



Two- and Three-Dimensional Figures

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Content Support

3.6A Classify and sort two- and three-dimensional figures, including cones, cylinders, spheres, triangular and rectangular prisms, and cubes, based on attributes using formal geometric language.

3.6B Use attributes to recognize rhombuses, parallelograms, trapezoids, rectangles, and squares as examples of quadrilaterals and draw examples of quadrilaterals that do not belong to any of these subcategories.

Background Knowledge

Students have been exposed to two-dimensional and three-dimensional figures in every grade level, beginning in kindergarten. Students are familiar with attributes that determine if figures are two-dimensional or three-dimensional. They can create two-dimensional figures and can identify both two-dimensional and three-dimensional figures. Students have a basic knowledge of formal geometric language.

Misconceptions and Obstacles

- Confusing two-dimensional and three-dimensional figures
- Difficulty correctly using formal geometric language
- Understanding similarities, differences, and attributes of quadrilaterals
- Understanding that polygons may fit under more than one subcategory based on their attributes

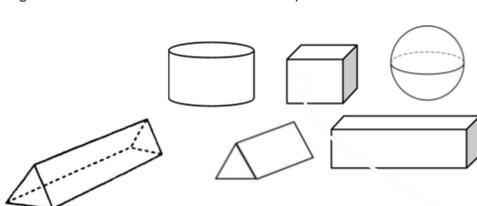
Current Scope

Students will build on their prior knowledge of two-dimensional and three-dimensional figures to classify two-dimensional and three-dimensional figures. In addition, students will learn about and understand attributes of quadrilaterals, including rhombuses, parallelograms, trapezoids, rectangles, and squares.

- Terms to Know**
 - Two-dimensional:** A flat figure having two measurable dimensions
 - Three-dimensional:** A solid having three measurable dimensions (length, width, height)
 - Polygon:** A closed, two-dimensional figure with at least three straight sides and no overlapping sides
 - Vertex:** A point at which two line segments or two edges meet
 - Edge:** A point at which two faces meet on a three-dimensional figure
 - Face:** A flat surface on a three-dimensional figure
 - Cube:** A three-dimensional figure with six square surfaces that are all the same size
 - Sphere:** A three-dimensional, ball-shaped object
 - Cone:** A three-dimensional object with a circular face on one end and a point on the opposite end
 - Cylinder:** A three-dimensional object with circular faces on both ends
 - Prism:** A three-dimensional object with identical faces at the ends and identical faces in between the ends; shapes of the flat faces at the ends determine what kind of prism it is
 - Triangular prism:** A prism with triangular faces on the ends
 - Rectangular prism:** A prism with six faces that are all rectangles
 - Quadrilateral:** A two-dimensional, closed figure with four straight sides
 - Parallelogram:** A quadrilateral with opposite sides that are parallel and equal in length
 - Rectangle:** A parallelogram with opposite equal sides and four right angles
 - Rhombus:** A parallelogram with four sides of equal length, parallel opposite sides, and equal opposite angles
 - Square:** A parallelogram with four equal sides and four right angles
 - Trapezoid:** A quadrilateral with one set of parallel sides
 - Kite:** A quadrilateral with two pairs of sides of the same length that form vertices
 - Irregular quadrilateral:** A four-sided polygon that does not fall under any subcategory

Both two-dimensional and three-dimensional figures can be classified based on the attributes of each figure. Three-dimensional figures are often referred to as solids. Three-dimensional solids are often sorted based on the number of vertices, faces, or edges they possess. Students must be able to identify the differences between prisms, cylinders, and cones.

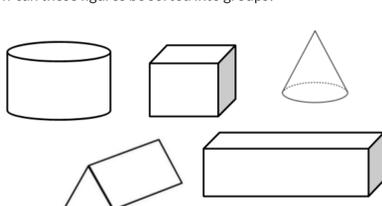
Example: Classify these 3-D figures based on the number of vertices they have.



Answer:

- Spheres and cylinders have zero vertices.**
- Cones have zero vertices.**
- Triangular prisms have six vertices.**
- Cubes and rectangular prisms have eight vertices.**

Example: Classify and sort: How can these figures be sorted into groups?

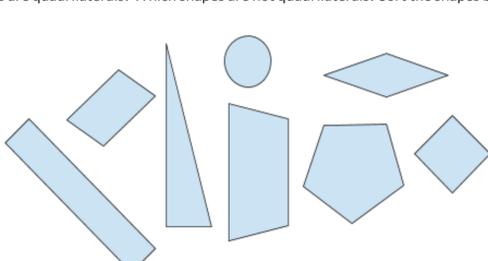


- A. One pyramid, one cone, one cylinder, two prisms
 B. One sphere, one cone, one cylinder, two prisms
 C. **One cone, one cylinder, three prisms**
 D. One cone, two cylinders, and two prisms

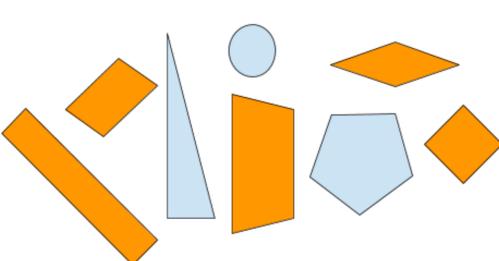
In this example, there are one cylinder, one cone, and three prisms (cube, rectangular prism, and triangular prism). Students must be able to classify and sort the 3-D shapes by their attributes, including cylinders, cones, and prisms.

Students will build on their prior knowledge of quadrilaterals (two-dimensional, closed figures with four straight sides) to recognize specific categories of quadrilaterals (including parallelograms, rectangles, rhombuses, squares, and trapezoids) and to draw irregular quadrilaterals.

Example: Which shapes are quadrilaterals? Which shapes are not quadrilaterals? Sort the shapes below.



Students should be able to identify quadrilaterals.



Example: Draw and label the following 2-D figures in the correct categories of the T-chart: rhombus, triangle, square, circle, oval, rectangle, kite, pentagon, trapezoid, and parallelogram.

Possible Answers

<u>Quadrilateral</u>	<u>Not a Quadrilateral</u>
 Square*	 Triangle
 Trapezoid	 Pentagon
 Rectangle*	 Circle
 Rhombus	 Oval
 Kite	
 Parallelogram	

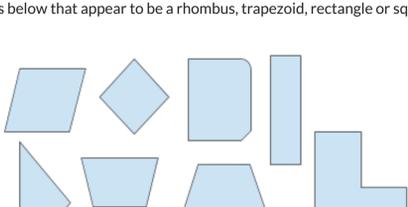
*Note:
 A square is also a rectangle, a parallelogram, and a rhombus.
 A rectangle is also a parallelogram.
 Not all quadrilaterals are easy to define. Some are irregular, with varying lengths of sides and different sizes of angles.

Example: Draw an irregular quadrilateral.

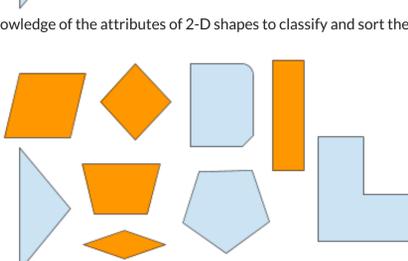


*Answers will vary. Anything that is a closed, two-dimensional figure made of four straight lines that do not overlap is correct.

Example: Identify the shapes below that appear to be a rhombus, trapezoid, rectangle or square.



Students should use their knowledge of the attributes of 2-D shapes to classify and sort the shapes.



Coming Attractions

In fourth grade, students will rely on their base knowledge of two-dimensional and three-dimensional figures and formal geometric language to add in new concepts of identifying points, lines, line segments, rays, angles, and perpendicular and parallel lines. In addition, students will learn how to draw lines of symmetry on two-dimensional figures and identify acute, right, and obtuse angles. Students will continue to classify two-dimensional figures, but on new criteria based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size, such as a right angle.

Example: Draw lines of symmetry on the rectangle.



Example: Which of the following figures is a right triangle that contains a right angle?

