

# MATH EXTENSION—PROBLEM OF THE WEEK

## Investigation 1: The Sun

A girl made a Sun tracker and measured the shadows on a day in late December. The table shows the data she collected.

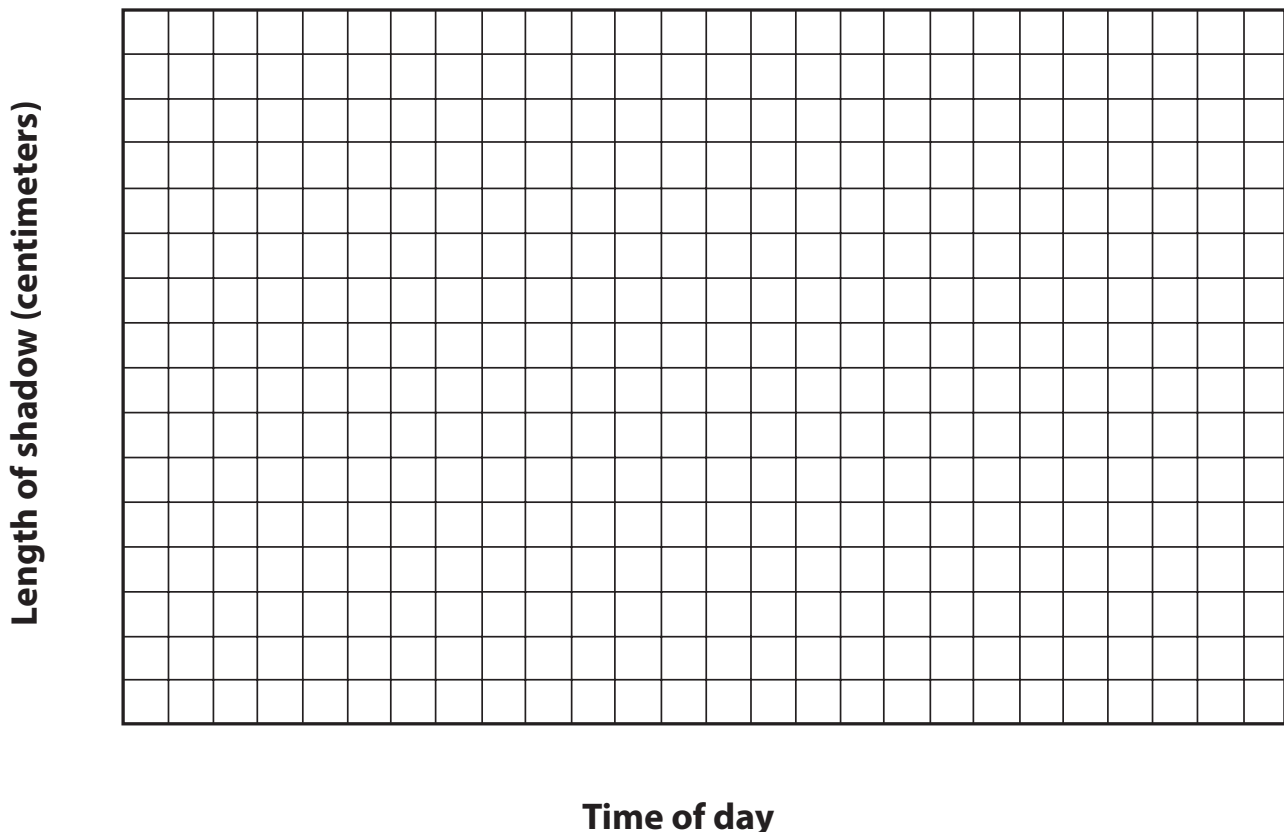
Time	Shadow length (cm)
9:30 a.m.	13.0
11:45 a.m.	8.0
12:30 p.m.	7.5
1:00 p.m.	8.2
1:45 p.m.	10.0
2:15 p.m.	12.0
3:30 p.m.	14.4

Create a graph, using her shadow measurements.

Use your graph to answer the questions below. Use the back of this sheet for your answers.

1. If the girl measured the shadow at 10:00 a.m., what would its length have been? How do you know?
2. If she measured the shadow at 4:00 p.m., what would its length have been? How do you know?
3. What problems, if any, do you see with her measurements?
4. A boy also set up a Sun tracker on the same day and measured a shadow 10 centimeters (cm) long at 12:00 noon. Could his measurement be correct? Why or why not?

### Graph of the Shadow Data

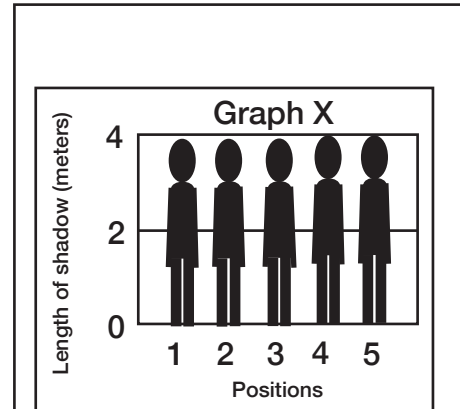
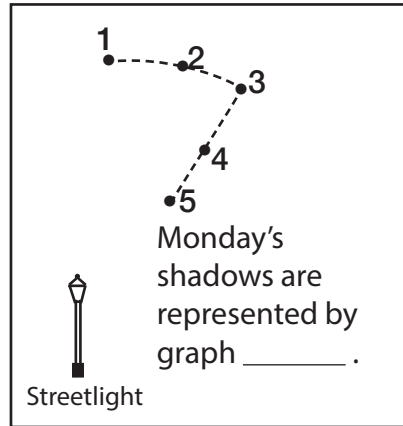


# MATH EXTENSION

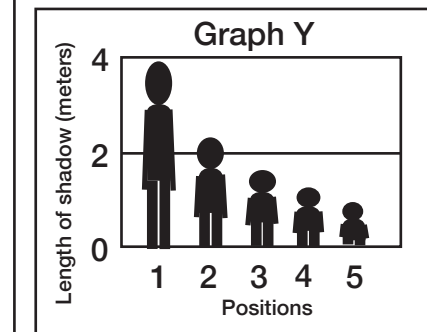
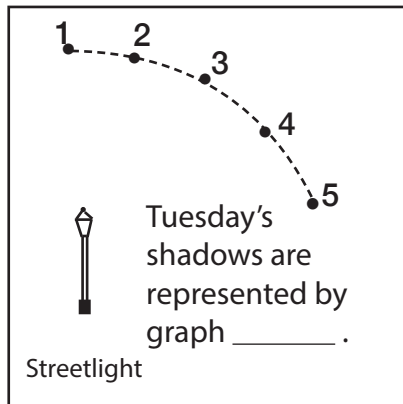
## Shadow Graphs

Read the three stories and look at the pictures. Figure out which graph (X, Y, Z) goes with each story. Write the letter of the graph on the line in the picture.

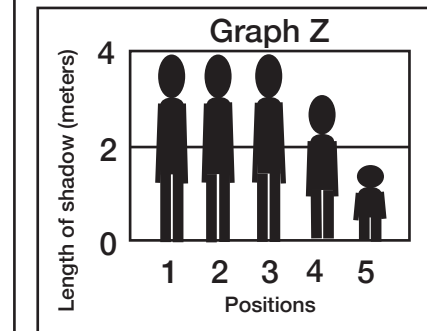
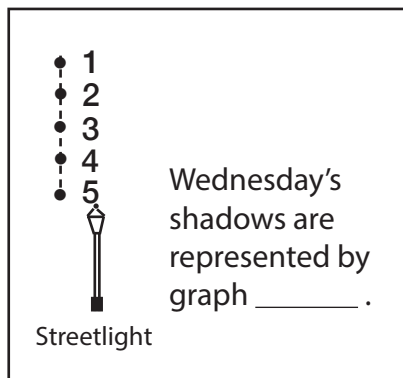
**1. Monday** night you are standing near a streetlight at position 1. Your friend measures the length of your shadow. It is 4 meters (m) long. You then walk to positions 2, 3, 4, and 5. At each position, your friend measures the length of your shadow.



**2. Tuesday** night you begin from the same place near the streetlight and walk a different path. Your friend measures the length of your shadow at each of the five positions.



**3. Wednesday** night you start from the same spot but walk in another direction. Again, your friend records the length of your shadow at five positions.



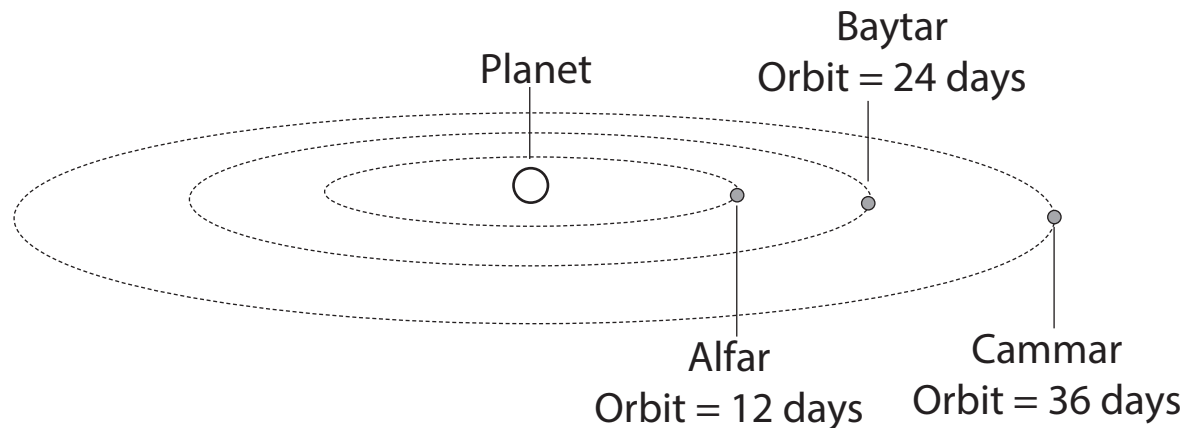
Your friend makes a bar graph of the shadow lengths for each night's walk. Those graphs are shown here on the far right. Match each graph with the path walked each day. Explain your answers on a separate page in your notebook.

[Fold this sheet in half to fit into your science notebook.]

**MATH EXTENSION—PROBLEM OF THE WEEK** .....

## Investigation 2: Planetary Systems

In a make-believe planetary system, three moons orbit a planet. The closest moon is Alfar, the middle moon is Baytar, and the farthest moon from the planet is Cammar.



One day the people on the planet noticed that all three moons were lined up.

1. How many months will it be until the three moons line up again?
2. How many orbits will Cammar make before the moons line up again?
3. How many orbits will Alfar and Baytar make?

Name \_\_\_\_\_

Date \_\_\_\_\_

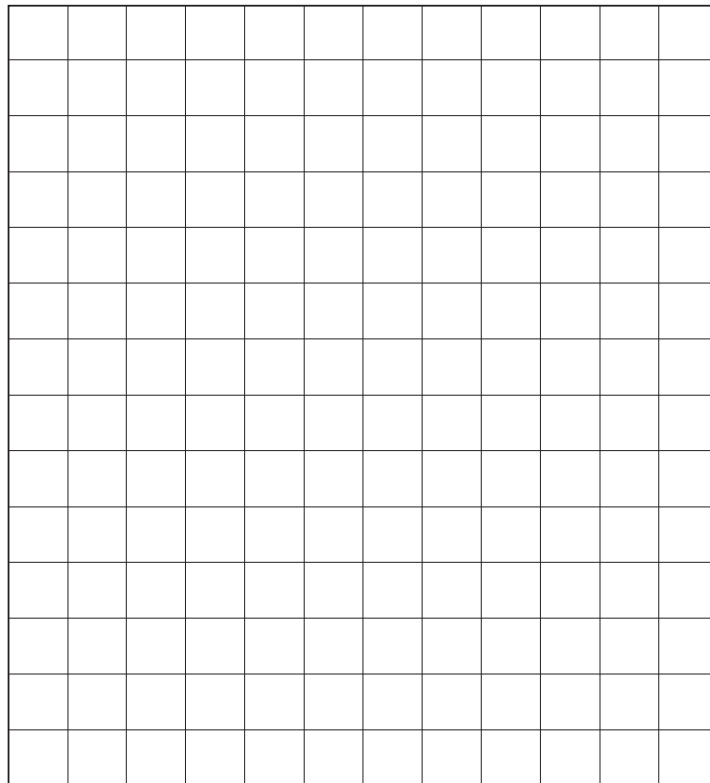
# MATH EXTENSION—PROBLEM OF THE WEEK

## Investigation 3: Earth's Atmosphere

Find the high and low temperatures for two cities for 5 consecutive days. Make a table of the data. One of those can be your own city and the second should be another city in North America.

Graph the data for the low and high temperatures for the two cities. Describe what the graph shows.

City	Temperature °C			
	High	Low	High	Low
Day 1				
Day 2				
Day 3				
Day 4				
Day 5				



---

---

---

---

---

# MATH EXTENSION—PROBLEM OF THE WEEK

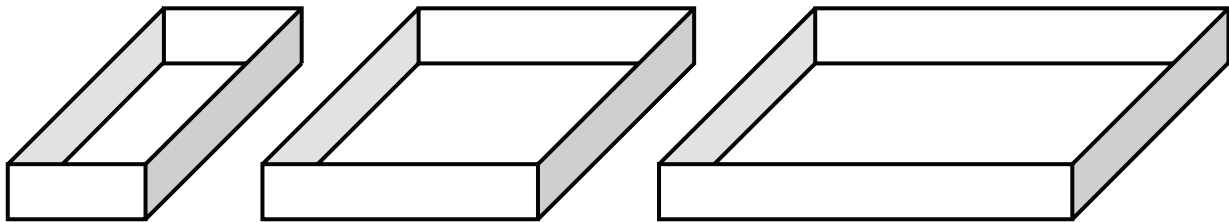
## Investigation 4: Heating Earth

How does the volume of water affect the change in temperature over time? A student filled three containers with water, measured the initial temperature, and placed each box in sunlight.

Box A is  $5 \times 8 \times 2$  cm.

Box B is  $10 \times 8 \times 2$  cm.

Box C is  $15 \times 8 \times 2$  cm.



After 20 minutes, the student measured the temperature again. Here are the data.

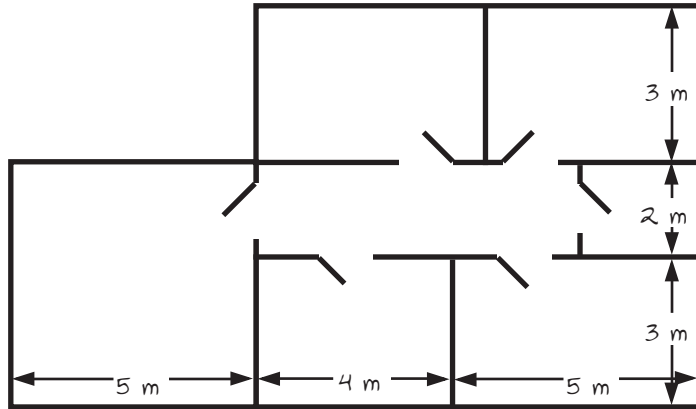
Box	Initial temperature (°C)	Temperature (°C) after 20 minutes
Box A	18	24
Box B	18	22
Box C	18	20

1. What is the volume of water in each box?
2. How does the volume of water affect the change in temperature over time?
3. The student wants to find a way to change each box's temperature at the same rate. What could the student do so the volume of water is the same in each box?

# MATH EXTENSION—PROBLEM OF THE WEEK

## Investigation 5: Water Planet

A family is building the house shown in the plan. They are going to insulate all the outside walls to keep the house warm in the winter and cool in the summer. They need to figure out how much insulating material to buy.



Floor plan

1. How many square meters of insulating material will the family need to insulate the walls of the house?
2. The insulating material comes in bats (sheets) that are 1 meter (m) wide and 6 m long. How many bats will they need?
3. How many more bats will they need if they decide to insulate the ceiling, too?
4. **Extra credit.** The insulating material is 10 centimeters thick. What is the total volume (cubic meters) of insulation that will be used in this project to insulate the walls and ceiling?



Side view