

The following question refers to shadows created by sunlight.

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

Scoring Guide

Score & Description
<p>Complete</p> <p>Student describes an appropriate procedure for determining how much a shadow changes throughout the day. An appropriate procedure consists of three parts:</p> <ol style="list-style-type: none">1. an object or person whose shadow is cast,2. a measuring method or statement that the length of the shadow is measured,3. at least three observations throughout the day that must specify or imply both morning and afternoon observations.
<p>Essential</p> <p>Student describes a procedure but omits one of the three parts outlined above.</p>
<p>Partial</p> <p>Student describes a procedure but omits two of the three parts outlined above. Response may be vague but seemingly logical.</p>
<p>Unsatisfactory/Incorrect</p> <p>Student does not describe what would be needed to make the measurements or the procedures that would be used to make the measurements, or lists equipment only. Response does not illustrate logical methodology.</p>

Complete - Student Response

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

I would use a dummy to make a shadow and use a ruler to measure how long the shadow is. I would record how much the shadow changed every 2 hours.

Scorer Comments:

Student response provides an equipment list and all parts of an appropriate procedure. The stated time intervals imply both morning and afternoon observations.

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

You would need a clock, an object that can sit outside all day, and a tape measure. You would put the object out, and measure the length of the shadow of the same object at certain, regular points in the day.

Scorer Comments:

Student response provides an equipment list and all parts of an appropriate procedure. The stated times specified imply that observations are made throughout the course of the day.

Essential - Student Response

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

I would need a tape measure
and a friend. I would stand
in a spot all day and
have my friend measure
me every hour.

Scorer Comments:

Student response provides an appropriate procedure, but includes a faulty description of a person being measured instead of the person's shadow.

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

materials
1) The sun (for length), 2) A pole
or person etc., 3) a ruler.
procedure: 1) At about 8:30 AM
measure the shadow. 2) At
10:30 AM measure the shadow.
3) At noon measure the
shadow

Scorer Comments:

Student response provides an appropriate procedure, but includes only morning observations instead of observations throughout the day.

Partial - Student Response

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

In the morning I would
get a measuring tape
& have someone measure
it. At evening I would
do the same.

Scorer Comments:

Student response provides only the measurement portion of the procedure correctly. Response is not credited for number of observations because the procedure lists only two observations.

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

The only material you would need is light and a person. The procedure to take is stand outside at different times of the day and notice the difference in a shadow.

Scorer Comments:

Student response provides a general procedure without specifying what object casts the shadow or that the shadow needs to be measured. The response recognizes that the observations need to be made throughout the day.

Unsatisfactory/Incorrect - Student Response

Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

The materials I would use would be a measuring stick.

In the morning I would go outside. I would put the measuring stick on cement. I would leave it there all day. When the sun was setting I would go outside, and see how much the sun moved that day.

Scorer Comments:

Student response shows lack of understanding that the length of an object's shadow needs to be measured and, instead, attempts to gauge how much the Sun moves.

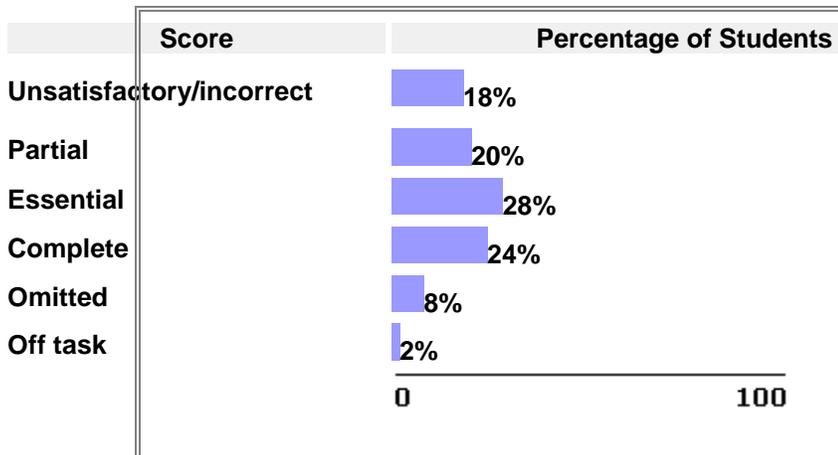
Suppose that for a science project you wanted to find exactly how much the length of a shadow changes during the day. Describe both the materials and the procedures you would use to make these observations.

a ruler and a object for the
sun to reflect on so you can
measure the distance

Scorer Comments:

Student response shows lack of understanding that the length of an object's shadow needs to be measured, and provides an incoherent procedure.

2000 National Performance Results



Note:

- These results are for public and nonpublic school students.
- Percentages may not add to 100 due to rounding.

The Fields of Science: *Earth & Space Sciences* (Sub content classification: *Earth in Space*)
Knowing and Doing Science : *Scientific Investigation*

The Fields of Science

Earth & Space Sciences

This question measures basic knowledge and understanding of the following:

Earth in Space

- setting of the Earth in the solar system;
- setting and evolution of the solar system in the universe (not in grade 4);
- tools and technology that are used to gather information about space;
- apparent daily motions of the Sun, the Moon, the planets, and the stars;
- rotation of the Earth about its axis, and the Earth's revolution around the Sun;
- tilt of the Earth's axis that produces seasonal variations in climate; and
- earth as a unique member of the solar system that may be approximated in other galaxies in the universe, and that evolved at least 4.5 billion years ago.

Knowing and Doing Science

Scientific Investigation

Scientific investigation probes students' abilities to use the tools of science, including both cognitive and laboratory tools. Students should be able to acquire new information, plan appropriate investigations, use a variety of scientific tools, and communicate the results of their investigations.