

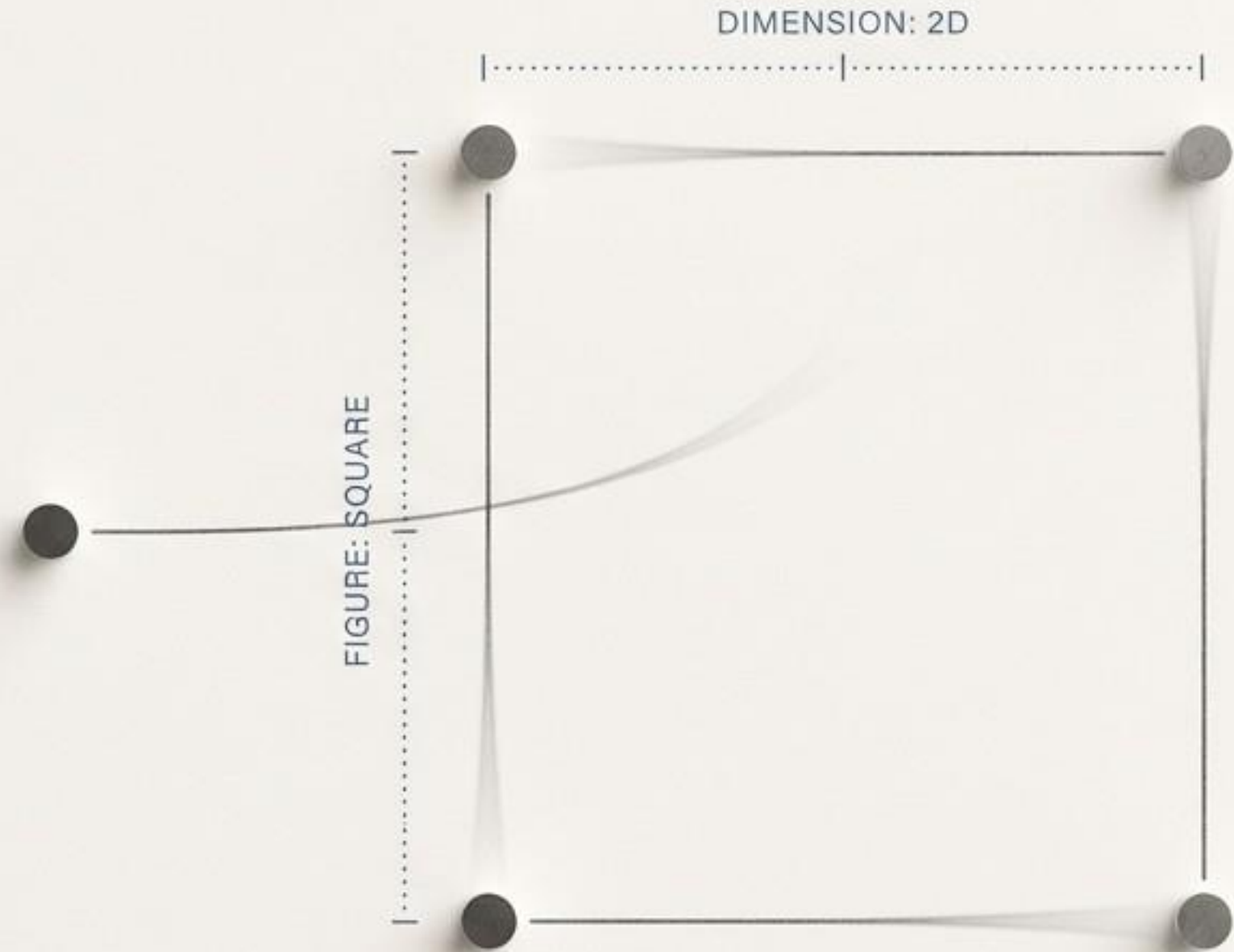


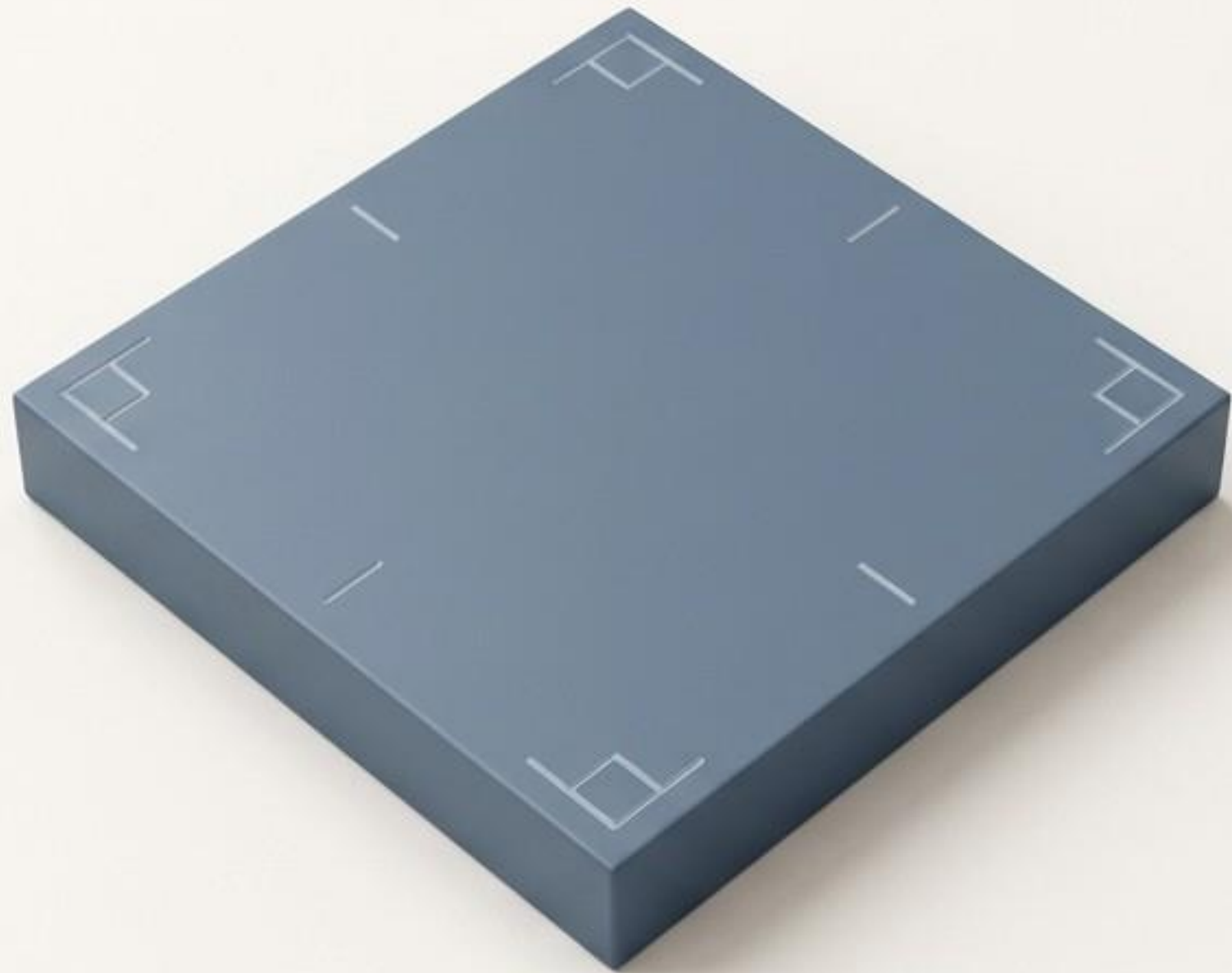
The Architecture of Form

A Compendium of Geometric Shapes

We Begin on the Plane

This compendium explores the fundamental dimensions of geometry. Our journey begins in the two-dimensional plane, a flat world of shapes defined by area and perimeter. Here, we will map the properties of the foundational figures that form the building blocks of design.





The Square: Four Equal Sides, Four Right Angles

Properties

- All sides are equal in length.
 - All angles are right angles (90 degrees).
 - Opposite sides are parallel and equal in length.
-

Formulas

- Area = Side x Side
- Perimeter = 4 x Side



The Rectangle: A Quadrilateral with Four Right Angles

Properties

- Opposite sides are equal in length.
 - All angles are right angles (90 degrees).
 - Opposite sides are parallel.
-

Formulas

- Area = Length x Width
- Perimeter = $2 \times (\text{Length} + \text{Width})$



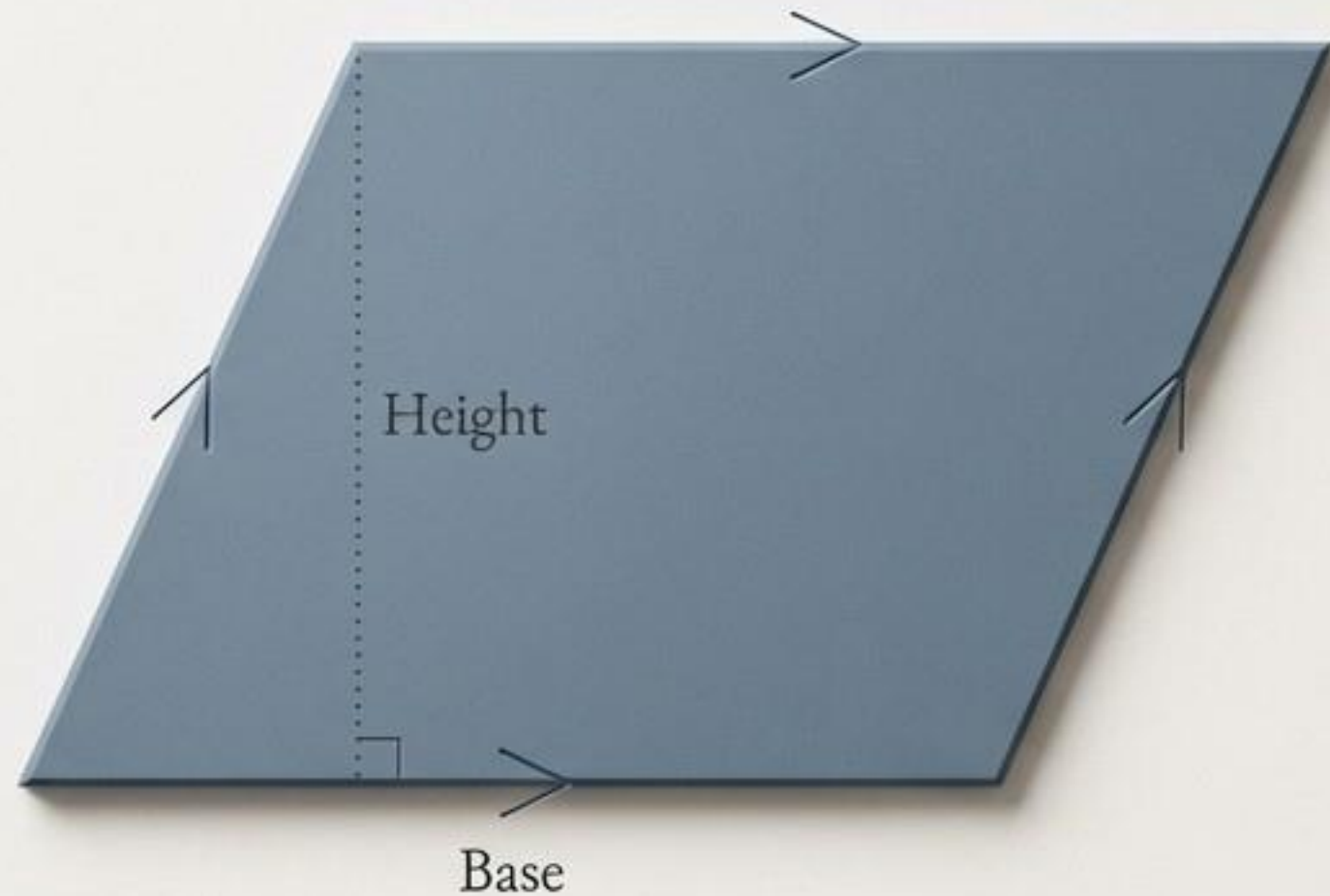
The Circle: A Constant Distance from a Single Point

Properties

- No straight sides; consists of a curved boundary.
- No angles.
- All points on the boundary are equidistant from the center.

Formulas

- Area = πr^2
- Perimeter (Circumference) = $2 \times \pi \times \text{Radius}$



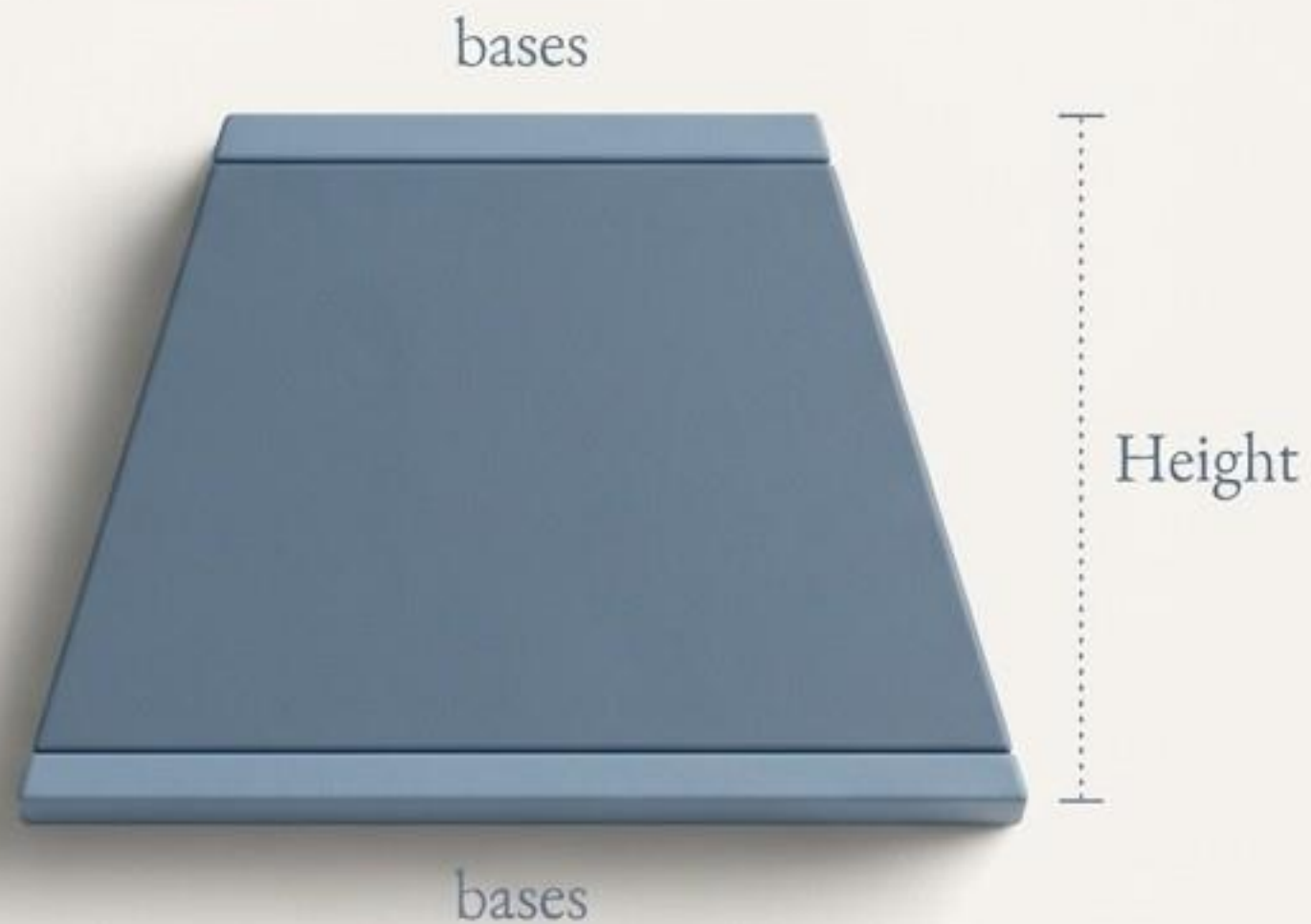
The Parallelogram: Two Pairs of Parallel Sides

Properties

- Opposite sides are equal in length.
- Opposite angles are equal.
- Opposite sides are parallel.

Formulas

- $\text{Area} = \text{Base} \times \text{Height}$
- $\text{Perimeter} = 2 \times (\text{Base} + \text{Side})$



The Trapezoid: At Least One Pair of Parallel Sides

Properties

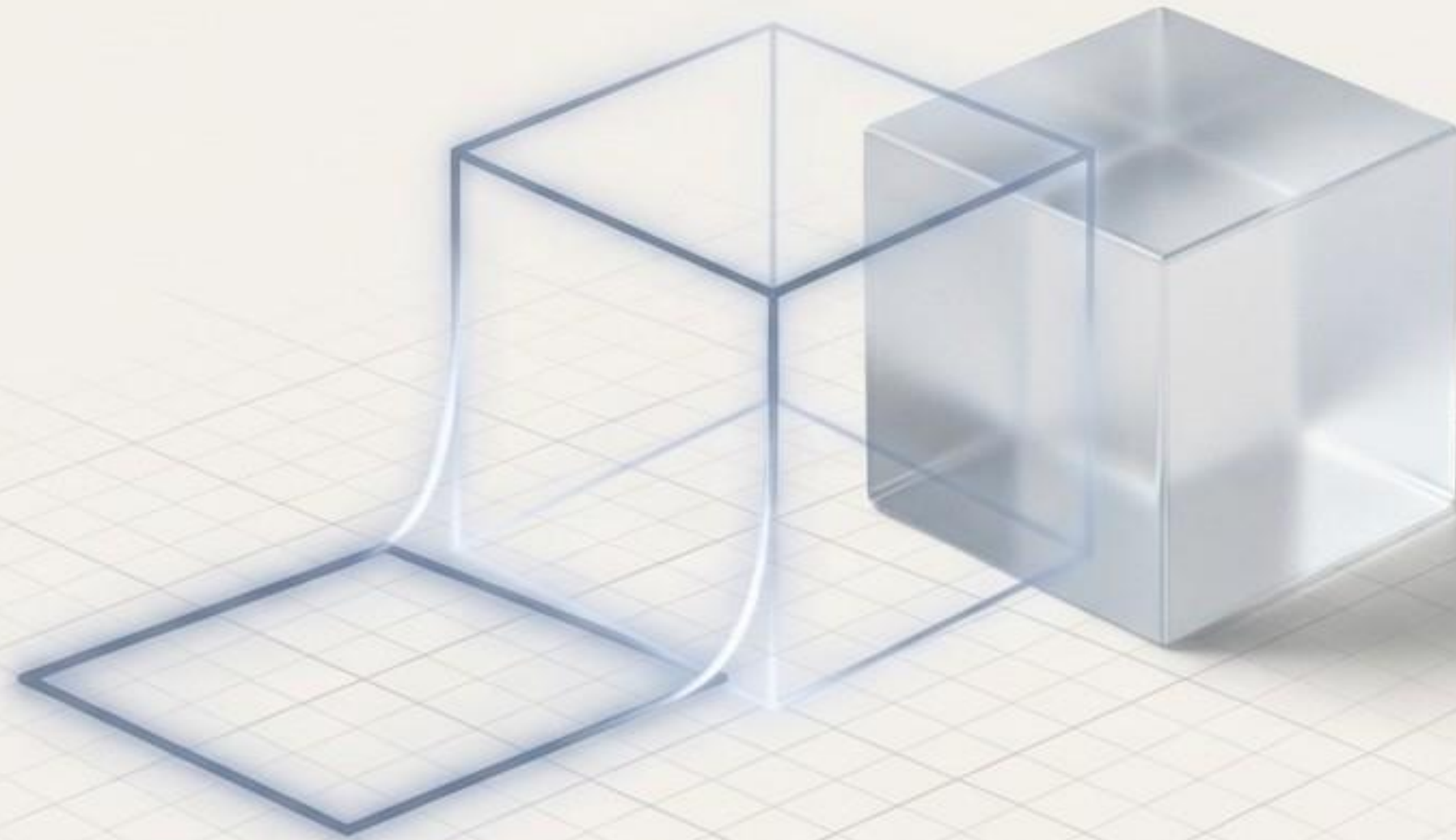
- At least one pair of parallel sides.
- Note: No sides are equal in length (unless it's an isosceles trapezoid).

Formulas

- Area = $\frac{1}{2} \times (\text{Sum of parallel sides}) \times \text{Height}$
- Perimeter = Sum of all four sides

Entering the Third Dimension

We now add depth to our forms, moving from area to volume.
These are the shapes of the physical world.





Side

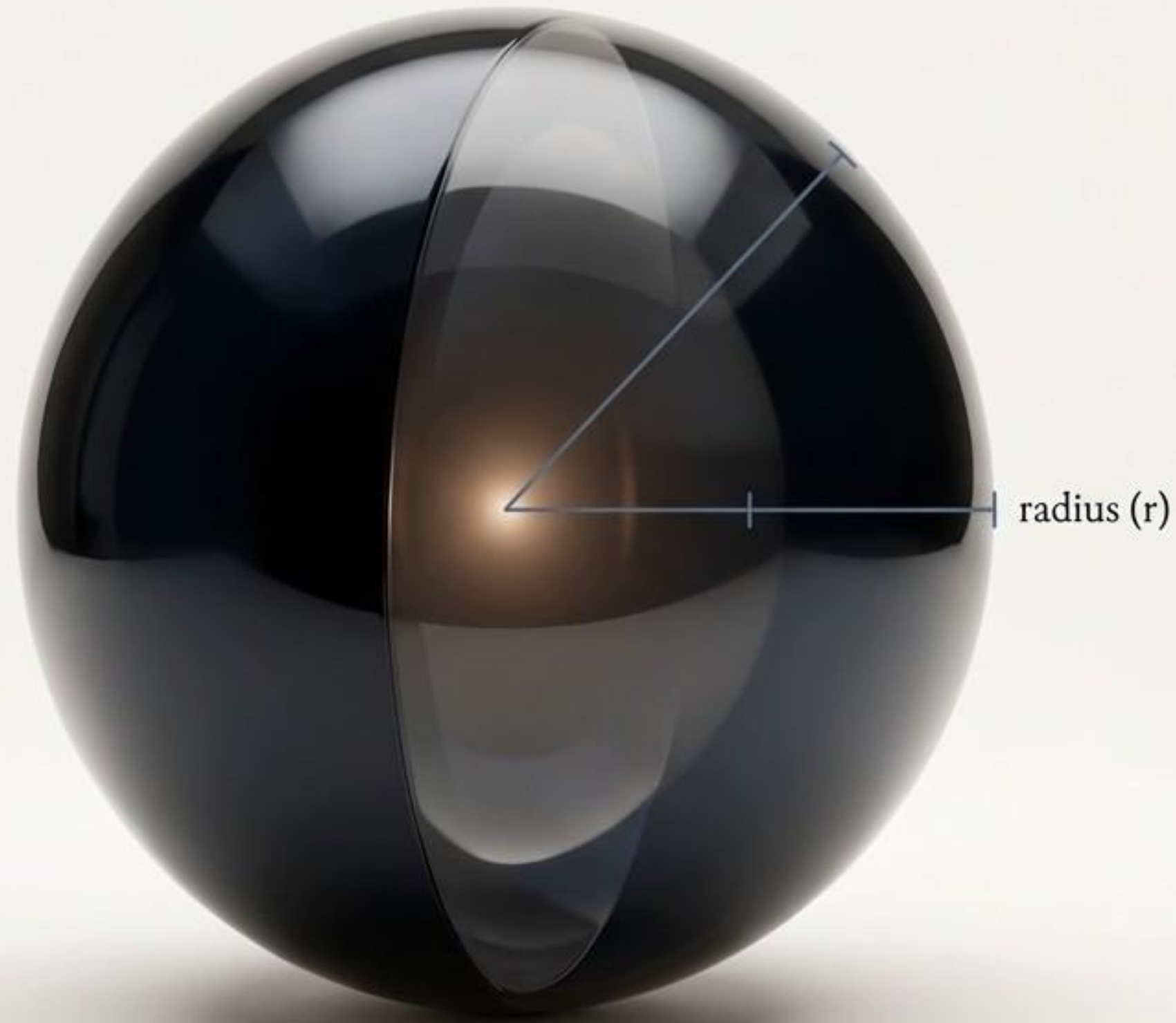
The Cube: Six Square Faces

Properties

- All faces are squares.
- All edges are equal in length.
- All angles are right angles.

Formula

- Volume = Side³



The Sphere: Perfectly Round in Three Dimensions

Properties

Neue Haas Grotesk Display Pro (Medium)

- A perfectly round shape.
- No edges or vertices.
- All points on the surface are equidistant from the center.

Formula

Neue Haas Grotesk Display Pro (Medium)

- Volume = $(4/3)\pi r^3$
- (Volume is equal to four-thirds pi times the radius cubed)

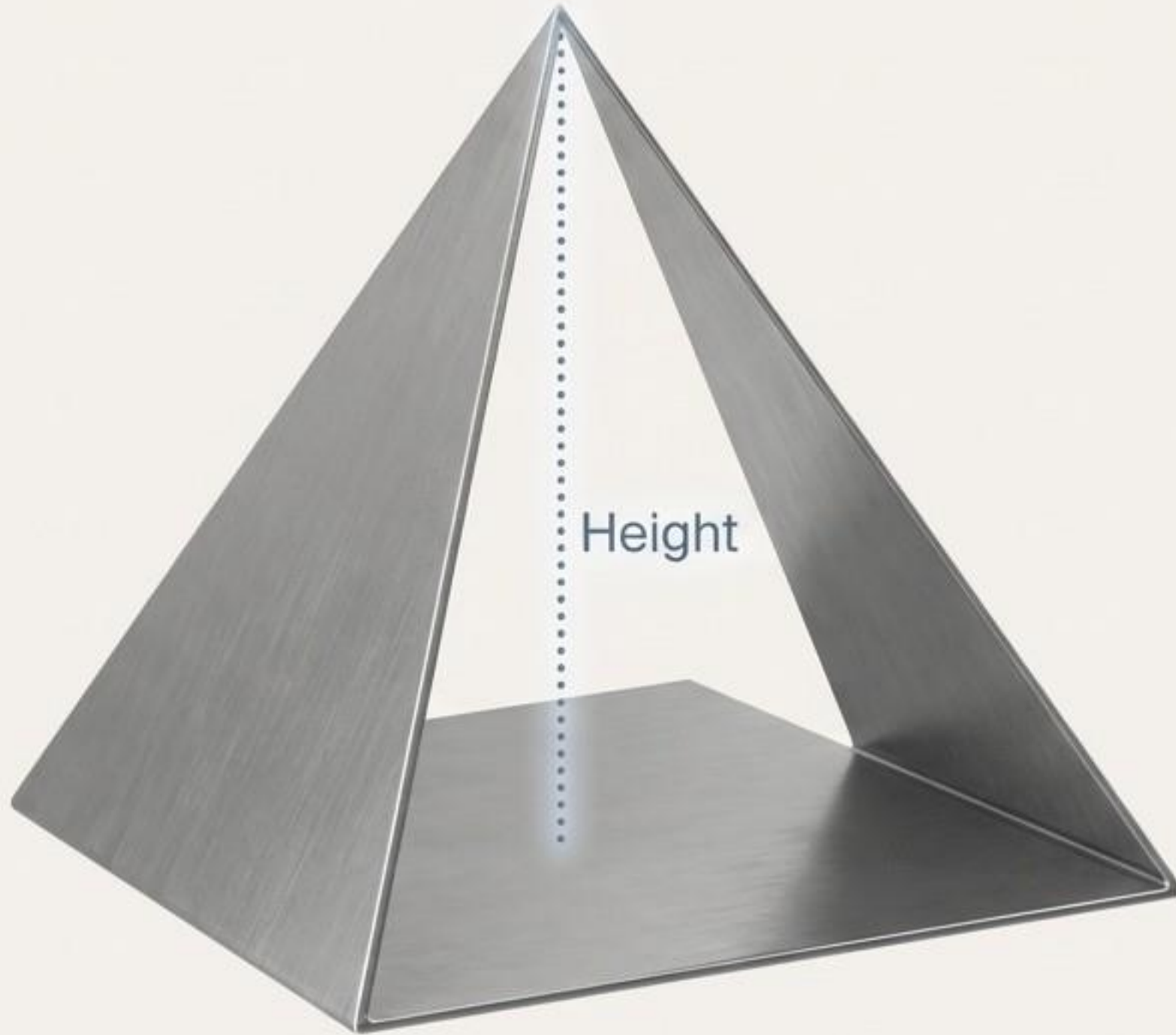
The Pyramid: A Polygonal Base and an Apex

Properties (for a square base)

- Four triangular faces.
- Five vertices.
- One square base.

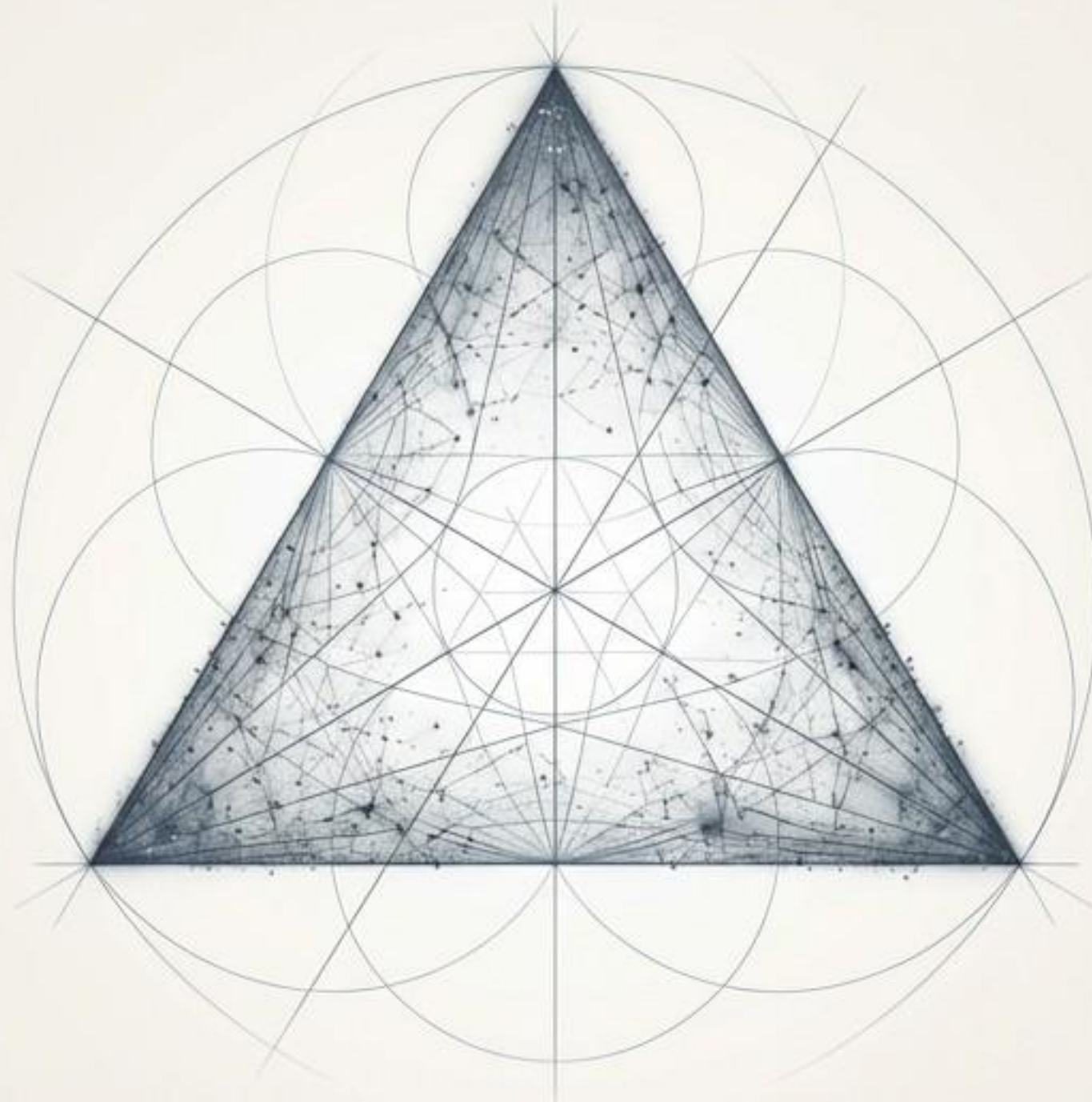
Formulas (for a square base)

- Volume = $\frac{1}{3} \times \text{Base Area} \times \text{Height}$
- Volume = $\frac{1}{3} \times \text{side}^2 \times \text{Height}$



A Closer Look: The Triangle

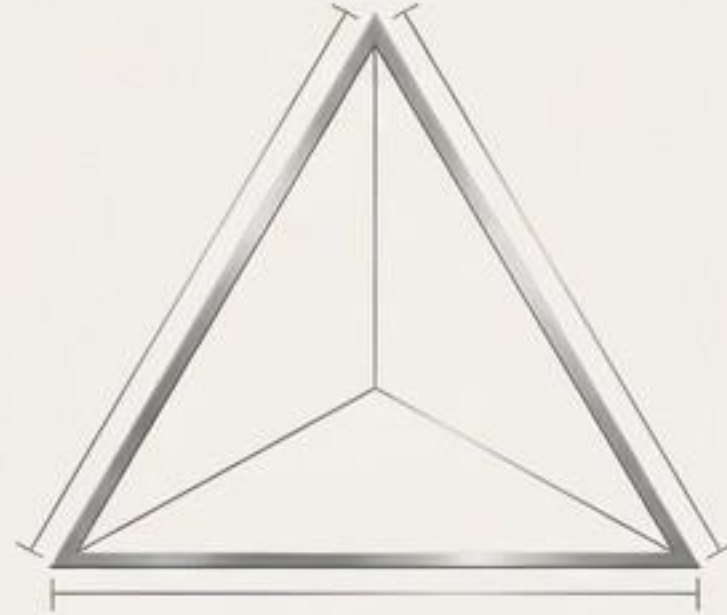
We conclude by deconstructing the most essential polygon. Triangles are fundamental geometric shapes in mathematics, forming the rigid backbone of more complex structures.



The Universal Properties of a Triangle

Core Attributes

Three sides, three angles. The sum of interior angles is always 180 degrees.



General Formulas

- Area = $\frac{1}{2} \times \text{Base} \times \text{Height}$
- Perimeter = Side 1 + Side 2 + Side 3

Triangles are classified by the lengths of their sides and the measures of their angles.

By Side Length

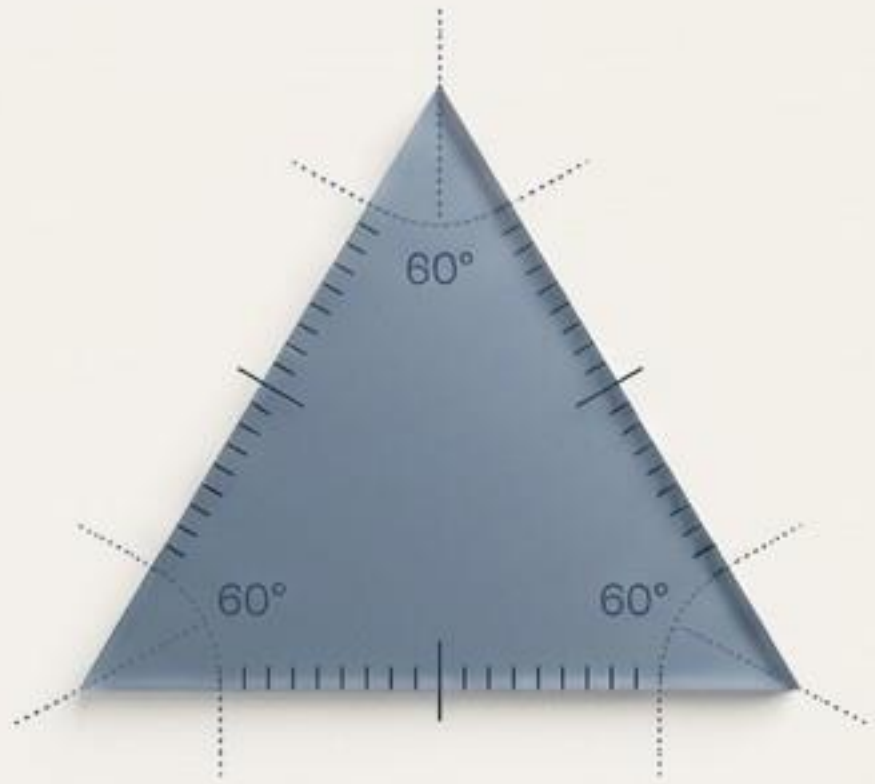
Equilateral
Isosceles
Scalene

By Angle Measure

Right
Acute
Obtuse

Triangles Classified by Side Length

Equilateral



Definition: An equilateral triangle has three equal sides.

Properties: All angles are also equal, and each angle measures 60 degrees.

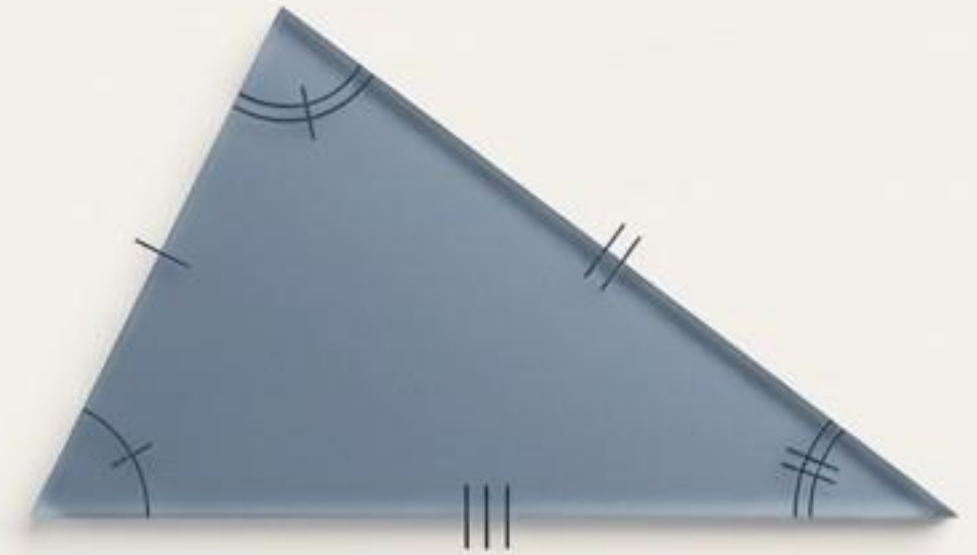
Isosceles



Definition: An isosceles triangle has two sides of equal length.

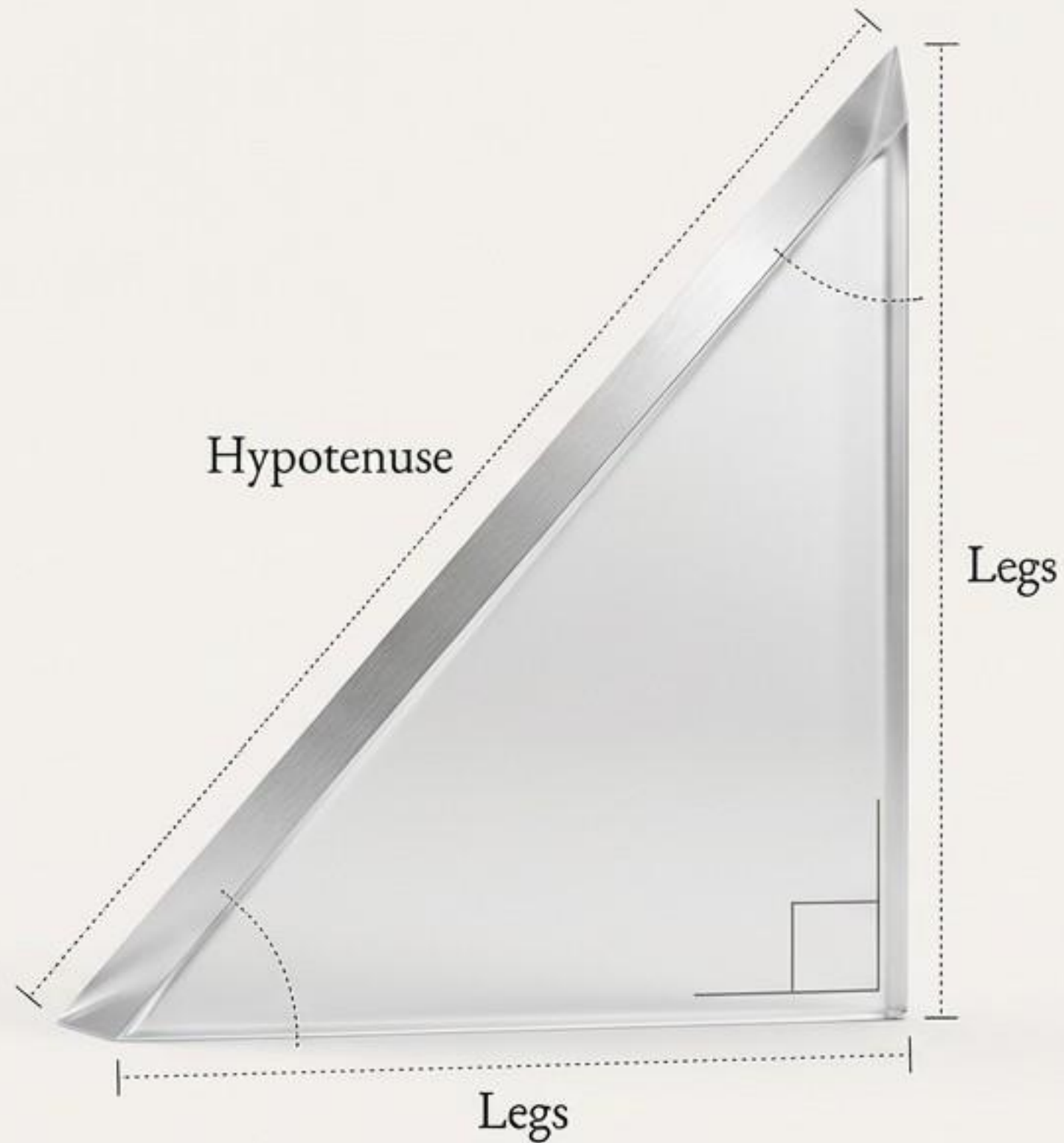
Properties: The angles opposite the equal sides are also equal.

Scalene



Definition: A triangle in which all three sides have different lengths.

Properties: None of the angles are equal.



A Special Case: The Right-Angled Triangle

Definition

A triangle in which one of the angles is a right angle (90 degrees).

Properties

- The side opposite the right angle is called the hypotenuse, and it is the longest side.
- The other two sides are called legs.

Example

A triangle with side lengths of 3, 4, and 5 units, where the angle opposite the side of length 5 is a right angle.

The Geometric Toolkit

Shape	Area/Volume Formula	Perimeter Formula
Square	Side^2	$4 \times \text{Side}$
Rectangle	$\text{Length} \times \text{Width}$	$2 \times (\text{Length} + \text{Width})$
Circle	πr^2	$2\pi r$
Parallelogram	$\text{Base} \times \text{Height}$	$2 \times (\text{Base} + \text{Side})$
Trapezoid	$\frac{1}{2} \times (\text{Base}_1 + \text{Base}_2) \times \text{Height}$	Sum of all four sides
Triangle	$\frac{1}{2} \times \text{Base} \times \text{Height}$	$\text{Side}_1 + \text{Side}_2 + \text{Side}_3$
Cube	Side^3	N/A
Sphere	$(\frac{4}{3})\pi r^3$	N/A
Pyramid	$\frac{1}{3} \times \text{Base Area} \times \text{Height}$	N/A

From the simplest triangle to the perfect sphere, geometry provides the language to describe the architecture of our world.