

# HAWAIIAN GARDEN DESIGN COMPETITION

“You Be The Designer of a Hawaiian Garden!”

BY JACQUELINE MEGGS

“How can we design a Hawaiian garden area that can support Hawaiian activities, culture, and botany?”

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HIGHSCHOOL 10TH - 11TH GRADE, GEOMETRY

TIMEFRAME 4 CLASS PERIODS / ONE 55 MIN. PERIOD  
& THREE 82 MIN. PERIODS

## STANDARD BENCHMARKS AND VALUES

### GEOMETRY COMMON CORE MATHEMATICS STANDARDS

**Modeling with Geometry:** Apply geometric concepts in modeling situations

- G.MG.3 = Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

**Quantities:** Reason quantitatively and use units to solve problems.

- N.Q.1 = Use units as a way to understand problems and to guide the solution of multi step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- N.Q.2 = Define appropriate quantities for the purpose of descriptive modeling.

- N.Q.3 = Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

### MATHEMATICAL PRACTICE STANDARDS

1. Make Sense of Problems and Persevere in Solving Them-highlights the skills and attitudes required to become an effective problem solver.
2. Reason Abstractly and Quantitatively-focuses on students' abilities to see the connection between real situations and symbolic representation and to accurately represent problems with quantities and symbolic representations.
4. Model with Mathematics-emphasizes that mathematically proficient students model math situations with diagrams, manipulatives, tables, graphs, and equations and apply math to solve real-world problems.

**ENDURING UNDERSTANDING:**

1. We can analyze an area and design using geometrical drawings a garden that incorporates Hawaiian culture and functionality.
2. Scale factor, area calculations and careful planning can be used to construct and justify the feasibility of a design for the allotted space we are given.
3. By creating a space where the community can appreciate Hawaiian plants and activities like the Imu, we are paying respect to the culture of this land.

**CRITICAL SKILLS AND CONCEPTS:**

- Use representations to model an actual space on a coordinate plane.
- Apply formulas to calculate area.
- Understand and create a scale factor to draw and design shapes.

**AUTHENTIC PERFORMANCE TASK:**

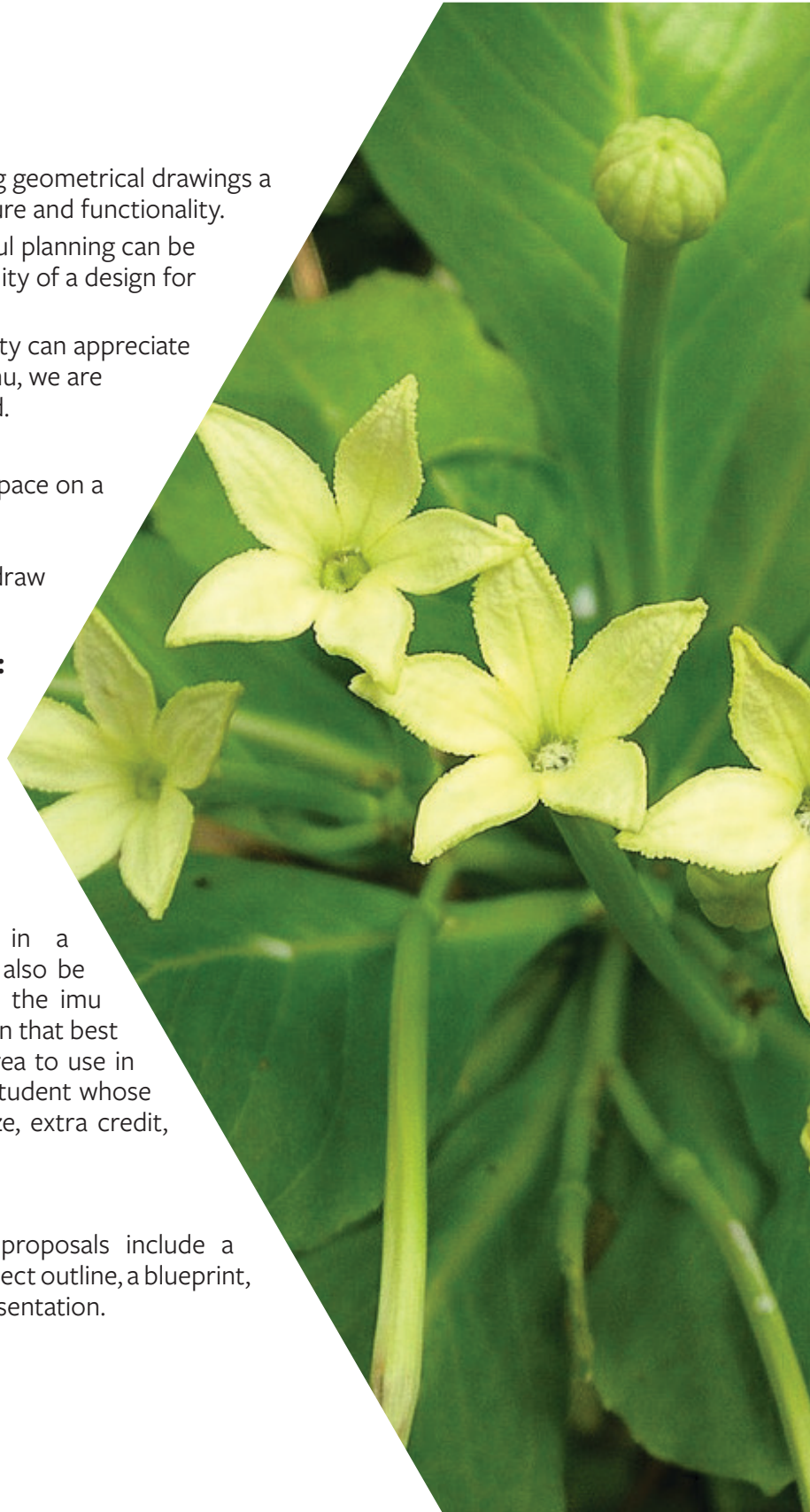
Students will visit a site on campus that the school holds a Hawaiian imu to take measurements. They will draft a proposal for a Hawaiian garden with the limited space that can incorporate Hawaiian plants to support the imu.

**AUTHENTIC AUDIENCE:**

Students will present their proposal in a presentation to their peers. Proposals will also be submitted to school faculty that manages the imu area. Faculty will review and select the design that best suits the needs of the students and imu area to use in creating the garden next school year. The student whose design was selected will also receive a prize, extra credit, and a certificate.

**OTHER EVIDENCE:**

The individually created student design proposals include a booklet of area formulas, the completed project outline, a blueprint, written description of their garden, and presentation.



## LEARNING PLAN

### DAY ONE: Introductions and Brainstorming / 55 mins

Materials: white paper, pencils/pens, internet for video, overhead projector, outline packet.

- 1.) Create Area/Volume Toolkit: (15 mins)
  - a.) Students create a mini booklet on white paper on area and volume of common shapes that they will use in their project
- 2.) Introduction to project: (15 mins)
  - a.) Show video of Hawaiian Imu  
[https://www.youtube.com/watch?v=4l<\\_fqjuql<w](https://www.youtube.com/watch?v=4l<_fqjuql<w)
  - b.) Present instructions via powerpoint
  - c.) Students who were involved with building the Imu share out.
- 3.) Students complete “Day 1” questions in outline packet \*see attached (20 mins)

### DAY TWO: DESIGNING AND SKETCHING / 85 MINS

Materials: Garden site, measuring tools, calculators, pencils, outline packet, graph paper, rulers, protractors.

- 1.) Class visits actual site of imu and takes dimensions (15-20 mins)
    - a.) class visits the site and uses measuring tape and calculators
    - b.) students calculate dimensions considering error in measurements (the area should be a perfect right triangle)
  - 2.) Students complete “Day 2” questions in outline packet (30+ mins)
    - a.) teacher answers student questions and briefly explains scale factor (note: teacher does not teach a lesson on scale factor so they can learn how to apply the idea on their own)
    - b.) teacher facilitates student calculations of scale factor/area of shapes and periodically checks individual student work
  - 3.) Students transfer sketch/ideas from yesterday to graph paper (30+ mins)
    - a.) Teacher must first approve student sketch of imu and if time permits, provides graph paper for student to draw blueprint on coordinate plane
    - b.) Students complete “Day 3” questions in packet \*see attached.
    - c.) students are expected to use appropriate rulers and protractors to create clean designs.
- \*Note: The lesson for this day may be broken into two instructional periods if needed.

## DAY THREE: TOUCH UPS AND PRESENTATIONS / 85 MINS

Materials: Outline packet, pencils/pens.

- 1.) Students finalize proposal and prepare for presentation (15 mins)
  - a.) teacher answers any last minute questions/concerns
- 2.) Presentations of blueprints to class (55 mins)
  - a.) students should explain their garden's focus, justify its design and function, and describe what it will look like
- 3.) Self + Peer Evaluation (15 mins)
  - a.) students complete the questions under "Day 4" of outline to reflect
- 4.) All proposal submitted to teacher
  - a.) includes blueprint, outline, and description of garden
  - b.) teacher should review proposals with faculty to select one.
  - c.) teacher grades each design according to the rubric \*see attached
- 5.) Next class period.
  - a.) teacher presents prize and award to students who are selected for designs
  - b.) see attached for the certificate!

NAME \_\_\_\_\_ PERIOD \_\_\_\_\_ DATE \_\_\_\_\_

**YOU BE THE DESIGNER OF A HAWAIIAN GARDEN AT WAIPAHU!****GEOMETRY FINAL PROJECT RUBRIC**

Requirement	Description	Points Received	Total Points Possible
<b>Shapes Manual</b>	Toolkit for Area and Shapes		5
<b>Garden Items</b>	Required items included in design		20
<b>Aesthetics</b>	Easy to understand and read		5
<b>Outline Packet</b>	Completed all questions and description		5
<b>Mathematics</b>	Scale factor and dimensions correct		5
<b>Presentation</b>	Shared final product with class		5

TOTAL POINTS: \_\_\_\_\_ / 50 PTS.

COMMENTS:

NAME \_\_\_\_\_ PERIOD \_\_\_\_\_ DATE \_\_\_\_\_

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**YOU BE THE DESIGNER OF A HAWAIIAN GARDEN AT WAIPAHU!****GEOMETRY FINAL PROJECT RUBRIC****GARDEN PLANNING**

Item:	Important Questions:
Imu (required)	Did you leave a 10 feet circle around the pit for walking room? Did you design a canopy over the imu for rain?
Shed (required)	Will the shed fit the rocks and burlap sacks needed?
Hawaiian Plants/Culture (required)	What plants will you choose that help the imu? Will you have banana leaves? Any other aspect of Hawaiian culture you might incorporate?
Taro Patch (optional)	Where will you put it? How big will you make it?
Other (Imagination required!)	Any other items you can think to add that will enhance the garden area? Be creative with this part!

**OTHER QUESTIONS TO CONSIDER:**

Some questions that might help you in brainstorming your garden.

- Is your drawing to scale? What is the scale factor of your drawing?
- Is your garden functional? Would it actually work and fit everything we need?
- Does your garden include everything we need for the imu and garden? You may add any other Hawaiian plants you feel have value to the space.
- What is unique or practical about your design that separates it from the others?
- How will you present this design proposal to the reviewer? Will you create a blueprint or prototype?
- How will your garden help the students/teachers at Waipahu?

**RUBRIC: 50 POINTS TOTAL**

REQUIREMENTS	DESCRIPTIONS	POINTS
Shapes Manual	Toolkit for designing (we created this booklet last class, make sure you have all the formulas).	5
Garden Items	Garden has everything required and plants are carefully selected to help the imu or for other reasons.	20
Aesthetic	Creative design and illustrated in a way that is easy to understand. Bonus points for color!	5
Paragraph Description and Outline	Write one paragraph that highlights your garden. Convince us that this is the one! Also include this sheet with your outline.	5
Mathematics	Calculations are correct and scale factor is accurate and written somewhere visible. Whatever item you include, you MUST have the dimensions for it in the outline or on the blueprint. (ex: the volume of the shed will be...)	10
Presentation	Share with the class in your own way.	5



**DAY TWO**

1. What are the actual dimensions of the space for the garden? (Length of each side, diagonals, imu, etc.)
2. What scale factor will you set the blueprint or prototype to? This stage might be helpful to outline on graph paper! \*Include the scale factor on the design.
3. What dimensions will you have for each item? \*Show the calculations here and write the scale factor on the graph paper/final draft.

**DAY THREE**

1. Finalize your sketch into the blueprint or prototype. (Include your labels or supplementary sheet with the mathematical calculations). \*Final should be on graph paper.
2. Write up a short description of your garden below (or you may type and attach it to this outline) and prepare your presentation!

**DAY FOUR**

1. Self-Reflection: If you were to build this garden, what would you have to change, reconsider, or include in addition to what you have?
2. Peer Reflection: What did you like most about other gardens you saw during the presentations? What did you learn from the other garden designs?