Name _____ Date _____

Shadows, Day and Night: Measuring a Shadow as Earth Rotates

Directions: Read about Lena and Marco's shadow test and look at their table. Then answer each question.

Chasing a Shadow

Lena and Marco noticed that their shadows were long in the morning and short at lunch. On a sunny day in May, they tested this at their school in eastern Iowa. They pushed a long stick into flat ground until exactly 1 meter of it stood straight up. Every hour from 9:00 in the morning to 5:00 in the afternoon, they measured its shadow with a tape measure. They also used a compass to record the direction the shadow pointed.

Each day, the Sun seems to cross the sky from east to west. It only looks that way because Earth is spinning. Earth **rotates** once about every 24 hours. Your side of Earth has daytime while it faces the Sun and nighttime after it turns away.

A shadow always points away from the Sun. When the Sun appears low in the sky, shadows are long. When it appears high, shadows are short.

Shadow of a stick standing 1 meter tall, measured each hour on a sunny day in May in eastern Iowa

Time (a.m. or p.m.)	Shadow length (cm)	Shadow direction (compass point)
9:00 a.m.	143	west
10:00 a.m.	97	west
11:00 a.m.	67	northwest
12:00 p.m. (noon)	48	northwest
1:00 p.m.	42	north
2:00 p.m.	49	northeast
3:00 p.m.	68	northeast
4:00 p.m.	98	east
5:00 p.m.	145	east

1. According to the table, at what time of day was the stick's shadow the shortest?

A. 12:00 p.m. (noon)
B. 9:00 a.m.
C. 1:00 p.m.
D. 5:00 p.m.

2. Which claim do Lena and Marco's measurements support?

A. The shadow got shorter each hour until 1:00 p.m. and longer each hour after that.

B. The shadow was shortest at the time when the air was warmest.

C. The shadow got longer each hour until 1:00 p.m. and shorter each hour after that.

D. The stick's shadow is shortest at 1:00 p.m. on every day of the year.

E. At 1:00 p.m., the Sun was straight overhead, so the stick had no shadow.

3. Why was the shadow so much longer at 9:00 in the morning than at 1:00 in the afternoon?

A. In the morning, the sunlight was weaker, and weak light makes long shadows.

B. In the morning, the Sun was farther from Earth, so the shadow stretched out.

C. In the morning, the Sun appeared lower in the sky, and a low Sun makes a long shadow.

D. In the morning, the Sun looked bigger, so it made a bigger shadow.

4. Use the table. What is the difference between the 9:00 a.m. shadow length and the 1:00 p.m. shadow length?

A. 95 centimeters B. 185 centimeters C. 101 centimeters D. 46 centimeters

5. Which time in the table had a shadow almost the same length as the 10:00 a.m. shadow?

A. 9:00 a.m. B. 4:00 p.m. C. 11:00 a.m. D. 2:00 p.m.

6. Use the word bank to finish the sentence about the 9:00 a.m. shadow.

Word bank
east • north • south • west

At 9:00 a.m., the stick's shadow pointed _____, so the Sun appeared in the _____.

7. What causes day and night in Lena and Marco's town?

A. Clouds cover the Sun every evening.

B. The Sun travels around Earth once every day.

C. Earth spins, so their town turns to face the Sun and later turns away from it.

D. The Moon moves in front of the Sun every night.

8. What would happen if Lena and Marco measured the shadow again at 6:00 p.m. that same day?

A. The shadow would be about as short as it was at 1:00 p.m.

B. The shadow would point west, the way it did at 9:00 a.m.

C. The shadow would be shorter than it was at 5:00 p.m.

D. The shadow would be longer than it was at 5:00 p.m.