

URBAN HEAT CITY DESIGN INVESTIGATION

Observe • Build • Revise • Compare • Explain

Name: _____ Class: _____ Date: _____

THE CHALLENGE: You are an urban designer. Create a functional neighborhood that protects people from extreme heat while staying within the construction budget.

Driving Question: How can material type and placement affect a city's heat, resilience, function, and cost?

MODEL CHALLENGE REQUIREMENTS

Requirement	Target
Resilience score	85 or higher
Heat score	82 or lower
Buildings	At least 10
Roads	At least 6
Construction cost	\$1,300,000 or less

READ THE SCORES: Higher resilience is better. Lower heat is better. Roads and buildings are required even though some increase heat.

1

Make Predictions

Use what you know about surfaces, shade, vegetation, and urban heat.

Which feature will lower heat most?

☐ Tree park ☐ Water feature ☐ Green space ☐ Shade plaza ☐ Cool-roof building

Which feature will increase heat most?

☐ Road ☐ Parking lot ☐ Standard building

Which requirement will be hardest to meet?

☐ Resilience ☐ Heat ☐ Buildings ☐ Roads ☐ Budget

Explain one prediction using scientific reasoning.

2

Explore and Notice

Place one tile, observe and record dashboard changes, then use Undo.

QUICK TEST: Before building your full city, test at least one infrastructure tile, one building tile, and one cooling tile. Record the cost in the tile library and the dashboard change.

Tile tested	Cost	Change in resilience	Change in heat	What I noticed
Infrastructure tile:	\$			
Building tile:	\$			
Cooling tile:	\$			
Student choice:	\$			

Did every tile affect heat and resilience in the same way? ☐ Yes ☐ No

Did any tile help one goal while making another harder? ☐ Yes ☐ No

Which tile appears to provide the best value for its cost? Use observations.

What do you predict when a tree, water feature, or shade plaza is placed directly beside a road, parking lot, or standard building?

3

Plan Design 1

Make your best first attempt. Aim to gather evidence, not perfection.

My priority: ☐ Lower heat ☐ Raise resilience

☐ Meet building/road requirements ☐ Stay under budget ☐ Balance all goals

Describe two design choices you plan to make before building.

4

Build Design 1

Build, then stop changing tiles and record the exact dashboard values.

City name: _____

DESIGN 1 TILE COUNTS

Tile type	Number used	Tile type	Number used
Standard buildings		Cool-roof buildings	
Roads		Parking lots	
Tree parks		Green spaces	
Water features		Shade plazas	

DESIGN 1 RESULTS

Measurement	Result	Measurement	Result
Resilience score		Heat score	
Buildings		Roads	
Total city cost	\$	Budget remaining	\$
City status		Requirements met	____ / 5

DESIGN 1 REQUIREMENT CHECK

Challenge requirement	Met?
Resilience score of 85 or higher	Yes / No
Heat score of 82 or lower	Yes / No
At least 10 buildings	Yes / No
At least 6 roads	Yes / No
Cost of \$1,300,000 or less	Yes / No

5**Observe Design 1**

Study your city and its data before changing anything.

Did Design 1 meet all five requirements? ☐ Yes ☐ NoAre cooling tiles directly beside roads, parking lots, or standard buildings? ☐ Yes ☐ NoAre cooling tiles placed where their neighboring effect may be wasted? ☐ Yes ☐ NoDid your city stay under budget? ☐ Yes ☐ No

What was Design 1's strongest feature? Use a score, cost, or requirement as evidence.

What was Design 1's biggest problem? Use a score, cost, or requirement as evidence.

Describe one placement pattern. For example, what was beside a hot surface or where were cooling features clustered?

6**Plan the Revision**

Use Design 1 evidence and model feedback to plan purposeful changes.

Change I plan	Evidence or reason	Predicted result

I will focus on: ☐ Resilience ☐ Heat ☐ Function ☐ Budget ☐ Tile placement

7

Build Design 2

Revise using your plan. Record results only after finishing changes.

DESIGN 2 TILE COUNTS

Tile type	Number used	Tile type	Number used
Standard buildings		Cool-roof buildings	
Roads		Parking lots	
Tree parks		Green spaces	
Water features		Shade plazas	

DESIGN 2 RESULTS

Measurement	Result	Measurement	Result
Resilience score		Heat score	
Buildings		Roads	
Total city cost	\$	Budget remaining	\$
City status		Requirements met	____ / 5

DESIGN 2 REQUIREMENT CHECK

Challenge requirement	Met?
Resilience score of 85 or higher	Yes / No
Heat score of 82 or lower	Yes / No
At least 10 buildings	Yes / No
At least 6 roads	Yes / No
Cost of \$1,300,000 or less	Yes / No

Copy the model's final optimization feedback.

8

Compare the Evidence
Use numbers, not just appearance, to understand the two designs.

Measurement	Design 1	Design 2
Resilience score		
Heat score		
Number of buildings		
Number of roads		
Total city cost	\$	\$
Budget remaining	\$	\$
Requirements met	____ / 5	____ / 5
City status		

What were the two most important differences between Design 1 and Design 2?

Did lower heat also come with higher resilience? ☐ Yes ☐ No

Did the city that cost more meet more requirements? ☐ Yes ☐ No

Did tile placement appear to affect the scores? ☐ Yes ☐ No ☐ Not enough evidence

Use at least three numbers from the table to explain which design was more successful.

9**Make a Final City Decision**

Choose the design you recommend and defend it with evidence.

I recommend: ☐ Design 1 ☐ Design 2**CLAIM**

State which design better protects people during extreme heat.

EVIDENCE

Give at least three pieces of evidence, including heat score, resilience score, and cost or budget.

REASONING

Explain why the evidence supports your recommendation. Include the city's functional requirements.
