Name: _____

> ## Performance Task Elementary
> ## **"Which Road Is Best"**

You will be part of a team working to build a new science museum for your community. The science museum will be built on a new site that will require roads to be built. The town council needs to answer the following question: *Should the new road be a smooth paved road or a rough gravel road?*

As a scientist, you will help the town council answer this question by investigating the forces required to move a truck on a smooth surface and a rough surface. You will investigate the following question:

Question: How does the road surface (smooth or rough) affect the amount of force needed to move a truck along the road?

You will investigate this question using a scientific model. Look at the materials on your placemat. The sandpaper will represent the **rough** road and the cardboard will represent the **smooth** road.

Part 1: Predictions

1. Using your observations of the model roads and what you know about force, motion, and energy, predict how the road surface will affect the amount of force needed to move a truck along the road. **Explain your thinking**.

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Part 2: Setting up and conducting the Investigation

In order to test your prediction, you will use the materials on your placemat to model the amount of force needed to move a light truck and a heavy truck along a smooth surface and a rough surface. Follow the directions below in order to conduct your experiment.
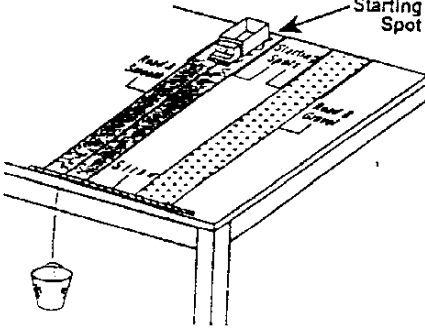
2.

Trial 1
Road A – Empty Truck on Smooth Road

Put the truck in the starting spot on Road A as shown in the picture.

Hold the bottom of the cup with one hand. Carefully add one washer at a time to the cup until the dump truck begins to roll.

Number of Washers Used → ☐

Starting Spot

Empty the cup and put the truck back in the starting spot.
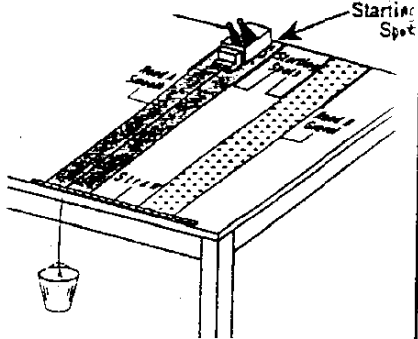
Trial 2
Road A – Truck with Two Weights on Smooth Road

Make sure that the truck is in the starting spot on Road A.

Add the two fishing weights to the back of the dump truck.

Hold the bottom of the cup with one hand. Carefully add one washer at a time to the cup until the dump truck begins to roll.
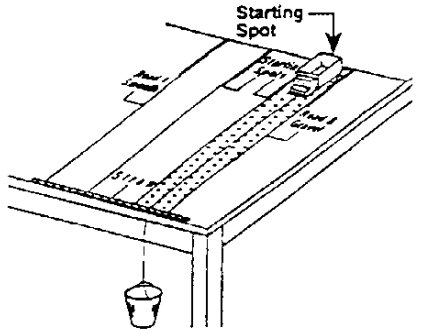
Number of Washers Used → ☐

Starting Spot

Empty the cup. Remove the weights from the back of the truck and move the truck to the starting spot on Road B.

Trial I
Road B – Empty Truck on Gravel Road

Put the truck in the starting spot on Road B as shown in the picture.

Carefully add washers one at a time to the cup until the dump truck begins to roll.

Number of Washers Used → ☐

Starting Spot

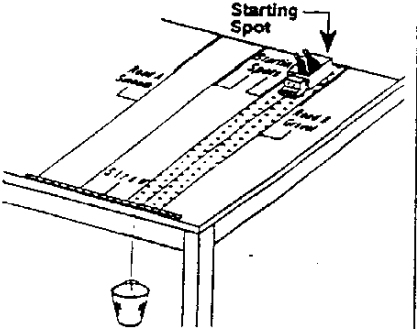Empty the cup and put the truck back in the starting spot.

Trial 2
Road B – Truck with Two Weights on Gravel Road

Make sure that the truck is in the starting spot on Road B.

Add the two fishing weights to the back of the dump truck.

Carefully add washers one at a time to the cup until the dump truck begins to roll.

Number of Washers Used → ☐

Starting Spot

Empty the cup and remove the truck from Road B.

Part 3: Organizing and Explaining results

3. Using your data from Part 2, make a table in the space below that shows the results from your investigation.

    The title of the table will be **The Effect of Road Surface on Force.**

    * **Make sure the table includes the labels Road Surface, Trial 1, Trial 2**

The Effect of Road Surface on Force

4. Go back to page 1 and read your prediction. Do the results of you experiment support your prediction about how the road surface will affect the amount of force needed to move a truck along the road? Explain your answer.

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5.Imagine doing another trial using four fishing weights in the back of the truck on the smooth road. Would it take more, fewer, or the same number of washers to move the truck? Use the results from this investigation to support your answer.

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6. Using your results and what you know about force, motion, and energy, which road surface (Smooth Paved or Rough Gravel) should the town council choose for the roads leading to the new science museum? Explain your thinking.

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Open-ended Questions

Directions:

You will be completing one open-ended question.

"Snails and Plants"

Please read the question and write your answers. Your answers will be judged on
How well you show your understanding of science; and
How well you can explain it to others.
You may include a picture to help explain your answer.

Wei and Lucia put snails and plants together in a jar of pond water. They sealed the jar and put it under a bright lamp. After several weeks they checked the jar and found that the snails and plants were alive and healthy.

Explain why they stayed alive. Include in your explanation:
Three things that all organisms need to survive
How the organisms in the jar were provided with these things

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Multiple – Choice Questions

Directions:

Mark the **one** best answer for each question.

1. The diagram below shows the Earth and the Moon in space. One night, Neesha noticed that as the hours passed, the Moon appeared to move across the sky from east to west. The best explanation for Neesha's observation is

Earth   Moon
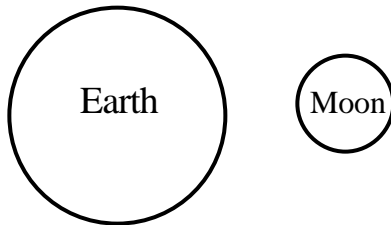
    A. The Earth was circling around the Moon.
    B. The Moon was circling around the Earth.
    C. The Earth was turning on its axis.
    D. Neesha observed an optical illusion

2. Diane and Hector were astronauts on the Space Station. They wanted to look at some distant stars from the window of the station. Which one or the following is the best scientific instrument for them to use?

A.   B.   C.   D.
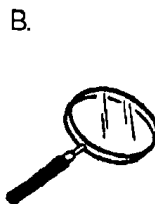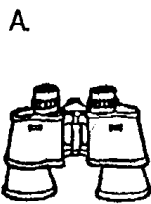
Elementary Performance Task and Alignment With PASS Performance Task Template

"Which Road Is Best"

Standards:

Vt. Framework: Inquiry 7.1 a., c., d., e., f.
                 Space, Time, Matter 7.12 d

NSES: Abilities Necessary to do Inquiry (K-4) 1.1, 1.2, 1.3, 1.4, 1.5,
        Understandings About Scientific Inquiry (K-4) 2.4,
        Physical Science (K-4) 2.1, 2.2, 2.3

Benchmarks: Scientific Inquiry 1B (K-2) 1, 2, 3 (3-5) 1, 2, 3, 4
            The Physical Setting 4F (3-5) 1

Scenario:

You will be part of a team working to build a new science museum for your community. The science museum will be built on a new site that will require roads to be built. The town council needs to answer the following question: *Should the new road be a Smooth Paved road or a Rough Gravel road?*
As a scientist, you will help the town council answer this question by investigating the forces required to move a truck on a smooth surface and a rough surface. You will investigate the following question:

Problem Statement:

How does the road surface (smooth or rough) affect the amount of force needed to move a truck along the road?

Prediction:

1. Using your observations of the model roads and what you know about force, motion, and energy, predict how the road surface will affect the amount of force needed to move a truck along the road. Explain your thinking.
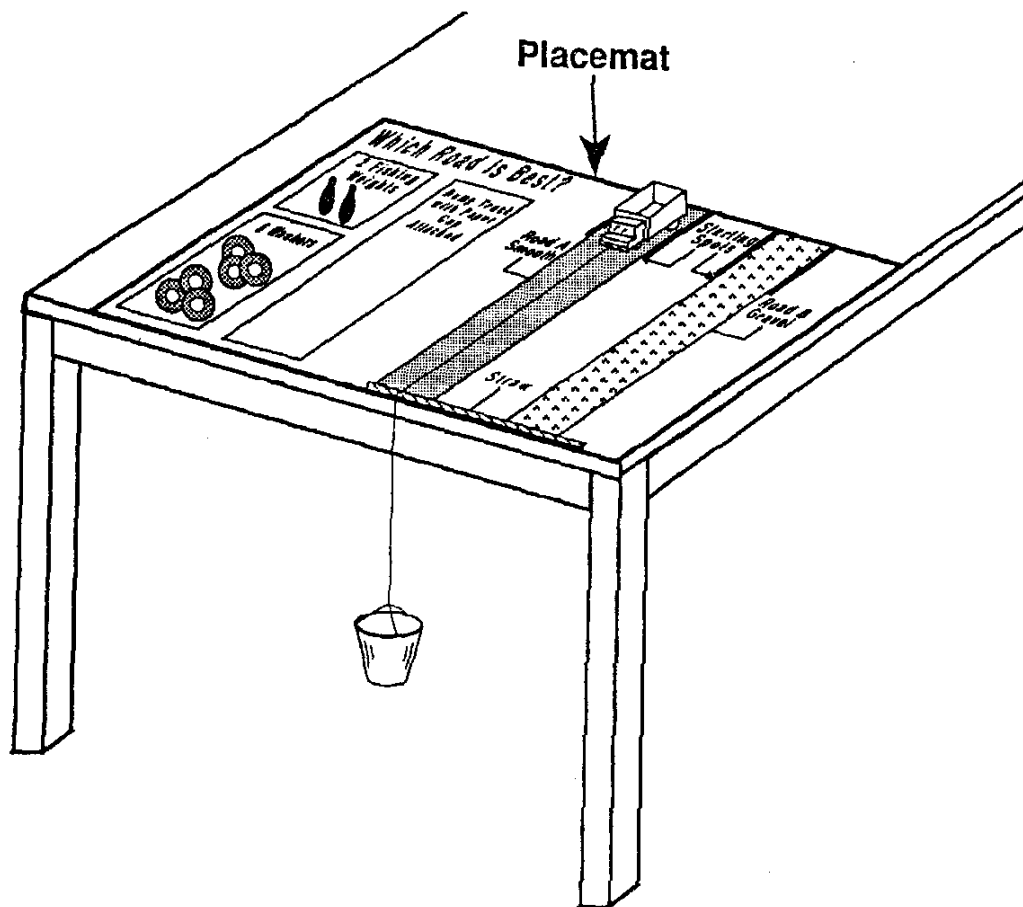

Scoring Guide

Key Elements:
      Establish cause and effect relationship between the road surface and force.
      Justify prediction with past experience, prior knowledge, or information from the scenario.
(ex. I predict it will take more force to move the truck on the sand paper because it will be harder to move the wheels over the rough bumps.)

Experiment:

Materials

2 fishing weights
6 washers
straw
toy truck
cup and string
sand paper (gravel road)
cardboard (smooth road)

Set Up

Data Collection and organization:

2. Observations and Findings

Scoring Guide
Key Elements:
      A number of washers (force) is recorded for each trial

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3. Data Table

Scoring Guide
Key Elements:
      Labels (Road Surface, Trial 1, Trial 2) included and observations displayed clearly in row and column format.
      At least one entry for each labeled row or column.
      Data entered accurately

Analysis-Interpretation-Synthesis-Application

4. Do the results of you experiment support your prediction about how the road surface will affect the amount of force needed to move a truck along the road? Explain your answer.

Scoring Guide
Key Elements:
      Response acknowledges that the results do support the prediction, do not support the prediction, or are not clear enough to make a determination.
      Explanation includes number or washers (force) as evidence supporting or refuting prediction

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5. Imagine doing another trial using 4 fishing weights in the back of the truck on the smooth road. Would it take more, fewer, or the same number of washers to move the truck? Use the results from this investigation to support your answer.

Scoring Guide
Key Elements:
      More washers
      The data from the investigation indicates that more washers (force) would be needed to move a truck with 4 fishing weights because it took more washers to move the truck with the 2 fishing weights than the lighter empty truck.

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6. Using your results and what you know about force, motion, and energy, which road surface (Smooth Paved or Rough Gravel) should the town council choose for the roads leading to the new science museum? Explain your thinking.

Scoring Guide
Key Elements:

       Smooth Paved: Makes a logical inference that because less force is needed to move a vehicle along a smooth paved road, this type of road surface would be more energy efficient.

<div align="center">or</div>

   *   Rough Gravel: Makes a logical inference that there are times when a rough surface might be beneficial (more friction on a bad weather day, slow traffic for safety, etc.)

<div align="center">or</div>

       Undetermined: Need more data such as cost of the road surfaces, durability etc.

<div align="center">

Vermont-PASS Sample Test
Open-ended Question Elementary
"Snails and Plants"

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Standards:
VT Framework: 7.13 a., c.
NSES: Life Science (K-4) 1.1, 3.1
Benchmarks: The Living Environment 5C (3-5) 1

Scoring Guide
Key Elements:

       All organisms (the snails and plants in the jar) need air, water, food/energy.
       Food: Light and water enabled the plants to grow (make food), snails ate the plants
       Water: stayed in the jar because the jar was sealed
       Air: oxygen/carbon dioxide cycle


Multiple-Choice Elementary

Standards:
VT-Framework: Universe, Earth, and the Environment 7.15 d.
NSES: Earth and Space Science (K-4) 3.3
Benchmarks: The Physical Setting 4A (K-2) 2 (3-5) 1

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1. The diagram below shows the Earth and the Moon in space. One night, Neesha noticed that as the hours passed, the Moon appeared to move across the sky from east to west. The best explanation for Neesha's observation is **C**
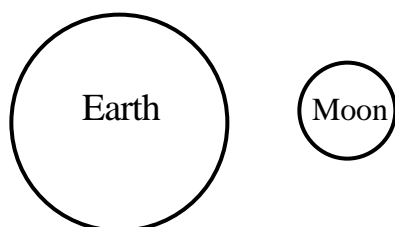
Earth   Moon

    A. The Earth was circling around the Moon.
    B. The Moon was circling around the Earth.
    C. The Earth was turning on its axis.
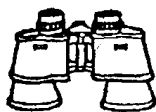   D. Neesha observed an optical illusion

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Standards:
VT-Framework: Inquiry 7.1 b.
NSES: Understanding About Scientific Inquiry (K-4) 2.3

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2. Diane and Hector were astronauts on the Space Station. They wanted to look at some distant stars from the window of the station. Which one or the following is the best scientific instrument for them to use? **D**

A.   B.   C.   D.