TEKS Cluster: Geometry

2.8 **Geometry and measurement.** The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties.

Two-Dimensional

Readiness Standards

2.8(C) classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices

Supporting Standards

2.8(A) create two-dimensional shapes based on given attributes, including number of sides and vertices

2.8(D) compose two-dimensional shapes and three-dimensional solids with given properties or attributes

2.8(E) decompose two-dimensional shapes such as cutting out a square from a rectangle, dividing a shape in half, or partitioning a rectangle into identical triangles and identify the resulting geometric parts

Three-Dimensional

Readiness Standards

2.8(B) classify and sort three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms), and triangular prisms, based on attributes using formal geometric language

Supporting Standards

2.8(D) compose two-dimensional shapes and three-dimensional solids with given properties or attributes

TEKS Scaffold

TEKS	Student Expectation
3.6(A)	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 (R)
2.8(C)	**2.8 Geometry and measurement.** The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to: **(C) classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices**
1.6(A)	classify and sort regular and irregular two-dimensional shapes based on attributes using informal geometric language (R)
K.6(E)	classify and sort a variety of regular and irregular two- and three-dimensional figures regardless of orientation or size (R)

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Content Builder (see Appendix for Tree Diagram)

- Classify polygons with 12 or fewer sides according to attributes using:
  - number of sides and number of vertices
- Sort polygons with 12 or fewer sides according to attributes using:
  - number of sides and number of vertices

Instructional Implications

Students must be given a variety of two-dimensional shapes to sort based on their attributes. Students need exposure to polygons up to 12 sides (e.g., triangles, quadrilaterals, pentagons, hexagons, heptagons, octagons, nonagons, decagons, etc.). Students should compare/contrast the attributes of various shapes to effectively sort and classify polygons.

Students need to be exposed to both regular (e.g., pentagon with all five sides equal in length) and irregular (e.g., chevron shaped pentagon where all sides are not of equal length) two-dimensional figures. Classifying a polygon includes the student's ability to name the polygon (e.g., triangles, quadrilaterals, pentagons, hexagons, heptagons, etc.).

Learning from Mistakes

Students may make the following mistakes:

- Interchanging the term "side" referencing two-dimensional shapes and "edge" referencing three-dimensional shapes
- Not viewing a square as a rectangle

Academic Vocabulary

hexagon
octagon
parallelogram
pentagon
polygon
rectangle
rhombus
side
square (as a special rectangle)
trapezoid
triangle
vertex/vertices

2.8(A) **2.8 Geometry and measurement.** The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to:

(A) create two-dimensional shapes based on given attributes, including number of sides and vertices

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

polygon
shape/figure
side
two-dimensional
vertex/vertices

Role in Concept Development

Supports

- 3.6(A) 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
- 2.8(C) classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices

Connection/ Relevance

Creating two-dimensional shapes given the number of sides and vertices allows students to focus on the geometric attributes of a figure. This attention to specific attributes supports the classification and sorting of various polygons.

When to Teach

Before/Prerequisite to 3.6(A), 2.8(A)

Instructional Implications

Students are provided with a variety of materials (e.g., toothpicks, straws, string, marshmallows, clay, etc.) and a description of a two-dimensional shape (e.g., polygon with five sides and five vertices). Students are to use the materials to build the shape or arrange the materials to create the shape based on the given attributes and associate the materials to the appropriate geometric attribute (e.g., the five marshmallows represent the five vertices and the five toothpicks represent the five sides of the pentagon). Encourage students to design more than one representation for a given description (e.g., How many different five-sided/ five-vertices polygons can you make?). This provides opportunities for students to discover irregular shapes.

Instruction should extend to the study of attributes by taking an already created shape and modifying it to create a new shape (e.g., students made a rectangle out of clay and are now asked to modify the rectangle to make it a square and explain how the attributes and properties of the two shapes were similar yet different).

Learning from Mistakes

Students may make the following mistakes:

- Interchanging the term “side” referencing two-dimensional shapes and “edge” referencing three-dimensional shapes
- Counting the common vertices of a two-dimensional figure twice as they view each side independently

2.8(D) **2.8 Geometry and measurement.** The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to:

(D) compose two-dimensional shapes and three-dimensional solids with given properties or attributes

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

circle
polygon
shape/figure
side
two-dimensional
vertex/vertices

Role in Concept Development

Supports

- 3.6(A) 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
- 2.8(C) classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices
- 2.8(B) classify and sort three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms), and triangular prisms, based on attributes using formal geometric language

Connection/ Relevance

Creating two-dimensional shapes given the attributes (e.g., the number of sides and vertices) and properties (e.g., all sides are of different lengths) requires students to focus on the geometric attributes of a figure. This attention to specific attributes and properties supports the classification and sorting of various figures.

When to Teach

Before/Prerequisite to 3.6(A), 2.8(C), 2.8(B)

Instructional Implications

Students are provided with a variety of materials (e.g., toothpicks, straws, string, marshmallows, clay, color tiles, pattern blocks, unit cubes, etc.) and a description outlining properties and/or attributes for a given figure (e.g., a two-dimensional figure with four vertices and four sides of equal length). Students are to use the materials to build the figure based on the given attributes and associate the materials used to the appropriate geometric attribute (e.g., the four balls of clay represent the vertices and the four toothpicks represent the sides).

Learning from Mistakes

Students may make the following mistakes:

- Interchanging the term “side” referencing two-dimensional shapes and “edge” referencing three-dimensional shapes
- Miscounting the common vertices of a two-dimensional figure twice as they view each side independently

2.8(E)

2.8 Geometry and measurement. The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to:

(E) decompose two-dimensional shapes such as cutting out a square from a rectangle, dividing a shape in half, or partitioning a rectangle into identical triangles and identify the resulting geometric parts

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

polygon
shape/figure
two-dimensional

Role in Concept Development

Supports

- 3.6(A) 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
- 2.8(C) classify and sort polygons with 12 or fewer sides according to attributes, including identifying the number of sides and number of vertices

Connection/ Relevance

Decomposing shapes into other polygons supports the classification and sorting of two-dimensional figures. The student focuses on the various attributes to identify the resulting geometric parts.

When to Teach

- Before/Prerequisite to 3.6(A)
- After 2.8(C)

Instructional Implications

As students begin to recognize and describe the attributes of given two-dimensional shapes, instruction leads to more spatial reasoning development.

Students are given a targeted two-dimensional shape (e.g., 

a trapezoid) and asked to decompose the figure into different smaller geometric parts (e.g.,  a rectangle and one triangle). Encourage students to partition shapes in different ways (e.g.,  one with three triangles;  one with two rectangles and one triangle, etc.).

Learning from Mistakes

Students may make the following mistakes:

- Believing that decomposed 2D shapes can consist only of shapes different than the original 2D shape (e.g., believing that a square cannot consist of 4 or 8 etc. smaller squares; it can only consist of 2 or 4 triangles or 2 or 4 rectangles, etc.)

2.8(B) Readiness

TEKS Scaffold

TEKS	Student Expectation
3.6(A)	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 (R)
2.8(B)	**2.8 Geometry and measurement.** The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to: **(B) classify and sort three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms), and triangular prisms, based on attributes using formal geometric language**
1.6(E)	identify three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes), and triangular prisms, and describe their attributes using formal geometric language (R)
K.6(B)	identify three-dimensional solids, including cylinders, cones, spheres, and cubes, in the real world (S)

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Content Builder (see Appendix for Tree Diagram)

- Classify three-dimensional solids based on attributes using formal geometric language:
  - spheres, cones, cylinders, rectangular prisms, cubes, triangular prisms
- Sort three-dimensional solids based on attributes using formal geometric language:
  - spheres, cones, cylinders, rectangular prisms, cubes, triangular prisms

Instructional Implications

Students must be given a variety of three-dimensional solids to sort based on their attributes (e.g., number of edges, number of vertices, number and types of congruent faces, types of bases, etc.). It is essential for students to recognize that a cube is a rectangular prism; it is a special rectangular prism that has all edges equal in length. Instruction should demonstrate how three-dimensional figures are comprised of two-dimensional shapes (e.g., six rectangles are put together to make a rectangular prism). Students should compare/contrast the attributes of various solids to effectively sort and classify three-dimensional figures.

Learning from Mistakes

Students may make the following mistakes:

- Interchanging the term “side” referencing two-dimensional shapes and “edge” referencing three-dimensional shapes
- Counting the common vertices of a three-dimensional figure twice as they view each face independently
- Not viewing a square as a rectangle or a cube as a rectangular prism
- Having difficulty identifying attributes of three-dimensional figures when pictorial representations are given (use of solid/dotted lines to create the illusion of depth)

Academic Vocabulary

base
cone
congruent
cube (as a special rectangular prism)
cylinder
edge
face
rectangular prism
solid
sphere
three-dimensional
triangular prism
vertex/vertices

2.8(D)

2.8 Geometry and measurement. The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to:

(D) compose two-dimensional shapes and three-dimensional solids with given properties or attributes

Stimulus

Word Problem	Verbal Description	Chart/Table	Graph
Equation/ Expression	Manipulatives	Diagram/Image	Number Line
Base Ten Blocks	Measurement Tool	Formula	Geometric Figures

Academic Vocabulary

edge
face
polygon
shape
side
solid
three-dimensional
vertex/vertices

Role in Concept Development

Supports

- 3.6(A) 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
- 2.8(B) classify and sort three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms), and triangular prisms, based on attributes using formal geometric language

Connection/ Relevance

Creating three-dimensional shapes given the attributes (e.g., the number of sides and vertices) and properties (e.g., all sides are of different lengths) requires students to focus on the geometric attributes of a figure. This attention to specific attributes and properties supports the classification and sorting of various figures.

When to Teach

Before/Prerequisite to 3.6(A), 2.8(B)

Instructional Implications

Students are provided with a variety of materials (e.g., toothpicks, straws, string, marshmallows, clay, color tiles, pattern blocks, unit cubes, etc.) and a description outlining properties and/or attributes for a given figure (e.g., a solid with 8 vertices, 6 faces, and 12 edges which are not all of equal length). Students are to use the materials to build the figure based on the given attributes and associate the materials used to the appropriate geometric attribute (e.g., the 8 balls of clay on each end represent the eight vertices and the 12 straws represent the 12 edges of my rectangular prism. However, I had to cut the straws to be different in length so that it would not represent a cube).

Learning from Mistakes

Students may make the following mistakes:

- Interchanging the term “side” referencing two-dimensional shapes and “edge” referencing three-dimensional shapes
- Miscounting the common edges of a three-dimensional figure twice as they view each edge independently