

Tools for Instruction

Subcategories of Plane Figures

Objective Extend understanding of categories of plane figures to include subcategories.

Students have sorted plane figures into groups according to specific attributes. They should know that some shapes belong in more than one category. Students may not be aware of how many ways a plane figure can be described in increasing detail, and yet still retain the basic attribute of the first category. Students will continue to use subcategories to describe two- and three-dimensional figures as they continue studying geometry. Understanding how categories nest within each other is an introduction to the organizational uses of hierarchical thinking.

Step by Step 20–30 minutes

1 Draw a shape to fit a description.

- Tell the student to draw a closed shape that is a polygon. Point out that polygons are a subcategory of closed shapes.
- Tell the student to draw a polygon that is a triangle. Point out that triangles are a subcategory of polygons.
- Tell the student to draw a right triangle. Point out that right triangles are a subcategory of triangles.
- Tell the student to draw an isosceles right triangle. Point out that isosceles right triangles are a subcategory of right triangles.

2 Categorize a right isosceles triangle.

- Have the student compare her drawings at each subcategory with other figures that fit the subcategory.
- Discuss why the student's drawings more closely resemble other figures as the subcategories get more specific. The only variations in right isosceles triangles are the size and orientation.
- Point out that every right isosceles triangle is also a right triangle, a triangle, a polygon, and a closed shape. All right triangles are triangles, polygons, and closed shapes, and all triangles are polygons and closed shapes. All shapes in a subcategory belong to each category listed previously.

3 Draw and categorize a rhombus.

- Tell the student to draw a polygon that is a quadrilateral.
- Ask the student to draw a quadrilateral that is a parallelogram.
- Tell the student to draw a parallelogram that is a rhombus.
- After making the drawings, have the student name all of the subcategories. Help the student to conclude that quadrilaterals are a subcategory of polygons, parallelograms are a subcategory of quadrilaterals, and rhombi are a subcategory of parallelograms.
- Have the student compare her drawings at each subcategory with other figures that fit the subcategory. The only variations in rhombi are the size and orientation.

4 Draw and categorize an irregular hexagon.

- Tell the student to draw a polygon that is a hexagon. Point out that hexagons are a subcategory of polygons.
- Tell the student to draw a hexagon that is irregular. Point out that irregular hexagons are a subcategory of hexagons.
- Have the student compare her drawings at each subcategory with other figures that fit the subcategory.
Ask: How are hexagons alike? How might they be different? How are irregular hexagons alike? How might they be different? Lead the student to conclude that all hexagons have six sides, but the side lengths and angle measures can differ. Irregular hexagons all have six sides that are different lengths, but some irregular hexagons might have different interior angle measures than other irregular hexagons.

Check for Understanding

Present the following problem to the student: Start with a triangle. Provide subcategories until only the size and orientation can be different.

For the student who struggles, use the chart below to help pinpoint where extra help may be needed.

If you observe...	the student may...	Then try...
the student gives too few subcategories	not recognize that she has not been specific enough in the categorization.	having the student draw a triangle that has a particular set of attributes. Then have the student draw a different triangle with the same attributes. Help the student to conclude that a more specific category can be created.
the student jumps to the final specific shape name without giving the intermediate subcategories	not understand that each subcategory should add just one attribute to the previous subcategory.	providing the student with two different examples of shapes. Help the student list the attributes.