What is Parametric Design?

Worksheet

Parametric design uses algorithms and adjustable parameters, rather than fixed geometry, to generate and optimize architectural forms - so changing an input automatically updates the entire design.

x(t) = a@cos(t), y(t) = b@sin(kt)

Questions

1. What defines parametric design?

A) Drawing fixed geometry by hand
B) Using algorithms and adjustable parameters to generate designs
C) Copying an existing building exactly
D) Ignoring computational tools entirely

2. If you change one parameter in a parametric model, what happens?

A) Nothing changes elsewhere
B) Only that one element updates
C) The whole model updates according to defined relationships
D) The file becomes corrupted

3. Which is a common use of parametric design in architecture?

A) Hand-sketching a facade
B) Generating solar-responsive shading panels automatically
C) Choosing paint colors
D) Writing a construction contract

4. What is the main advantage of parametric design over traditional CAD?

A) It requires no computer
B) It allows rapid exploration of many design variations
C) It eliminates the need for structural analysis
D) It only works for small buildings

5. A designer wants a facade with sun-shading panels that respond to solar exposure on each side of a building. How does a parametric approach solve this?

6. An architect needs to explore 50 variations of a stadium roof shape under a fixed budget of structural steel. How can parametric design help?

7. A housing developer wants unit layouts that maximize daylight and views across an irregular site. What's the parametric workflow?

8. Define: What is parametric design?

9. Define: What is a 'parameter' in parametric design?

10. Define: What software is commonly used for parametric design?

Answer Key

1. B) Using algorithms and adjustable parameters to generate designs - Parametric design generates and updates geometry through algorithms and parameters.

2. C) The whole model updates according to defined relationships - Parametric models are rule-based, so a parameter change ripples through the entire design.

3. B) Generating solar-responsive shading panels automatically - Parametric design is well-suited to generating many responsive elements, like shading panels, from rules.

4. B) It allows rapid exploration of many design variations - Because geometry is rule-driven, designers can generate and compare many variations quickly.

5. Define parameters: panel angle, size and spacing linked to each facade panel's compass orientation and sun angle. Build an algorithm that calculates solar exposure per panel and adjusts its angle to minimize glare and heat gain. Generate the full facade automatically - thousands of panels update from a handful of rules. Evaluate the result with a daylight simulation and tweak the shading parameters if needed.

6. Define parameters: roof curvature, span, and structural depth as adjustable variables. Link a structural analysis tool to the parametric model so steel weight updates automatically with each change. Generate multiple roof variations by adjusting the parameters within set ranges. Compare results and select the variation that meets the steel budget while maximizing span.

7. Define parameters: building footprint, unit depth, window size and orientation relative to site boundaries. Build an algorithm linking unit placement to sun path and view corridors on the irregular site. Generate several layout options automatically as the algorithm adjusts unit positions. Score each option for daylight hours and view quality, then select the best-performing layout.

8. A design approach using algorithms and adjustable parameters to generate and update architectural forms automatically.

9. A variable, like height, angle or spacing, that drives the design and can be changed to update the whole model.

10. Tools like Grasshopper (with Rhino), Dynamo (with Revit) and generative scripting environments.