

Learning Critical Thinking Through Astronomy:
Observing A Stick's Shadow 4

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STUDENT NOTE

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Questions

How does a stick's shadow behave as observed from the arctic and antarctic regions?

Materials Needed

For this activity, you will need the following materials:

- a simulation of a stick's shadow
- a ruler
- a pencil (do not use ink)
- the ability to read and follow directions
- you must have previously completed either Activity0201 or Activity0202 (but you need not have completed both) and Activity0203.

Points To Remember

The instructions from the previous activities apply to this activity. The instructions in this activity are open-ended compared to instructions in previous activities. That is because by now, you should be familiar with how to plan a procedure to answer a question that has been asked of you. You will likely be frustrated by this activity, but the experience is very important.

1 Location

Select either North Pole or South Pole as your location, whichever is closest to your current location (i.e. where you are performing this activity). If today's date is between January 1 and June 30, set the date for about June 20. If today's date is between July 1 and December 31, set the date for about December 18.

1.1 Sunrise And Sunset

Determine when sunrise and sunset occur throughout an entire year.

1. Summarize your sunrise and sunset findings in the space provided.

1.2 Limits

Determine whether or not there is a limit to where you can be located and still observe this behavior.

2. Articulate your findings in the space provided.

1.3 Noon

Reset the simulation to the original location and original date. Investigate the behavior of a stick's shadow throughout the year.

3. Summarize your findings in the space provided, making sure to mention something about the concept of *noon*, which you have investigated in previous activities.

1.4 Vanishing Shadows

Investigate whether or not the stick's shadow vanishes on any day in the year.

4. Summarize your findings in the space provided.

2 Inquiry

In an earlier activity, you defined the direction of a stick's noon shadow (minimum length shadow) to have some scientific significance.

5. Explain, in all necessary detail, whether or not that significance still holds in this activity?

6. In an earlier activity, you used a stick's shadow to establish a well defined system of directions. Explain, in all necessary detail, whether or not that **same** system of directions can be established in this activity. If a new system of directions is required, define it operationally.
7. Suppose you and a friend are standing at your simulated location (brrrrrrr!). Your friend tells you to face east. What **should** your response be?
8. In previous activities, you observed that a shadow's direction and length both change during daylight. Suppose you are standing at your simulated location (brrrrrrr! again) and you have a reliable watch with you (one that works in very cold temperatures). During one hour, would you predict the change in a shadow's direction to be more noticeable or the change in the same shadow's length? Defend your prediction.

9. How does a stick's shadow behave as observed from the arctic and antarctic regions? Using everything you have discovered, construct a framework that defines the behavior of a stick's shadow from the location you used in this activity.

———— CHECKPOINT ————

10. Map this activity into as many of the elements of thought as you can.

11. Every activity will have at least one standard associated with it.

STANDARD

I can create a framework for a shadow's behavior as observed from the North Pole or the South Pole.

3 Feedback

What could be done to make this activity more interesting? Please be honest.