Shade by the Numbers

Connect temperature data to a city planning proposal.

CCSS.ELA-Literacy.RH.9-10.7 "Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each number or measurement in the passage. Circle the words that explain what the data means or how planners use it, then draw a line from one number to its explanation.

Mapping Heat at Bus Stops

1 In this fictional classroom case, students at Mesa Vista High used an infrared thermometer to measure pavement surface temperatures at 3 p.m. A shaded bus stop beside mature trees measured 88°F; an unshaded stop measured 101°F. These are invented surface readings, not air temperatures or published observations. Shade blocks sunlight from reaching pavement, and vegetation can also cool through evapotranspiration. Different surfaces and shade can help explain why nearby locations feel different.

2 The planners compared the practice data with real research. McDonald and colleagues' 2021 PLOS ONE study examined tree cover and summer land-surface temperatures across 5,723 communities in 100 U.S. urbanized areas. Lower-income areas generally had less tree cover and higher surface temperatures; patterns varied among communities. The study describes associations, not a controlled experiment at these bus stops. In the fictional case, a fabric-canopy stop measured 90°F. Together, the readings and site observations suggest investigating where shade is missing; they do not isolate shade from every other factor.

3 After reviewing the evidence, the city's transportation office proposed three changes. First, it would plant trees at stops that had enough soil and sidewalk space. Second, it would add canopies where underground pipes, narrow sidewalks, or overhead wires made trees impractical. Third, it would use lighter-colored pavement during scheduled repairs, because light surfaces reflect more sunlight than dark asphalt. The proposal did not promise that one solution would work everywhere. Instead, it combined temperature measurements with observations of each location. Planners also noted that shade matters most when riders are waiting outside, so they ranked stops used by many passengers during the afternoon.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the 88°F and 101°F measurements support the explanation of how trees affect heat at a bus stop?

2. What pattern connects the 2021 study with the observations from Mesa Vista? Include the limitation described in the passage.

3. Why is the 90°F fabric-canopy stop important evidence for planners? Use both the measurement and the description of the stop.

4. How does the transportation office combine quantitative and qualitative evidence when choosing changes for bus stops?

3 YOUR TURN

Your own words

Write a 3-sentence recommendation for a bus stop that has a pavement surface temperature of 98°F at 3:00 p.m., has a narrow sidewalk and overhead wires, and serves 120 afternoon riders. Use the temperature, at least one site detail, and evidence from the passage to explain your recommendation.

ANSWER KEY

Shade by the Numbers

HIGH SCHOOL · RH.9-10.7

PART 1 · READ AND MARK

Underline each number or measurement in the passage. Circle the words that explain what the data means or how planners use it, then draw a line from one number to its explanation. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the 88°F and 101°F measurements support the explanation of how trees affect heat at a bus stop?	**The shaded pavement was 13°F cooler. That association is consistent with shade reducing surface heating, but these invented readings do not isolate shade's effect or measure air temperature.**
2	What pattern connects the 2021 study with the observations from Mesa Vista? Include the limitation described in the passage.	**Less shade/tree cover is associated with hotter surfaces in both accounts. Local conditions vary; the fictional sites and published study do not isolate one cause.**
3	Why is the 90°F fabric-canopy stop important evidence for planners? Use both the measurement and the description of the stop.	**The canopy site's pavement was 90°F, cooler than the 101°F unshaded site. Built shade is worth considering where trees do not fit; this comparison alone is not a controlled test.**
4	How does the transportation office combine quantitative and qualitative evidence when choosing changes for bus stops?	**It uses temperature measurements to identify heat problems and observations such as soil space, narrow sidewalks, pipes, overhead wires, and rider use to choose trees, canopies, or lighter pavement.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The city should install a canopy at this stop and consider light-colored pavement during its next repair. At 98°F, the pavement is much hotter than the shaded 88°F location, so riders need protection from direct sun. Because overhead wires and a narrow sidewalk make a tree difficult to plant, a canopy fits the site, especially for the 120 afternoon riders.

Accept answers that accurately connect numerical evidence to a qualitative explanation, observation, or planning choice. For the open task, accept a different reasonable recommendation if the student uses the 98°F measurement, a site detail, and passage evidence. Research: McDonald et al. (2021), "The tree cover and temperature disparity in US urbanized areas," PLOS ONE, doi:10.1371/journal.pone.0249715. Distinguish simulated local measurements, surface temperature, and observational association from established causal estimates.