SCIENCE NOTEBOOK

FOSS

MOTION AND MATTER

3RD GRADE

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MOTION AND MATTER

3RD GRADE

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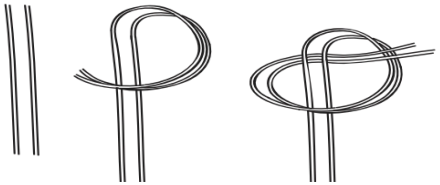
Magnetic-Force Checklist

Focus question: What happens when magnets interact with other magnets and with paper clips?

Some things to try

❑ a. Tie a magnet on a string. Swing the magnet on a string over another magnet sitting on a table. What happens if you tape the magnet to the table?

How to tie a knot →



❑ b. Tie a paper clip on the end of a string. Swing the paper clip on a string over a magnet.

❑ c. Put several magnets on a straw.

❑ d. Put magnets on two sides of a stick.

❑ e. Stretch a rubber band the length of a stick. Hang several paper clips from the rubber band. Move the stick over a magnet.

❑ f. Set up a "talking magnet" with a partner.

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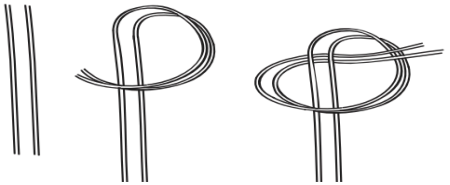

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Motion and Matter Module
Investigation 1: Forces
No. 1—Notebook Master

Focus Question What happens when magnets interact with other magnets and with paper clips?	Focus Question What happens when magnets interact with other magnets and with paper clips?

Force at a Distance

a. Write the focus question in your notebook.

b. Use the measurement ruler on this notebook sheet to find out how close to the magnet the paper clip needs to be to snap to one magnet. Make sure one person holds the magnet and the other moves the paper clip 1/2 centimeter (cm) at a time. Each person should test three times and record all three trials on the ruler below.

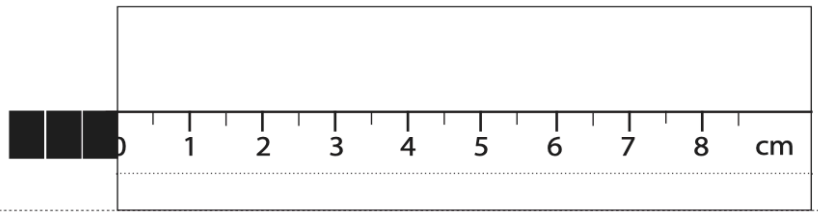
c. Test the distance using three (not two) magnets. (Skip two magnets—that's what we're trying to predict.) Record your data. Use the number 3 to mark the distance with three magnets.

d. Analyze your data. Then predict. Predict what the snap distance will be when you use two magnets. Write the number 2 under the ruler to show your prediction.

e. Test and record the actual distance, using two magnets.

f. Compare predictions to the data.

g. Write an answer to the focus question.



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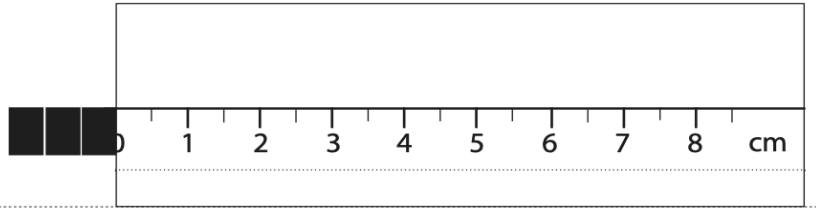

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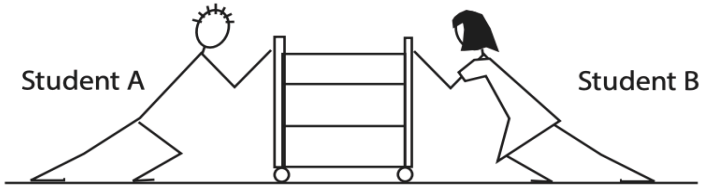
Motion and Matter Module
Investigation 1: Forces
No. 2—Notebook Master

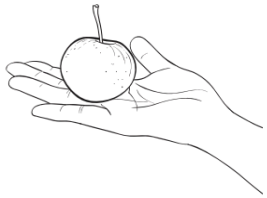
Response Sheet—Investigation 1

Write your answers on a blank page of your notebook (not on this sheet).

1. Student A pushes on a cart with 500 units of force. Student B pushes on the other side of the cart. The cart doesn't move. How much force is student B applying? Explain why you wrote that answer.



2. Explain why the apple is not moving. Describe all of the forces at work when you are holding an apple in your hand as you see in the picture.



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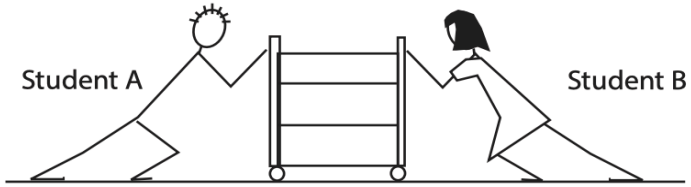

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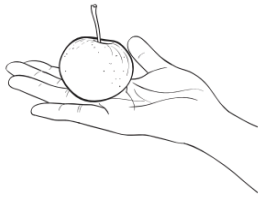

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Motion and Matter Module
Investigation 1: Forces
No. 3—Notebook Master

Science Practices A

1. **Asking questions.** Scientists ask questions to guide their investigations. This helps them learn more about how the world works.

2. **Developing and using models.** Scientists develop models to represent how things work and to test their explanations.

3. **Planning and carrying out investigations.** Scientists plan and conduct investigations in the field and in laboratories. Their goal is to collect data that test their explanations.

4. **Analyzing and interpreting data.** Patterns and trends in data are not always obvious. Scientists make tables and graphs. They use statistical analysis to look for patterns.

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Motion and Matter Module
Investigation 1: Forces
No. 4—Notebook Master

Science Practices B

5. **Using mathematics and computational thinking.** Scientists measure physical properties. They use computation and math to analyze data. They use mathematics to construct simulations, solve equations, and represent different variables.

6. **Constructing explanations.** Scientists construct explanations based on observations and data. An explanation becomes an accepted theory when there are many pieces of evidence to support it.

7. **Engaging in argument from evidence.** Scientists use argumentation to listen to, compare, and evaluate all possible explanations. Then they decide which best explains natural phenomena.

8. **Obtaining, evaluating, and communicating information.** Scientists must be able to communicate clearly. They must evaluate others' ideas. They must convince others to agree with their theories.

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Motion and Matter Module
Investigation 1: Forces
No. 5—Notebook Master

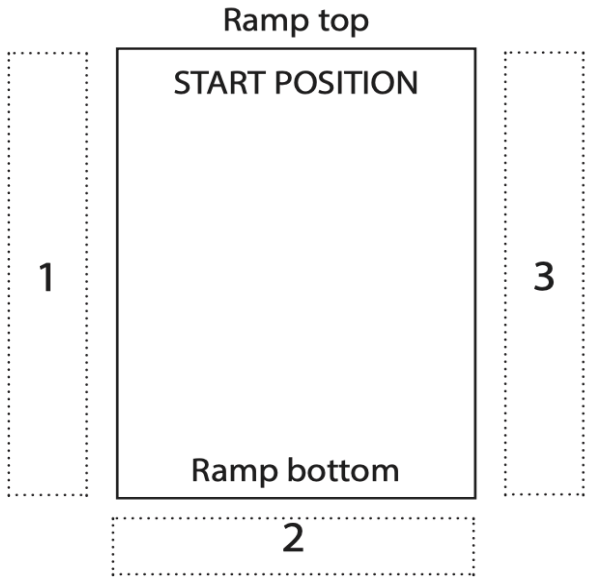
Focus Question How is the magnetic field affected when more magnets are added?	Focus Question How is the magnetic field affected when more magnets are added?

Focus Question What causes change of motion?	Focus Question What causes change of motion?

Focus Question How can we change the motion of wheel-and-axle systems rolling down ramps?	Focus Question How can we change the motion of wheel-and-axle systems rolling down ramps?

Response Sheet A—Investigation 2

A student in another class invented a game. In order to win the game, you have to pick three objects and roll each one off the ramp in a different place. First you have to roll an object onto the area marked 1. Then, roll a second object onto the area marked 2. Finally, roll a third object onto the area marked 3. You must let go of all objects at the place marked "START POSITION."



Response Sheet A—Investigation 2

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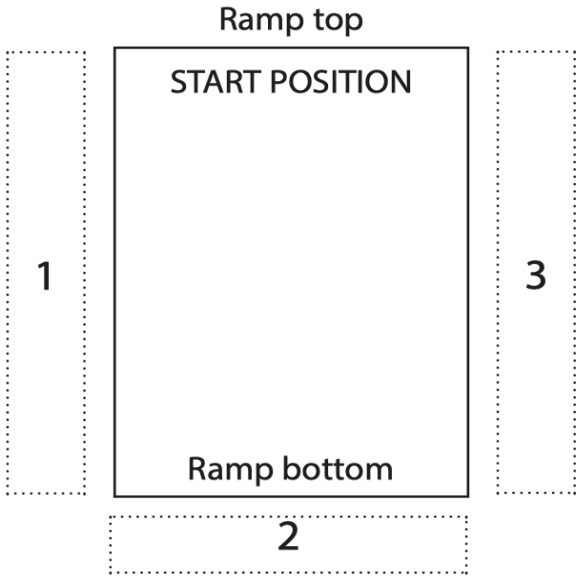

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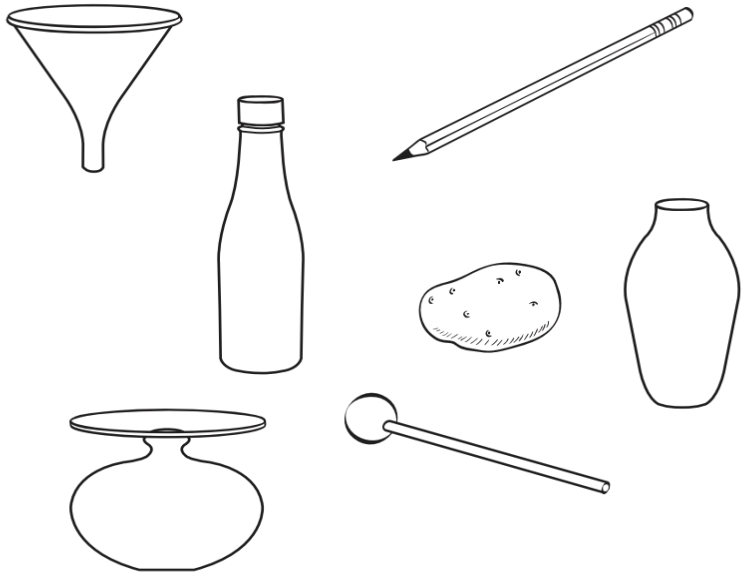
Motion and Matter Module
Investigation 2: Patterns of Motion
No. 6—Notebook Master

Response Sheet B—Investigation 2

Now it's your turn to play the game. Look at the objects at the bottom of the page. On a blank notebook page, answer these questions.

1. Which objects could you choose to land at position 1? Explain why those objects would work.
2. Which objects could you choose to land at position 2? Explain why you chose those objects.
3. Choose one object to land at position 3. Explain how you will use that object to land in position 3.



Response Sheet B—Investigation 2

Now it's your turn to play the game. Look at the objects at the bottom of the page. On a blank notebook page, answer these questions.

1. Which objects could you choose to land at position 1? Explain why those objects would work.
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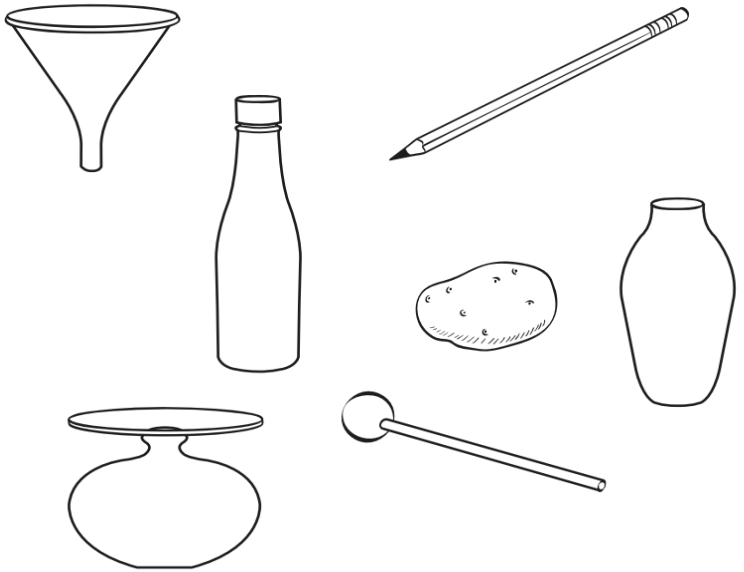

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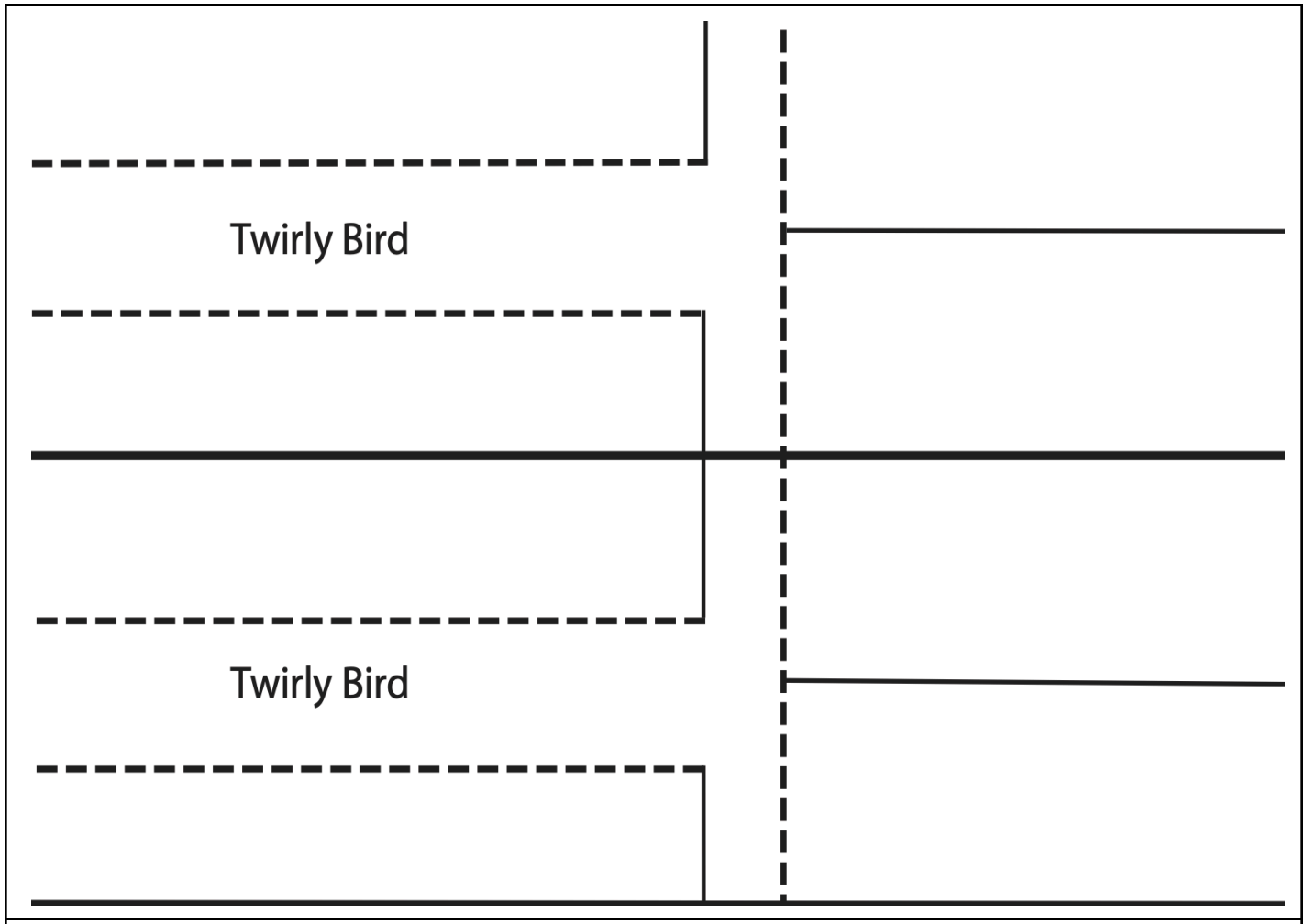
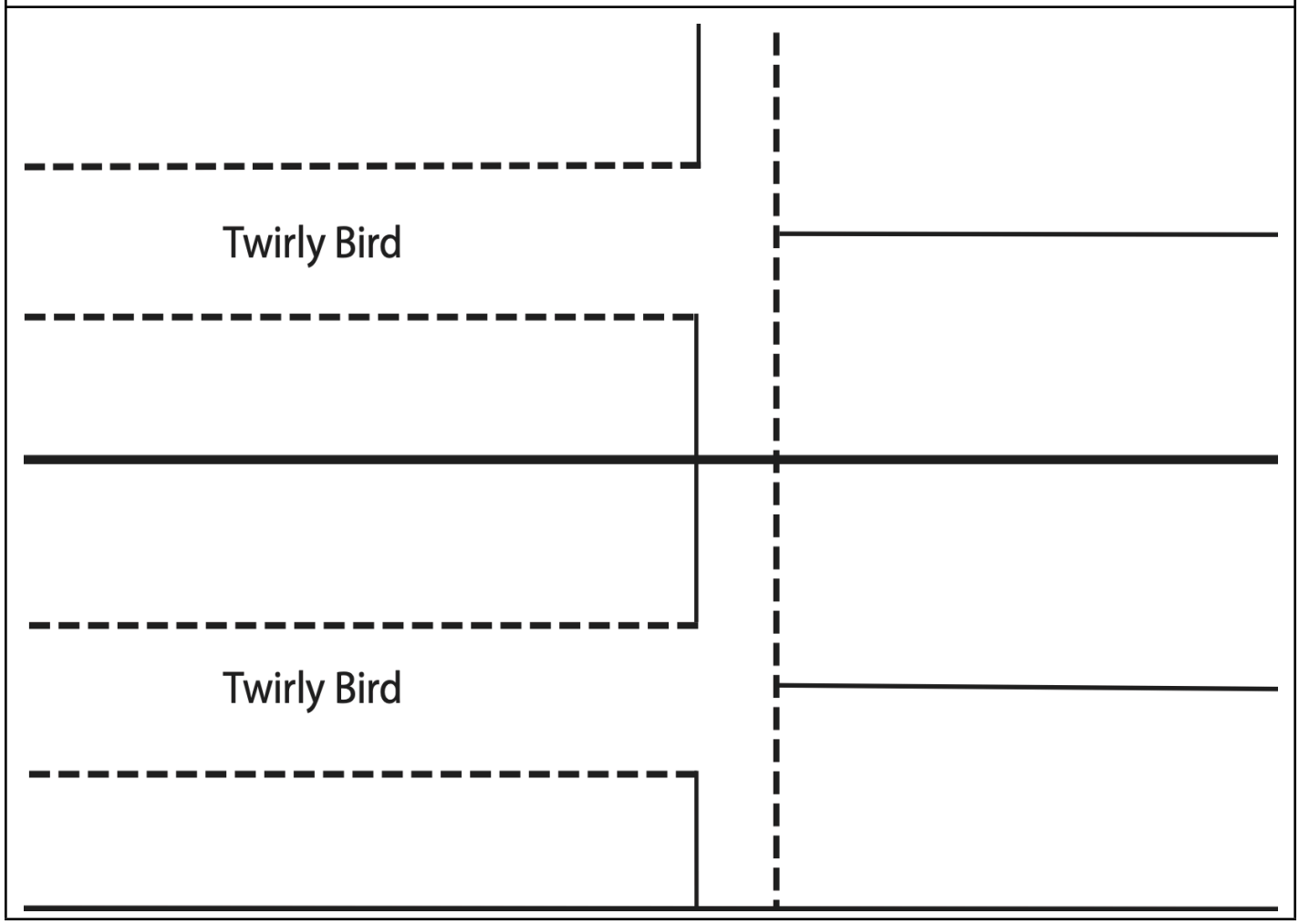
Motion and Matter Module
Investigation 2: Patterns of Motion
No. 7—Notebook Master

Focus Question What rules help predict where a rolling cup will end up?	Focus Question What rules help predict where a rolling cup will end up?


Twirly Bird
Twirly Bird


Twirly Bird
Twirly Bird

Twirly Bird Investigations

Describe or draw a picture of your standard twirly bird in the empty area below. (Be sure you write "standard" on the body of the twirly bird before going on.)

Write the following information about each new twirly bird that you make before you fly it.

a. Describe the variable you are changing.
b. Write a focus question.
c. Write a prediction about how the motion will change.
d. Fly the new twirly bird with the standard.
e. Describe the observed results. (What happened when you flew both twirly birds and compared their motion?)

Twirly Bird Investigations

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Motion and Matter Module
Investigation 2: Patterns of Motion
No. 8—Notebook Master

Focus Question What happens to the motion of the twirly bird when the design is changed?	Focus Question What happens to the motion of the twirly bird when the design is changed?

Focus Question What is the best design for a top?	Focus Question What is the best design for a top?

Elements of the Engineering Design Process

1. Understand the problem thoroughly.
2. Carefully define the criteria and constraints placed on a solution.
3. Devise a plan for a solution.
4. Build the planned solution.
5. Test the solution and evaluate its performance.
6. Return to the planning phase and revise the plan, based on data from the test.
7. Repeat Steps 4–6 until the solution satisfies the criteria and constraints.
8. Obtain a patent and go into production.

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Motion and Matter Module
Investigation 3: Engineering
No. 9—Notebook Master

Engineering Practices A

1. **Defining problems.** Engineers ask questions to make sure they understand problems they are trying to solve. They need to understand the constraints that are placed on their designs.

2. **Developing and using models.** Engineers develop and use models to represent systems they are designing. Then they test their models before building the actual object or structure.

3. **Planning and carrying out investigations.** Engineers plan and conduct investigations. They need to make sure that their designed systems are durable, effective, and efficient.

4. **Analyzing and interpreting data.** Engineers collect and analyze data when they test their designs. They compare different solutions. They use the data to make sure that they match the given criteria and constraints.

Engineering Practices A

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Investigation 3: Engineering
No. 10—Notebook Master

Engineering Practices B

5. **Using mathematics and computational thinking.** Engineers measure physical properties. They use computation and math to analyze data. They use mathematics to construct simulations, solve equations, and represent different variables.

6. **Designing solutions.** Engineers find solutions. They propose solutions based on desired function, cost, safety, how good it looks, and meeting legal requirements.

7. **Engaging in argument from evidence.** Engineers use argumentation to listen to, compare, and evaluate all possible ideas and methods to solve a problem.

8. **Obtaining, evaluating, and communicating information.** Engineers must be able to communicate clearly. They must evaluate other's ideas. They must convince others of the merits of their designs.

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Motion and Matter Module
Investigation 3: Engineering
No. 11—Notebook Master

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

Focus Question How can you improve the design of your cart?	Focus Question How can you improve the design of your cart?

Data Table

Start position	Trial 1	Trial 2	Trial 3

Data Table

Start position	Trial 1	Trial 2	Trial 3

Data Table

Start position	Trial 1	Trial 2	Trial 3

Data Table

Start position	Trial 1	Trial 2	Trial 3

Focus Question How does the start position on your ramp affect how far the cart will roll?	Focus Question How does the start position on your ramp affect how far the cart will roll?

Focus Question How can you use magnets to do cart tricks?	Focus Question How can you use magnets to do cart tricks?

Mixtures to Observe

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Use the 5 milliliter (mL) spoon to measure solids.

Use the syringe to measure the water.

Mixture 1

1 spoon of sand and 1 spoon of gravel

Mixture 2

1 spoon of sand and 50 mL of water

Mixture 3

1 spoon of salt and 50 mL of water

Mixture 4

1 spoon of calcium carbonate and 50 mL of water

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Motion and Matter Module
Investigation 4: Mixtures
No. 13—Notebook Master

Mixtures Data

WARNING — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

This mixture is _____ and _____ .

		Name	Mass (g)
Before mixing	Material 1		
	Material 2		
After mixing		Mixture	

This mixture is _____ and _____ .

		Name	Mass (g)
Before mixing	Material 1		
	Material 2		
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	Material 2		
After mixing		Mixture	

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Motion and Matter Module
Investigation 4: Mixtures
No. 14—Notebook Master

Focus Question What happens when you mix two materials?	Focus Question What happens when you mix two materials?

Baking Soda and Vinegar

Before you begin, review safety guidelines.

Procedure

- ☐ a. Put on safety goggles.
- ☐ b. Measure 50 mL of vinegar into one cup.
- ☐ c. Measure one 5 mL spoon of baking soda into another cup.
- ☐ d. Place the cup of vinegar inside the cup of baking soda. Do not mix the substances yet.
- ☐ e. Use a balance and mass set to weigh the nested cups of baking soda and vinegar. Record the mass.
- ☐ f. Leave the mass pieces you used to weigh the cups in the balance.
- ☐ g. Remove the nested cups from the balance. Carefully pour the vinegar ***very slowly*** into the baking soda cup. Observe what happens. Take turns pouring a little at a time. When all the vinegar is poured in, stir gently with a craft stick.
- ☐ h. Predict the mass of the mixture (more, same, or less than the parts).
- ☐ i. Place the baking soda and vinegar mixture inside the empty vinegar cup. Put the nested cups back on the balance.
- ☐ j. Record the final mass of the mixture.

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Motion and Matter Module
Investigation 4: Mixtures
No. 15—Notebook Master

Focus Question What happens when you mix two materials?	Focus Question What happens when you mix two materials?

Focus Question What is the importance of accurate measurements for a metric field day?	Focus Question What is the importance of accurate measurements for a metric field day?