

# TABLE OF CONTENTS

## MYSTERIOUS MACHINE

|  |    |
|--|----|
| <b>Purpose</b> .....                                   | 1  |
| <b>Overview</b> .....                                  | 2  |
| <b>Setup Directions</b> .....                          | 4  |
| <b>Assessment</b> .....                                | 10 |
| <b>Unit Time Chart</b> .....                           | 14 |
| <b>Daily Directions</b>                                |    |
| Day 1 .....  | 15 |
| Day 2 .....  | 21 |
| Day 3 .....  | 25 |
| Day 4 .....  | 29 |
| Day 5 .....  | 32 |
| Day 6 .....  | 36 |
| Day 7 .....  | 39 |
| Day 8 .....  | 42 |
| Days 9–11 .....  | 43 |
| Day 12 .....   | 45 |
| Day 13—Machine Day .....                               | 46 |
| <b>Reproducible Masters</b>                            |    |
| MY SCIENCE JOURNAL .....                               | 48 |
| WHAT I KNOW, WHAT I LEARNED, QUESTIONS I STILL HAVE .. | 49 |
| SCIENTIFIC METHOD .....                                | 50 |
| TIME RECORD .....                                      | 51 |
| BUTTER GRAPH .....                                     | 52 |
| SCIENCE JOURNAL RUBRIC .....                           | 53 |
| T.E.A.M. ACTIVITY RUBRIC .....                         | 54 |
| T.E.A.M. ACTIVITY 1 .....                              | 55 |
| MACHINE CLUES (Machine Clues 1–6) .....                | 56 |
| INCLINED PLANE EXPERIMENT .....                        | 57 |
| INCLINED PLANE DATA .....                              | 58 |
| INCLINED PLANE GRAPH .....                             | 59 |
| T.E.A.M. ACTIVITY 2 .....                              | 60 |
| THREE WEDGE PATTERNS .....                             | 61 |
| WEDGE EXPERIMENT .....                                 | 63 |
| WEDGE DATA .....                                       | 64 |
| WEDGE GRAPH .....                                      | 65 |
| T.E.A.M. ACTIVITY 3 .....                              | 66 |
| LEVER EXPERIMENT .....                                 | 67 |
| LEVER DATA and LEVER GRAPH .....                       | 68 |
| T.E.A.M. ACTIVITY 4 .....                              | 69 |
| WHEEL AND AXLE EXPERIMENT .....                        | 70 |
| WHEEL AND AXLE DATA .....                              | 71 |
| WHEEL AND AXLE GRAPH .....                             | 72 |

CONTENTS

# TABLE OF CONTENTS

## MYSTERIOUS MACHINE

# CONTENTS

### Reproducible Masters (continued)

|                                |    |
|--------------------------------|----|
| T.E.A.M. ACTIVITY 5 .....      | 73 |
| PULLEY EXPERIMENT .....        | 74 |
| PULLEY DATA .....              | 76 |
| T.E.A.M. ACTIVITY 6 .....      | 77 |
| SCREW EXPERIMENT .....         | 78 |
| SCREW DATA .....               | 79 |
| SCREW GRAPH .....              | 80 |
| TEAM MACHINE .....             | 81 |
| MACHINE DAY INSTRUCTIONS ..... | 82 |
| MACHINE RUBRIC .....           | 84 |
| DISPLAY RUBRIC .....           | 85 |
| ESSAY RUBRIC .....             | 86 |
| MACHINE CERTIFICATE .....      | 87 |

### 1. **What is Authentic Assessment?**

Authentic assessment involves looking at more than a single test to judge a student's ability or mastery of content. Assess a student's progress over a period of time. At the end of a unit of study, a student should show thoughtful understanding of a complex idea. A student can demonstrate knowledge and skills orally, in writing, and through photographs, videos, and projects. Interact simulations are ideal tools to use for authentic assessment because they emphasize students facing challenges and producing something to demonstrate their accomplishments.

### 2. **Achieving Authentic Assessment**

In MYSTERIOUS MACHINE, students learn and apply the scientific method. They write down thoughts, ideas, observations, and experiments in a Science Journal. The skills and knowledge they acquire will benefit them throughout their lives. Each science journal is both an assessment tool and a demonstration (for administrators, parent, other teachers, etc.) of the learning that has taken place. Use the **Science Journal Rubric** (page 53) for assessment purposes.

Observe how well students work together in their teams during daily T.E.A.M. Activity problem solving. Use the **T.E.A.M. Activity Rubric** (page 54) for assessment purposes. During the daily debriefing session, assess how well students learned and understand concepts covered that day. If additional discussion is needed, provide that immediately. Of course, the successful completion of daily science activities is also a type of authentic assessment.

### 3. **Phase 2**

The entire Phase 2 involves your students in authentic assessment as they apply what they learned in **Phase 1** to create their own Team Machines and to prepare a display of one of the six simple machines. Their displays and explanations—both oral and written—clearly indicate mastery of the concepts of both the simple machines and of the scientific method. Use the **Machine and Display Rubrics** (pages 84 and 85) for assessment purposes.



# UNIT TIME CHART

## MYSTERIOUS MACHINE

| PHASE 1   |   |   |   |
|---|---|---|---|
| DAY 1   | DAY 2   | DAY 3   | DAY 4   |
| <b>Introduce Simulation</b> <ul style="list-style-type: none"> <li>• Create Science Journals and Team Folders</li> <li>• Form Cooperative Teams</li> <li>• Butter Experiment</li> <li>• WHAT I KNOW, WHAT I LEARNED, QUESTIONS I STILL HAVE</li> <li>• SCIENTIFIC METHOD</li> <li>• TIME RECORD</li> <li>• BUTTER GRAPH</li> <li>• Science Journal entries</li> </ul> | <b>Inclined Plane Experiment</b> <ul style="list-style-type: none"> <li>• T.E.A.M. ACTIVITY 1</li> <li>• Machine Clue 1</li> <li>• INCLINED PLANE EXPERIMENT</li> <li>• INCLINED PLANE DATA</li> <li>• INCLINED PLANE GRAPH</li> <li>• Science Journal entries</li> </ul> | <b>Wedge Experiment</b> <ul style="list-style-type: none"> <li>• T.E.A.M. ACTIVITY 2</li> <li>• Machine Clue 2</li> <li>• WEDGE PATTERNS</li> <li>• WEDGE EXPERIMENT</li> <li>• WEDGE DATA</li> <li>• WEDGE GRAPH</li> <li>• Science Journal entries</li> </ul> | <b>Lever Experiment</b> <ul style="list-style-type: none"> <li>• T.E.A.M. ACTIVITY 3</li> <li>• Machine Clue 3</li> <li>• LEVER EXPERIMENT</li> <li>• LEVER DATA and LEVER GRAPH</li> <li>• Science Journal entries</li> </ul>                      |
| PHASE 1   |   |   |   |
| DAY 5   | DAY 6   | DAY 7   | DAY 8   |
| <b>Wheel and Axle Experiment</b> <ul style="list-style-type: none"> <li>• T.E.A.M. ACTIVITY 4</li> <li>• Machine Clue 4</li> <li>• WHEEL AND AXLE EXPERIMENT</li> <li>• WHEEL AND AXLE DATA</li> <li>• WHEEL AND AXLE GRAPH</li> <li>• Science Journal entries</li> </ul>   | <b>Pulley Experiment</b> <ul style="list-style-type: none"> <li>• T.E.A.M. ACTIVITY 5</li> <li>• Machine Clue 5</li> <li>• PULLEY EXPERIMENT</li> <li>• PULLEY DATA</li> <li>• Science Journal entries</li> </ul>   | <b>Screw Experiment</b> <ul style="list-style-type: none"> <li>• T.E.A.M. ACTIVITY 6</li> <li>• Machine Clue 6</li> <li>• SCREW EXPERIMENT</li> <li>• SCREW DATA</li> <li>• SCREW GRAPH</li> <li>• Science Journal entries</li> </ul>                           | <b>Solve the Mystery</b>  |
| PHASE 2   |   |   |   |
| DAY 9   | DAYS 10–11  | DAY 12  | DAY 13  |
| <b>Introduce Team Machine</b> <ul style="list-style-type: none"> <li>• Brainstorm Team Machine ideas</li> <li>• Science Journal entries document process</li> <li>• TEAM MACHINE</li> <li>• MACHINE RUBRIC</li> </ul>   | <b>Develop and Test Team Machines</b> <ul style="list-style-type: none"> <li>• Create and test Team Machines</li> <li>• Science Journal entries document process</li> </ul>   | <b>Introduce <i>Machine Day</i></b> <ul style="list-style-type: none"> <li>• Designate expert groups and assign team roles</li> <li>• Prepare for <i>Machine Day</i> presentations</li> <li>• MACHINE DAY INSTRUCTIONS</li> <li>• DISPLAY RUBRIC</li> </ul>     | <b><i>Machine Day</i></b> <ul style="list-style-type: none"> <li>• Present Display Boards</li> <li>• Present simple machine and team machine</li> <li>• Demonstrate Team Machines</li> <li>• ESSAY RUBRIC</li> <li>• MACHINE CERTIFICATE</li> </ul> |

# LEVER EXPERIMENT



## MYSTERIOUS MACHINE

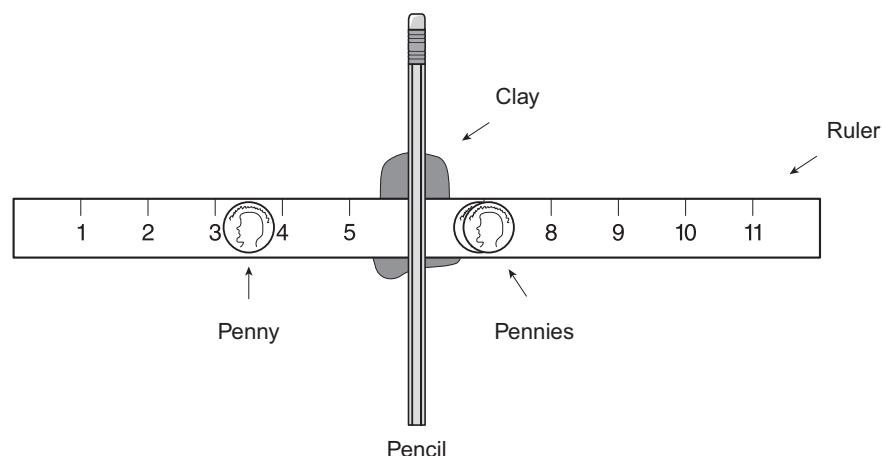
Study the diagram as you read the written directions.

### Materials

- Clay
- Pencil (unsharpened) — *one*
- Pennies — *seven*
- Ruler (12-inch or 30-cm) — *one*

### Procedure

1. Roll the clay into an elongated ball. Place the pencil firmly, without burying it, in the clay on a desk. (The pencil will act as the fulcrum that your lever will pivot on.) Place the ruler on top of the pencil (at the 6-inch mark) so that it balances on the pencil.
2. Put *one penny* at the 7-inch mark (one inch to the right of the fulcrum). Slide *one penny* along the ruler, beginning just to the left of the pencil (fulcrum), until this penny lifts and balances the penny placed at the 7-inch mark. (If your set up is balanced, the pennies should be the same distance from the fulcrum.) On your **Lever Data** page, record how far from the fulcrum the single penny was placed.
3. Stack a *second penny* on top of the first penny at the 7-inch mark. Slide *one penny* along the ruler, beginning just to the left of the pencil (fulcrum), until this penny lifts and balances the pennies placed at the 7-inch mark. On your **Lever Data** page, record how far from the fulcrum the single penny was placed.
4. Continue this process with stacks of three, four, five, and six pennies. Record your data indicating how far from the fulcrum the single penny must be placed to lift and balance each stack of pennies.
5. Complete your **Lever Data** sheet and indicate to your teacher when you have finished this experiment.





# MACHINE RUBRIC

## MYSTERIOUS MACHINE

### Machine Rubric

#### Level 4 — *Exemplary*

- Your machine incorporates more than two simple machines in its design.
- Your machine moves a weight (roll of pennies) at least three feet.
- Your machine presentation demonstrates a thorough, well-developed understanding of concepts learned.
- You worked exceptionally well as a team.

#### Level 3 — *Expected*

- Your machine incorporates at least two simple machines in its design.
- Your machine moves a weight (roll of pennies) at least three feet.
- Your machine presentation demonstrates an accurate understanding of concepts learned.
- You worked well as a team.

#### Level 2 — *Nearly There*

- Your machine incorporates one to two simple machines in its design.
- Your machine moves a weight (roll of pennies) less than three feet.
- Your machine presentation demonstrates a limited understanding of concepts learned.
- You teamwork was limited.

#### Level 1 — *Incomplete*

- Your machine does not incorporate two simple machines in its design.
- Your machine moves a weight (roll of pennies) less than three feet.
- Your machine presentation demonstrates a minimal understanding of concepts learned.
- You do not work well as a team.

### Machine Rubric

#### Level 4 — *Exemplary*

- Your machine incorporates more than two simple machines in its design.
- Your machine moves a weight (roll of pennies) at least three feet.
- Your machine presentation demonstrates a thorough, well-developed understanding of concepts learned.
- You worked exceptionally well as a team.

#### Level 3 — *Expected*

- Your machine incorporates at least two simple machines in its design.
- Your machine moves a weight (roll of pennies) at least three feet.
- Your machine presentation demonstrates an accurate understanding of concepts learned.
- You worked well as a team.

#### Level 2 — *Nearly There*

- Your machine incorporates one to two simple machines in its design.
- Your machine moves a weight (roll of pennies) less than three feet.
- Your machine presentation demonstrates a limited understanding of concepts learned.
- You teamwork was limited.

#### Level 1 — *Incomplete*

- Your machine does not incorporate two simple machines in its design.
- Your machine moves a weight (roll of pennies) less than three feet.
- Your machine presentation demonstrates a minimal understanding of concepts learned.
- You do not work well as a team.