

Name:

Date:

Class:

Car on a Ramp Challenge Worksheet

Phase 1: Explore

Instructions: Your teacher will give you a ramp, two balls, and a cup. You have **5 minutes** to explore. Go!

Write at least two observations about what you noticed. Be specific. (Describe exactly what was different between the two balls or between different heights.)

Write at least one question you have about why it happened.

Draw an initial model of this system below.

Label the parts. Use arrows to show how the energy moves. Where does the energy come from? Where does it go? Identify at least one variable you could change.

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Phase 2: Engineering Challenge

★ **Your Challenge:** Design a ramp and cart system that moves the wooden block more than ***half a meter*** (50 cm) with the ***least*** amount of energy.

ASK

What do you know? What do you need to find out?

What materials do you have to work with?

What questions do you have before you begin?

RESEARCH

Use what you already know.

What variables can you change? List them. (Hint: Think about what you discovered in Phase 1.)

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IMAGINE

Brainstorm possible designs before you start testing.

Brainstorm: Which combination of height and mass do you think will move the block the farthest? Explain your reasoning.

List at least three different ramp configurations your group could try. What will you change from one test to the next?

PLAN

Design your six tests before you begin. Change one variable at a time.

Sketch six designs your team will test.

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CREATE & TEST

Build your setup and run all six tests. Record every result.

Test at least six ramp and cart configurations. Document the amount the block moves for each attempt.

Describe the setup. Be specific. (height of ramp, number of washers)	Photo or sketch + distance block moved (cm)

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Which ramp and cart setup moved the block the most? The least?

IMPROVE

Use your data to find the minimum energy setup that still meets the constraint.

Which setup moved the block more than half a meter using the *least* energy? Describe that setup and explain what you changed to get there.

Demo your optimal ramp system to classmates. Draw or take a picture of your demo here.

After the class discussion, which group had the best setup? Describe the setup and explain why it used the least energy to meet the constraint.

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Model Revision

Compare what worked best to your initial Phase 1 model. What is the same? What is different?

Make edits to your initial model to create a revised model here. Your revised model should:

- Label all physical components (ramp, cart, washers, wooden block, book stack).
- Use directional arrows to show how the energy moves through the system.
- Label where **potential energy** is greatest and where **kinetic energy** is greatest.
- Identify which variables you changed and how they affected the energy in the system.

Take notes from the class discussion here.

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Add the scientific terms *mass*, *height*, *speed*, *kinetic energy*, and *potential energy* to your revised model. Copy your final model here.

Write a paragraph to explain your model. Use the words *mass*, *height*, *speed*, *kinetic energy*, *potential energy*, *work*, and *gravity* in your explanation.