

URBAN HEAT CITY DESIGN INVESTIGATION

Observe • Build • Revise • Compare • Explain

Name: _____ Class Period: _____ 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. A higher resilience score is better. A lower heat score is better. Roads and buildings are required, even though some of them increase heat.

1

Make Predictions

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

Which feature do you think will lower the heat the most? ☐ Tree park ☐ Water feature ☐ Green space ☐ Shade plaza ☐ Cool-roof building

Which feature do you think will increase heat the most? ☐ Road ☐ Parking lot ☐ Standard building

Which requirement do you think will be hardest to meet? ☐ Resilience ☐ Heat ☐ Buildings ☐ Roads ☐ Budget

Explain one prediction using scientific reasoning.

2

Explore and Notice

Test a few tiles before building your full city. Place one tile, observe the dashboard, record what changed, and then use Undo.

QUICK TEST DIRECTIONS Test at least one infrastructure tile, one building tile, and one cooling tile. Record the cost shown in the tile library and the change shown on the dashboard.

Tile tested	Cost	Change in resilience score	Change in heat score	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 goal harder? ☐ Yes ☐ No

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

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

3

Plan Design 1

Create your best first attempt. Your goal is not perfection; your goal is to gather useful evidence.

My main design priority will be: ☐ Lower heat ☐ Raise resilience ☐ Meet building and road requirements ☐ Stay under budget ☐ Balance all goals

Describe two design choices you plan to make before you begin building.

4

Build Design 1

Build your first city. When you are ready to evaluate it, stop changing tiles and record the dashboard exactly as shown.

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

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Observe Design 1

Study the city and its data before changing anything.

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

What was the strongest part of Design 1? Use a score, cost, or requirement as evidence.

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

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

6

Plan the Revision

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

Change I plan to make	Evidence or reason	What I predict will happen

During the revision, I will focus most on: ☐ Resilience ☐ Heat ☐ Function
☐ Budget ☐ Tile placement

7

Build Design 2

Revise your city using the plan above. Record the final design only after you stop making 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 the numbers—not just appearance—to make sense of 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 the city with the lower heat score also have the higher resilience score? ☐ Yes ☐ No

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

Did changing 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 would recommend and defend it with evidence.

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

State which design is better for protecting 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.
