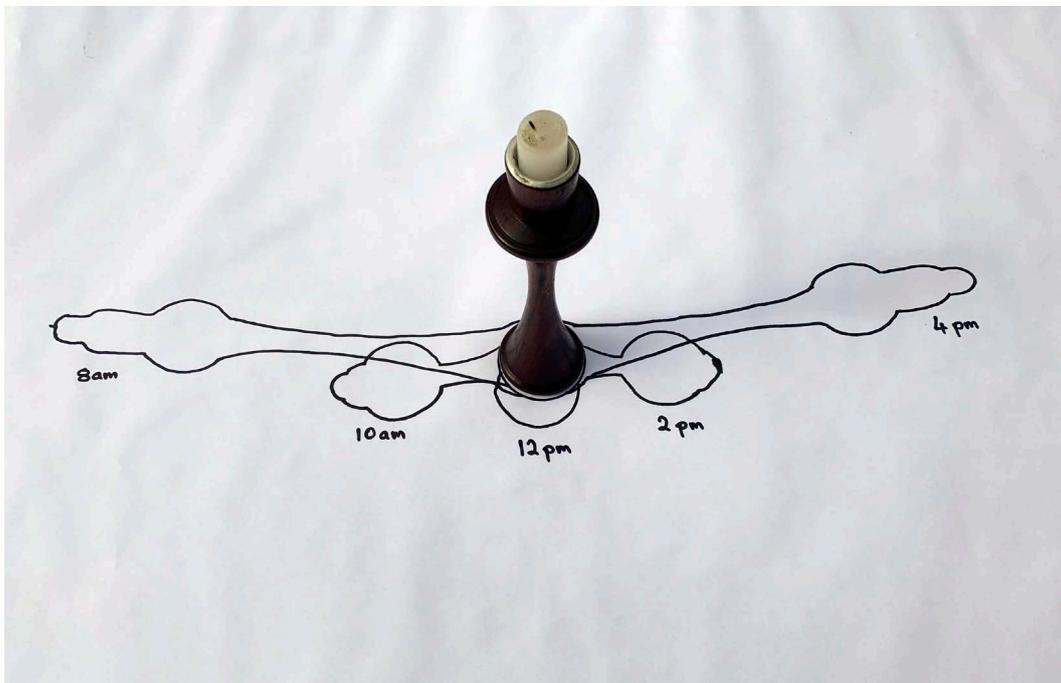


Science Inquiry Task

Level 2 Task B Length of Shadows!

Through this task, students will demonstrate their ability to carefully analyse and carry out a series of measurements. Students will be provided with a photo of an object's shadows at different times of the day and will measure the length of the shadows. They will be encouraged to record and represent their findings using tables, drawings and graphs. This task assesses the inquiry skills of, 'Planning and Conducting', 'Recording and Processing', and 'Analysing and Evaluating'.



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 2 Task B: Length of Shadows!

Task Summary:

Through this task, students will demonstrate their ability to carefully analyse and carry out a series of measurements. Students will be provided with a photo of an object's shadows at different times of the day and will measure the length of the shadows. They will be encouraged to record and represent their findings using tables, drawings and graphs. This task assesses the inquiry skills of, 'Planning and Conducting', 'Recording and Processing', and 'Analysing and Evaluating'.

Question for investigation:

Can you measure how the length of a shadow changes over a day?

Equipment list and preparation:

To complete this task, students will need:

	EQUIPMENT	DESCRIPTION
	Photo in worksheet	Students will need to decide how they measure the length of the five shadows
	Grid/graph paper, ruler	Optional. May be provided for measuring in formal units, and/or representing data in graphical form.
	Small figure and torch	For teacher demonstrations and explanations.

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.

Students are asked about their experience of shadows during the day. What happens to a shadow as the sun rises then sets? The teacher then introduces the task by showing the photo of the candle in the sun and explains how each two hours a line was drawn around the shadow outline to track what happens to it. Students are then shown a photograph of the patterns over the day with shadows recorded at each two hours from 8am – 4pm. This is the photograph each group will work with. The teacher could also model the situation with a small figure and torch, to emphasise how the shadow changes according to the position of the sun. Students are asked to observe the photos and comment.

The following questions and prompts can be used to guide students through the task and their worksheets:

- *“Look at the objects in this container, what can you see?” — allow students to touch and share the objects. Circulate and probe the language of individual students.*

The photo shows the shadow outline at 8am, 10am, 12pm, 2pm and 4pm.

- *What happens to the shadow of the candle at different times of the day?*
- *What does that mean about what happens to the sun during the day?*

Students may need prompting through discussion. Students might do a sketch/drawing on the board of the pattern; relate the pattern to the sun's movement over the day. Explain — ‘we are going to be scientists and measure the length of the shadow of the candle to see how it changes over time’.

- *How will we do this? How will we record it? With prompting, students suggest a table.*
- *Through a guided discussion with the class, the teacher constructs on the board an example of a table showing shadow length at different times of day and discusses how to enter the data.*
- *Students, in groups, measure the shadow length from the photo and then individually reconstruct the table and enter their data. (It is not necessary to consider the scale of the photo since we are only interested in the pattern. Note that a cross marks the centre of the candle, as a place to take measurements from).*
- *The teacher circulates around the groups prompting their reflection: What happens to the length of the shadow over the day? Did everyone get the same measurements? Why might they be different? (measurement variation)*

- *Once most students have constructed their tables, the teacher asks — Why does the length of the shadow change over time?*
- *How could we represent the change in shadow length using a drawing or a graph? Student suggestions could be used to construct a sample graph on the board. Students, individually, are challenged to construct a sample representation on the board.*

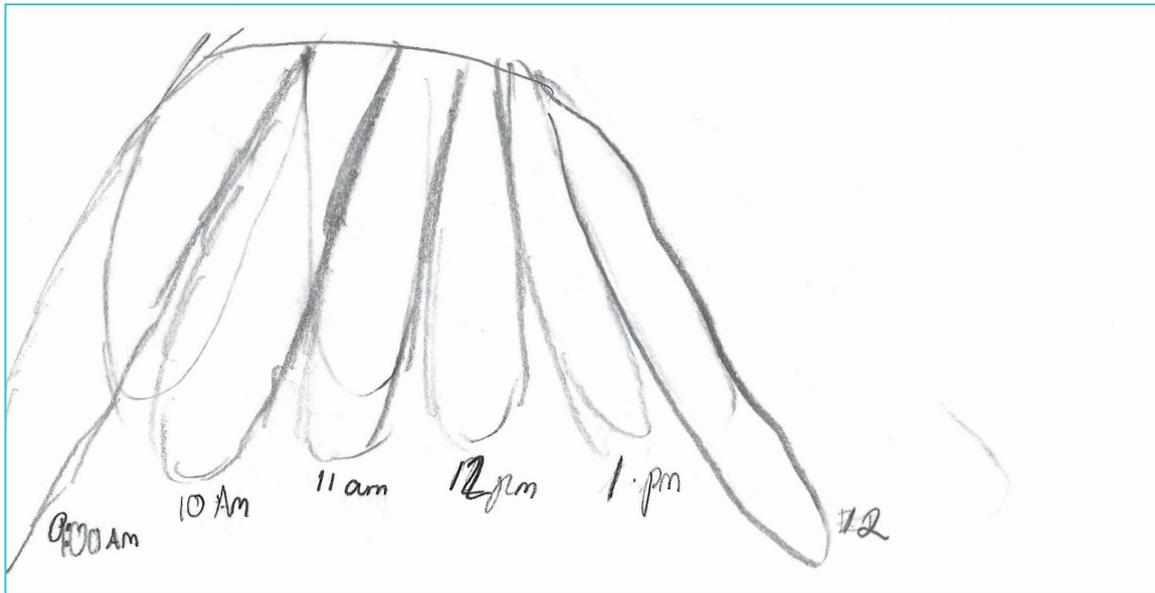
Gathering evidence:

Students could present their measurements in a variety of ways — text, tables, graphically, pictorially. Students ask questions and comment on the accuracy of their measurements and hypothesise about the length of the shadow at another time.

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 2 Task B: Student Work Samples

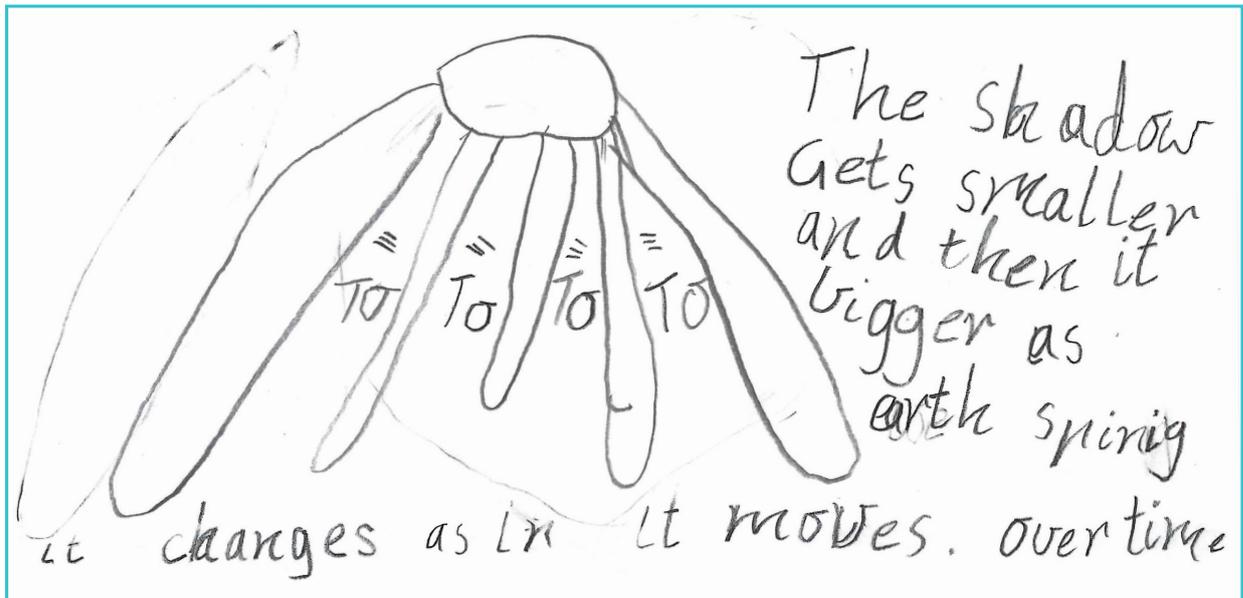
Note: These work samples relate to a different object and shadow pattern.



Low A student's sketch of the data image provided to them.

Time of Day	Length of Shadow
9:00 am	10.5 cm
10:00 am	8.5 cm
11:00 am	6 cm
12:00 pm	5.5 cm
1:00 pm	5 cm
2:15 pm	9 cm

Low-medium Has included units of measurement but lacks command of table structure. Note: Although this sample includes formal measurements, informal measurements could be used.



Medium Represents the change in shadow over time with a written scientific interpretation.

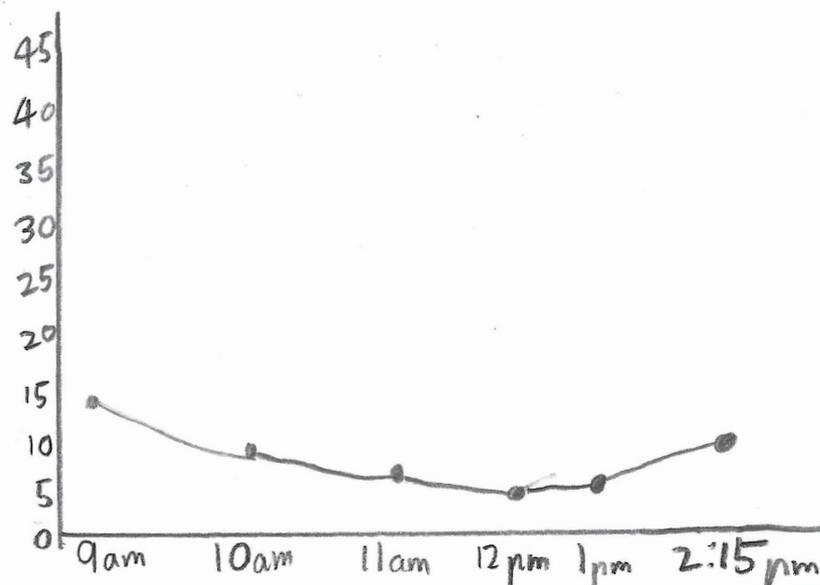
Times of the day	Length of Shadow
9am	13
10 am	8
11 am	7
12 am Midday	5
13 pm	6
14.25	9

Medium Clear layout but needs units of measurements.

Times of the Day	Length of shadow
9 am	14.5 cm
10 am	9.5 cm
11 am	7.5 cm
12 pm	6.5 cm
1 pm	6.7 cm
2:15 pm	10.3 cm

Measure the length of the shadow at each time, then add them to your table.

What happens to the length of the shadow over the day? Draw or use a graph to show how the shadow length changes.

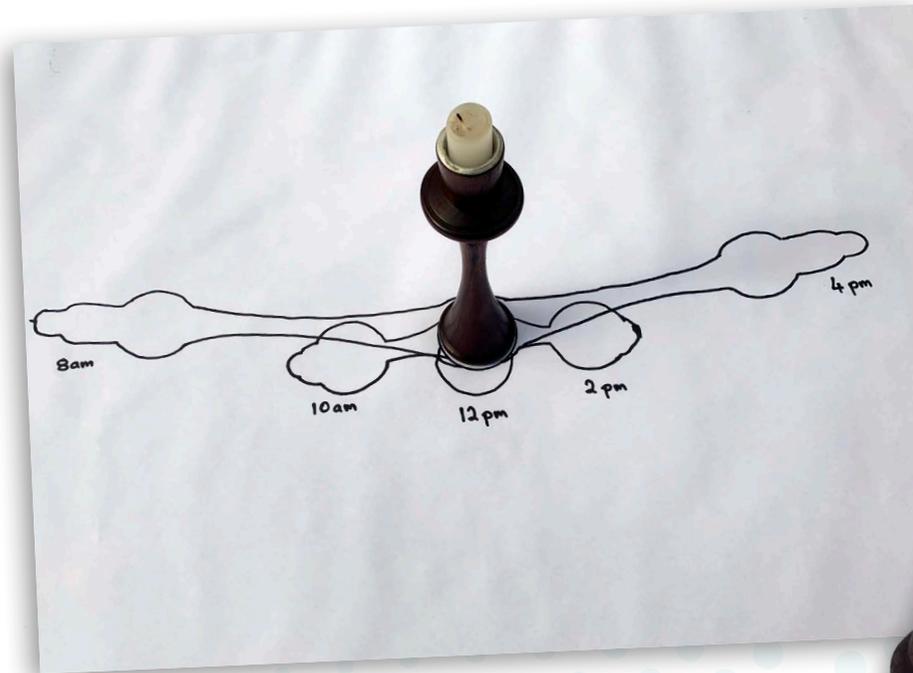


High Shows skills in advance of level.

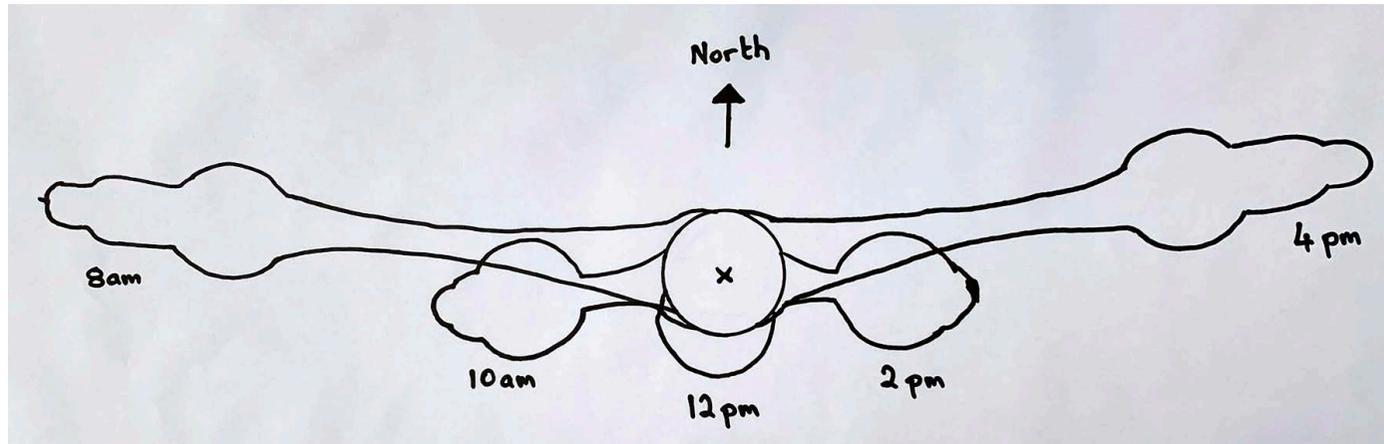
Level 2 Task B: Length of Shadows!

What's bigger than you but doesn't weigh anything? – Your shadow!
But is this always true?

- 1 Look at the photos of the candle's shadow at different times of the day.
What do you notice?
- 2 What happens to the shadow at different times of the day?
'The photo shows what the candle's shadow looks like at 8am, 10am, 12pm, 2pm and 4pm.
Can you match these times to the pictures?
- 3 We are going to be scientists and measure the length of the shadow of the candle!
How will we do this?
How will we record it?

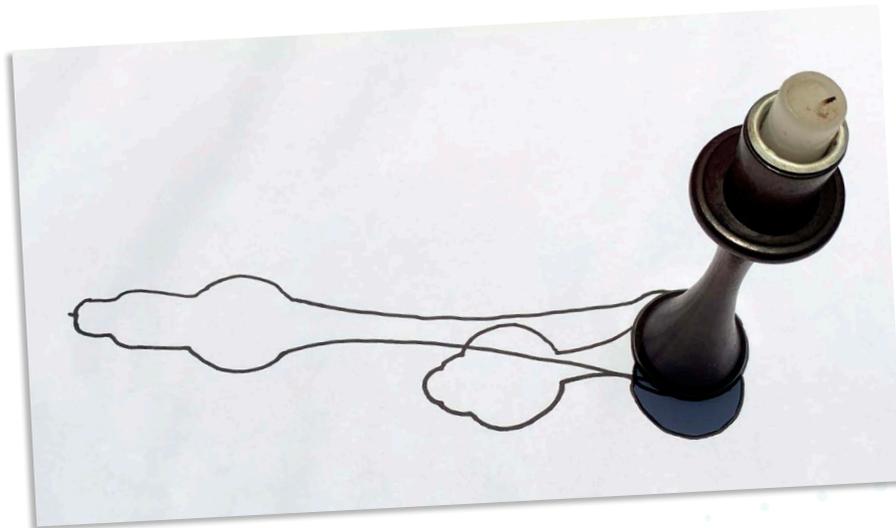


Level 2 Task B: Length of Shadows!



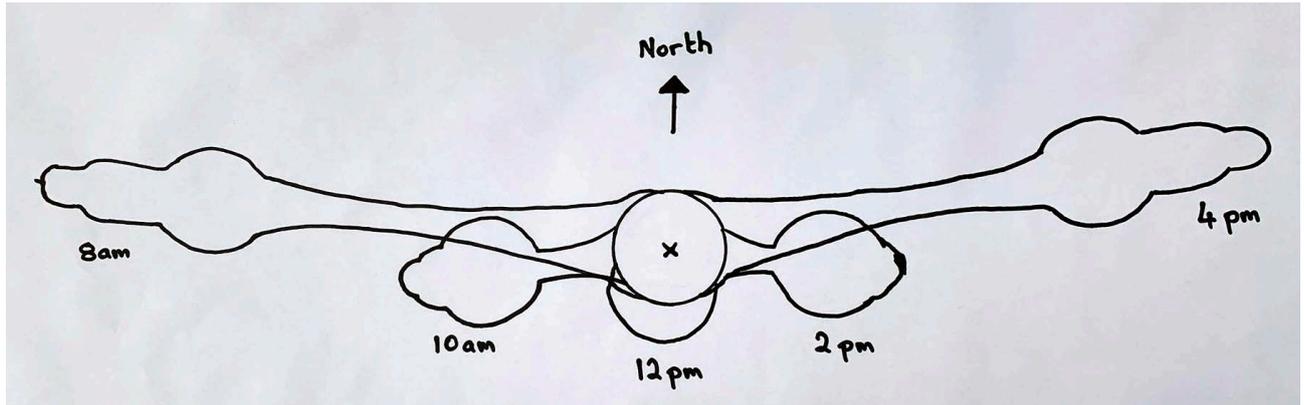
5 Compare your measurements with others. Are they the same?

6 Why have different groups got slightly different measurements?



Level 2 Task B: Length of Shadows!

Name: _____



Look carefully at the photo showing the shadow outline at 8am, 10am, 12 noon, 2pm and 4pm.

Q1. Your task is to investigate how the length of the candle's shadow changes over the day. In the box below, draw a table that you could use to record your measurements.

Measure the length of the shadow at each time, then add them to your table.

A large, empty rectangular area defined by a dashed black border, intended for students to record their measurements and calculations. The box occupies most of the page below the instruction.

Q2. What happens to the length of the shadow over the day? Draw or use a graph or other means to show how the shadow length changes.



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 Foundation-2		
Working Toward	Achieved (F-2)	Exceeded (3-4)
Planning & Conducting		
<p>With significant support, participate in guided investigations including making observations using the senses.</p> <p><i>Follows instructions to measure and record shadow lengths.</i></p>	<p>Participate in guided investigations, including making observations using the senses, to explore and answer questions.</p> <p><i>Follows suggestions to measure and record shadow lengths and does so reasonably accurately.</i></p>	<p>Suggest ways to plan and conduct investigations to find answers to questions and consider the elements of fair tests.</p> <p><i>Suggests ways to compare/record shadow lengths and does so accurately.</i></p>
Recording & Processing		
<p>With guidance, use informal measurements and follows methods to sort information.</p> <p><i>Orders shadows and, with guidance, uses measures and constructs a table.</i></p>	<p>Use informal measurements in the collection and recording of observations. Use a range of methods, including drawings and provided tables, to sort information.</p> <p><i>Uses informal measures and drawings and competently enter data in the table.</i></p>	<p>Use formal measurements in the collection and recording of observations.</p> <p>Use a range of methods, including tables and column graphs, to represent data and to identify patterns and trends.</p> <p><i>Enters measurements to complete table competently. Draws and comments on pattern.</i></p>

Group Scoring Template (cont.)

Analysing & Evaluating		
<p>With support, compare observations and predictions with those of others. <i>Notices some variation in measurements and ideas.</i></p>	<p>Compare observations and predictions with those of others. <i>Identifies variation in measurements and ideas.</i></p>	<p>Compare results with predictions, suggesting possible reasons for findings. Reflect on an investigation, including whether a test was fair. <i>Identifies and evaluates variations in measurements and ideas.</i></p>

