Shadow Graph - Teacher's Notes

Shadow Graph

For this activity, students, in pairs go outside, on an hourly basis, for several hours to measure the height of each other's shadow. They enter their own data in the table provided and draw a graph of the results.

Precision and accuracy
You may wish to discuss with students the degree of accuracy, which would make the data acceptable. Using a standard ruler, students can only accurately measure to millimeters. Although in secondary school they are encouraged to measure to two decimal places, this equipment is limiting. In the third column students can comment on anything else that they notice about their shadow.

Materials

- Compass, phone app or school map to establish which direction is south
- Sunny day
- Hard, smooth outdoor surface such as concrete, bricks or bitumen
- Worksheet
- Ruler or measuring tape
- Pen or pencil
- Watch or clock
- Chalk
- Optional – a broom or brush to clean off chalk marks

Method

1. Select a dry sunny day if possible.
2. Establish which direction is south and mark a spot for students to stand, facing that direction. They need to be standing on exactly the same spot facing south every time.

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3. Working in pairs, one student should stand still on the marked spot (facing south).
4. The other student marks the top of the stationary students shadow with chalk then measures the length of the shadow from the marked spot to the top of the shadow's head.
5. Students should write the time and length of shadow in the table on the worksheet. They can also add any other observations in the 'comment' column such as which direction the shadow is and whether it is longer or shorter than their height.
6. Repeat this process for the second student.
7. Return to exactly the same spot in one hour's time and repeat steps 3-6. Come back and repeat the experiment as many times as possible in a day.
8. When all data has been collected, students can draw a bar or column graph of the results.

Why can't you measure the length of your own shadow? Because the moment you move down to measure it, the shape changes.

Note: If climate or class members make measurements difficult, the data below can be used. Times and shadow directions will vary due to seasonal changes. (The average height for a Year 3 student is 1270mm)

Observations

Note: observations will vary slightly, depending on time of year and location.

Time	Length in mm	Comment
8.30am	1300	The shadow is to my right and is longer than my height
9.30am	1250	The shadow is becoming shorter and seems to be moving to my left

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10.30am	1150	The shadow has become even shorter
11.30am	1050	The shadow lies directly in front of me
12.30pm	1140	The shadow is becoming longer and is moving towards my left
1.30pm	1240	The shadow continues to lengthen and turn to the left (east)
2.30 pm	1300	The shadow is longer than me and is further to the left (east)

If measurements are scaled by 1/100 then the bars can fit into the graph sheet provided.

Extension

Students might wish to use the diagram below to display both the change in length and direction of the shadow. A suitably scaled line could be drawn on the appropriate ray.

Please Note: The shadow moves anticlockwise in the Southern Hemisphere.