

Heat Chain Detectives

Trace causes, effects, and evidence in a schoolyard investigation.

8.5.B “identify and investigate cause-and-effect relationships to explain scientific phenomena or analyze problems;”

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each cause, circle its effect, and number the links in one cause-and-effect chain. This will help you see how one change can lead to another.

Why Some Schoolyard Spaces Feel Hotter

- ① On a sunny afternoon, students measured air temperatures at three places near their school: a blacktop parking lot, a grassy field, and a shaded sidewalk. The parking lot was warmest. Dark asphalt absorbs much of the Sun’s energy and changes it to thermal energy. Grass reflects more light and cools the air nearby as water evaporates from its leaves and soil. The sidewalk stayed cooler than the parking lot because a tree blocked direct sunlight from reaching much of its surface.
- ② To investigate whether surface type caused the temperature differences, the students used identical thermometers. They placed each thermometer 1 meter above the ground and recorded temperatures at the same time. They also repeated the measurements on three clear days. Keeping height, time, and weather similar helped them test one main variable: the surface below each thermometer. If one thermometer had been placed in shade while another was in sun, the results could not show whether surface type alone caused the difference.
- ③ The investigation suggests a chain of effects in paved areas. More dark pavement can absorb more solar energy, raising surface and nearby air temperatures. Higher temperatures may make buildings use more electricity for air conditioning. Power plants that burn fossil fuels can release gases that warm Earth’s climate, which can increase the frequency or intensity of some heat waves. Planting trees and using lighter-colored surfaces can interrupt this chain by providing shade, reflecting sunlight, or cooling air through evaporation.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 What caused the blacktop parking lot to be warmer than the other places?

2 Why did the students keep the thermometer height, measurement time, and weather similar?

3 Why would comparing a thermometer in shade with one in direct sun make the investigation less reliable?

4 Trace the cause-and-effect chain that connects more dark pavement to some heat waves.

3 YOUR TURN _____ Your own words

Choose one change a school could make to reduce heat around a building. In exactly two sentences, explain a three-link cause-and-effect chain that predicts how the change could reduce air-conditioning use.

PART 1 • READ AND MARK

Underline each cause, circle its effect, and number the links in one cause-and-effect chain. This will help you see how one change can lead to another. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What caused the blacktop parking lot to be warmer than the other places?	Dark asphalt absorbed much of the Sun's energy and changed it to thermal energy.
2	Why did the students keep the thermometer height, measurement time, and weather similar?	Keeping those conditions similar helped them test whether the surface below each thermometer caused the temperature differences.
3	Why would comparing a thermometer in shade with one in direct sun make the investigation less reliable?	The results could not show whether surface type alone caused the difference because sunlight and shade would also affect temperature.
4	Trace the cause-and-effect chain that connects more dark pavement to some heat waves.	More dark pavement absorbs more solar energy, raising temperatures. Higher temperatures can increase air-conditioning electricity use. Fossil-fuel power plants can release warming gases, which can increase the frequency or intensity of some heat waves.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Installing a green roof would cover dark roofing with plants and soil, so the roof would absorb less solar energy and stay cooler. A cooler roof would transfer less heat into the building, so the building could need less air conditioning.

Accept equivalent cause-and-effect explanations supported by the passage. For Part 3, accept any realistic school change and a logical three-link chain that connects the change to reduced air-conditioning use.