Module 5: Identifying, Composing, and Partitioning Shapes

Module 5: Identifying, Composing, and Partitioning Shapes

Suggested Duration: 18 days

JUMP TO SECTION

Overview

Introduction

This module bundles student expectations that address understandings of part-whole relationships through a geometric lens. The part-whole relationships examined in this module include distinguishing attributes that define two-dimensional geometric figures; using attributes to identify, classify, sort, compose, and create two-dimensional figures; partitioning two-dimensional figures into halves and fourths; identifying examples and non-examples of halves and fourths; and telling time to the hour and half hour. According to the Texas Education Agency, TEKS Mathematical Process Standards for Grade 1, including application, a problem-solving model, and representations, should be integrated (when applicable) with content knowledge and skills so that students are prepared to use mathematics in everyday life, society, and the workplace.

This module contains the following topics:

Topic/Assessment	Suggested # of Days
***Topic A**: Attributes of Shapes*	6
***Topic B**: Part-Whole Relationships Within Composite Shapes*	3
***Topic C**: Halves and Quarters of Rectangles and Circles*	3
***Topic D**: Application of Halves to Tell Time*	4
End-of-Module Assessment Task: Topics A–D	2
Total Number of Instructional Days	18

Note: A day is equivalent to one 60-minute session.

Prior to this Unit / Module

In Kindergarten, students identified, classified, sorted, and created circles, triangles, rectangles, and squares and identified attributes of these two-dimensional shapes using both informal and formal geometric language. They created two-dimensional shapes using a variety of materials and drawings. Students also identified three-dimensional solids, including cylinders, cones, spheres, and cubes, in the real world and identified two-dimensional components of three-dimensional objects. Additionally, students classified and sorted a variety of regular and irregular two- and three-dimensional figures regardless of orientation or size.

During this Unit / Module

In Topic A, students identify the defining parts, or attributes, of two- and three-dimensional shapes. They create and describe shapes without naming them, which allows them to attend to and clarify a shape's defining characteristics. Then, students name two- and three-dimensional shapes and find them in pictures and in their environment. In Topic B, students combine shapes to create a new whole: a composite shape. Students identify the name of the composite shape as well as the names of each shape that forms it. Students see that another shape can be added to a composite shape so that the composite shape becomes part of an even larger whole. In Topic C, students build on their concrete work with composite shapes and begin naming equal parts of wholes, specifically halves and fourths (or quarters). Students recognize that as they partition, or decompose, the whole into more equal shares, they create smaller units. In Topic D, students apply their understanding of halves to tell time to the hour and half-hour. They construct simple clocks and begin to understand the hour hand, then the minute hand, and then both together. Students also read both digital and analog clocks to tell time.

To access TEA Bluebonnet Learning online resources, click here: Bluebonnet Learning Grade 1 Math, Edition 1. This link includes the Grade 1 Additional Days School Year (ADSY) module which provides up to 30 days of instruction in addition to the instructional days already included in the regular academic calendar. ADSY lessons are supplemental to the core instructional materials, and topics can be taught independently based on students' needs.

After this Unit / Module

In Grade 2, students will create, classify, and sort polygons with up to 12 sides based on attributes, including the number of sides and vertices. Students will compose two-dimensional shapes and three-dimensional solids with given properties or attributes. They will also 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. Additionally, students will read and write time to the nearest one-minute increment using analog and digital clocks and distinguish between a.m. and p.m.

Additional Notes

In Grade 1, identifying two- and three-dimensional figures using formal geometric language and distinguishing between attributes that define and do not define two- and three-dimensional figures are subsumed within the Grade 1 *Texas Response to Curriculum Focal Points* (TxRCFP): Analyzing attributes of two-dimensional shapes and three-dimensional solids. Classifying, sorting, composing, and creating two-dimensional figures and partitioning two-dimensional figures into equal parts are also subsumed within the Grade 1 *Texas Response to Curriculum Focal Points* (TxRCFP): Analyzing attributes of two-dimensional shapes and three-dimensional solids. Identifying examples and non-examples of halves and fourths and telling time to the half hour are subsumed within the Grade 1 *Texas Response to Curriculum Focal Points* (TxRCFP): Grade Level Connections. This module is supporting the development of the *Texas College and Career Readiness Standards* (TxCCRS): I. Numeric Reasoning B1, C1; III. Geometric and Spatial Reasoning A1; V. Statistical Reasoning A1; VII. Problem Solving and Reasoning A1, A2, A3, A4, A5, D1, D2; VIII. Communication and Representation B1, B2, C1, C2; IX. Connections A1, A2, B1, B2, B3.

Suggested Tools & Representations

See Bluebonnet Learning Math – Grade 1 Module 5 Overview for visual representations and/or examples.

- Pattern blocks
- Square tiles
- Straws
- Student clocks, preferably with gears that can provide the appropriate hour-hand alignment
- Three-dimensional shape models (commercially produced or commonly found examples) including cube, cone, cylinder, rectangular prism, and sphere

Misconceptions

(BL) indicates a misconception identified in the Bluebonnet Learning Grade 1 Module 5 Overview.

Students think rectangles are squares (e.g., "Rectangles have square corners, so they are squares."). (BL)

Students misunderstand that the area of the targeted shape and the area of the newly created shape are equal. (e.g., "I

(TEKS RS) indicates a misconception shared from TEKS Resource System.

used 6 triangles to make a hexagon. My partner used 2 red shapes to make a hexagon. My hexagon is bigger because I used more shapes."). (BL)

Students do not understand that fractional parts of the same whole must be equal in area (e.g., "I can divide a circle into fourths by drawing four vertical lines."). (BL)

Students misidentify the hour and minute hands, confusing how to read each one, and/or not understanding what each hand measures (e.g., "The clock shows half past 6 because the hands are making a half-circle."). (BL)

Some students may think a figure may be categorized based on only a few attributes of the figure rather than considering all of the figure's defining attributes (e.g., a student may say, "If the shape has four sides, it is a square," although this may not be true because a four-sided figure could also be a rectangle or rhombus). (TEKS RS)

Some students may think irregular two-dimensional figures have a different name than regular two-dimensional figures rather than recognizing a two-dimensional figure is identified by the number of sides and vertices (e.g., a triangle has 3 sides and 3 vertices regardless of the length of the sides or the size of the vertices, etc.). (TEKS RS)

Some students may think all fractional parts named "one-half" must be equal rather than understanding that the size of the half depends on the size of the whole. (TEKS RS)

Some students may think partitioning a shape into any 2 parts means that these parts are halves rather than understanding that parts of a shape must be two equal parts in order to be halves. (TEKS RS)

Some students may think fractions can only be represented using commercial manipulatives rather than applying the concept of fractions to other models (e.g., a students may be familiar with a red trapezoid representing one-half of a hexagon using pattern blocks but may struggle identifying one-half of a rectangle, circle, or clock face). (TEKS RS)

Some students may think the hour hand and the minute hand are interchangeable rather than recognizing each as having a distinct function. (TEKS RS)

Some students may think the numeral closest to the hour hand names the hour rather than the numeral that the hour hand has passed. (TEKS RS)

Some students may think the numeral 1 should be at the top of the clock rather than the numeral 12. (TEKS RS)

Some students may think since half an hour is half-way around the clock, then half of an hour is half of 12, 6 minutes, rather than 30 minutes. (TEKS RS)

Underdeveloped Concepts

(TEKS RS) indicates an underdeveloped concept shared from TEKS Resource System.

Although some students may be able to sort or classify a set of figures by size, orientation, texture, or color, they may have difficulty sorting and classifying

Some students may call a three-dimensional figure by the name of one of its two-dimensional faces (e.g., a student may refer to a cube as a square, etc.). (TEKS RS)

figures based on geometric attributes. (TEKS RS)

Students may have difficulty remembering formal geometric terms or distinguishing formal vocabulary from informal vocabulary (e.g., students may confuse the informal edge and the formal side of a two-dimensional figure with the formal edge of a three-dimensional figure). (TEKS RS)

Vocabulary

See Bluebonnet Learning Math – Grade 1 Module 5 Overview for visual representations and/or examples.

Familiar Terms and Symbols

- **Clock:** a tool used to tell time.
- **Circle:** a closed, round, curved shape; the space from the middle to the curve is always the same.
- **Cube:** a three-dimensional shape with 6 square faces.
- **Cylinder:** a three-dimensional shape with 2 circle faces that are the same size and that is curved around the side.
- **Edge:** the place where two faces meet.
- **Rectangle:** a closed shape with 4 straight sides and 4 square corners.
- **Sphere:** a three-dimensional shape that is shaped like a ball and has no flat faces.
- **Square:** a special rectangle with 4 sides and 4 square corners; all the sides are the same length.
- **Triangle:** a closed shape with 3 straight sides and 3 corners, or vertices.
- **Vertex:** a point where the sides meet in a two-dimensional shape and the point where the edges meet in a three-dimensional shape; vertices is the plural form of vertex.

Content Vocabulary

Term	Definition
Attributes	the things you can see about an object, such as the number of sides and corners, or vertices.
Composite shape	a shape that is made up of other shapes.
Cone	a three-dimensional shape with only 1 circle face and 1 point.
Digital clock	an electronic clock that shows the hour and minutes with numbers.
Face	a flat part of a three-dimensional solid.
Fourth of	1 out of 4 equal parts.
Fourths	the pieces of a shape that is cut into 4 equal parts.
Half hour	30 minutes.
Half of	1 out of 2 equal parts.

Term	Definition
Half past	a way to say the time is 30 minutes past a given hour; the minute hand is halfway around the clock.
Half-circle	a half of a whole circle; it has 1 straight side and a curved line.
Halves	the pieces of a shape that is cut into 2 equal parts.
Hour	a unit of time measuring 60 minutes.
Hour hand	the short hand on the clock that tracks hours.
Minute	a unit of time measuring 60 seconds.
Minute hand	the long hand on the clock that tracks minutes.
O'clock	a way to say time to the exact hour, with no additional minutes.
Quarter of	1 out of 4 equal parts.
Quarter-circle	a fourth of a whole circle; it has 2 straight sides and a curved line.
Rectangular prism	a three-dimensional shape with 6 rectangle faces.
Rhombus	a closed shape with 4 straight sides that are all the same length.
Three-dimensional shapes	solid shapes with faces, edges, and corners or vertices.
Triangular prism	a three-dimensional shape with 2 triangle faces and 3 rectangle faces.
Two-dimensional shapes	flat, closed shapes.

PA Bundle

Overarching Understandings and Questions

Geometric, spatial, and measurement reasoning are foundational to visualizing, analyzing, and applying relationships within and between scale, shapes, quantities, and spatial relations in everyday life.

- Why is developing geometric, spatial, and measurement reasoning essential?
- How does geometric, spatial, and measurement reasoning affect how one sees and works in the world?

Understandings & Questions	Concepts

Illustrating and analyzing geometric relationships in models and diagrams aid in representing and describing the attributes of geometric figures in order to generalize geometric relationships and solve problem situations.
• What attributes and properties exist in …
  ◦ two-dimensional figures?
  ◦ three-dimensional figures?
• What attributes and properties are …
	Geometry
	• Composition of Figures
	• Decomposition of Figures
	  ◦ Fractions
	• Geometric Attributes and Properties
	  ◦ Classification

Understandings & Questions

- used
- not used

... to sort and classify geometric figures? Why?

- How are attributes and properties used to ...
  - identify two-dimensional figures?
  - classify two-dimensional figures?
  - identify three-dimensional figures?
- How are ...
  - the attributes of circles and other two-dimensional figures
  - two-dimensional figures and three-dimensional figures
  - figures with curved surfaces and figures with only flat surfaces
  - real-world examples and models of three-dimensional figures

... alike and different?

- What relationship exists between ...
  - the sides (outer edges) and the vertices (corners) in two-dimensional figures?
  - two-dimensional figures and three-dimensional figures?
- Why is a square considered a special type of rectangle?
- How can a collection of two-dimensional figures be sorted and classified in more than one way?
- What strategies can be used to ...
  - compose two-dimensional shapes to produce a target shape?
  - create two-dimensional shapes when given specific attributes or properties?
- How can a two-dimensional shape be decomposed in more than one way?
- How can the resulting parts of a decomposed two-dimensional figure be described?
- What strategies can be used to determine ...
  - if the resulting parts of a decomposed two-dimensional shape are equal?
  - examples of halves and fourths?
  - non-examples of halves and fourths?
- How are attributes of three-dimensional figures represented in a picture or diagram?
- Why is a cube considered a special type of rectangular prism?

Objects and events have unique measurable attributes that can be defined and described in order to make sense of their relationship to other objects and events in the world *(time to the half hour)*.

- How can time be described as a measurement?
- Why is it important to be able to tell time?
- In what situations might someone need to tell time?

Attributes of objects and events can be measured using tools, and their measures can be described using units, in order to quantify a measurable attribute of the object or event *(time to the half hour)*.

- What tools can be used to measure time?
- What is the role of the ...
  - hour hand
  - minute hand

... on an analog clock?

- What units of measure are used to describe time?
- What relationships exist between ...
  - 30 minutes and half an hour?
  - 30 minutes and an hour?
  - the numerals, hour hand, minute hand, and second hand on an analog clock?
  - the numerals and symbols on a digital clock?
  - the markings on an analog clock and a number line?

Concepts

- Geometric Representations
  - Two-dimensional figures
  - Three-dimensional figures

Measurement

- Measurable Attributes
  - Time
- Measure
  - Measurement tools
  - Units of measure

Associated Mathematical Processes

- Application
- Problem-Solving Model
- Representations

Understandings & Questions	Concepts

- How does a(n) ...
  - analog clock
  - digital clock

  ... show when a(n) ...
  - hour
  - half hour

  ... has passed?
- How are an analog clock and a digital clock ...
  - similar?
  - different?
- In what ways can time to the ...
  - hour
  - half hour

  ... be described orally?
- What strategies aid in estimating time of day?
- What tasks might last ...
  - more than one hour?
  - less than one hour?
  - more than a half hour?
  - less than a half hour?

Resources

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Standard

1.1

Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

Standard

`1.1.A`

apply mathematics to problems arising in everyday life, society, and the workplace;

T Taught Directly

`1.1.B`

use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

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`1.1.E`

create and use representations to organize, record, and communicate mathematical ideas;

T Taught Directly

`1.6`

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:

`1.6.A`

classify and sort regular and irregular two-dimensional shapes based on attributes using informal geometric language;

T Taught Directly

`1.6.B`

distinguish between attributes that define a two-dimensional or three-dimensional figure and attributes that do not define the shape;

T Taught Directly

`1.6.C`

create two-dimensional figures, including circles, triangles, rectangles, and squares, as special rectangles, rhombuses, and hexagons;

T Taught Directly

`1.6.D`

identify two-dimensional shapes, including circles, triangles, rectangles, and squares, as special rectangles, rhombuses, and hexagons and describe their attributes using formal geometric language;

T Taught Directly

`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;

T Taught Directly

`1.6.F`

compose two-dimensional shapes by joining two, three, or four figures to produce a target shape in more than one way if possible;

T Taught Directly

`1.6.G`

partition two-dimensional figures into two and four fair shares or equal parts and describe the parts using words; and

T Taught Directly

Standard

1.6.H

identify examples and non-examples of halves and fourths.

T Taught Directly

1.7

Geometry and measurement. The student applies mathematical process standards to select and use units to describe length and time. The student is expected to:

1.7.E

tell time to the hour and half hour using analog and digital clocks.

T Taught Directly

English Language Proficiency Standards

The English Language Proficiency Standards (ELPS), as required by 19 Texas Administrative Code, Chapter 74, Subchapter A, §74.4, outline English language proficiency level descriptors and student expectations for English language learners (ELLs). School districts are required to implement ELPS as an integral part of each subject in the required curriculum.

School districts shall provide instruction in the knowledge and skills of the foundation and enrichment curriculum in a manner that is linguistically accommodated commensurate with the student's levels of English language proficiency to ensure that the student learns the knowledge and skills in the required curriculum. School districts shall provide content-based instruction including the cross-curricular second language acquisition essential knowledge and skills in subsection (c) of the ELPS in a manner that is linguistically accommodated to help the student acquire English language proficiency.

☐ Show all ELPS Learn more about ELPS

Research

According to Chapin, "an ability to move flexibly between two and three dimensions is also needed in such diverse fields as architecture, biochemistry, art, and graphic design. Furthermore, since powerful computer programs readily translate between dimensions, it is now even more important for individuals to be able to make sense of this type of material" (p. 173). Van de Walle explains, "Rich experiences with shape and spatial relationships, when provided consistently over time, can and do develop spatial sense" (p. 187). According to the article "Young Children's Concepts of Shape," teachers should capitalize on geometry skills since "some children's competence with geometric and spatial concepts exceeds their number skills" (Clements, et al. 1999). The National Association for the Education of Young Children believes that "children's mathematical thinking in geometry allows them to make a connection to number" (2002). Many researchers make connections between geometric concepts and other mathematical concepts. Students with well-developed understandings in geometry are more likely to be successful with the concepts of number, measurement, and fractions due to the development of spatial reasoning and deductive reasoning. According to Van de Walle (2006), "if approached in a developmental manner, students in the primary grades can be helped to construct a firm foundation for fraction concepts, preparing them for the skills that are later built on these ideas" (p. 251). Empson and Levi (2011) discuss the importance of beginning the instruction of fractions by building meaning and not by introducing the symbol alone (p. 78). Also, according to Van de Walle (2006), "learning to tell time has little to do with time measurement and more to do with the skills of learning to read a dial-type instrument" (p. 243). Sherman, Richardson, and Yard (2009) also discuss the challenge students face in learning to tell time due to the abstract nature of this measurement attribute and the need to work with indirect measurement scales. They conclude that students must be given numerous hands-on opportunities to practice reading clocks as they begin to understand the relationship between the hands and the numerals on a clock.

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To access OER Bluebonnet Learning K-5 Research, reference the K-5 Math Program and Implementation Guide.