to record students' responses.

IWB Use the *Pen Tool* to write when you want students to finish the activity.

New Word Introduce *criterion*.

criterion (plural, criteria): a rule for evaluating or testing something

New Word Introduce *constraint*.

constraint: the limitations that must be taken into account when working in the classroom, such as the materials available and the amount of time students have to work

Add all new words to the word wall.



Teacher
Notes

IG pg. 176, Steps 1–3

Investigation 3, Part 1

Solve a Design Problem



Many of you have seen
systems like y
but the cart s

An **engineer**
and looks for

What do you
that might he

What will all

Motion and Matter, IG pg 176–177, Steps 4–6



Acknowledge the common design problem where a cart slides rather than rolls.

Ask students to look in their material bags to see if there is anything that could be used to help solve the problem.

Have students continue to work on their carts.

IWB When several groups have constructed carts that involve bearings, click the arrow to discuss what a bearing is and to introduce different bearings that could be constructed with the materials that students have.

After 30 minutes have elapsed, have students share what they've engineered so far. If students have not been successful yet, ask them to explain the specific problems they are having and what they think may be possible solutions. If students are successful, ask them what parts of the cart work together to allow the system to move.

New Word Introduce *engineer*.

engineer: a scientist who designs ways to accomplish a goal or solve a problem

New Word Introduce *solution*.

solution: the act of solving a problem. Engineers solve problems. In chemistry, a mixture formed when one or more substances dissolve in another

New Word Introduce *bearing*.

bearing: a part in a machine that supports or guides a rotating part

Add all new words to the word wall.



Teacher
Notes

IG pg. 176–177, Steps 4–6

Investigation 3, Part 1

Vocabulary Review



Motion and Matter, IG pg 177, Step 7



Review vocabulary.

IWB You can use the *Pen Tool* to write class definitions beside the words or use this slide as a resource/reminder.

IWB Click each word to reveal its definition at the top of the page.

These words should find a permanent place on a word wall in your classroom so that they are always accessible to students.



Teacher
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IG pg. 177, Step 7

Focus Question

► What are some important features of a cart that will roll from here to there?



Motion and Matter, IG pg 178, Steps 8–9 and 11



Ask students to write the focus question in their notebooks.

Have students also record the constraints under the focus question.

Ask students to answer the focus question in their notebooks. See Step 9 for what students should include in their answers.

Tell students they will be taking their vehicles apart, so they should make any necessary notes or drawings they need so they can reassemble the cart the same way on another day.

Assess progress using the "What to Look For" in Step 11.

Clean up is on the next slide.

IG pg. 178, Steps 8–9 and 11



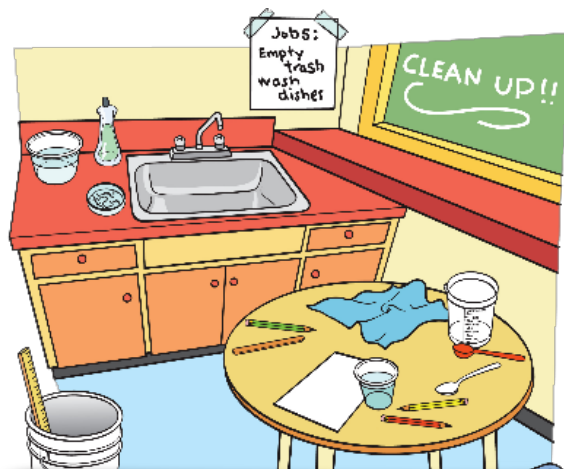
Teacher
Notes

Investigation 3, Part 1

Clean Up!



- Take your carts apart. You can keep usable subassemblies together.
- Put all materials in the labeled bags.
- Write your names on a scrap of paper and place in the bag.
- Return the labeled bags, tape, and scissors to the materials station.



Motion and Matter, IG pg 178, Step 10

Clean up.



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IG pg. 178, Step 10

Investigation 3, Part 1

Reading Science Resources



Motion and Matter, IG pg 179–180, Steps 12–17

X

Turn to page 22, "What Engineers Do," in *Science Resources*. Have students preview and read the selection as described in Steps 12–13.

Distribute notebook sheet 9, *Elements of the Engineering Design Process*, and have students tape this sheet in their notebooks for future reference.

Discuss the reading using the questions in Step 14. Have students read the section about different types of engineers and pick one to discuss with their group. See Step 15.

Distribute notebook sheets 10 and 11, *Engineering Practices A* and *Engineering Practices B*, to each student. Have students discuss what they are doing or could do in the future that are engineering practices described on the sheets.

Turn to pages 32 and 33, "Science Practices" and "Engineering Practices," in *Science Resources* and have each group focus on one of the practices and compare how the statements apply to scientists and engineers. Students can make notes on notebook sheets 4 and 5, *Science Practices A* and *Science Practices B*, and notebook sheets 10 and 11, *Engineering Practices A* and *Engineering Practices B*.

For reading strategies to support English learners and below-grade-level readers, see the Science-Centered Language Development chapter in *Teacher Resources*.

IWB Click the *Notebook Button* to open notebook sheets 9, 10, 11, 4, and 5.



IG pg. 179–180, Steps 12–17

Wrap-Up/Warm-Up



➤ What are some important features of a cart that will roll from here to there?



Pair up with a partner to

- share and compare your drawings of your cart;
- share problems and solutions you encountered;
- share an interesting thing you learned about being an engineer.

Motion and Matter, IG pg 180, Step 18

Wrap-Up/Warm-Up

Conclude this part or start the next part by having students share their notebook entries with a partner.

See the Science-Centered Language Development chapter in *Teacher Resources* for suggestions for how students can share responses.



IG pg. 180, Step 18

Investigation 3, Part 1

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