

Plane and Solid: Compare Them

Use sides, faces, edges, vertices, and angles

GRADE 4 • 4.MG.6.c

4.MG.6.c "Compare and contrast plane and solid figures (limited to circles, squares, triangles, rectangles, spheres, cubes, square pyramids, and rectangular prisms) according to their characteristics (number of sides, angles, vertices, edges...)"

NAME _____

DATE _____

READ, COMPARE, EXPLAIN

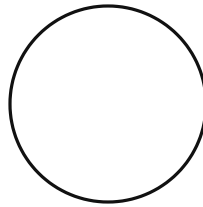
Plane figures are flat; solids take up space. Sides and angles describe a plane figure. Solids may have flat faces, edges where faces meet, and vertices where edges meet. Count each vertex once. Count face angles separately on each flat face. Dashed straight lines are hidden edges; a sphere's curved guide is not an edge.

WORKED EXAMPLE

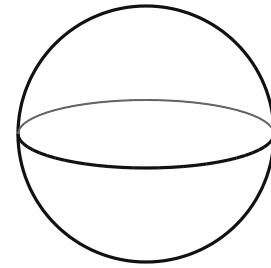
Compare the circle and sphere. Give one similarity and one difference.

1. Neither has vertices or straight sides or edges.
2. The circle is flat; the sphere has one curved surface and takes up space.

Answer: Both have no corners. Only the sphere is a solid; it has no flat faces.



Circle



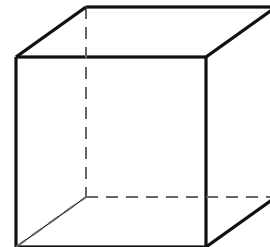
Sphere

PRACTICE 4 problems

- 1** Compare the square and cube. Give the square's numbers of sides, angles, and vertices. Give the cube's numbers of faces, edges, and vertices, and name its face shape.



Square

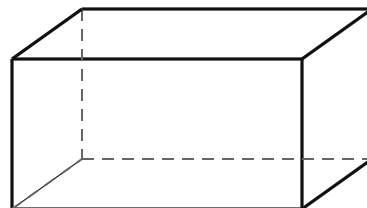


Cube

- 2** Compare the rectangle and rectangular prism. Give the rectangle's side, angle, and vertex counts. Give the prism's face, edge, and vertex counts. How are their shapes related?

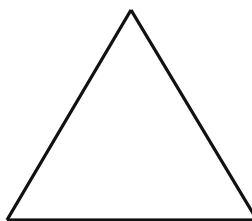


Rectangle

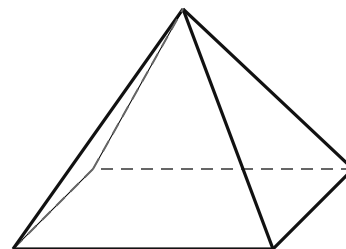


Rectangular prism

- 3** Compare the triangle and square pyramid. Count the triangle's sides, angles, and vertices. Count the pyramid's faces, edges, and vertices. Which of its faces match the plane figure's shape?



Triangle



Square pyramid

- 4** Use the square and cube in Practice 1. The square has 4 right angles. Count the right angles on all six cube faces separately. Why is that total different from the cube's vertex count?

APPLY IT Show your work

- 1** A sign is shaped like a circle; a ball is shaped like a sphere. Use the worked-example figures. Explain why neither has vertices, but only one is a solid with a curved surface.

- 2** Use the triangle and pyramid in Practice 3. Count the angles on all the pyramid's faces separately. Compare the total with the triangle's angle count and the pyramid's vertex count.

CHALLENGE One step up

A student says, "A square is the same as a cube because both have square shapes." Write a clear correction using at least three properties from Practice 1. Include one real similarity.

Accept equivalent comparisons that correctly distinguish plane sides from solid edges and faces. Face angles are counted on each face separately: cube/prism 24, square pyramid 16; these are not distinct vertex counts. A circle has no straight sides, angles, or vertices; a sphere has no flat faces, edges, or vertices. Physical sign and ball are modeled by the named ideal geometric figures.

PRACTICE 1

Square: 4 sides, 4 angles, 4 vertices. Cube: 6 square faces, 12 edges, 8 vertices.

PRACTICE 2

Rectangle: 4 sides, 4 angles, 4 vertices. Prism: 6 rectangular faces, 12 edges, 8 vertices. Each prism face is a rectangle.

PRACTICE 3

Triangle: 3 sides, 3 angles, 3 vertices. Pyramid: 5 faces, 8 edges, 5 vertices. Four faces are triangles; the base is a square.

PRACTICE 4

$6 \times 4 = 24$ face angles, but only 8 vertices. Each cube vertex belongs to three square faces, so face-angle counting repeats vertices.

APPLY IT 1

Neither boundary has corners where straight sides or edges meet. The circle-shaped sign is modeled by a plane figure; the sphere-shaped ball is a solid with a curved surface.
Require the stated evidence and reasoning; accept equivalent correct wording.

APPLY IT 2

The pyramid has $4 + (4 \times 3) = 16$ face angles: 4 on its square base and 12 on its triangular faces. A triangle has 3 angles; the pyramid has 5 distinct vertices.
Require the stated evidence and reasoning; accept equivalent correct wording.

CHALLENGE

A cube has square faces, but a square is flat and a cube is solid. A square has 4 sides and 4 vertices; a cube has 12 edges and 8 vertices. Their similarity is the square shape of the cube's faces.