

Science Inquiry Task

Level 1 Task A

Ordering Objects by Movement!

Students will be presented with a range of rolling objects. With teacher support to implement a fair test and make fair comparisons, students will be assessed on their ability to order the objects based on how far they roll along a surface. The inquiry skills of focus here are, 'Questioning and Predicting', 'Recording and Processing', and 'Communicating'.



Science Inquiry Assessment – An Introduction to the SIAs

Science inquiry is increasingly recognised as a critically important aspect of a science education. Students need not only to be introduced to the concepts of science through which we understand the world, but also to the inquiry practices through which science has investigated and established this knowledge. For students to be literate in interpreting and using science in their lives, they need to be aware of how science operates. This is increasingly important in these times of unlimited access to social media and the fake news that can be promoted.

Often, with practical activities in science, the focus is on illustrating concepts without special attention to developing investigative practices. Even with activities where students develop their own inquiries or aspects of these, the particular inquiry practices are often neither independently focused on nor assessed, reducing the opportunity to systematically develop students' capabilities with inquiry.

These inquiry assessment tasks have three aims:

- 1. To help teachers and students clarify the meaning of different aspects of science inquiry practices; what these involve and how they might be recognised and assessed as a progression. They can help develop for teachers a language to discuss science inquiry practices and outcomes.*
- 2. To provide the tools for assessing student inquiry at different points in the primary years. These can be used to track student inquiry learning over time.*
- 3. To provide exemplar inquiry activities that can develop students' inquiry practices in contexts that engage their interest. These can be used to stimulate the development of further inquiry activities in a range of topics.*

Using the tasks:

The tasks are designed to be used independently of curriculum units, matched to different year levels and covering a range of inquiry practices.

However:

- They can be matched to curriculum topics by utilising them flexibly at different year levels. Most could be adapted to focus on skills at higher or lower levels.*
- Tasks are designed to focus on three of the science inquiry skills. However, they can be adapted to focus on other skills and, depending on the assessment processes used, one or two skills might be of particular focus. For the Grade 6 tasks, rubrics are produced for all 5 inquiry skills but teachers would preferably choose from these rather than attempt to track them all.*
- Assessment can involve multiple data sources: field notes as students' work on tasks; notes on student productions; students' answers to questions; and presentations of group reports.*
- The tasks and advice to teachers assume that teachers interact with students to scaffold their inquiries but make judgments about the extent of support needed. Similarly, they are group tasks but students report individually, so that judgments need to be made about the role of each student in a group.*
- The tasks are designed around activities that are intrinsically captivating for students, but this depends on teachers constructing a narrative to bring these to life. For this, open questioning and introductory discussions to provide ways into the activity are important.*
- Teachers need to make judgments about the nature and specificity of the introductory discussions to support students to the point where they can productively engage with the tasks. The support for students may be at this whole class level, but during the tasks also tailored to particular students and groups so that ideally each student works at their own level. This support might be through targeted questioning, modelling, or suggestions and encouragement to pursue specific directions.*
- Prior to engaging with the tasks teachers need to be clear about its purposes and the levels of student inquiry practices that could be encouraged/engaged with. Students will of course come up with surprising and inventive ideas, and care should be taken to not constrain these possibilities.*

Level 1 Task A: Ordering Objects by Movement!

Task Summary:

Students will be presented with a range of rolling objects. With teacher support to implement a fair test and make fair comparisons, students will be assessed on their ability to order the objects based on how far they roll along a surface. The inquiry skills of focus here are, 'Questioning and Predicting', 'Recording and Processing', and 'Communicating'.

Question for investigation:

Can you order objects by how far they can roll?

Equipment list and preparation:

The list for this task is as follows:

	EQUIPMENT	DESCRIPTION
	A solid cylinder	e.g., a C battery.
	A hollow cylinder	e.g. a piece of pipe or cardboard tub.
	A solid sphere	e.g. a marble, or golf ball.
	A hollow sphere	e.g. a tennis ball.
	A ramp	a book leaning against a box.

Students will first predict and then order these objects according to how far they roll along a carpet when released down a ramp. If the room does not have carpet, trial the activity to see if the floor is suitable in terms of the distance these objects roll.

Conducting the task:

Included in the online materials are PowerPoint slides that can be used to introduce and guide the students through the assessment. Students perform the investigation in groups but report individually.

Give each group four rolling objects. Their task is to order them in terms of the distance they roll along the floor when released down a short ramp (for example, a book propped up with a solid object).

The following questions can be used as prompts to guide students through the task:

- Q1. *Which object will roll furthest along the floor?*
- Q2. *How can we find out which object will roll the furthest?*
- Observe students discussing the task and how they test their ideas.
- Q3. *Can you list the objects in order of the distance they have travelled?*
- Q4. *Is this order the same as what you predicted? Why did some roll further than others?*

Gathering evidence:

Students could present their results by, e.g., taking photos or drawing the objects to show their observations. The students may present their ranking verbally or in written/pictorial form. Verbal descriptions or written statements could provide evidence of students' reasoning for their ranking. A student may include reference to the relative distance rolled and some may even include this in their representation.

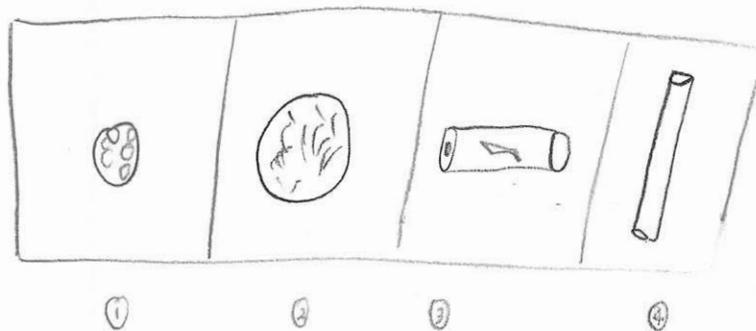
There are two (2) scoring options for the inquiry task. The Group Scoring Template rubric is designed to assess the skills observed by each group. The Class Grid rubric is to record the skills of each student within the class.

Level 1 Task A: Student Work Samples

I predict the tennis ball will roll the furthest because it looks fast, and its big. 

I predict the ~~tennis~~ battery will roll the shortest because it is heavier than the others. 

Low-medium Although the prediction is imaginative, they haven't adopted a consistent explanatory factor.



My discussion

Is this order the same as what you predicted? Why?

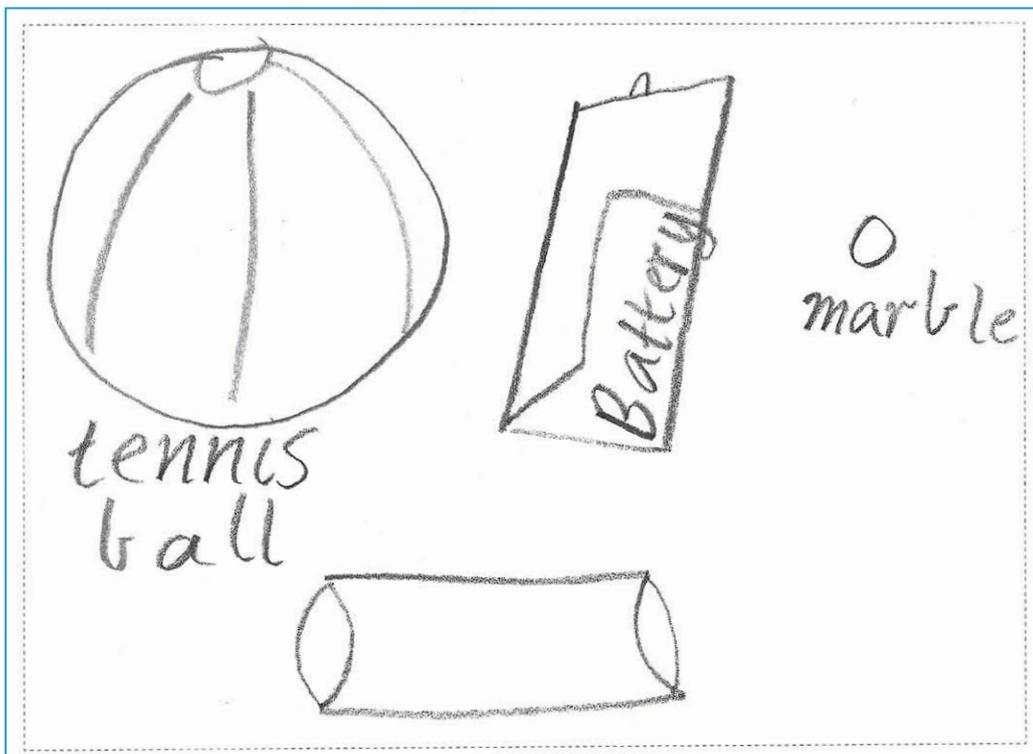
smaller thing roll faster down hill.

The pipe is the last one because
it is hollow

Medium Although they have ranked the objects in order, there is no representation of the distance travelled by each object. They have considered explanatory factors.

I predict the battery will roll the furthest because it is the heaviest. I predict the marble will roll the shortest because it is the lightest.

Medium-high Clearly articulated speculation about the factors governing rolling distance.



Low No clear order of objects.

Level 1 Task A: Ordering Objects by Movement!

1 Predicting

Look at the rolling objects that have been given to your group.

Which object do you think will roll furthest along the floor when released from a short ramp?

Which object do you think will roll the shortest distance?



2 Planning

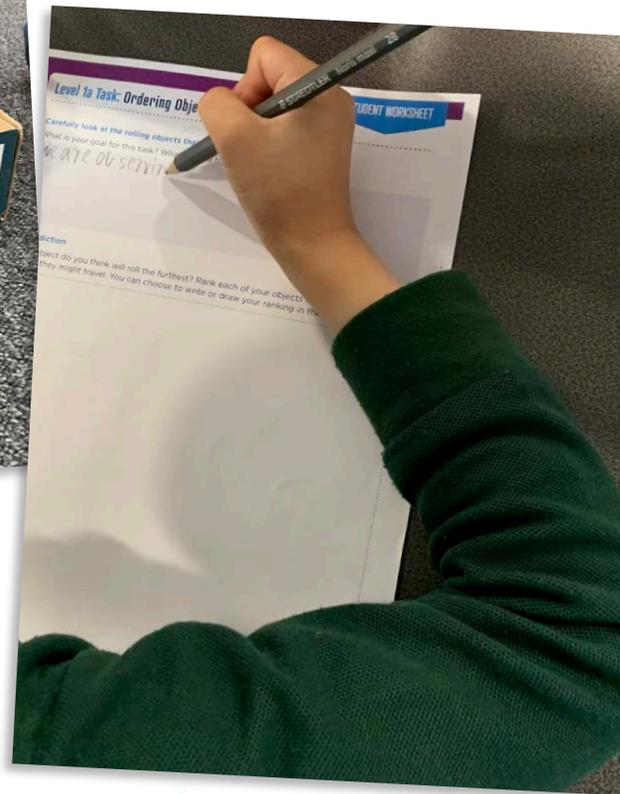
How can we find out which object will roll the furthest?

3 Recording

List the objects in order of the distance they have travelled.

4 Discussing

Why did some roll further than others?



Level 1 Task A: Ordering Objects by Movement!

Name: _____

Carefully look at the rolling objects that have been given to your group.

Q1. What is your goal for this task? What are you trying to do?

My prediction

Q2. Which object do you think will roll the furthest when released down a short ramp?

Rank each of your objects in order of the distance they might travel. You can choose to write or draw your ranking in the box.

My results

Q3. Use the space in the box below to show your results. For example, you can list or draw the objects in order of the distance they actually rolled, or draw the different distances they rolled from the ramp.

My discussion

Q4. Why did some objects roll further than others?

Group Scoring Template

Choose the appropriate outcome/s to focus your assessment on. It may be possible to assess three outcomes for some students or you may choose to use two or one outcome to assess the entire class.
Suggested use: student initials and notes can be recorded in the space for each outcome/level.

Victorian Curriculum Level F-2		
Beginning	Working Toward	Achieved (F-2)
Questioning & Predicting		
<p><i>Actively joins in activity but has difficulty responding to the questions being asked</i></p>	<p>Actively joins in exploration of familiar objects and events. <i>Engages productively with questions about the rolling objects.</i></p>	<p>Responds to and poses questions, and makes predictions about familiar objects and events. <i>Speculates imaginatively about possible differences in rolling and reasons for this.</i></p>
Recording & Processing		
<p>Has difficulty in recording measurements and observations or sorting information. <i>Has difficulty in recording order of predictions and results without strong guidance.</i></p>	<p>Uses pictures, words and provided simple graphic organisers to record observations and findings and sort objects into groups based on particular characteristics. <i>Records the order of objects for the prediction and results with guidance. Needs significant guidance to represent relative distances of rolling.</i></p>	<p>Uses informal measurements in the collection and recording of observations. Uses a range of methods, including drawings and provided tables, to sort information <i>Competently records the order of objects' rolling distance and with guidance, represents relative distances in informal measures</i></p>

Group Scoring Template (cont.)

Communicating		
<p>Has difficulty in describing observations.</p> <p><i>With significant support, describes the differences in rolling for different objects, and what this implies.</i></p>	<p>Uses both general terms and simple, scientific vocabulary to begin to describe their activities and observation.</p> <p><i>With support, describes the purpose and outcomes of the experiment.</i></p>	<p>Represents and communicates observations and ideas about changes in objects and events in a variety of ways.</p> <p><i>Articulates differences in rolling distances for different character objects, and possible reasons for this.</i></p>

