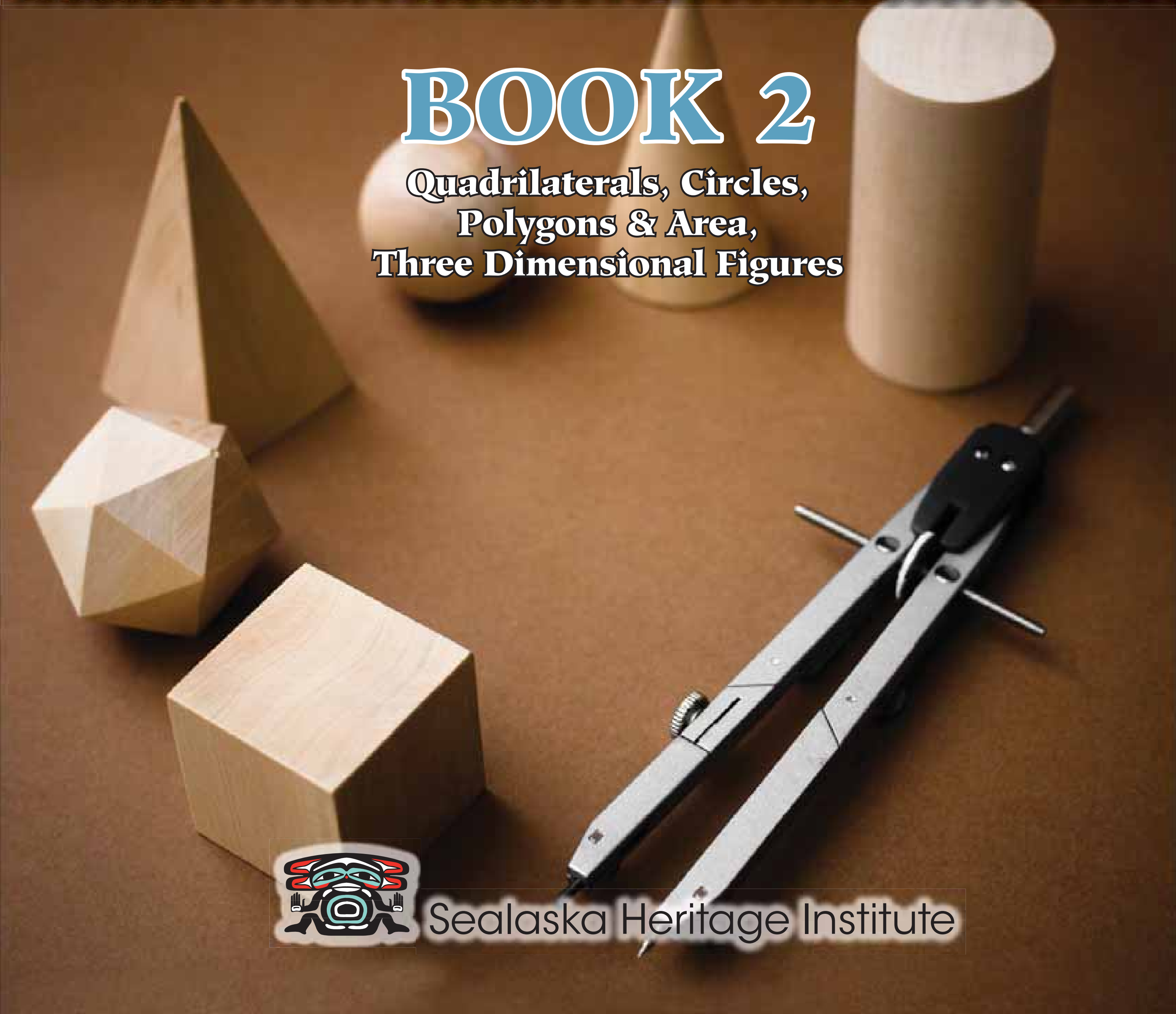
Grades 9–11

# High School Geometry

## Language Development for Success

# BOOK 2

### Quadrilaterals, Circles, Polygons & Area, Three Dimensional Figures



Sealaska Heritage Institute

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2009

# Integrating Culturally Responsive, Place-Based Content with Language Skills Development for Curriculum Enrichment

**DEVELOPED BY**
Stephanie Hoage
Steve Morley
Jim MacDiarmid

**Unit Assessments**
Bev Williams

**LAYOUT & FORMATTING**
Matt Knutson

**PRINTERS**
Capital Copy, Juneau, Alaska

**PROJECT ASSISTANT**
Tiffany LaRue

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## BOOK 2

# INTRODUCTION

Over the years, much has been written about the successes and failures of students in schools. There is no end to the solutions offered, particularly for those students who are struggling with academics. There have been efforts to bring local cultures into the classroom, thus providing the students with familiar points of departure for learning. However, most often such instruction has been limited to segregated activities such as arts and crafts or Native dancing rather than integrating Native culture into the overall learning process. Two core cultural values, *Haa Aaní,* the reference for and usage of the land, and *Haa Shagóon,* the tying of the present with the past and future, are known by both students and parents, and can be included in a curriculum that simultaneously provides a basis for self-identity and cultural pride, within the educational setting. This will provide a valuable foundation for improved academic achievement.

While the inclusion of Native concepts, values, and traditions into a curriculum provides a valuable foundation for self-identity and cultural pride, it may not, on its own, fully address improved *academic* achievement.

This program is designed to meet the academic realities, faced by high school students every day, using a developmental process that integrates *culture* with *skills* development. The values of *Haa Aaní* and *Haa Shagóon* are reinforced through the various activities in the program.

During math lessons, students are exposed to math information and to key vocabulary that represent that information. While the students may acquire, through various processes, the mathematical information, the vocabulary is often left at an exposure level and is not internalized by them. Over time, this leads to *language-delay* that impacts negatively on a student's on-going academic achievement.

Due to *language delay*, many Native Alaskan high school students struggle with texts that are beyond their comprehension levels and writing assignments that call for language they do not have. To this end, in this resource program each key vocabulary word in math is viewed as a *concept*. The words are introduced concretely, using place-based information and contexts. Using this approach, the students have the opportunity to acquire new information in manageable chunks; the sum total of which represent the body of information to be learned in the math program. In many high school math classes it is assumed that the academic vocabulary is being internalized during the learning process, which is most often an erroneous assumption.

When the key vocabulary/concepts have been introduced, the students are then taken through a sequence of listening, speaking, reading, and writing activities, designed to instill the vocabulary into their long term memories - see the **Developmental Language Process**, which follows.

It should be understood that these materials are not a *curriculum* - rather, they are resource materials designed to encourage academic achievement through intensive language development in the content areas.These resource materials are *culturally responsive* in that they utilize teaching and learning styles effective with Native students. As the students progress through the steps of the Process, they move from a concrete introduction of the key vocabulary, to a symbolic representation of the vocabulary, and finally, to their abstract forms - reading and writing. This provides a format for the students to develop language and skills that ultimately lead to improved academic performance.

**The Integration of Place-Based, Culturally Responsive Math Content and Language Development**

**Introduction of Key Math Vocabulary**

↓

**Math, Vocabulary Development**

**Listening, speaking, reading & writing**

↓

**Math Application**

**Reinforcement Activities**

# The Developmental Language Process

The Developmental Language Process (DLP)is designed to instill language into long term memory. The origin of the Process is rooted in the struggles faced by language-delayed students, particularly when they first enter school.

The Process takes the students/children through developmental steps that reflect the natural acquisition of language in the home and community. Initially, once key language items have been introduced concretely to the students, the vocabulary are used in the first of the language skills, Basic Listening. This stage in the process represents *input* and is a critical venue for language acquisition and retention. A baby hears many different things in the home, gradually the baby begins to *listen* to what he/she hears. As a result of the *input* provided through Basic Listening, the baby tries to repeat some of the language heard – this is represented by the second phase of the Process, Basic Speaking - the oral *output* stage of language acquisition.

As more language goes into a child's long-term memory, he/she begins to understand simple commands and phrases. This is a higher level of listening represented by the stage, Listening Comprehension. With the increase in vocabulary and sentence development, the child begins to explore the use of language through the next stage in the Process, Creative Speaking. All of these steps in the Process reflect the natural sequence of language development.

The listening and speaking skill areas represent *true* language skills; most cultures, including Alaska Native cultures, never went beyond them to develop written forms. Oral traditions are inherent in the listening and speaking skills.

However, English does have abstract forms of language in reading and writing. Many Native children entering kindergarten come from homes where language is used differently than in classic Western homes. This is not a value judgment of child rearing practices but a definite cross-cultural reality. Therefore, it is critical that the Native child be introduced to the concepts of reading and writing before ever dealing with them as skills areas. It is vital for the children to understand that reading and writing are *talk in print*.

The Developmental Language Process integrates the *real* language skills of listening and speaking with the related skills of reading and writing. At this stage in the Process, the students are introduced to the printed words for the first time. These abstract representations are now familiar, through the listening and speaking activities, and the relationship is formed between the words and language, beginning with Basic Reading.

As more language goes into the children's long-term memories, they begin to comprehend more of what they read, in Reading Comprehension.

Many Alaskan school attics are filled with reading programs that didn't work – in reality, any of the programs would have worked had they been implemented through a language development process. For many Native children, the printed word creates angst, particularly if they are struggling with the reading process. Often, children are asked to read language they have never heard.

Next in the Process is Basic Writing, where the students are asked to write the key words. Finally, the most difficult of all the language skills, Creative Writing, has the students writing sentences of their own, using the key words and language from their long-term memories. This high level skill area calls upon the students to not only retrieve language, but to put the words in their correct order within the sentences, to spell the words correctly and to sequence their thoughts in the narrative.

The Developmental Language Process is represented in this chart:

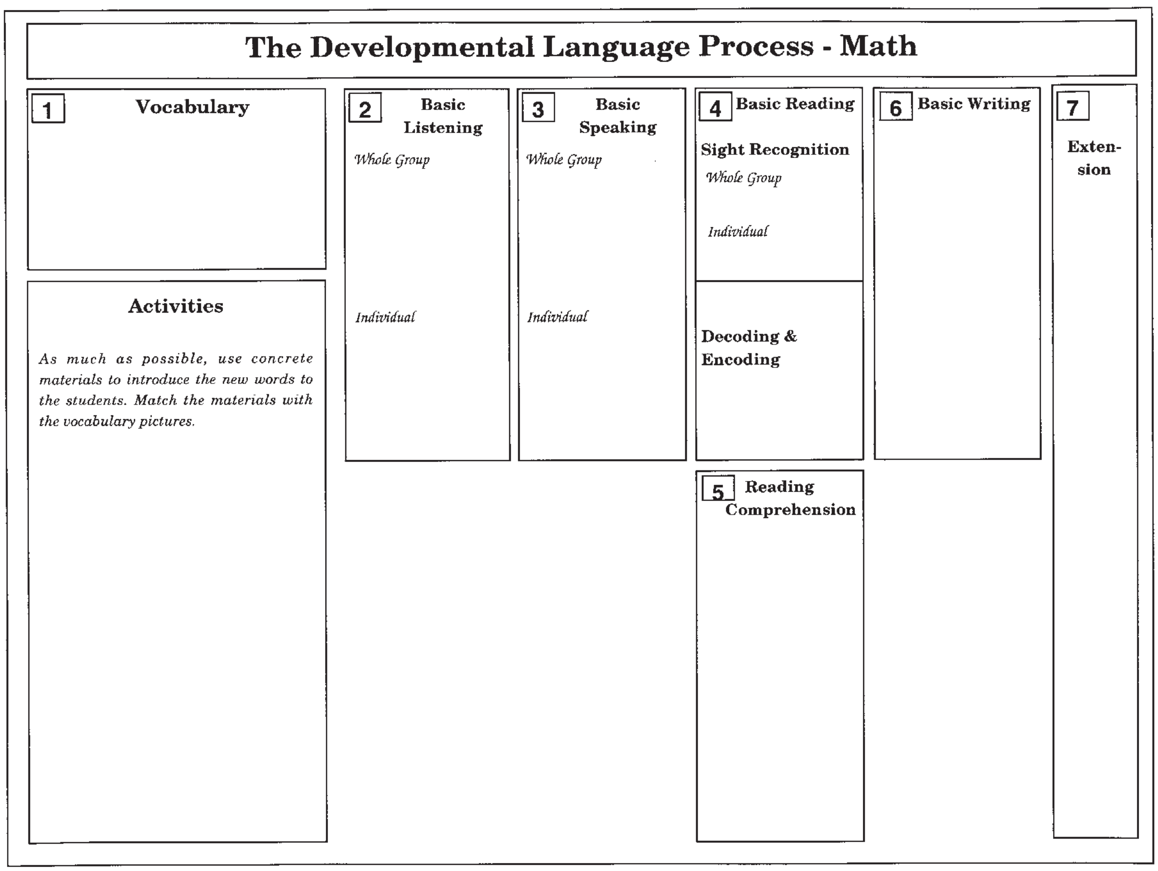

At the end of the Process, the students participate in enrichment activities based on recognized and reasearch-based *best practices*. By this time the information and vocabulary will be familiar, adding to the students'feelings of confidence and success.

The Unit's Assessment is also administered during the Extension Activities section of the Process. This test provides the teacher with a clear indication of the students' progress based on the objectives for basic listening, basic reading, reading comprehension, basic writing and creative writing.

Since the DLP is a *process* and not a program, it can be implemented with any materials and at any grade or readiness level. A student's ability to comprehend well in *listening* and *reading*, and to be creatively expressive in *speaking* and *writing*, is dependent upon how much language he/she has in long-term memory.

# Math & The Developmental Language Process

The Developmental Language Process can be applied effectively in the development of math concepts and their vocabulary. Not all math vocabulary lend themselves well to listening comprehension, creative speaking, and creative writing activities and therefore the Process can be adapted to create a *fast track* in math. This schema represents the use of the Process in math:




Activities for listening comprehension, creative speaking, and creative writing can be used, depending upon the vocabulary being developed.

This resource book is designed to be used approximately once per month for a sixty to ninety minute lesson. During this time, the development of ***math vocabulary*** is the principle endeavor, not the teaching of the math concepts. However, the math concepts form the bases for language development.

Increased vocabulary development in math will ultimately lead to improved academic achievement, increased self-esteem, and to a higher success rate on academic assessments.

# UNIT 6
# Quadrilaterals

Sealaska Heritage Institute

# Grade Level Expectations for Unit 6

## Unit 6—Quadrilaterals

**Alaska State Mathematics Standard A**
A student should understand mathematical facts, concepts, principles, and theories.

A student who meets the content standard should:

A5) construct, draw, measure, transform, compare, visualize, classify, and analyze the relationships among geometric figures; and

**Alaska State Mathematics Standard C**
A student should understand and be able to form and use appropriate methods to define and explain mathematical relationships.

A student who meets the content standard should:

C1) express and represent mathematical ideas using oral and written presentations, physical materials, pictures, graphs, charts, and algebraic expressions;

C2) relate mathematical terms to everyday language;

**GLEs**
The student demonstrates an understanding of geometric relationships by

[10] G-1 identifying, analyzing, comparing, or using properties of plane figures:
• sum of interior or exterior angles of a polygon

The student communicates his or her mathematical thinking by:

[9] PS-3 representing mathematical problems numerically, graphically, and/ or symbolically, translating among these alternative representations; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

[10] PS-3 representing mathematical problems numerically, graphically, and/ or symbolically, communicating math ideas in writing; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

# Vocabulary & Definitions

# Introduction of Math Vocabulary

## Regular polygon

A regular polygon is one in which all sides are congruent and all angles are congruent. Equilateral triangles and squares are examples of regular polygons.  A regular polygon that you might see frequently is a stop sign – it is a regular octagon, with eight equal sides.


## Irregular polygon

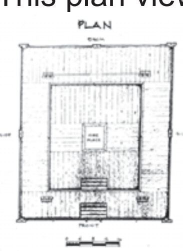
Any closed plane figure with straight sides is an irregular polygon, unless all of the sides and angles are congruent.

Floor plans of buildings are frequently in the shape of irregular polygons:

## Quadrilateral

A quadrilateral is any four-sided polygon.

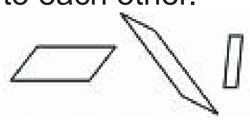
This plan view of a tribal house shows many different quadrilaterals.



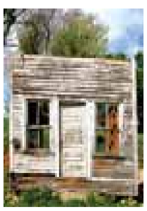
# Introduction of Math Vocabulary

## Parallelogram

A parallelogram is a four-sided polygon with both pairs of opposite sides parallel to each other.

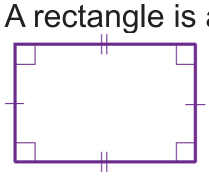


The front of this old building, with corners that are no longer square, is shaped like a parallelogram.

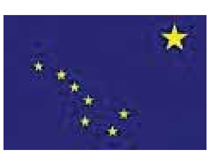


## Rectangle

A rectangle is a four-sided polygon with four right angles.



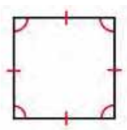
Rectangles are a very common type of quadrilateral. Items shaped like rectangles include floors, ceilings, walls, windows, doors, sheets of paper, and flags.



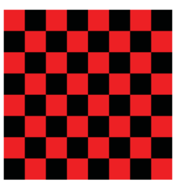
# Introduction of Math Vocabulary

## Square

A square is a four-sided polygon with four right angles and all four sides congruent.

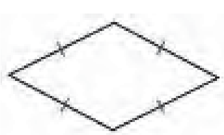


For fun, challenge students to find all 204 squares on the checker (chess) board. (There are 64 1x1, 49 2x2, 36 3x3, 25 4x4, 16 5x5, 9 6x6, 4 7x7, and 1 8x8 squares)



## Rhombus

A rhombus is a parallelogram with four congruent sides.

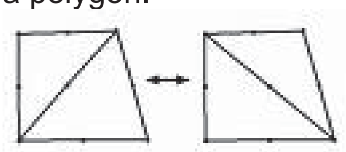


When a fishing net is stretched, the mesh takes the shape of a rhombus.

# Introduction of Math Vocabulary

## Diagonal

A diagonal is a line segment that connects two non-adjacent corners (vertices) of a polygon.



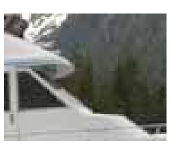
In this design, rectangles are divided into triangles by diagonals.

## Trapezoid

A trapezoid is a quadrilateral with one pair of parallel sides.

Which window(s) on this boat is in the shape of a trapezoid?

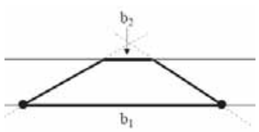
Here they are:



# Introduction of Math Vocabulary

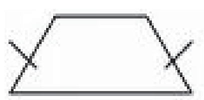
## Base of a trapezoid

Either of the parallel sides of a trapezoid is referred to as a base of the trapezoid.



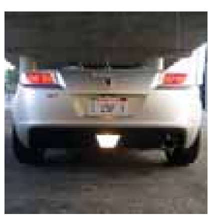

## Leg of a trapezoid

A leg of a trapezoid is a side that is not parallel to another side.



## Isosceles trapezoid

An isosceles trapezoid is one in which the legs are equal in length.
The designer of this car used several isosceles trapezoids.



# Introduction of Math Vocabulary

## Kite
A kite is a quadrilateral with two pairs of adjacent sides that are congruent to each other.  How do you think a kite got its name?

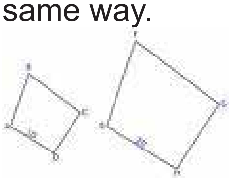
## Similar polygons
Similar polygons are identical in shape, but are not necessarily the same size.

On this quilt, the pattern is made with similar triangles.

# Introduction of Math Vocabulary

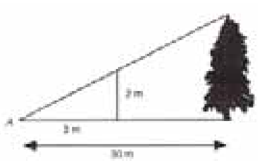
## Corresponding sides

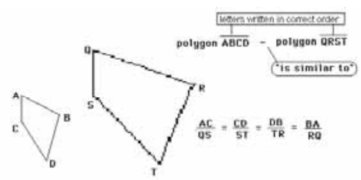
Corresponding sides are two sides of different objects that are situated in the same way.



## Proportional

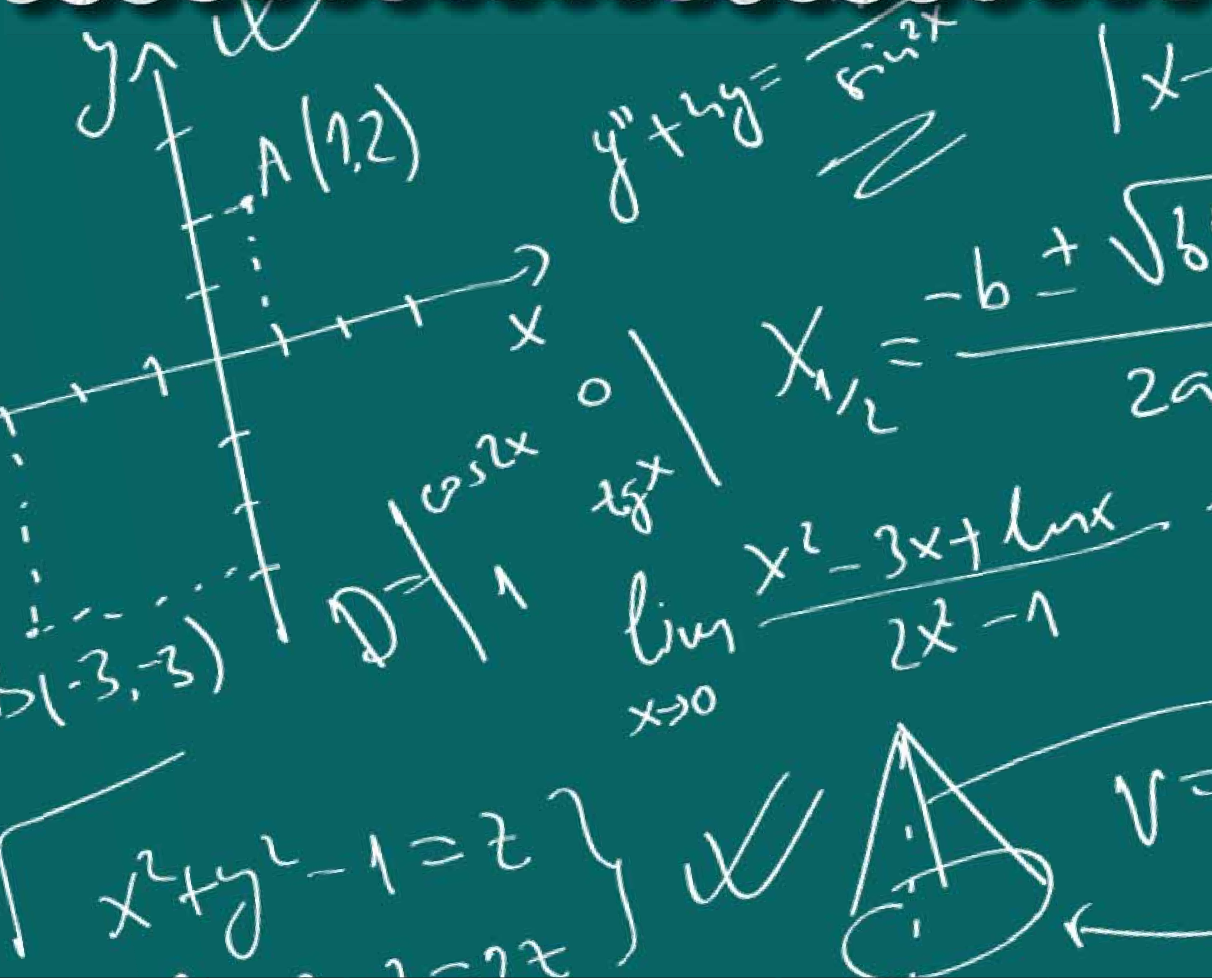
Proportional means that the ratio is the same.  In similar polygons, the sides are proportional to each other, and that fact is often used to find missing lengths and solve problems:





# Language and Skills Development

## Using the Math Vocabulary Terms



# Language & Skills Development

**LISTENING**

Use the activity pages from the Student Support Materials.

**Illustration Sequence**

Before the activity begins, give the students the mini-illustrations from this unit. Say a sequence of vocabulary words (four or five words). After you have said the sequence of words, the students should find the necessary illustrations to represent the sequence you said. Each student should lay the four or five illustrations on his/her desk in the same order as you said the vocabulary words. Repeat this process with other sequences of vocabulary words.

**SPEAKING**

**Illustration Jigsaw**

Cut each of the vocabulary illustrations into four pieces. Mix the cut out pieces together and distribute them to the students (a student may have more than one illustration section). When you say "Go," the students should attempt to match the jigsaw sections they have to reproduce the original vocabulary illustrations. When the students put the necessary pieces of an illustration together, they should identify the illustration by its vocabulary word. Continue until all vocabulary illustrations have been put together and named in this way.

**READING**

Use the activity pages from the Student Support Materials.

**Half Time**

Before the activity begins, cut each of the sight words in half. Keep one half of each sight word and give the remaining halves to the students. Hold up one of your halves and the student who has the other half of that word must show his half an say the sight word. Repeat in this way until all students have responded. An alternative to this approach is to give all of the word halves to the students. Say one of the sight words and the two students who have the halves that make up the sight word must show their halves. Depending upon the number of students in your class, you may wish to prepare extra sight word cards for this activity.

**WRITING**

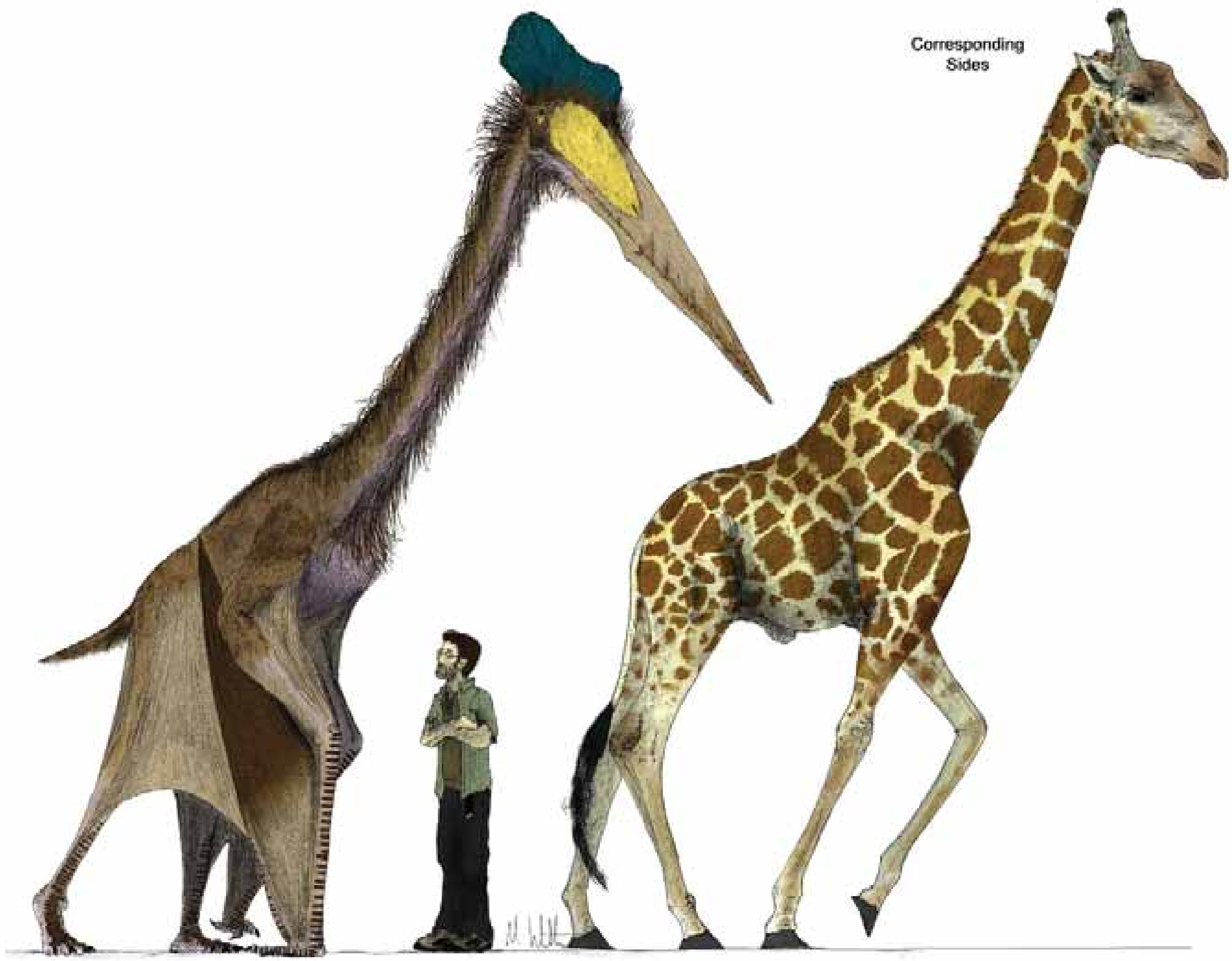
Use the activity pages from the Student Support Materials.

**What's Your Letter?**

Provide each student with writing paper and a pen. Say a sight word. Each student should then write ONE letter from that word (any letter). Review the students' responses to determine if *all* letters from the sight word were used. If all letters from the sight word were not used, call upon the students to identify the letters that are "missing." Repeat with other sight words.

# Student Support Materials


Base of a Trapezoid


Corresponding
Sides


Diagonal
PACO CT 2007

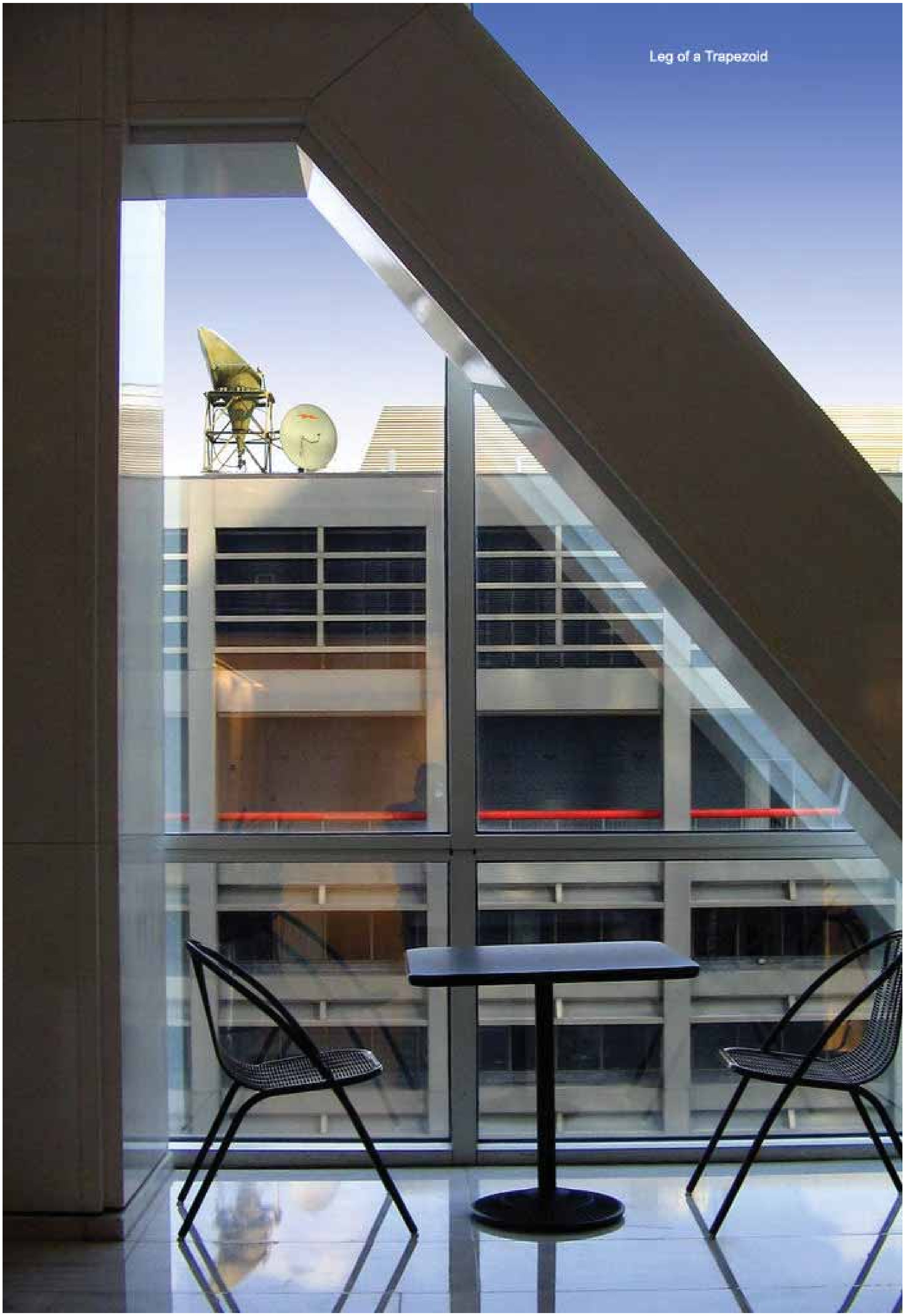
Current Layout

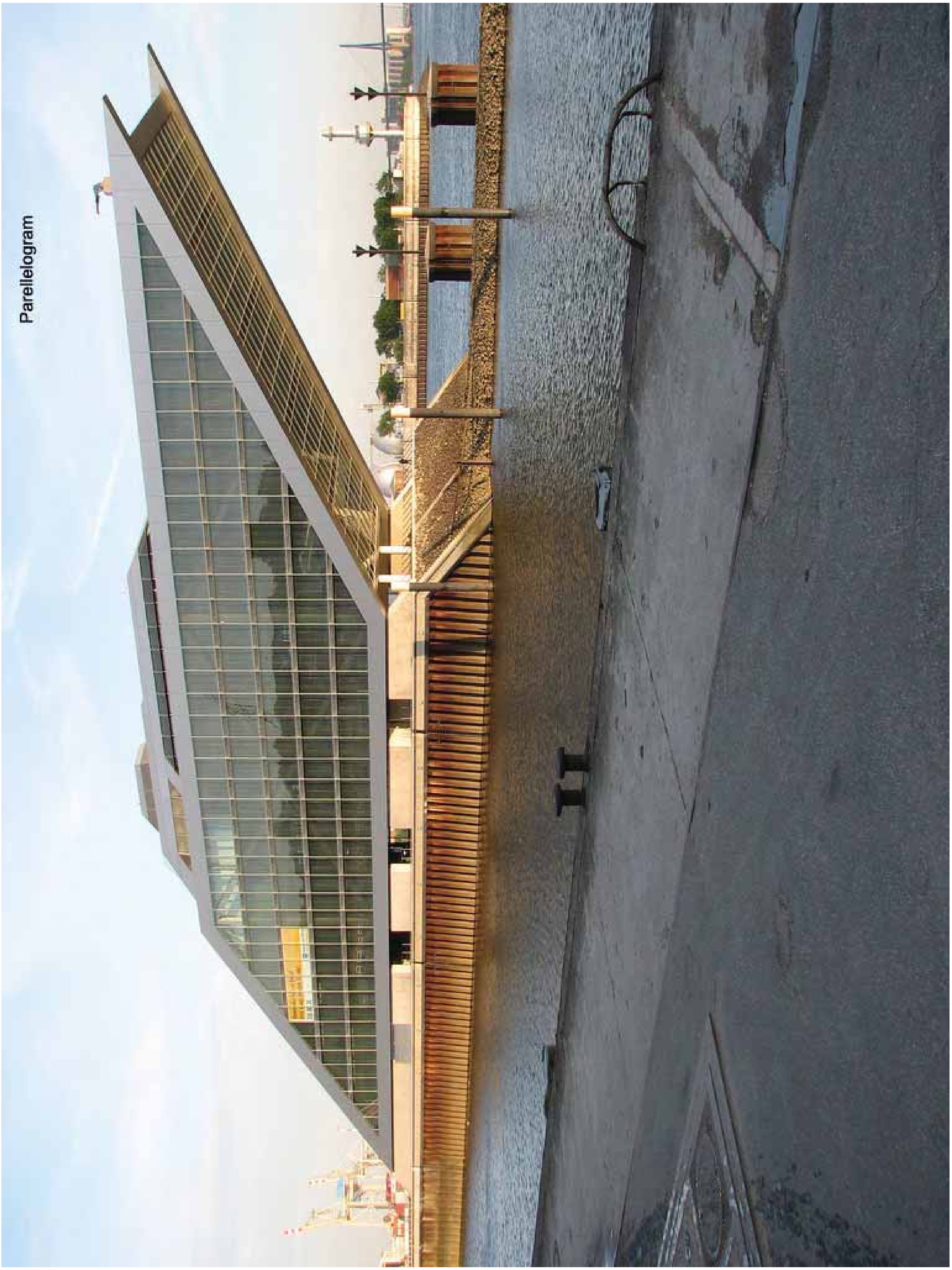

Layout Option 1

Layout Option 2


Layout Option 3

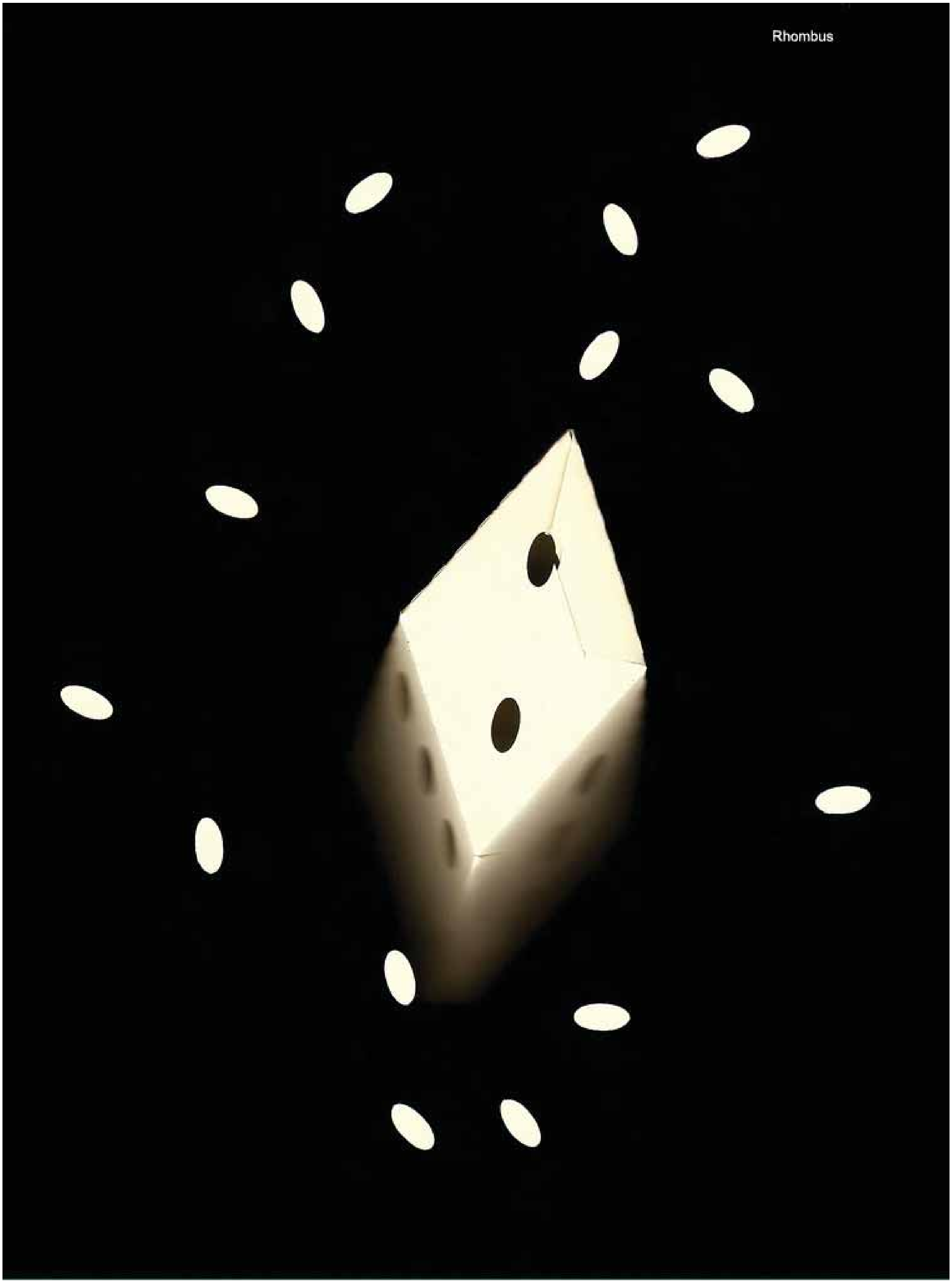
Kite

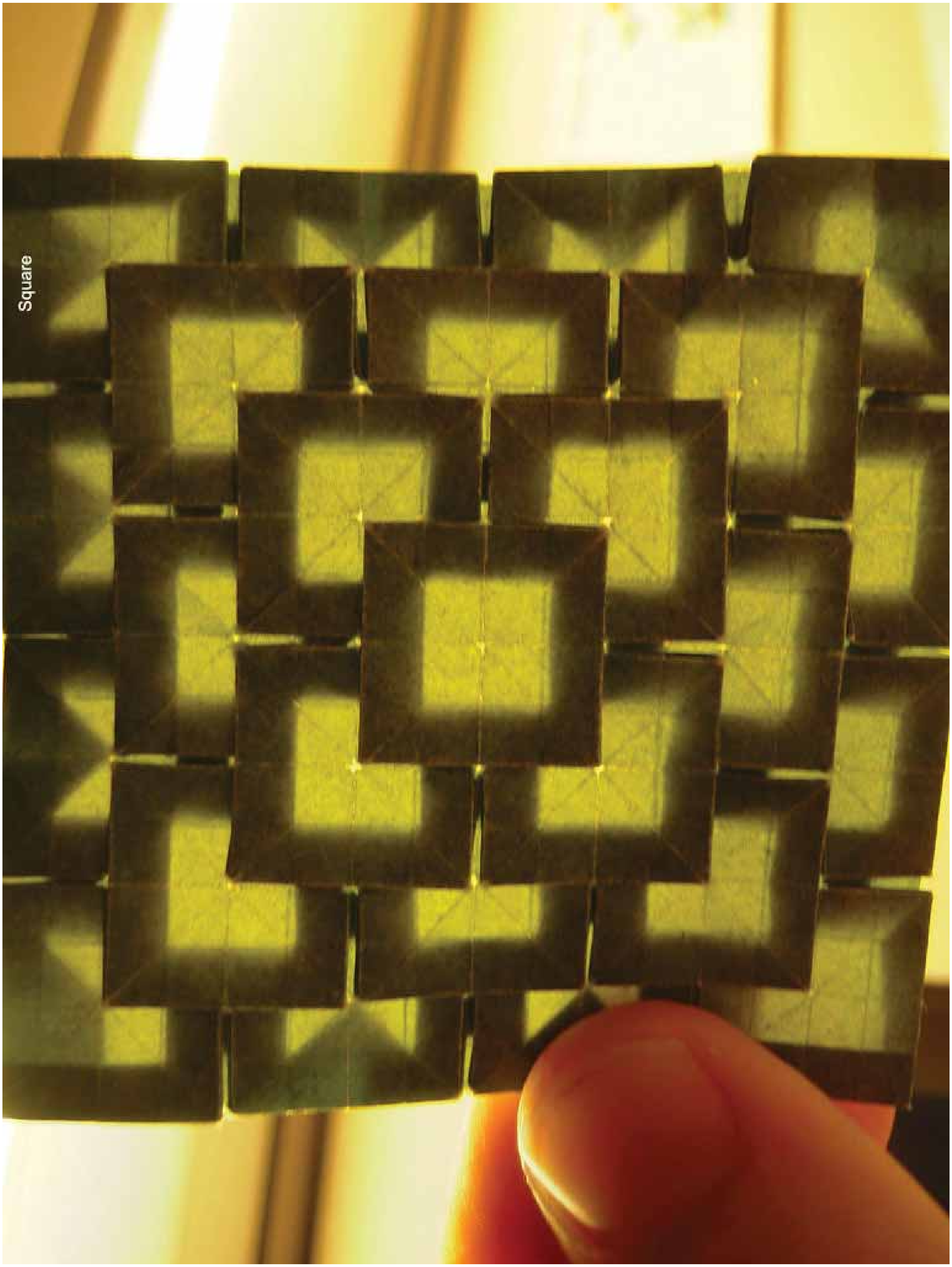

Leg of a Trapezoid

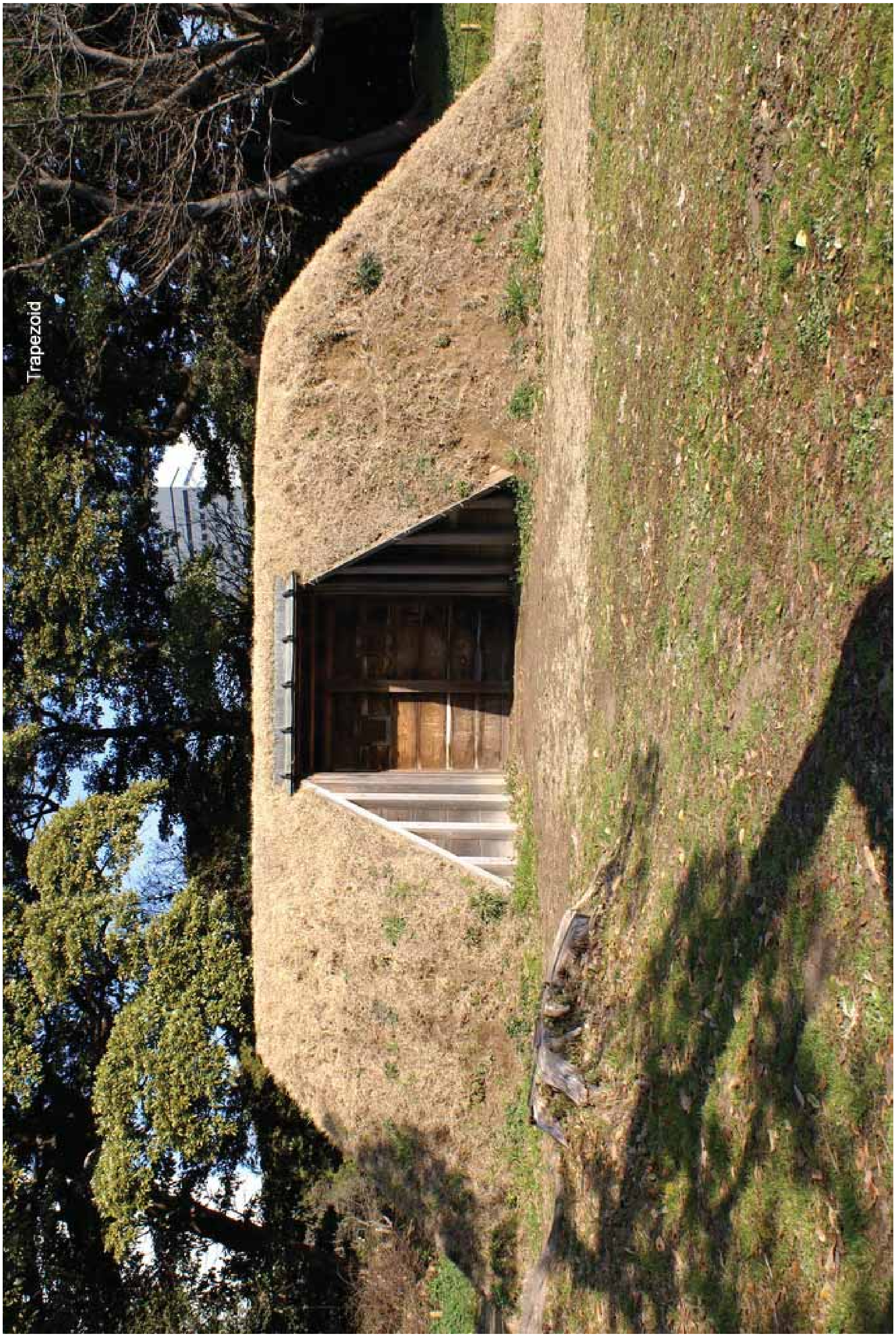

Parellelogram


Quadrilateral

Regular Polygon


Rhombus





Trapezoid

# True-False Sentences
**(Listening and/or Reading Comprehension)**

1. In **regular polygons**, all of the angles are congruent.
2. All of the sides of an **irregular polygon** could be congruent.
3. Any figure with four sides is a **quadrilatera**l.
4. Opposite sides of a **parallelogram** are congruent.
5. The adjacent sides of a **rectangle** are congruent.
6. If all four sides of a quadrilateral are the same length, it is a **square**.
7. A kite is one type of **rhombus**.
8. A **diagonal** connects two corners of a polygon.
9. A rectangle is also a **trapezoid**.
10. The **base** of a trapezoid is one of the two parallel sides.
11. A **leg** of a trapezoid is not parallel to any other side.
12. The bases of an **isosceles** trapezoid are congruent.
13. A **kite** has two pairs of congruent sides.
14. A rectangle and a kite are **similar polygons**.
15. **Corresponding sides** of two figures are in the same position on each figure.
16. When a pair of line segments has the same ratio as another pair of segments, they are **proportional**.

Answers: 1T, 2T, 3F, 4T, 5F, 6F, 7F, 8T, 9F, 10T, 11T, 12F, 13T, 14F, 15T, 16T

1. A rectangle is a **regular polygon**.
2. A square is an **irregular polygon**.
3. A rhombus, a square, and a kite are examples of **quadrilaterals**.
4. Right angles are never found in **parallelograms**.
5. Any four-sided polygon with four right angles is a **rectangle**.
6. A **square** is a regular polygon.
7. A **rhombus** has four congruent sides.
8. A **diagonal** is always longer than any side of a polygon.
9. Two sides of a **trapezoid** are parallel to each other.
10. Only the longest side of a trapezoid is called the **base**.
11. Every trapezoid has four **legs**.
12. The legs of an **isosceles** trapezoid are congruent.
13. A trapezoid might also be a **kite**.
14. **Similar polygons** have the same shape, but not always the same size.
15. If two sides are adjacent to each other, they are **corresponding sides**.
16. **Proportional** sides can be found on any two trapezoids.

Answers: 1F, 2F, 3T, 4F, 5T, 6T, 7T, 8F, 9T, 10F, 11F, 12T, 13F, 14T, 15F, 16F

## Match the Halves

| | |
|---|---|
| 1. A rhombus is like a square | A. they are proportional. |
| 2. The diagonal of a quadrilateral | B. regular polygon with four sides. |
| 3. Any four-sided polygon | C. parallelograms. |
| 4. When segments have the same ratio | D. it is an irregular polygon. |
| 5. Two pairs of congruent adjacent sides | E. are similar polygons. |
| 6. Squares and rectangles are types of | F. without square corners |
| 7. A regular polygon | G. is not parallel to any other side |
| 8. The leg of a trapezoid | H. corresponding sides. |
| 9. A square is a | I. is called a quadrilateral. |
| 10. If its two legs are the same length, | J. Exactly two parallel sides. |
| 11. A big square and a small square | K. can have any number of sides |
| 12. Sides of objects that are situated the same way are | L. a rhombus. |
| 13. A rectangle cannot also be | M. Divides it into two triangles. |
| 14. If all of the sides and all of the angles are not congruent, | N. it is an isosceles trapezoid. |
| 15. Either one of its parallel sides | O. are found on a kite. |
| 16. A trapezoid has | P. Is the base of a trapezoid. |

1F, 2M, 3I, 4A, 5O, 6C, 7K, 8G, 9B, 10N, 11E, 12H, 13L, 14D, 15P, 16J

## Definitions

**Regular polygon**: a polygon in which all sides are congruent and all angles are congruent.

**Irregular polygon:** any closed plane figure with straight sides is an irregular polygon, unless all of the sides and angles are congruent.

**Quadrilateral:** any four-sided polygon.

**Parallelogram:** a four-sided polygon with both pairs of opposite sides parallel to each other.

**Rectangle:** a four-sided polygon with four right angles. **Square:** a four-sided polygon with four right angles and all four sides congruent.

**Rhombus:** a parallelogram with four congruent sides.

**Diagonal:** a line segment that connects two non-adjacent corners (vertices) of a polygon.

**Trapezoid**: a quadrilateral with one pair of parallel sides.

**Base of a trapezoid:** Either of the parallel sides of a trapezoid is referred to as a base of the trapezoid.

**Leg of a trapezoid:** a side that is not parallel to another side.

**Isosceles trapezoid**: a trapezoid in which the legs are equal in length.

**Kite**: a quadrilateral with two pairs of adjacent sides that are congruent to each other.

**Similar polygons:** polygons that are identical in shape, but are not necessarily the same size.

**Corresponding sides**: two sides of different objects that are situated in the same way.

**Proportional:** having the same ratio.

## Which Belongs

1. An ordinary door to a room is (an irregular polygon, a regular polygon, a trapezoid.)
2. To make a new table that was bigger than the old one, Sam doubled the length of each side of the table. The sides of the two tables were (diagonal, isosceles, proportional.)
3. Squares, rectangles, and rhombi are all types of (parallelograms, trapezoids, regular polygons).
4. One wall of a house was shaped like a (rectangle, trapezoid, kite) because the floor and the ceiling were parallel, but the sides of the wall were at odd angles.
5. Beth had a box of toothpicks that were all the same length, and she could connect them at their tips to make (rectangles, trapezoids, regular polygons).
6. A movie screen is almost always a (rectangle, rhombus, kite).
7. A (base, leg, diagonal) of a trapezoid is one of its sides that is not parallel to another side.
8. To make (a square, a kite, an isosceles trapezoid), Alex cut an equilateral triangle along a line parallel to its base.
9. Four straight sticks can always be joined at their ends into the shape of a (quadrilateral, trapezoid, parallelogram).
10. To follow a (square, kite-shaped, rectangular) compass course, Judy walked 20 yards in one direction, then 30 yards in another direction. She turned a corner and walked another 30 yards, then turned again and walked 20 yards back to her starting point.
11. The fence had parallel rails that formed the (bases, legs, diagonals) of trapezoids.
12. All of the houses in the village had the same shape, so Frank knew that they were (regular polygons, irregular polygons, similar polygons).
13. Wanda cut some fabric to make napkins that were 12 inches on each side, but she didn’t get the corners quite square so each napkin was shaped like a (trapezoid, rectangle, rhombus).
14. Teddy got kicked out of the softball game because he ran from first base to third base along a (diagonal, side, leg) of the diamond.
15. Three classrooms along one wall of the high school had windows on (corresponding sides, parallelograms, diagonals)
16. A Scrabble board is (trapezoidal, rectangular, square).

1. Irregular polygon
2. Proportional
3. Parallelograms
4. Trapezoid
5. Regular polygon
6. Rectangle
7. Leg of a trapezoid
8. Isosceles
9. Quadrilateral
10. Kite
11. Base of a trapezoid
12. Similar polygons
13. Rhombus
14. Diagonal
15. Corresponding sides
16. Square

## Multiple Choice

1. A side of a trapezoid that is parallel to another side is a
   A. base
   B. corresponding side
   C. leg

2. A square is a regular quadrilateral because
   A. it is a very familiar and common shape
   B. it has right angles at each corner.
   C. all of its angles are congruent and all of its sides are congruent.

3. If two sides of a quadrilateral are the same length but are not opposite each other, then it is a
   A. parallelogram
   B. kite
   C. both of the above

4. Sides of two figures that have the same ratio are
   A. diagonals
   B. proportional
   C. adjacent

5. If both pairs of opposite sides of a four-sided figure are parallel, it might be a
   A. rhombus
   B. a parallelogram
   C. either of the above

6. Which of the following are always similar polygons?
   A. two squares
   B. two rectangles
   C. two rhombi

7. Which of the following is not a parallelogram?
   A. a rectangle
   B. a trapezoid
   C. a rhombus

8. Which of the following is always an irregular polygon?
   A. a rectangle
   B. a parallelogram
   C. a trapezoid

9. Squares, rectangles, trapezoids, parallelograms, kites, and rhombi are all
   A. quadrilaterals
   B. similar Polygons
   C. irregular polygons

10. In every case, a rectangle is also a
   A. parallelogram
   B. square
   C. regular polygon

11. A segment that connects two opposite corners of a quadrilateral is its
   A. leg
   B. altitude
   C. diagonal

12. All rectangles are not regular polygons because
   A. they don't have four congruent angles
   B. they don't have four congruent sides
   C. the are not always parallelograms

13. How many sides of an isosceles trapezoid are congruent?
   A. two
   B. three
   C. four

14. Which of the following are examples of parallelograms?
   A. isosceles trapezoids, squares, and kites
   B. squares, rectangles, and rhombi
   C. trapezoids, rectangles, and quadrilaterals

15. Which parts of a trapezoid might be congruent?
   A. legs
   B. bases
   C. adjacent sides

16. Sides of polygons that have similar positions or situations are
   A. proportional sides
   B. complementary sides
   C. corresponding sides

Answer: 1A, 2C, 3B, 4B, 5C, 6A, 7B, 8C , 9A, 10A, 11C, 12B, 13A, 14B, 15A, 16C

## Complete the Sentence

1. A _________ is a quadrilateral, but not a parallelogram or a trapezoid.
2. Two opposite corners of a quadrilateral are connected by a _____________.
3. ______________________ have the same shape but not always the same size.
4. A regular polygon with four sides is a ________________.
5. The ________ of a trapezoid is parallel to but not congruent to its opposite side.
6. If all of the sides of a polygon are congruent, and all of its angles are also congruent, it is a(n) ________________.
7. Any quadrilateral that is not a square is a(n) ________________________.
8. If a polygon has more than three sides but less than five sides, it is a _______________________.
9. When both pairs of opposite sides of a quadrilateral are parallel, it is a __________________.
10. A rug with four straight sides is shaped like a _______________ if all of its corners are right angles.
11. A _________ of a trapezoid is not parallel to any other side.
12. The difference between a square and a _________________ is that a square has $90^{o}$ angles at each corner.
13. The sides of two rectangles each had a ratio of 1:4 so they were __________________.
14. The legs of an ______________________trapezoid are congruent to each other.
15. Two houses were next door to each other, and their ______________________ were facing the street.
16. Only one pair of sides of a ________________are parallel to each other.

Answers:

1. Kite
2. Diagonal
3. Similar polygons
4. Square
5. Base
6. Regular polygon
7. Irregular polygon
8. Quadrilateral
9. Parallelogram
10. Rectangle/Square
11. Leg
12. Rhombus
13. Proportional
14. Isosceles
15. Corresponding sides
16. Trapezoid

# Creative Writing

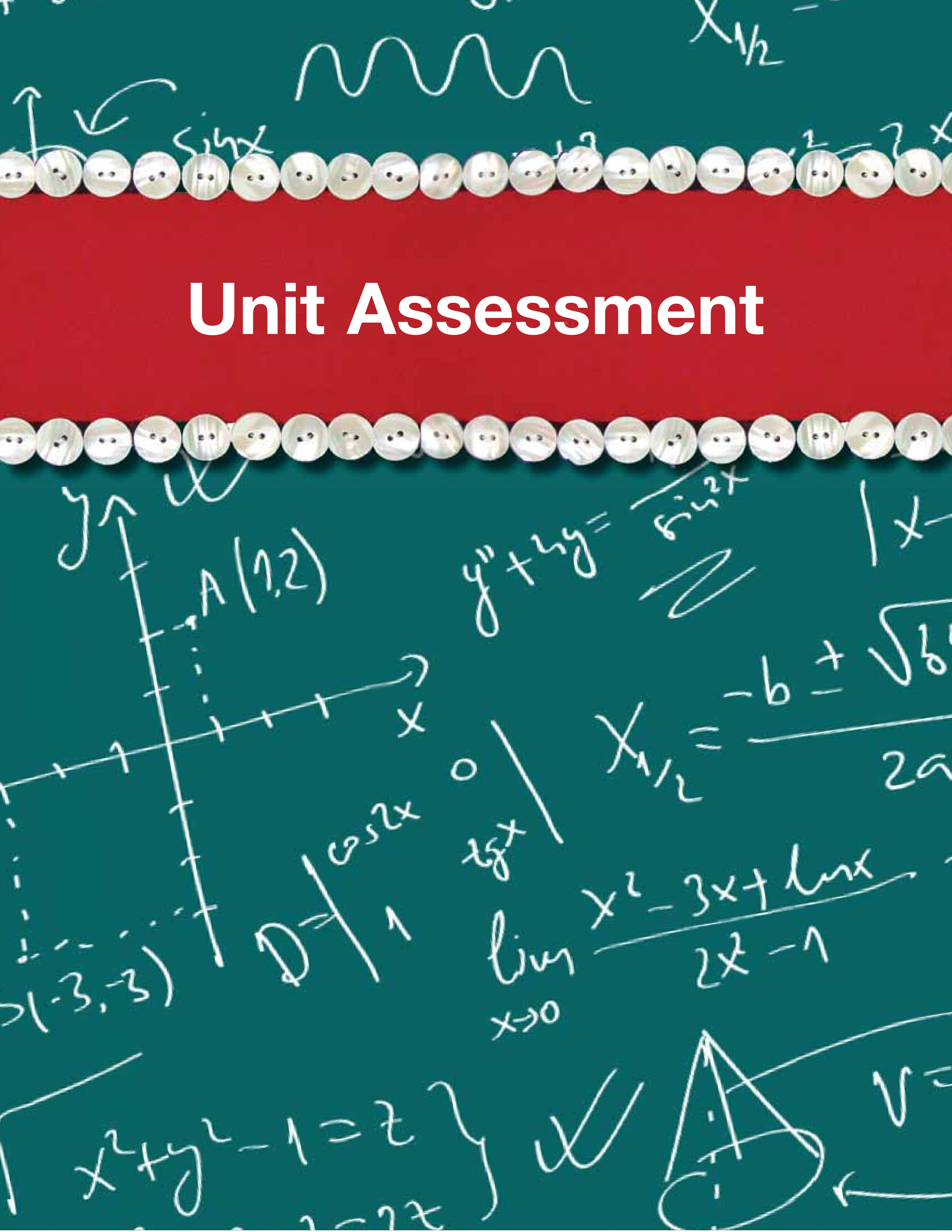
*Have the students write sentences of their own, based on the picture below. When finished, have each student read his/her sentences to the others.*

## Place-Based Practice Activity

1. Have students make designs for ski hats, quilts, borders, rugs, blankets, or other objects using different types of quadrilaterals.

2. Challenge groups of students to come up with a design that has examples of all sixteen terms from this unit. Exchange designs with another group and see if you can find all of their examples.

3. Using books, internet sources, a trip to a museum, or a visit from a local art expert, study traditional designs (on baskets, blankets, boxes, tribal houses, etc.) to find examples quadrilaterals.



# Unit Assessment

# Geometry: Unit 6

## Quadrilaterals

Name: ___________________

Date: ___________________

1) Look at the illustration below and circle the letter of the word or words that match the illustration.

a) irregular polygon

b) regular polygon

c) quadrilateral

d) parallelogram

2) Look at the illustration below and circle the word or words that match the illustration.

a) irregular polygon

b) regular polygon

c) quadrilaterals

d) parallelogram

3) Look at the illustration below and circle the word or words that match the illustration.

a) irregular polygon

b) regular polygon

c) quadrilaterals

d) parallelogram

4) Any four-sided polygon is a ________________.

a) irregular polygon

b) regular polygon

c) quadrilateral

d) parallelogram

**Match the key vocabulary on the left with the correct definition on the right. Place the letter of the definition in front of the word it matches.**

5) _____ rectangle

6) _____ square

7) _____ trapezoid

8) _____ rhombus

9) _____ proportional

a. a parallelogram with four congruent sides.

b. a four-sided polygon with four right angles and all four sides congruent

c. the ratio is the same

d. A quadrilateral with one pair of parallel sides

e. a four-sided polygon with four right angles

**Fill in the Blanks: Complete each statement below with the word that fits best. Choose the word from the Word Bank.**

| **Word Bank** | | |
|---|---|---|
| corresponding | diagonal | isosceles |
| rhombus | similar | similar |

10) A/an ________ trapezoid is one in which the legs are equal in length.

11) ________ polygons are identical in shape, but are are not necessarily the same size.

12) ________ polygons are identical in shape, but are not necessarily the same size.

13) ________ sides are two sides of different objects that are situated in the same way.

14) A/an ________ is a line segment that connects two nonadjacent corners (vertices) of a polygon.

**Illustrations: illustrations will be used in the following items to identify key concepts.**

15) In the illustration below, place an X on the part of the drawing that represents a **base of the trapezoid.**

16) In the illustration below, put an X on the part of the drawing that represent the **leg of a trapezoid.**

# Geometry: Unit 6

## Quadrilaterals

Name: ____________________

Date: ____________________

1) Look at the illustration below and circle the letter of the word or words that match the illustration.

a) irregular polygon

b) regular polygon

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d) parallelogram

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a) irregular polygon

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c) quadrilaterals

d) parallelogram

3) Look at the illustration below and circle the word or words that match the illustration.

a) irregular polygon

b) regular polygon

c) quadrilaterals

d) parallelogram

4) Any four-sided polygon is a ________________.

a) irregular polygon

b) regular polygon

c) quadrilateral

d) parallelogram

**Match the key vocabulary on the left with the correct definition on the right. Place the letter of the definition in front of the word it matches.**

5) _e_ rectangle

6) _b_ square

7) _d_ trapezoid

8) _a_ rhombus

9) _c_ proportional

a. a parallelogram with four congruent sides.

b. a four-sided polygon with four right angles and all four sides congruent

c. the ratio is the same

d. A quadrilateral with one pair of parallel sides

e. a four-sided polygon with four right angles

**Match the key vocabulary on the left with the correct definition on the right. Place the letter of the definition in front of the word it matches.**

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6) b square

7) d trapezoid

8) a rhombus

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a. a parallelogram with four congruent sides.

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c. the ratio is the same

d. A quadrilateral with one pair of parallel sides

e. a four-sided polygon with four right angles

**Fill in the Blanks: Complete each statement below with the word that fits best. Choose the word from the Word Bank.**

| **Word Bank** | | |
|---|---|---|
| corresponding | diagonal | isosceles |
| rhombus | similar | similar |

10) A/an isosceles trapezoid is one in which the legs are equal in length.

11) similar polygons are identical in shape, but are are not necessarily the same size.

12) similar polygons are identical in shape, but are not necessarily the same size.

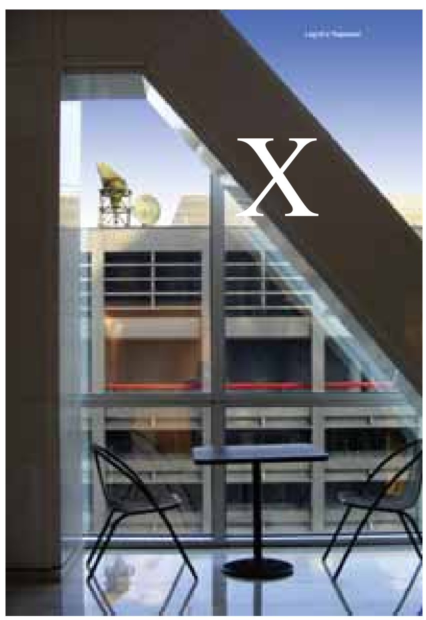
13) corresponding sides are two sides of different objects that are situated in the same way.

14) A/an **diagonal** is a line segment that connects two nonadjacent corners (vertices) of a polygon.

**Illustrations: illustrations will be used in the following items to identify key concepts.**

15) In the illustration below, place an X on the part of the drawing that represents a **base of the trapezoid.**


16) In the illustration below, put an X on the part of the drawing that represent the **leg of a trapezoid.**



# UNIT 7
## Circles

Sealaska Heritage Institute

# Grade Level Expectations for Unit 7

## Unit 7—Circles

**Alaska State Mathematics Standard A**
A student should understand mathematical facts, concepts, principles, and theories.

A student who meets the content standard should:

A5) construct, draw, measure, transform, compare, visualize, classify, and analyze the relationships among geometric figures; and

**Alaska State Mathematics Standard C**
A student should understand and be able to form and use appropriate methods to define and explain mathematical relationships.

A student who meets the content standard should:

C1) express and represent mathematical ideas using oral and written presentations, physical materials, pictures, graphs, charts, and algebraic expressions;

C2) relate mathematical terms to everyday language;

**GLEs**
The student demonstrates an understanding of geometric relationships by

[9] G-1 identifying, analyzing, comparing, or using properties of circles (degrees in a circle)

The student demonstrates an understanding of geometric relationships by

[10] G-1 identifying, analyzing, comparing, or using properties of plane figures:
- central angles, chords, inscribed angles or arcs of a circle

The student communicates his or her mathematical thinking by

[9] PS-3 representing mathematical problems numerically, graphically, and/or symbolically, translating among these alternative representations; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

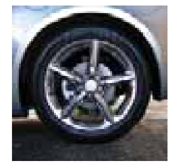
[10] PS-3 representing mathematical problems numerically, graphically, and/ or symbolically, communicating math ideas in writing; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

# Vocabulary & Definitions

# Introduction of Math Vocabulary

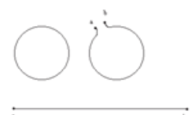
## Circle

A circle is a closed curve whose points are all on the same plane and at the same distance from a fixed point (the center). What would happen if a wheel were not a circle?

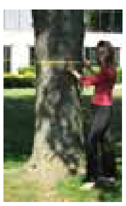


## Circumference

The circumference is the perimeter or outer boundary of a circle, and also the distance around the outside of a circle.

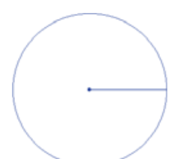


It might be useful to know the circumference of a tree, or of a ring.



## Radius

A radius is a line segment that connects the center of a circle with a point on its circumference, or, the length of that line segment.



Downhill skiers measure the “sidecut radius” of skis to determine how well the skis will turn.

# Introduction of Math Vocabulary

## Diameter

A diameter is a line segment between two points on a circle which passes through the center. The word diameter also refers to the length of this line segment.

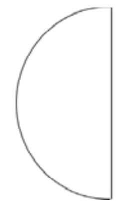
The saw that these men are using must be longer than the diameter of the tree.

## Arc

An arc of a circle is any unbroken part of its circumference.

The word “arc” comes from a Latin word “arcus” which means a bow, arch, or curve.

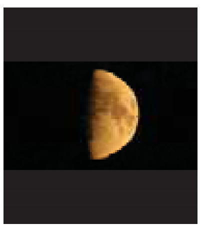
# Introduction of Math Vocabulary



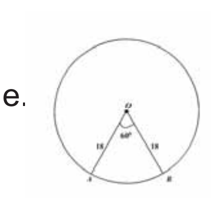
## Semicircle

A semicircle is half a circle, or an arc with 180º.

When you look at a half moon, you are seeing a semicircle

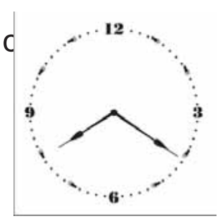


## Central angle



A central angle is an angle whose vertex is at the center of a circle.

The hands of a clock form c



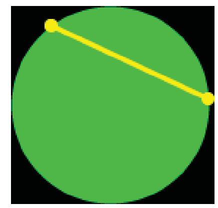

## Sector

A sector of a circle is a part of a circle that is bounded by two radii and the arc between them. You might hear the word "sector" used in everyday language to refer to a section or portion of something.

A piece of pie is a sector.

# Introduction of Math Vocabulary

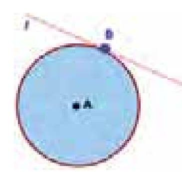
## Chord



A chord is a line segment in the interior of a circle that has both endpoints on a circle.

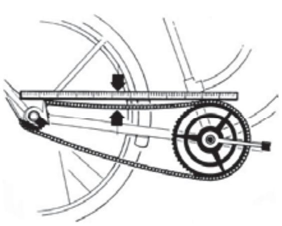
Segments of the strings of a guitar form chords of the circular sound hole.

## Tangent



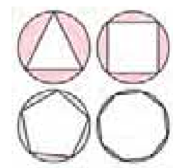
Tangent means touching at a single point (the point of tangency) without crossing over. The word tangent is used with lines and curves that touch each other.

In this picture, the ruler is positioned so that it is tangent to the gear wheel of the bicycle, in order to measure the tension of the chain.



# Introduction of Math Vocabulary

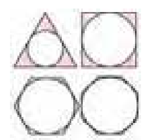
## Circumscribed



If something is circumscribed it is surrounded by the smallest circle (or other figure) possible.

To make this ornament, a star was circumscribed by a circle.

## Inscribed



When something is inscribed, it is on the inside of another figure, touching it in as many points as possible. These circles are inscribed in other figures:

This is a symbol for washing instructions that means “Do Not Tumble Dry”. It uses a circle inscribed in a square.

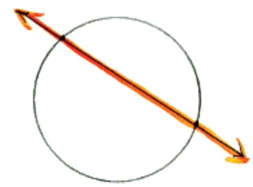
## Pi

Pi, symbolized as $\varpi$, is a letter of the Greek alphabet. In mathematics, it stands for the ratio of the circumference of a circle to its diameter. When the circumference is divided by the diameter of any circle, the value of $\varpi$ is 22/7 or 3.141592……

$\varpi = C/d$.

# Introduction of Math Vocabulary

## Secant



A secant is a line that intersects a circle (or another curve) at two points.

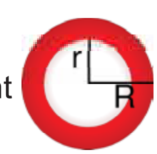
## Concentric



Concentric means having a common center.

Raindrops created these concentric circles on water.

## Annulus




An annulus is a region between two concentric circles that are different sizes.

Common examples of annuli are easy to find, and include tires, washers, and compact discs.

# Language and Skills Development

## Using the Math Vocabulary Terms

# Language & Skills Development

**LISTENING**

Use the activity pages from the Student Support Materials.

### Pencil of Fortune

Before the activity begins, prepare a stencil which contains small versions of the vocabulary illustrations. Provide each student with a copy of the stencil. Each student should cut out his/her illustrations. The students should then lay their illustrations on their desks (around the edges of their desks). When the students have arranged their illustrations in this way, each student should then place a pen or pencil in the center of his/her desk. Say a vocabulary word. The students should then spin their pencils/pens on their desks. When the pencils/pens stop spinning, any student or students whose pencils/pens are pointing to the vocabulary illustration for the word you said win(s) the round. When a student wins in this way, he/she may remove that illustration from his/her desk. The winner or winners of this activity are those students who have no illustrations left on their desks.

**SPEAKING**

### Feel the Number

Mount the vocabulary illustrations on the chalkboard and number each one. Have a student stand, facing the illustrations. Stand behind the student and use your index finger to "write" one of the illustration numbers on his/her back. When the student feels the number, he/she should orally identify the illustration with that number. This activity may also be done in team form. In this case, "write" one of the numbers on the back of the last player in each team. When you say "Go," the last player in each team should write the number on the back of the student in front of him/her, and so on. When the first player in each team feels the number, he must name the illustration with that number. The first team to do this wins the round. The first player in each team should move to the back of the team after each round of the activity.

**READING**

Use the activity pages from the Student Support Materials.

### Reflection

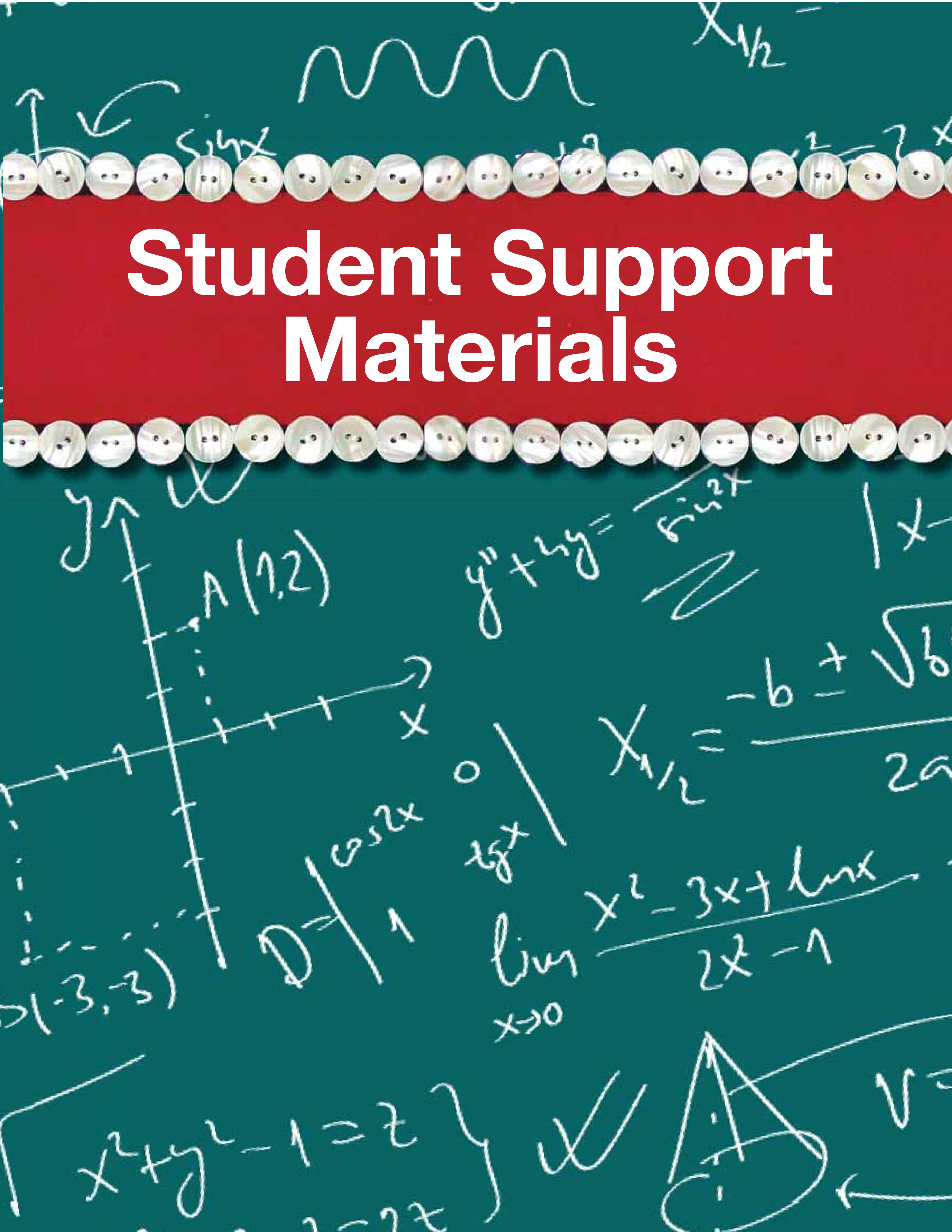
Mount the sight word cards on the chalkboard. Group the students into two teams. Have the first player from each team stand in front of the chalkboard, facing the sight word cards. Give each of the two players a small, unbreakable mirror. Stand some distance behind the two players and hold up a vocabulary illustration (for one of the sight words on the chalkboard). The two players must then look over their shoulders with the mirrors to see the illustration you are holding. When a student sees the illustration you are holding, he/she must point to its sight word on the chalkboard. The first player to do this correctly wins the round. Repeat with other pairs of players until all students have participated.

**WRITING**

Use the activity pages from the Student Support Materials.

### Numbered Illustrations

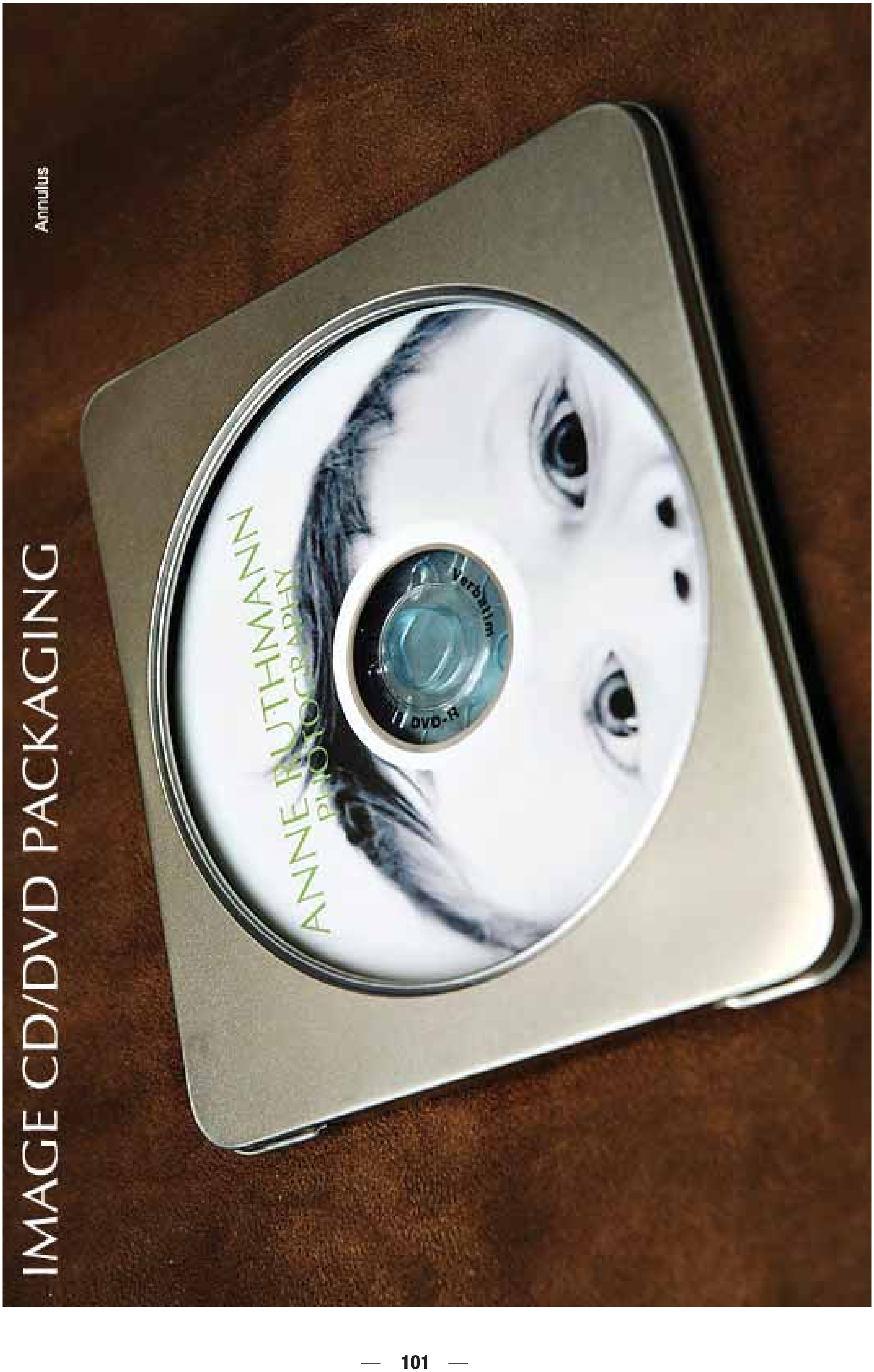
Mount the vocabulary illustrations on the chalkboard and number each illustration. Provide each student with writing paper and a pen. Call the number of an illustration. Each student should write the vocabulary word for the illustration represented by that number. Repeat until all vocabulary words for the illustrations have been written. Review the students' responses.

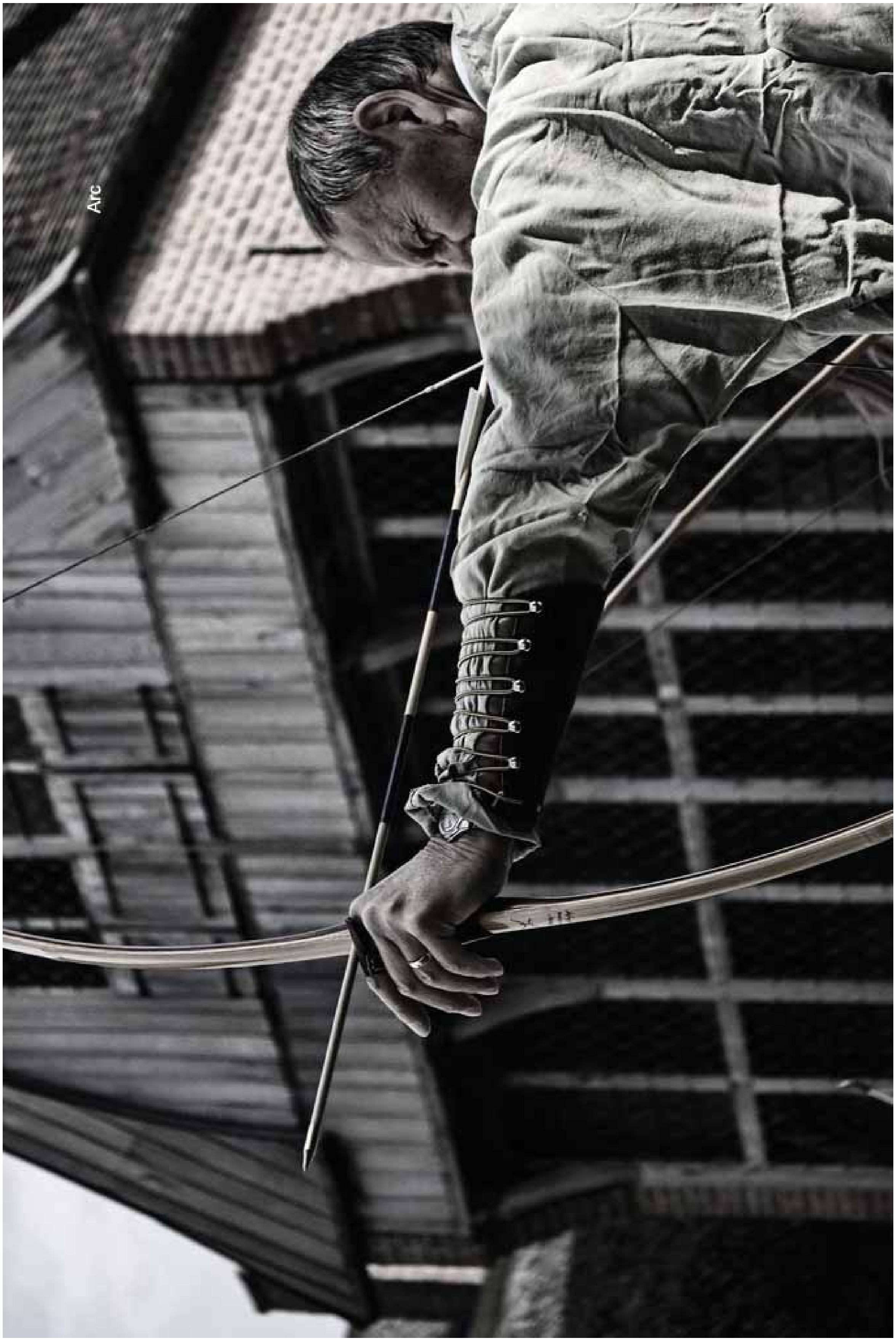


# Student Support Materials

IMAGE CD/DVD PACKAGING

Annulus




Arc

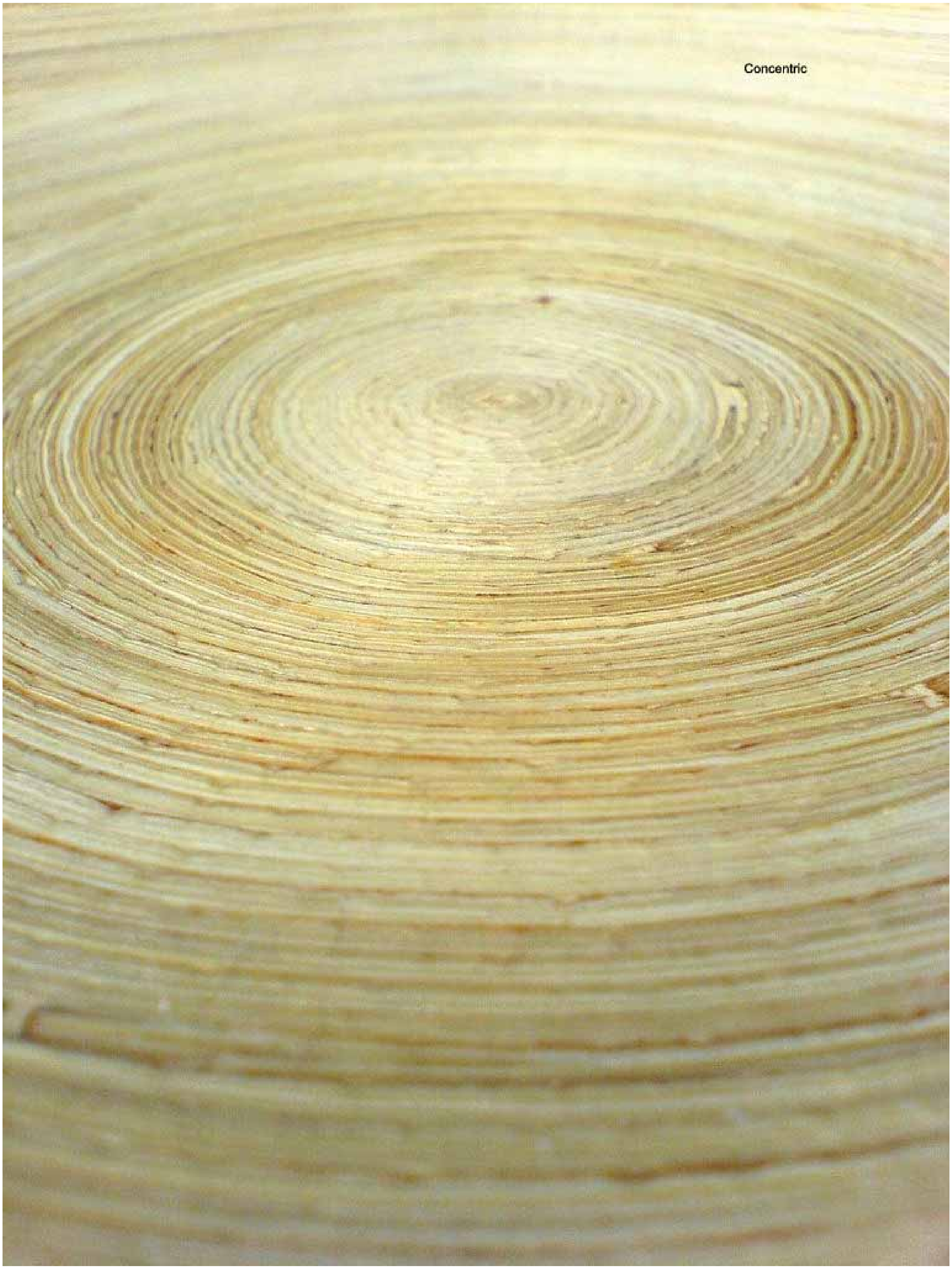

Central Angle
G.W.R
KLIK
Goldsmiths &
Silversmiths


Chord

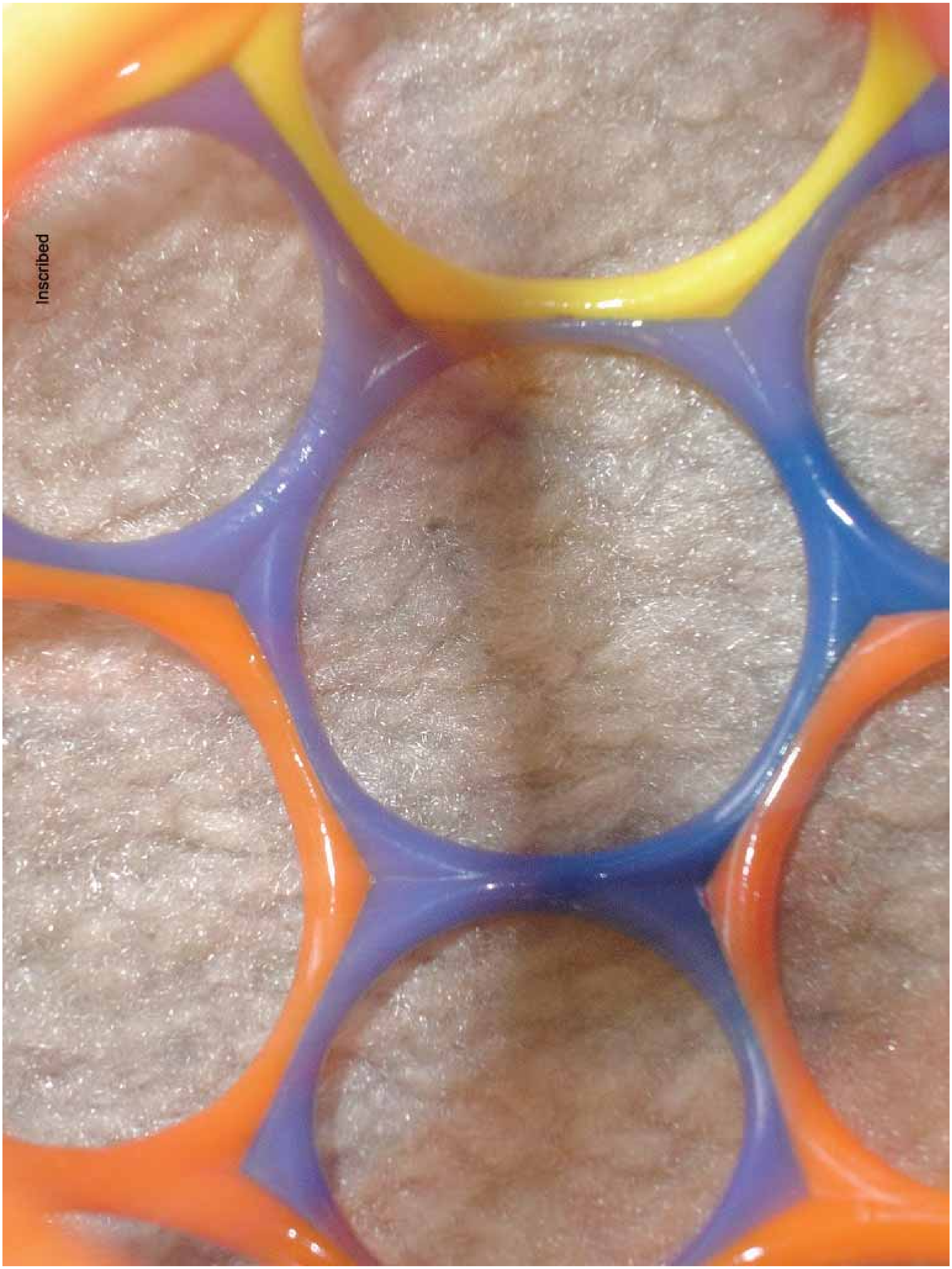
Circle

Circumference

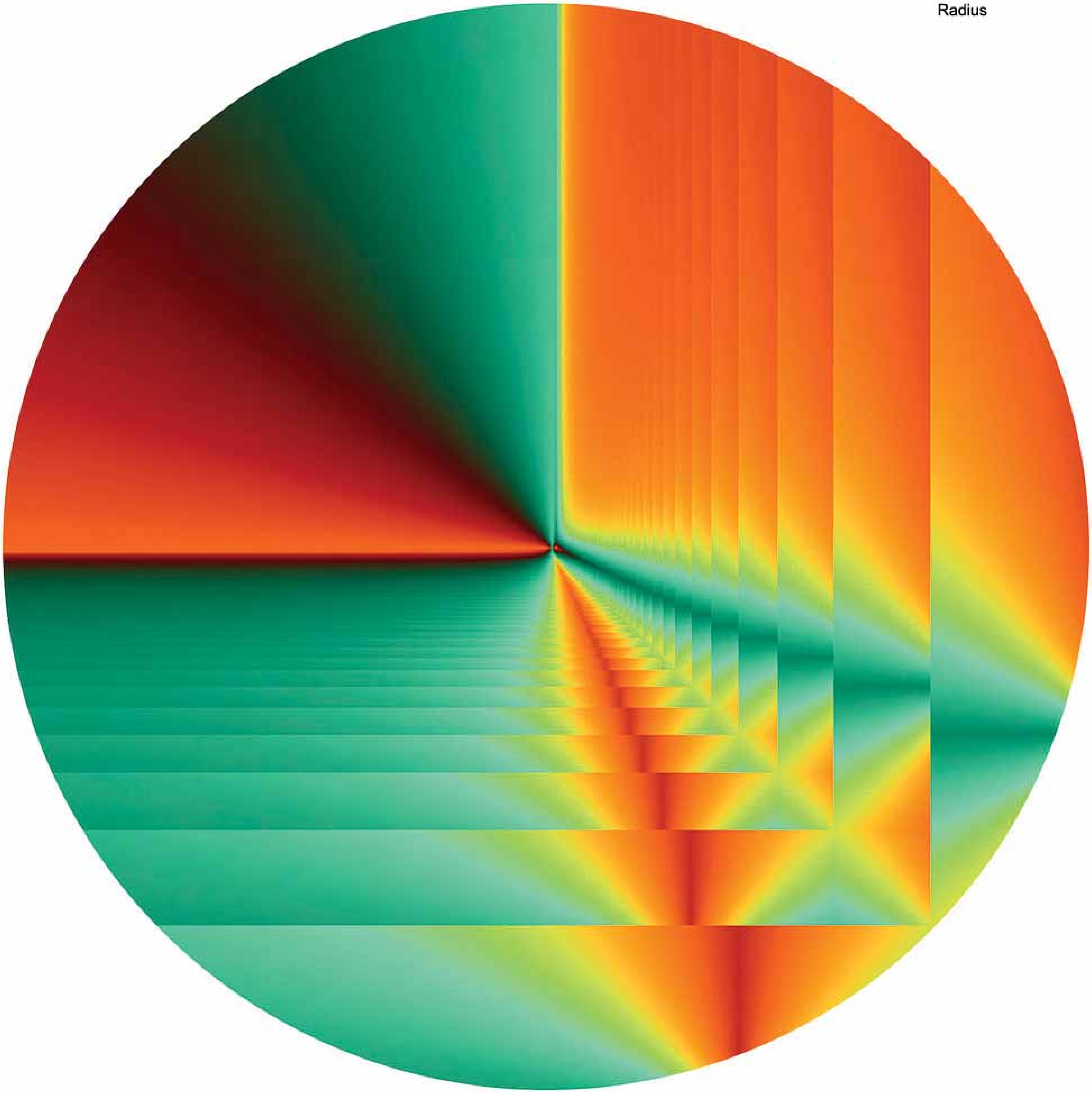

Circumscribed


Concentric

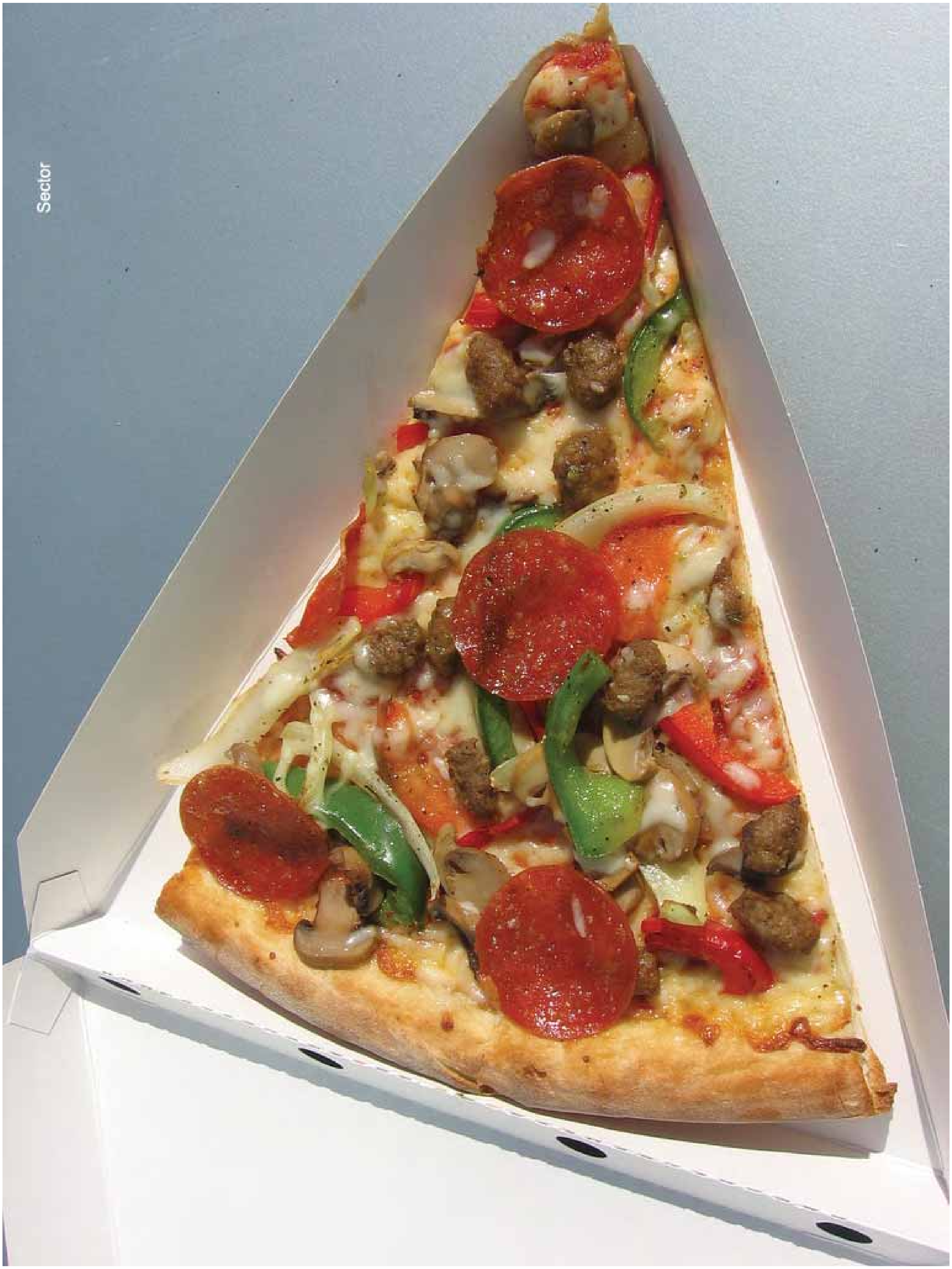
Diameter



Pi




Secant


Sector

Semicircle


Tangent

# True-False Sentences

**(Listening and/or Reading Comprehension)**

1. All of the points of a **circle** are coplanar.
2. The **circumference** of a circle is the same as its perimeter.
3. A **radius** and a chord of a circle are the same thing.
4. The **diameter** of a circle is also a chord.
5. Each circle can have only one **arc**.
6. One quarter of a circle is a **semicircle**.
7. A **central angle** has its vertex at the center of a circle.
8. Any pie-shaped piece of a circle is a **sector.**
9. A **chord** has endpoints that are on a circle.
10. A line that is **tangent** to a circle touches it at only one point.
11. A triangle inside a circle is **circumscribed** by the circle if each vertex is on the circle.
12. An irregular polygon cannot be **inscribed** in a circle.
13. A large circle has a higher value of **pi** than a small circle.
14. A **secant** does not have endpoints on a circle.
15. **Concentric** circles intersect each other.
16. An **annulus** is formed by concentric circles.

Answers: 1. T, 2. T, 3. F, 4. T, 5. F, 6. F, 7. T, 8. F, 9. T, 10. T, 11. T, 12. F, 13. F, 14. T, 15. F, 16. T

1. A **circle** can have a radius that is longer than its diameter.
2. The center of a circle is also on its **circumference**.
3. The **radius** of a circle has one endpoint at the center.
4. Concentric circles always have the same diameters.
5. An **arc** is part of the circumference of a circle.
6. A **semicircle** is also an arc.
7. There are exactly twelve **central angles** in each circle.
8. A **sector** of a circle has two sides formed by radii.
9. Part of a **chord** might be outside of the circle.
10. Each circle has a limited number of **tangents.**
11. Any figure inside a circle is said to be **circumscribed**.
12. The sides of a triangle would be tangents of a circle **inscribed** in the triangle.
13. The value of **pi** is the same for every circle.
14. A curved line might be a **secant**.
15. **Concentric** circles have the same center.
16. A chord and a radius are sides of an **annulus**.

Answers: 1. F, 2. F, 3. T, 4. F, 5. T, 6. T, 7. F, 8. T, 9. F, 10. F, 11. F, 12. T, 13. T, 14. F, 15.T, 16. F

## Match the Halves

| | |
|---|---|
| 1. The radius of a circle | A. does not intersect a circle |
| 2. Two radii and an included arc make | B. is shaped like a circle. |
| 3. Pizzas' sizes | C. a sector of a circle. |
| 4. A tangent | D. is shaped like an arc. |
| 5. Fold a circle in half | E. the circle is on the outside. |
| 6. A secant | F. has a vertex at the center. |
| 7. The top of a tuna can | G. is an annulus |
| 8. If something is circumscribed by a circle | H. has two endpoints on the circle |
| 9. If something is inscribed in a circle | I. you would need to know the circumference. |
| 10. A rainbow | J. the value of pi is obtained. |
| 11. When the circumference is divided by the diameter | K. you can see concentric circles. |
| 12. The central angle of a circle | L. refer to the diameter. |
| 13. The sidewall of a tire | M. for a semicircle. |
| 14. To choose chains for tires, | N. it is inside the circle. |
| 15. When you look at the lens of a camera | O. has one endpoint at the center. |
| 16. A chord of a circle | P. does intersect a circle |

1O, 2C, 3L, 4A, 5M, 6P, 7B, 8N, 9E, 10D, 11J, 12F, 13G, 14I, 15K, 16H

# Definitions

**Circle**: a closed curve whose points are all on the same plane and at the same distance from a fixed point (the center).

**Circumference**: the perimeter or outer boundary of a circle, and also the distance around the outside of a circle.

**Radius**: a line segment that connects the center of a circle with a point on its circumference, or, the length of that line segment.

**Diameter**: a line segment between two points on a circle which passes through the center. The word diameter also refers to the length of this line segment.

**Arc**: any unbroken part of a circle's circumference.

**Semicircle**: half a circle, or an arc with 180o.

**Central angle:** an angle whose vertex is at the center of a circle.

**Sector**: a part of a circle that is bounded by two radii and the arc between them.

**Chord**: a line segment in the interior of a circle that has both endpoints on a circle.

**Tangent**: touching at a single point (the point of tangency) without crossing over.

**Circumscribed**: surrounded by the smallest circle (or other figure) possible.

**Inscribed**: on the inside of another figure, touching it in as many points as possible.

**Pi**: the ratio of the circumference of a circle to its diameter.

**Secant**: a line that intersects a circle (or another curve) at two points.

**Concentric**: having a common center.

**Annulus**: a region between two concentric circles that are different sizes.

## Which Belongs

1. A line that touches a circle but does not intersect it is a (tangent, secant, chord).

2. Any part of the circumference of a circle is (a sector, a semicircle, an arc) if it is an unbroken part.

3. A circle that is inside a square is (circumscribed, inscribed, concentric) if it touches each side of the square.

4. Each point on the perimeter of a (square, circle, triangle) is equidistant from its center.

5. A (chord, radius, secant) intersects a circle at two points.

6. To find the (diameter, radius, circumference) of a circle you could measure across it from one side to the other, as long as you measured through the center.

7. An angle with its vertex inside a circle is a (sector, chord, central angle) only if the vertex is at the center.

8. A central angle intersects a circle to form (an arc, a sector, a semicircle).

9. A (circumference, radius, chord) of a circle is always longer than its diameter.

10. A donut shape is (a sector, an arc, an annulus)

11. The circumference of a circle has only one point in common with a (radius, diameter, chord).

12. One type of arc is a (sector, semicircle, secant).

13. A numerical value that is the same for every circle is (circumference, diameter, pi).

14. A diameter is also a (chord, secant, tangent).

15. When Valerie found a hula hoop that fit over a box so that each corner of the box touched it, she had (inscribed, circumscribed, circled) the box.

16. On a wheel, the rim and the tire are (concentric, inscribed, tangent) circles.

1. Tangent
2. Arc
3. Inscribed
4. Circle
5. Secant
6. Diameter
7. Central angle
8. Sector
9. Circumference
10. Annulus
11. Radius
12. Semicircle
13. Pi
14. Chord
15. Circumscribed
16. Concentric

# Multiple Choice

1. To begin a folk dance, dancers formed two circles, one inside the other. This is an example of:
    A. tangent circles
    B. concentric circles
    C. inscribed circles

2. Ann was making a round "stuff sack" for her camping trip. She cut out a circle for the bottom of the bag. In order to measure the material she needed to cut for the main part of the bag, what would she need to know about her circle?
    A. Its circumference
    B. Its central angle
    C. Its diameter

3. Benjamin had a can of smoked salmon that he wanted to give his mom as a present. He made a box that exactly fit around the can. Looking down on the can in the box, he saw:
    A. A square circumscribed by a circle
    B. A circle inscribed in a square
    C. An annulus

4. The car's tires were buried in snow right up to their axles, so each one looked like a
    A. Sector of a circle
    B. Chord
    C. Semicircle

5. To make an "angel food" cake, Herman used a round pan with a hole in the middle. The cake was shaped like a(n)
    A. Sector
    B. Arc
    C. Annulus

6. To raise money, the club was selling pizza by the slice. They were careful to cut each pizza so that all six slices were exactly the same size. Each slice was a
    A. Sector
    B. Semicircle
    C. Secant

7. A forester wanted to count the number of spruce trees that were located within fifty feet of a large red cedar, so he measured a circle with a fifty foot
    A. Arc
    B. Radius
    C. Diameter

8. Thomas walked one third of the way on the sidewalk around the traffic circle. He walked along a(n)
    A. Arc
    B. Chord
    C. Circle

9. A closed curve whose points are all on the same plane and at the same distance from a fixed point (the center) is called a:
   A. Secant
   B. Arc
   C. Circle

10. Two spokes on a wheel begin at the center of the wheel and extend to its edge, forming a:
    A. Central angle
    B. Chord
    C. Secant

11. Some children standing in a circle take turns tossing a ball of string to another person, letting the string unwind as it is tossed. They end up with segments of string stretched across the circle in all directions. Each segment of string is a
    A. Tangent
    B. Secant
    C. Chord

12. A wheel is rolling along a line on the floor, and only one point on the wheel at a time touches the line. The line would be a
    A. Chord
    B. Tangent
    C. Diameter

13. When you put a circular hat on your head, you might say that your head is
    A. Inscribed in the hat
    B. Circumscribed by the hat
    C. Adjacent to the hat

14. For every circle, Pi is the ratio of
    A. The circumference to the diameter
    B. The circumference to the radius
    C. Any central angle to its chord.

15. A buttonhole must be at least as long as which measurement of the button
    A. Circumference
    B. Radius
    C. Diameter

16. Jeff made a mouse trap by laying a long stick across the top of a round bucket full of water. The stick formed a
    A. Radius
    B. Tangent
    C. Secant

Answers:

1B, 2A, 3B, 4C, 5C, 6A, 7B, 8A, 9C, 10A, 11C, 12B, 13B, 14A, 15 C, 16C

## Complete the Sentence

1. To find the diameter of a round tree trunk, Helen measured around the tree and divided by ____________________.
2. A ____________________ is a line that intersects a circle in two places.
3. The distance around the outside of a dinner plate is its ____________________.
4. If the dinner plate was sitting on a square placemat so that its edges were even with the sides of the placemat, it would be like a circle __________________in (or by) a square.
5. A pie chart is divided into ____________________.
6. The longest distance across a round frying pan would be the __________________ of the pan.
7. The curve at the top of a window is shaped like one third of a circle, so it would be a(n) ______________________________of the circle.
8. If a slice of a round cake was cut perfectly, its two sides would form a(n) ____________________ of the cake.
9. It is important that a wheel be shaped like a perfect __________________.
10. The lid of a bucket had a round hole cut out of its middle, so it was shaped like a (n) _________________.
11. Sue and Sam were riding on a Ferris wheel in different "cars". The shortest distance between them would be a _________________ of the circle formed by the wheel.
12. A straight knife that is next to a plate and barely touching it would be ________________ to the plate.
13. A square label just barely fit the top of the jar of jam: all of its corners touched the rim of the lid. The label was __________________________ by the rim.
14. A _____________________________ of a circle forms each side of each central angle.
15. When Alan ate half of a pizza, he was eating a ___________________________.
16. Two things with the same center are ___________________________________.

Answers:

1. Pi
2. Secant
3. Circumference
4. Inscribed
5. Sectors
6. Diameter
7. Arc
8. Central angle
9. Circle
10. Annulus
11. Chord
12. Tangent
13. Circumscribed
14. Radius
15. Semicircle
16. Concentric

## Creative Writing

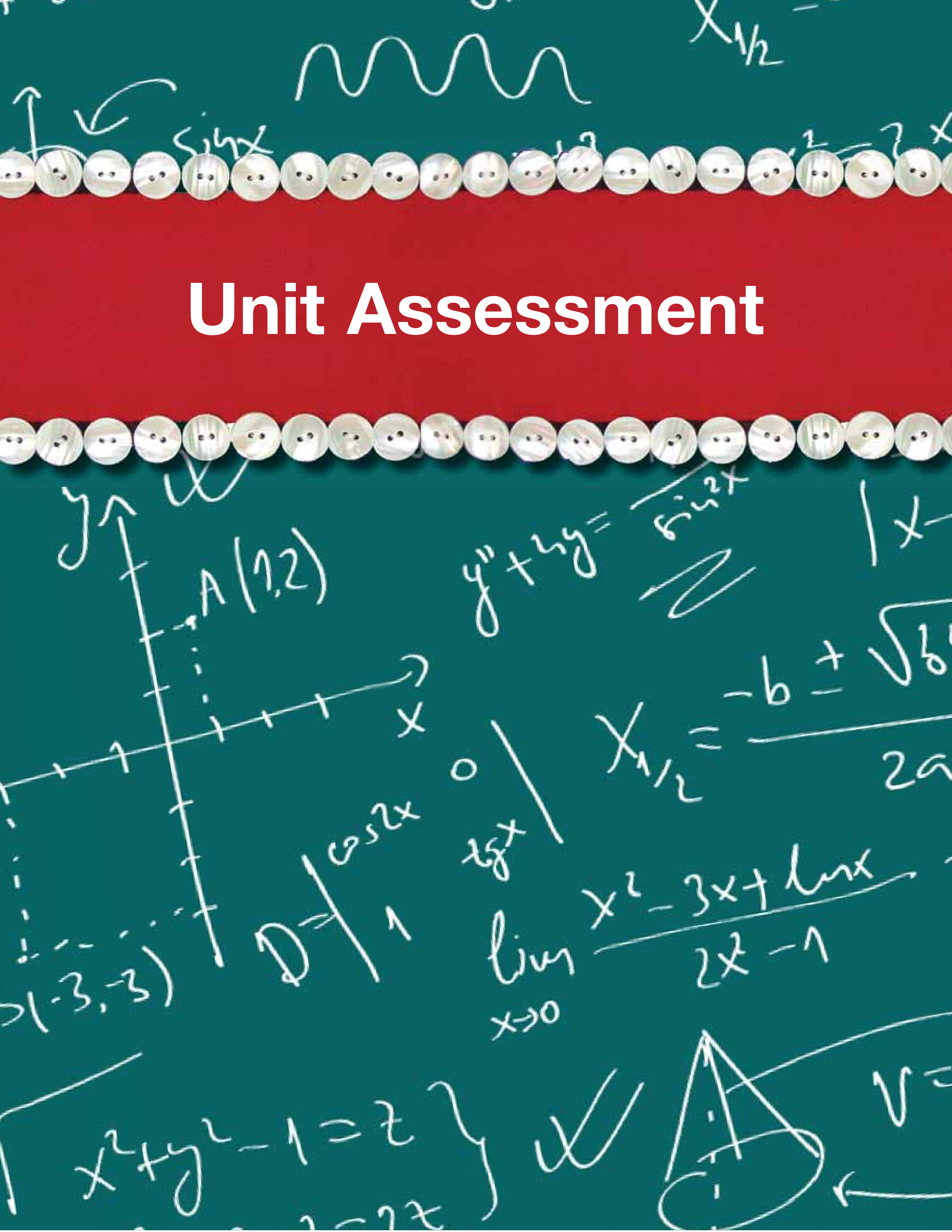
*Have the students write sentences of their own, based on the picture below. When finished, have each student read his/her sentences to the others.*

## Place-Based Practice Activity

Ask students to use something with a circular shape that is part of their daily lives to illustrate the terms in the unit.

They can measure it, finding its radius, diameter, and circumference. They can use other common materials to depict secants, chords, tangents, arcs, central angles, and sectors of their object, cover up half of it to make a semicircle, inscribe it, and circumscribe it. They can make another circle that is concentric and then find an annulus.

Make a digital camera available in the classroom for students who do not have one at home. They can take digital pictures of their illustrations, and share their work with a poster, booklet, or power point presentation.




# Unit Assessment

## Geometry: Unit 7-Circles

Name: ___________________
Date: ___________________

**Fill in the Blank: Read each sentence carefully and choose a word from the Word Bank that that best fits the sentence.**

| **Word Bank** | | |
|---|---|---|
| annulus | chord | circle |
| concentric | PI | tangent |

1) An ________ is a region between two concentric circles that are different sizes

2) ________ means touching at a single point without crossing over and is used with lines and curves that touch each other.

3) A ________ is a closed curve whose points are all on the same plane and at the same distance from a fixed point (the center).

4) In mathematics, ________ 03C0, stands for the ratio of the circumference of a circle to its diameter.

**Scrambled Words: unscramble the words below and write the correct word in the space provided. Use the definition to help.**

5) **usidar:** a line segment that connects the center of a circle with a point on its circumference, or, the length of that line segment ________

6) **teremaid:** a line segment between two points on a circle which passes through the center ________

7) **reohc:** a line segment in the interior of a circle that has both endpoints on a circle ________

8) **ntaces:** a line that intersects a circle (or another curve) at two points ________

9) **ecnerefmucric:** the perimeter or outer boundary of a circle, and also the distance around the outside of a circle ________

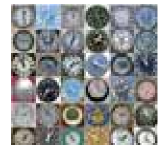
**Matching: Match the key vocabulary word on the left with the illustration that matches it on the right. Place the letter from the illustration in front of the correct word.**

10) _____ arc

11) _____ semicircle

12) _____ diameter

13) _____ central angle

a. 

b. 

c. 

d. 

**Multiple Choice: Look at the illustration for each item, and choose the word that matches the illustration.**

14) Look at the following illustration. Select the key vocabulary word that defines the illustration.

a) inscribed

b) concentric

c) circumscribed

15) Look at the following illustration. Select the key vocabulary word that defines the illustration.

a) inscribed

b) concentric

c) circumscribed

16) Look at the following illustration. Select the key vocabulary word that define the illustration.

a) inscribed

b) concentric

c) circumscribed

**True/False: Read each statement below to decide if it is true or false. Circle the correct answer.**

17) An arc of a circle is any unbroken part of its circumference.

a) True

b) False

18) A semicircle is half a circle, or an arc with 360o.

a) True

b) False

19) A central angle is an angle whose vertex is at the center of a circle.

a) True

b) False

20) The value of 03C0 is 22/7 or 3.14159 = C/d

a) True

b) False

## Geometry: Unit 7-Circles

Name: ____________________
Date: ____________________

**Fill in the Blank: Read each sentence carefully and choose a word from the Word Bank that that best fits the sentence.**

| **Word Bank** | | |
|---|---|---|
| annulus | chord | circle |
| concentric | PI | tangent |

1) An **annulus** is a region between two concentric circles that are different sizes

2) **tangent** means touching at a single point without crossing over and is used with lines and curves that touch each other.

3) A **circle** is a closed curve whose points are all on the same plane and at the same distance from a fixed point (the center).

4) In mathematics, **PI** 03C0, stands for the ratio of the circumference of a circle to its diameter.

**Scrambled Words: unscramble the words below and write the correct word in the space provided. Use the definition to help.**

5) **usidar:** a line segment that connects the center of a circle with a point on its circumference, or, the length of that line segment **radium**

6) **teremaid:** a line segment between two points on a circle which passes through the center **diameter**

7) **reohc:** a line segment in the interior of a circle that has both endpoints on a circle **chord**

8) **ntaces:** a line that intersects a circle (or another curve) at two points **secant**

9) **ecnerefmucric:** the perimeter or outer boundary of a circle, and also the distance around the outside of a circle **circumference**

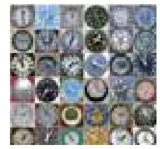
**Matching: Match the key vocabulary word on the left with the illustration that matches it on the right. Place the letter from the illustration in front of the correct word.**

10) b arc

11) d semicircle

12) c diameter

13) a central angle

a. 

b. 

c. 

d. 

**Multiple Choice: Look at the illustration for each item, and choose the word that matches the illustration.**

14) Look at the following illustration. Select the key vocabulary word that defines the illustration.

a) inscribed

b) concentric

c) circumscribed

15) Look at the following illustration. Select the key vocabulary word that defines the illustration.

a) inscribed

b) concentric

c) circumscribed

16) Look at the following illustration. Select the key vocabulary word that define the illustration.

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**True/False: Read each statement below to decide if it is true or false. Circle the correct answer.**

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b) False

19) A central angle is an angle whose vertex is at the center of a circle.

a) True

b) False

20) The value of 03C0 is 22/7 or 3.1415922026202603C0 = C/d.

a) True

b) False

# UNIT 8
## Polygons & Area

Sealaska Heritage Institute

# Grade Level Expectations for Unit 8

## Unit 8—Polygons and Area

**Alaska State Mathematics Standard A**
A student should understand mathematical facts, concepts, principles, and theories.

A student who meets the content standard should:

A5) construct, draw, measure, transform, compare, visualize, classify, and analyze the relationships among geometric figures; and

**Alaska State Mathematics Standard C**
A student should understand and be able to form and use appropriate methods to define and explain mathematical relationships.

A student who meets the content standard should:

C1) express and represent mathematical ideas using oral and written presentations, physical materials, pictures, graphs, charts, and algebraic expressions;

C2) relate mathematical terms to everyday language;

**GLEs**
The student demonstrates an understanding of geometric relationships by

[10] G-1 identifying, analyzing, comparing, or using properties of plane figures:
• sum of interior or exterior angles of a polygon

The student demonstrates a conceptual understanding of geometric drawings or constructions by

[10] G-8 drawing, measuring, or constructing geometric models of plane figures (containing parallel and/or perpendicular lines, angles, perpendicular bisectors, congruent angles, regular polygons) (L)

The student communicates his or her mathematical thinking by

[9] PS-3 representing mathematical problems numerically, graphically, and/or symbolically, translating among these alternative representations; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

[10] PS-3 representing mathematical problems numerically, graphically, and/ or symbolically, communicating math ideas in writing; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

# Vocabulary & Definitions

# Introduction of Math Vocabulary

*Note: For fun, a You Tube video ("TMBG: Here Come the 123s Nonagon", http://ie.youtube.com/watch?v=x5ohtlewREI, gives a singing introduction to polygons (nonagons, hexagons, etc.)*

**Review from previous units:**
A polygon is a closed plane figure with straight sides.

## Regular polygon

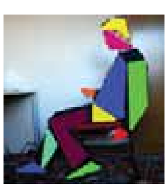
A regular polygon is one in which all sides are congruent and all angles are congruent. Equilateral triangles and squares are examples of regular polygons.
If all of the sides of a polygon are not congruent, or all of its angles are not congruent, it is an irregular polygon. Here are regular polygons with 3, 4, 5, 6, 7, 8, and 9 sides:

A soccer ball is made of regular polygons with four, six, and ten sides.

## Base

The base is the bottom side of a figure, or the side to which an altitude is drawn. If the top is parallel to the bottom (as in a trapezoid or prism), both the top and bottom are called bases.

This "polygon man" is sitting on the base of a triangle. Have students point out bases for other polygons in the picture.



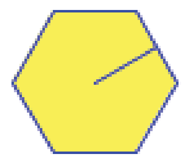
# Introduction of Math Vocabulary

## Altitude

The altitude or height is the shortest distance between the base of a geometric figure and its top, whether that top is a vertex or another base.

Ask students to identify the shape of the front of this wall tent (a pentagon). Then ask them what they would measure to find the altitude, assuming the base is the side along the ground. (They would measure the zipper)

## Apothem



An apothem is the line segment from the center of a regular polygon to the midpoint of a side, or the length of this segment.

Note: Apothem is pronounced with the emphasis on the first syllable with the "a" pronounced as in apple (A-puh-thum).

This quilt design is made with apothems. The larger squares are divided along their apothems to make the blocks of four small squares.

## Area

Area is the extent of a two-dimensional surface or region within given boundaries. It is measured in square units, such as square miles, square meters, or square inches.

This map of Southeast Alaska has boundaries drawn to divide it up into areas that correspond to boroughs and census areas.

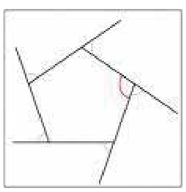
# Introduction of Math Vocabulary

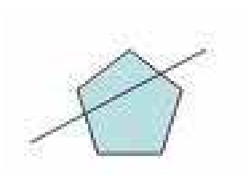
## Concave

A concave polygon is one for which a diagonal can be drawn that contains points that are outside the polygon. Think of a concave polygon as “caved in”.

## Convex

A convex polygon is one for which no side can be extended to intersect any other side or vertex; it can be cut by a straight line in at most two points.





## Perimeter

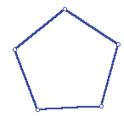
For a polygon, the perimeter is the sum of the lengths of all of its sides.

Ask students why they might want to measure the perimeter of a polygon. (They might want to order materials for a fence or a border; there are many more possible answers).

A fence surrounds the perimeter of this old garden at Porcupine Creek near Haines about 100 years ago.

# Introduction of Math Vocabulary

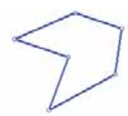
## Pentagon

A pentagon is a polygon with five sides.

This flower, called a wild morning glory, has a pentagon shape:

## Hexagon

A hexagon is a polygon with six sides.

A hexagonal shape is frequently found in nature. Examples include snowflakes, lava columns, and honeycombs.

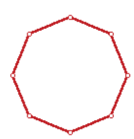
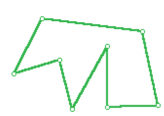


## Heptagon


A heptagon is a polygon with seven sides.

Some coins, such as this British pence, are shaped like heptagons.

## Octagon

An octagon is a polygon with eight sides.

This trampoline is in the shape of an octagon.

# Introduction of Math Vocabulary

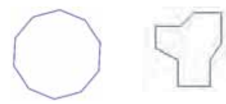
## Nonagon

A nonagon is a polygon with nine sides

One example of a nonagon is found on the bottom of this glass.

## Decagon

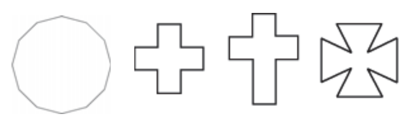
A decagon is a polygon with ten sides.



The stars on the Alaska Flag are decagons. Ask students if these are regular or irregular decagons. (Irregular) Are they concave or convex? (Convex)

## Dodecagon

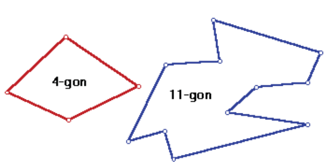
A dodecagon is a polygon with twelve sides.



Ask students why a dodecagon might be a good shape for a clock face. (On a clock, time measurements are divided into twelve equal parts).

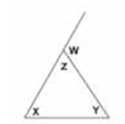
## N-gon

An n-gon is a polygon with n sides.



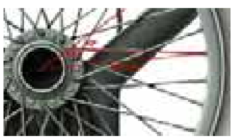
# Introduction of Math Vocabulary

## Exterior angle (of a polygon)




An exterior angle of a polygon is an angle between one side of a polygon and the extension of an adjacent side.

Here is an example of an exterior angle of a triangle formed by spokes on a bicycle wheel.



# Language and Skills Development

## Using the Math Vocabulary Terms

# Language & Skills Development

**LISTENING**

Use the activity pages from the Student Support Materials.

**Nod and Clap**

Mount the vocabulary illustrations on the chalkboard. Point to one of the illustrations and say its name. The students should nod their heads to indicate that you said the correct vocabulary word for the illustration. However, when you point to an illustration and say an incorrect name for it, the students should clap their hands ONCE. Repeat this process until all of the vocabulary illustrations have been used a number of times in this way.

**SPEAKING**

**One to Six**

Provide each student with two blank flashcards. Each student should then write a number on each of his flashcards, between one and six - one number per card. When the students' number cards are ready, toss two dice and call the numbers showing. Any student or students who have those two numbers must then identify a vocabulary illustration you show. The students may exchange number cards periodically during this activity.

**READING**

Use the activity pages from the Student Support Materials.

**What's the Word?**

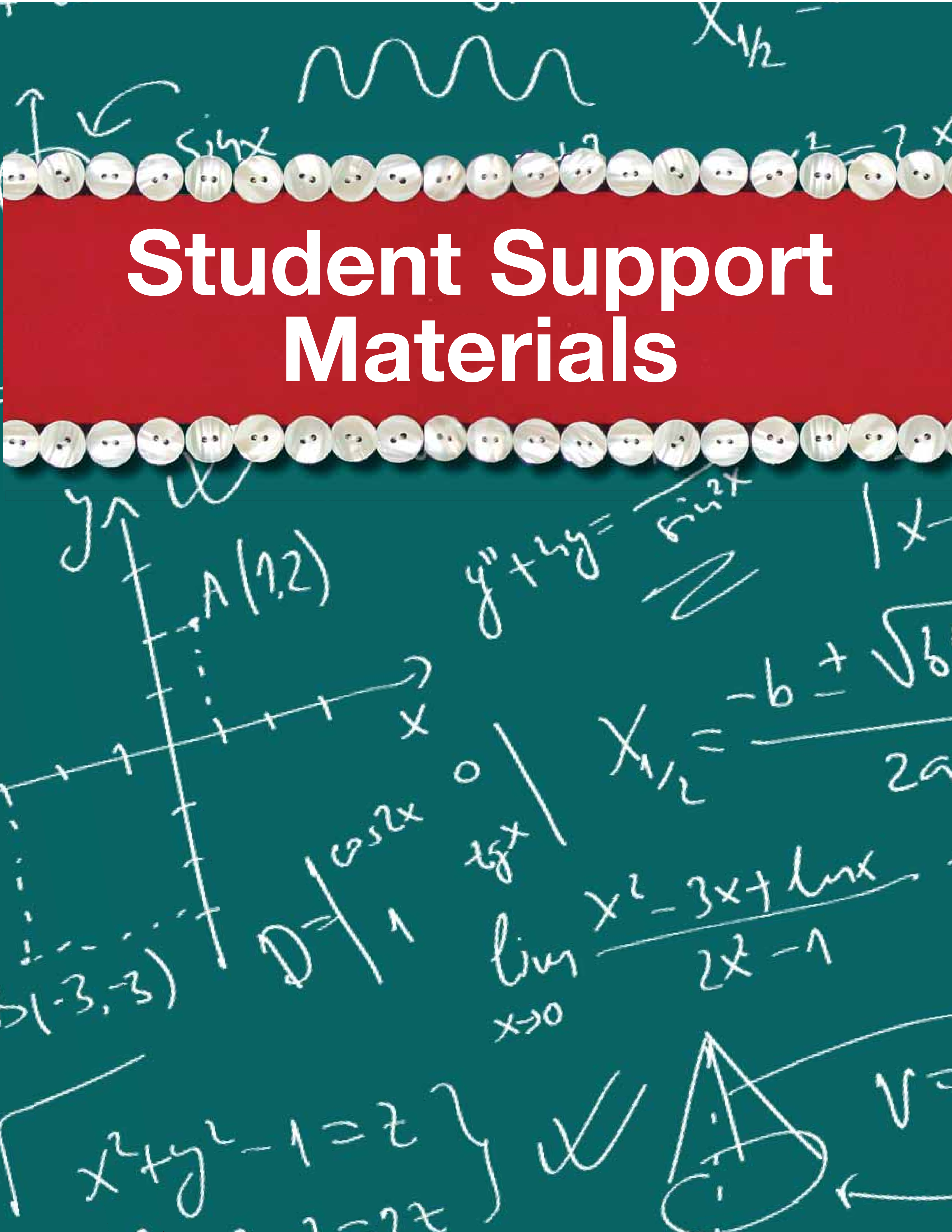
Before the activity begins, prepare clozure sentences on sentence strips (leaving out the sight words). Write the sight words on individual sight word cards. Mount the sentence strips on the chalkboard. Lay the sight words on the floor, in front of the chalkboard. Group the students into two teams. When you say "Go," the first player from each team must rush to the sight words. Each player must select a sight word and then place it in its correct sentence on the chalkboard. Repeat this process until all students have had an opportunity to respond (be certain to have a sufficient number of clozure sentences for this activity). An alternative approach for this activity is to provide each student with a sight word card. Hold up one of your sentence strips and the student or students who have the sight word that best completes the sentence you are holding, should show their cards. Have the students exchange sight word cards periodically during the activity.

**WRITING**

Use the activity pages from the Student Support Materials.

**What's the Title**

Before the activity begins, prepare a paragraph related to *motion*. Do not title the paragraph. Provide each student with a copy of the paragraph and a pencil/pen. The students should read the paragraph silently. Then, each student should create a title for it. They should write their titles at the top of the paragraph. When the students are finished, have each student read his/her title orally.



# Student Support Materials

Apothem


Area
© Allen Hsu

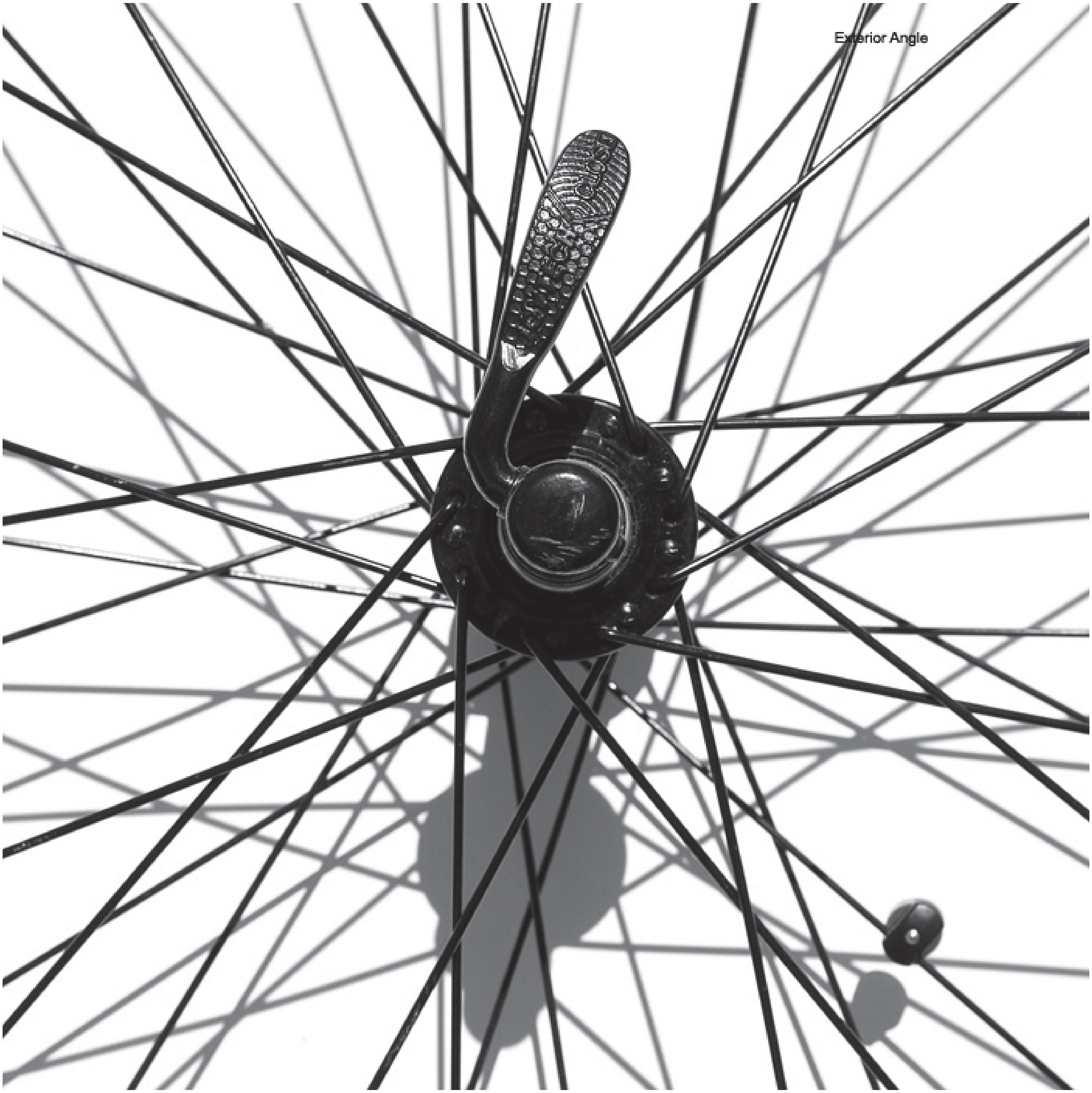

Base

Concave


Convex

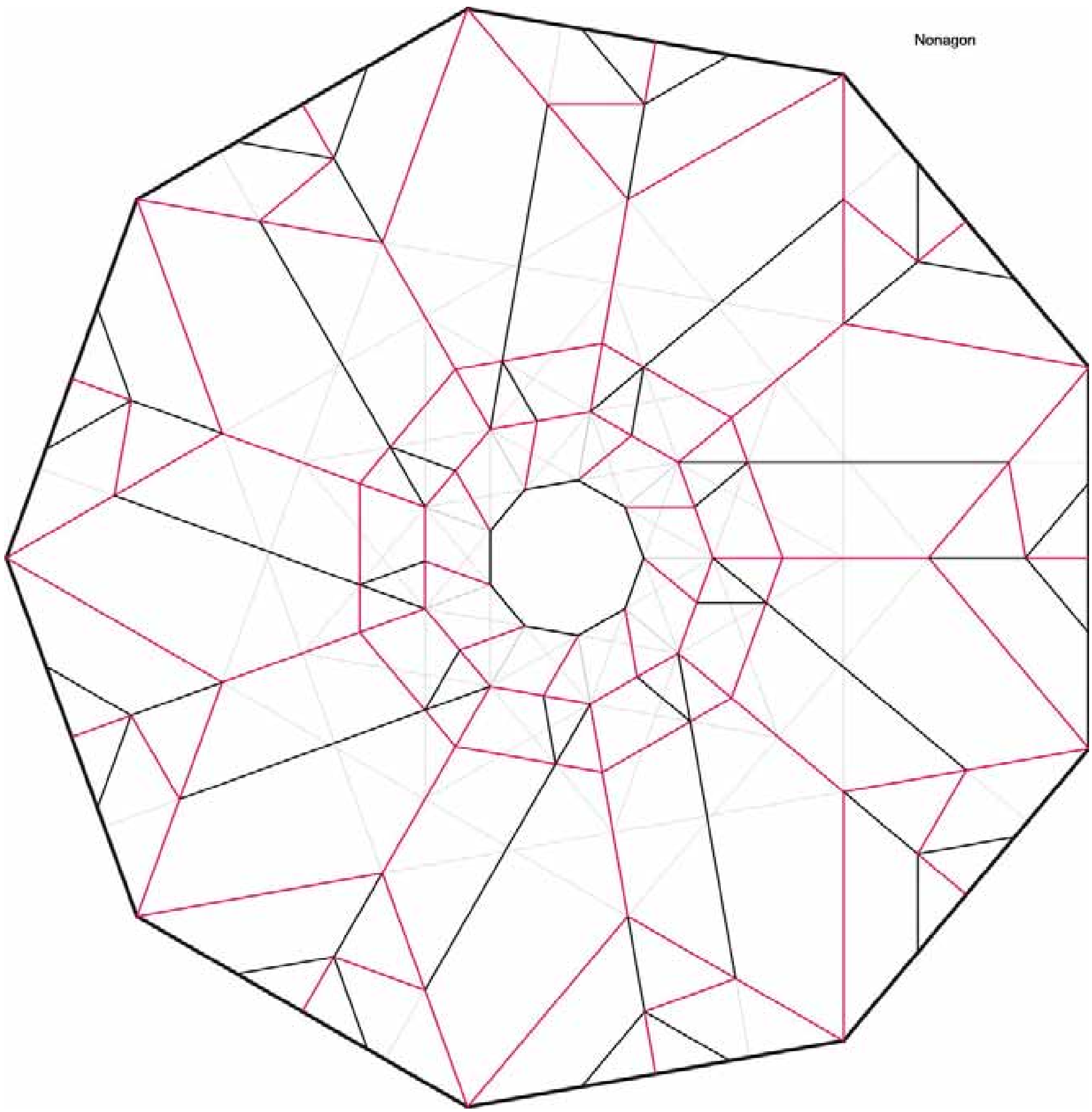

Decagon

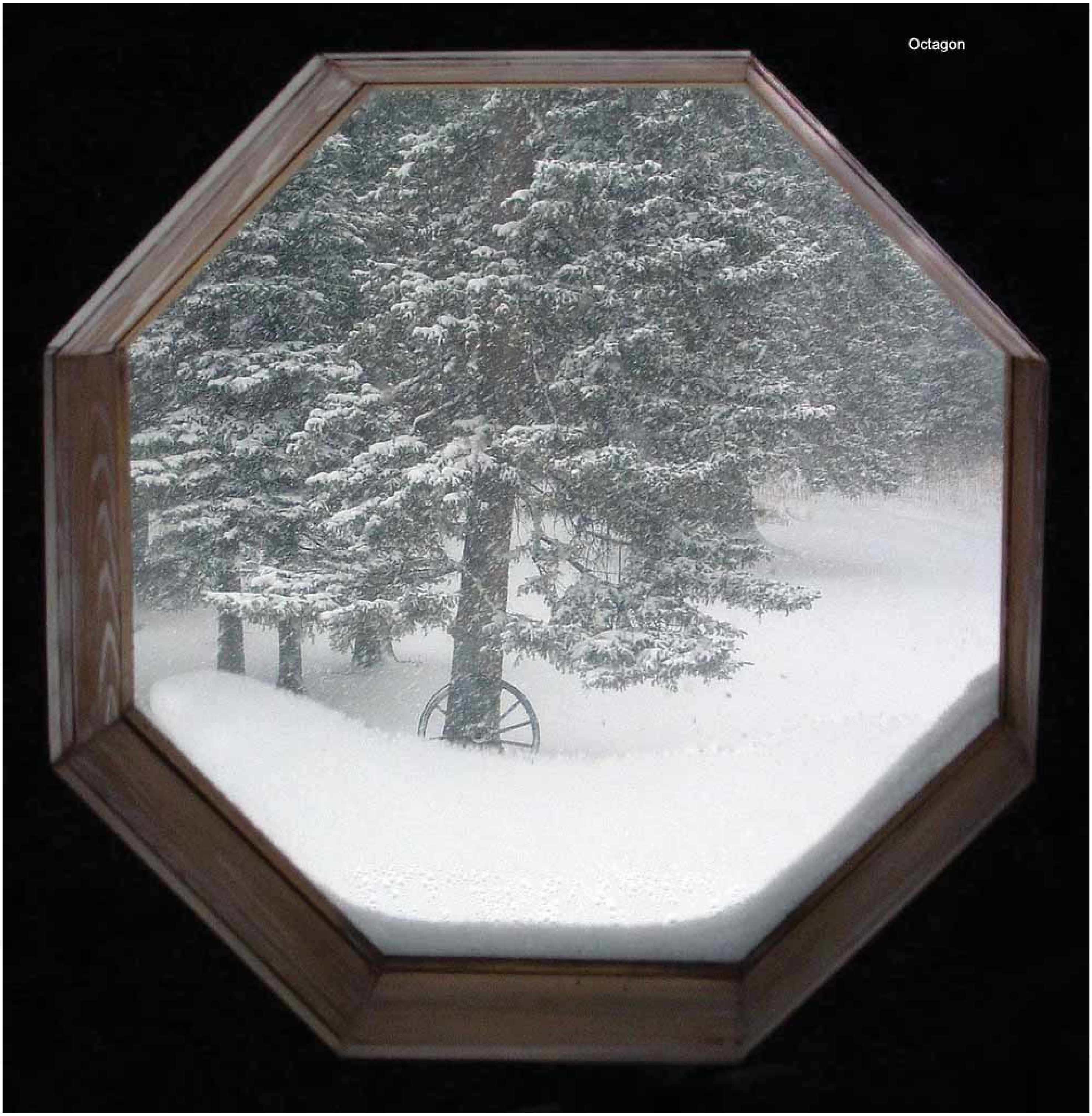

Dodecagon


Exterior Angle

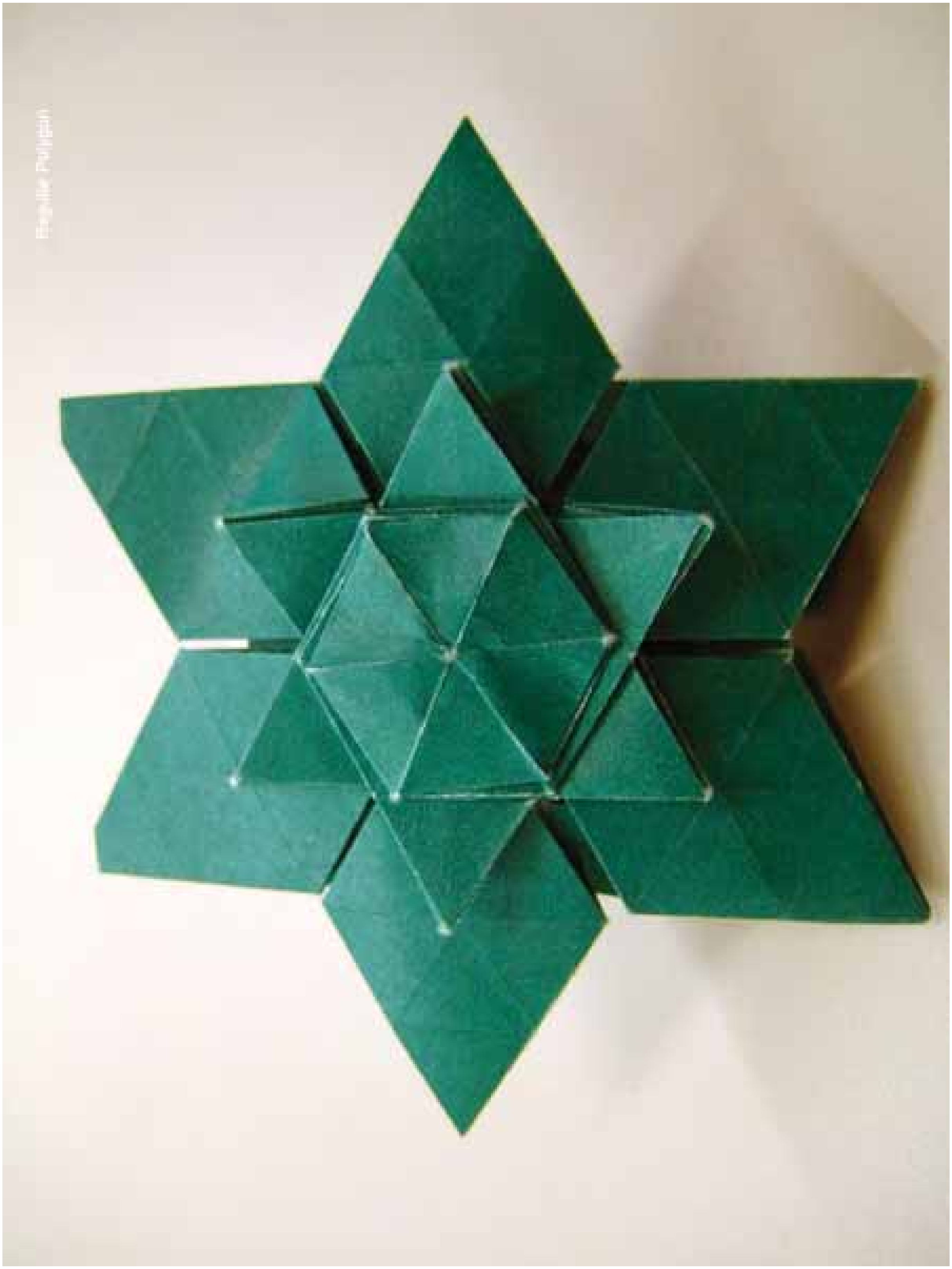

Heptagon
WS
PU
X
GIVE
WOMEN
THE
VOTE
50
PENCE
2003
1903


Hexagon


Nonagon


Octagon


Pentagon



# True-False Sentences

**(Listening and/or Reading Comprehension)**

1. A **regular polygon** has all sides congruent and all angles congruent.
2. Each polygon has only one **base**.
3. A polygon may have more than one base, but only one **altitude**.
4. There are as many **apothems** as there are sides on a polygon.
5. It is impossible to find the **area** of a concave polygon.
6. An L-shaped floor plan is an example of a **concave** polygon
7. All regular polygons are **convex**.
8. The **perimeter** of a polygon is longer than any of its sides.
9. A **pentagon** can never have two parallel sides.
10. A **hexagon** shape is found in honeycombs.
11. A **heptagon** has eight sides.
12. An **octagon** is one of the shapes that are found on a soccer ball.
13. A **nonagon** has two more sides than a heptagon.
14. **Decagons** are never convex.
15. A **dodecagon** has more sides than a decagon.
16. One type of an **n-gon** might have 27 sides.
17. Concave polygons cannot have **exterior angles.**

Answers: 1T, 2F, 3F, 4T, 5F, 6T, 7T, 8T, 9F, 10T, 11F, 12F, 13T, 14F, 15T, 16T, 17

1. If all the sides of a polygon are congruent, it is always a **regular polygon.**
2. The **base** of a polygon is always a straight line segment.
3. A polygon's **altitude** is measured from a base to its topmost vertex or side.
4. An **apothem** is measured from the center of a polygon to a vertex.
5. **Area** is a two-dimensional measurement.
6. If a polygon is irregular it is also **concave**.
7. If all the sides of a polygon are equal, it is **convex**.
8. If a polygon has two parallel sides the same length, only one of them is included in the **perimeter.**
9. A **pentagon** can be convex or concave.
10. A six-pointed star is shaped like a **hexagon.**
11. Regular **heptagons** are a challenge to find in the average living room.
12. A stop sign is shaped like an **octagon.**
13. Most classrooms are shaped like **nonagons.**
14. In the word **decagon**, the number 10 is indicated by the prefix "dec", just like the word decimal.
15. A **dodecagon** has twice as many sides as a decagon.
16. An **n-gon** always has an odd number of sides.
17. One side of a polygon forms one side of its **exterior angle**.

Answers: 1F, 2T, 3T, 4F, 5T, 6F, 7F, 8F, 9T, 10F, 11T, 12T, 13F, 14T, 15F, 16F, 17 T

## Match the Halves

| | |
|---|---|
| 1. A closed plane figure made with ten line segments is a | A. is measured to a vertex or a parallel side. |
| 2. A regular polygon must have all sides congruent and | B. bases. |
| 3. The altitude of a polygon | C. nine toothpicks. |
| 4. A six pointed star is | D. pentagon. |
| 5. A model of a nonagon could be constructed using | E. has seven sides. |
| 6. To create an exterior angle | F. one side of a polygon is extended. |
| 7. A dodecagon has twice as many sides as | G. convex. |
| 8. A hexagon might be created by | H. decagon. |
| 9. If two sides of a polygon are parallel, both are called | I. an octagon |
| 10. A polygon is called heptagonal if it | J. perimeter. |
| 11. To make a fence for an octagonal dog yard, a measurement is needed for the | K. two dimensions. |
| 12. A "T-shaped" building has eight sides so its flat roof is shaped like | L. also all angles congruent. |
| 13. Each side of a regular polygon has | M. an n-gon. |
| 14. Area is a measurement with | N. cutting two corners off a square to make two new sides. |
| 15. Half of a regular octagon would be a | O. an apothem. |
| 16. A polygon with an unknown number of sides is | P. concave |
| 17. All regular polygons are | Q. a hexagon. |

1H, 2L, 3A, 4P, 5C, 6F, 7Q, 8N, 9B, 10E, 11J, 12I, 13O, 14K, 15D, 16M, 17G

## Definitions

**Regular polygon:** one in which all sides are congruent and all angles are congruent.

**Base:** the bottom side of a figure, or the side to which an altitude is drawn. If the top is parallel to the bottom (as in a trapezoid or prism), both the top and bottom are called bases.

**Altitude:** the shortest distance between the base of a geometric figure and its top, whether that top is a vertex or another base.

**Apothem:** the line segment from the center of a regular polygon to the midpoint of a side, or the length of this segment.

**Area:** the extent of a two-dimensional surface or region within given lines. It is measured in square units.

**Concave:** such that a straight line might be drawn that intersects it in four or more points.

**Convex:** such that no side can be extended to intersect any other side or vertex

**Perimeter**: the sum of the lengths of the sides.

**Pentagon**: a polygon with five sides.

**Hexagon**: a polygon with six sides.

**Heptagon**: a polygon with seven sides.

**Octagon**: a polygon with eight sides.

**Nonagon**: a polygon with nine sides.

**Decagon**: a polygon with ten sides.

**Dodecagon**: a polygon with twelve sides.

**n-gon**: a polygon with n sides.

**Exterior angle** (of a polygon): an angle between one side of a polygon and the extension of an adjacent side.

## Which Belongs

1. If a polygon has one dozen sides it is a (twelvogon, dodecagon, heptagon).
2. The (perimeter, area, apothem) of a polygon is the sum of all its sides.
3. If one more side was added to a hexagon, the result would be a (pentagon, nonagon, heptagon).
4. The (altitude, base, apothem) is the same as the height of a polygon.
5. A polygon with nine altitudes would be (a octagon, a nonagon, a ninogon)
6. If no line can intersect a polygon more than twice, it is (concave, regular, convex).
7. For a given base of a polygon, the (apothem, height, perimeter) would be shorter than the altitude.
8. If a segment connecting two vertices of a polygon is outside the polygon, it is (concave, regular, convex).
9. The (side, apothem, base) of a polygon is the side from which the altitude is measured.
10. If the number of sides of a polygon is the same as the number of years in a decade, it is a (tenagon, decagon, dodecagon).
11. A famous building in Washington DC is shaped like and named for a (nonagon, pentagon, n-gon).
12. If you don't know the number of sides of a polygon, you would call it an (irregular polygon, n-gon, octagon).
13. If the sides of a polygon are different lengths, it cannot be a (regular, convex, concave) polygon.
14. (Altitude, area, perimeter) is a two-dimensional measurement.
15. An (octagon, hexagon, pentagon) has the same number of sides as an octopus has legs.
16. A polygon with six angles is a (sexagon, hexagon, heptagon)
17. An (exterior angle, apothem, altitude) of a polygon is on the outside of it.

1. dodecagon
2. perimeter
3. heptagon
4. altitude
5. nonagon
6. convex
7. apothem
8. concave
9. base
10. decagon
11. pentagon
12. n-gon
13. regular
14. area
15. octagon
16. hexagon
17. exterior angle

## Multiple Choice

1. Suppose you can walk in a straight line from one corner of a building to another, on the outside of the building. How can you describe the building's shape?
   a) concave
   b) convex
   c) regular

2. If an octagon had one more side, what would it be?
   a) heptagon
   b) decagon
   c) nonagon

3. Which describes the shape of a stop sign?
   a) a pentagon
   b) a concave polygon
   c) regular polygon

4. What is the distance from a base of a polygon to an opposite vertex or base?
   a) the height
   b) the altitude
   c) both of the above

5. An octogenarian is a person in their '80s. Which polygon has the same number of sides as the decades of an octogenarian's life?
   a) an octagon
   b) a decagon
   c) a nonagon

6. If one side of a polygon is extended, which of the following is formed?
   a) an exterior angle
   b) a perimeter
   c) an apothem

7. What kind of polygon might have one hundred sides?
   a) a concave polygon
   b) an n-gon
   c) both of the above

8. The decimal system is based on the number ten. Which polygon is also based on the number ten?
   a) a dodecagon
   b) a pentagon
   c) a decagon

9. Which of the following does not ever intersect a vertex of a polygon?
   a) an altitude
   b) an apothem
   c) an exterior angle

10. To find the amount of carpet needed for a room, which of the following floor measurements would be needed?
   a) the perimeter
   b) the area
   c) the apothem

11. Which of the following is true of any regular polygon?
   a) It is concave
   b) One base is longer than another
   c) It is convex

12. What is always true of a polygon with five sides?
   a) It is a regular polygon
   b) It is a concave polygon
   c) It is a pentagon

13. Which matches the number of sides of a polygon?
   a) the number of possible bases
   b) the number of possible perimeters
   c) the number of possible exterior angles

14. Which of the following has seven apothems?
   a) a heptagon
   b) a hexagon
   c) a heftagon

15. How many sides does a dodecagon have?
   a) twenty
   b) two
   c) twelve

16. How would you find the perimeter of a nonagon?
   a) multiply the base times the altitude
   b) add the measurements of all of its sides
   c) add the measurements of all 9 apothems

17. How many sides does a hexagon have?
   a) seven
   b) sixty
   c) none of the above

Answers:

1A, 2C, 3C, 4B, 5A, 6A, 7B, 8C, 9B, 10B, 11C, 12A, 13A, 14A, 15 C, 16B, 17C

## Complete the Sentence

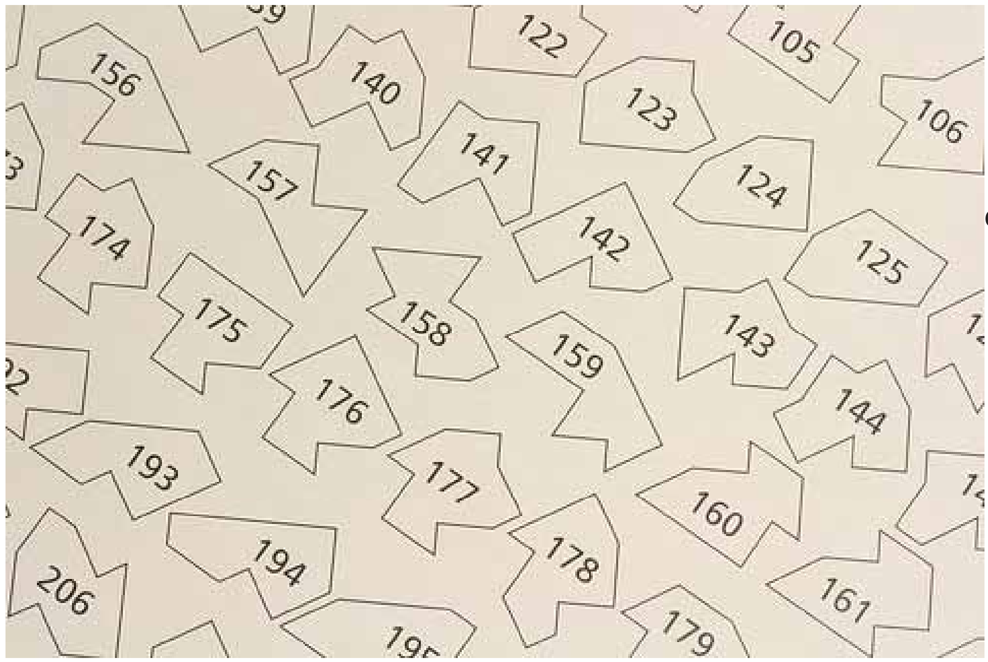
1. A(n) ____________________ has all sides congruent and all angles congruent.
2. Any polygon with ten sides is a(n) ____________________.
3. An angle formed by the side of a polygon and the extension of another side is a(n) _________________________of the polygon.
4. A(n) _____________________is a polygon with nine sides.
5. A five-sided polygon is called a(n) _________________________
6. A(n) __________________________has an endpoint at the center of a polygon.
7. A(n) ________________________can have any number of sides.
8. Any polygon with seven sides is called a(n) _________________________.
9. To measure the extent of a region of a plane, you would find its _____________.
10. A _________________________polygon is one that has a diagonal on its exterior.
11. The sum of the measurements of the sides of polygon is its ________________.
12. A six-sided polygon is a(n) _____________________even if it is irregular.
13. The __________________________of a polygon is measured from a base to a vertex or another side.
14. A(n) ______________________has twelve sides.
15. Each side of a polygon can also be a(n) ____________________.
16. If no line can intersect a polygon more than twice, it is __________________.
17. A(n) ______________________________is an eight-sided polygon.

Answers:

1. regular polygon
2. decagon
3. exterior angle
4. nonagon
5. pentagon
6. apothem
7. n-gon
8. heptagon
9. area
10. concave
11. perimeter
12. hexagon
13. altitude
14. dodecagon
15. base
16. convex
17. octagon

# Creative Writing

In 1999, an inventor by the name of Christopher Monckton created a puzzle called Eternity, involved tiling a dodecagon with 209 irregularly shaped polygons called polydrafters. The game included a £1,000,000 prize for any person who could solve the puzzle. In just 18 months two young Cambridge mathematicians produced a result. This is an image of the inventory of polydrafters that came with the game.




Students can use the words from the unit to talk about the irregular polygons shown, referring to them by number.

# Place-Based Practice Activity

1. Have students draw floor plans for a teen center, a remote cabin, a classroom, a house, or another type of structure that they might use alone or with their friends.

   Each floor plan should include at least one regular polygon with more than four sides. You may want to assign shapes to students of groups of students so that all of the shapes from the unit are covered, or to have students draw several floor plans using different shapes.

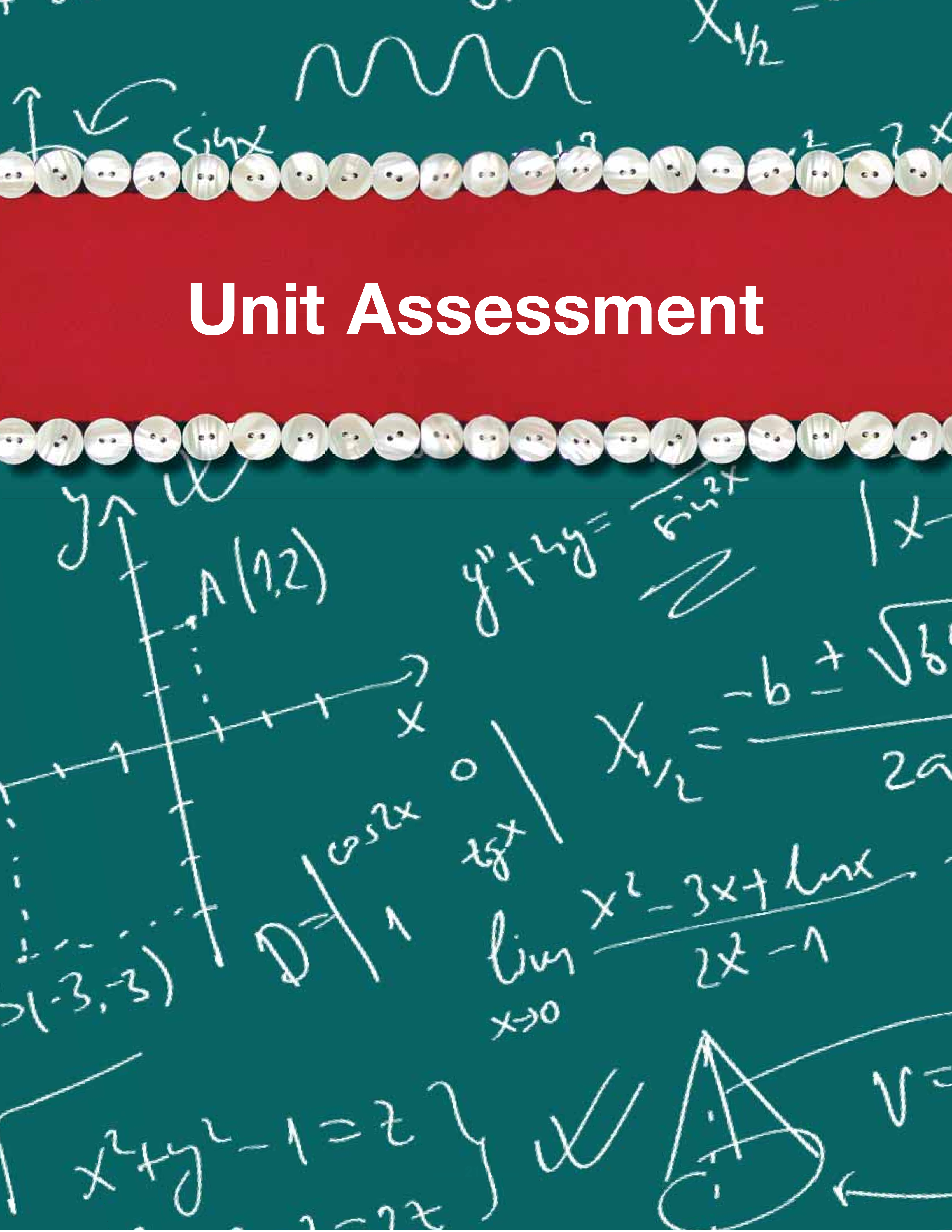
   Students can name the polygons on their floor plans and find their areas and perimeters. For regular polygons, they can label an apothem.

   Ask students to share the floor plans with the class.

   What are the advantages of each shape used on the floor plans? What are the disadvantages?

2. On a street map of your town, find polygons with more than four sides. Use the map scale to find the areas and perimeters of the polygons.

# Unit Assessment



## Geometry: Unit 8-polygons and area

Name: ____________________
Date: ____________________

| **Word Bank** | | |
|---|---|---|
| altitude | apothem | area |
| base | concave | polygon |

1) An ________ is the line segment from the center of a regular polygon to the midpoint of a side, or the length of this segment.

2) The ________ is the extent of a two-dimensional surface or region within given boundaries.

3) The bottom side of a figure is the ________.

4) The ________ or height is the shortest distance between the base of a geometric figure and its top, whether that top is a vertex or another base.

**Label Illustrations: Write the correct label below each of the illustrations below.**

5)

________________________

6)

________________________

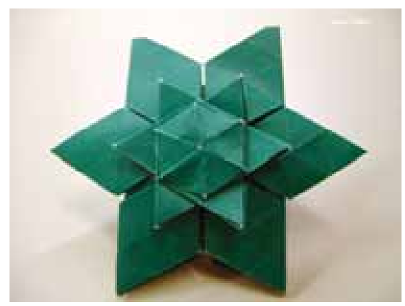
7)

_______________________________

8)

______________________

9)



______________________________

**Matching: Match the key vocabulary on the left with the correct definition on the right. Place the letter of the definition in front of the word it matches.**

10) ______ nonagon

11) ______ decagon

12) ______ dodecagon

13) ______ hexagon

14) ______ pentagon

15) ______ regular polygon

a. a polygon with ten sides

b. a polygon with 12 sides

c. a polygon with nine sides

d. polygon with all sides congruent and all angles congruent

e. a polygon with 6 sides

f. a polygon with 5 sides

**Multiple Choice: Choose the word that matches the illustration. Circle the letter in front of the correct word.**

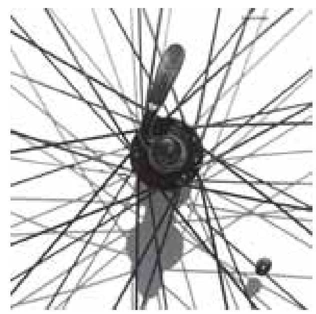
16) Choose the word that fits the following illustration.

a) concave polygon

b) convex polygon

c) exterior angle of a polygon

17) Choose the word that fits the following illustration.



a) concave polygon

b) convex polygon

c) exterior angle of a polygon

18) Choose the word that fits the following illustration.

a) concave polygon

b) convex polygon

c) exterior angle of a polygon

## Geometry: Unit 8-polygons and area

Name: ____________________
Date: ____________________

| **Word Bank** | | |
|---|---|---|
| altitude | apothem | area |
| base | concave | polygon |

1) An **apothem** is the line segment from the center of a regular polygon to the midpoint of a side, or the length of this segment.

2) The **area** is the extent of a two-dimensional surface or region within given boundaries.

3) The bottom side of a figure is the **base**.

4) The **altitude** or height is the shortest distance between the base of a geometric figure and its top, whether that top is a vertex or another base.

**Label Illustrations: Write the correct label below each of the illustrations below.**

5)

**pentagon**

6)

**heptagon**

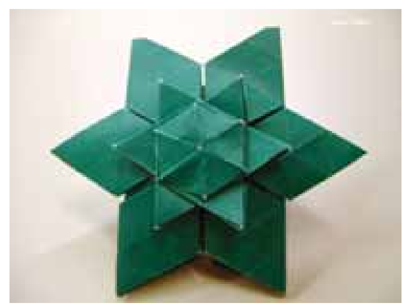
7)

hexagon

8)

octagon

9)



regular polygon

**Matching: Match the key vocabulary on the left with the correct definition on the right. Place the letter of the definition in front of the word it matches.**

10) c nonagon

11) a decagon

12) b dodecagon

13) e hexagon

14) f pentagon

15) d regular polygon

a. a polygon with ten sides

b. a polygon with 12 sides

c. a polygon with nine sides

d. polygon wilth all sides congruent and all angles congruent

e. a polygon with 6 sides

f. a polygon with 5 sides

**Multiple Choice: Choose the word that matches the illustration. Circle the letter in front of the correct word.**

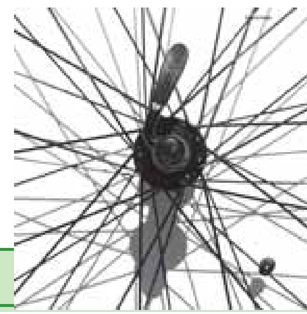
16) Choose the word that fits the following illustration.

a) concave polygon

b) convex polygon

c) exterior angle of a polygon

17) Choose the word that fits the following illustration.



a) concave polygon

b) convex polygon

c) exterior angle of a polygon

18) Choose the word that fits the following illustration.

a) concave polygon

b) convex polygon

c) exterior angle of a polygon

# UNIT 9
# Three Dimensional Figures

Sealaska Heritage Institute

# Grade Level Expectations for Unit 9

## Unit 9—Three Dimensional Figures

**Alaska State Mathematics Standard A**
A student should understand mathematical facts, concepts, principles, and theories.

A student who meets the content standard should:

A5) construct, draw, measure, transform, compare, visualize, classify, and analyze the relationships among geometric figures; and

**Alaska State Mathematics Standard C**
A student should understand and be able to form and use appropriate methods to define and explain mathematical relationships.

A student who meets the content standard should:

C1) express and represent mathematical ideas using oral and written presentations, physical materials, pictures, graphs, charts, and algebraic expressions;

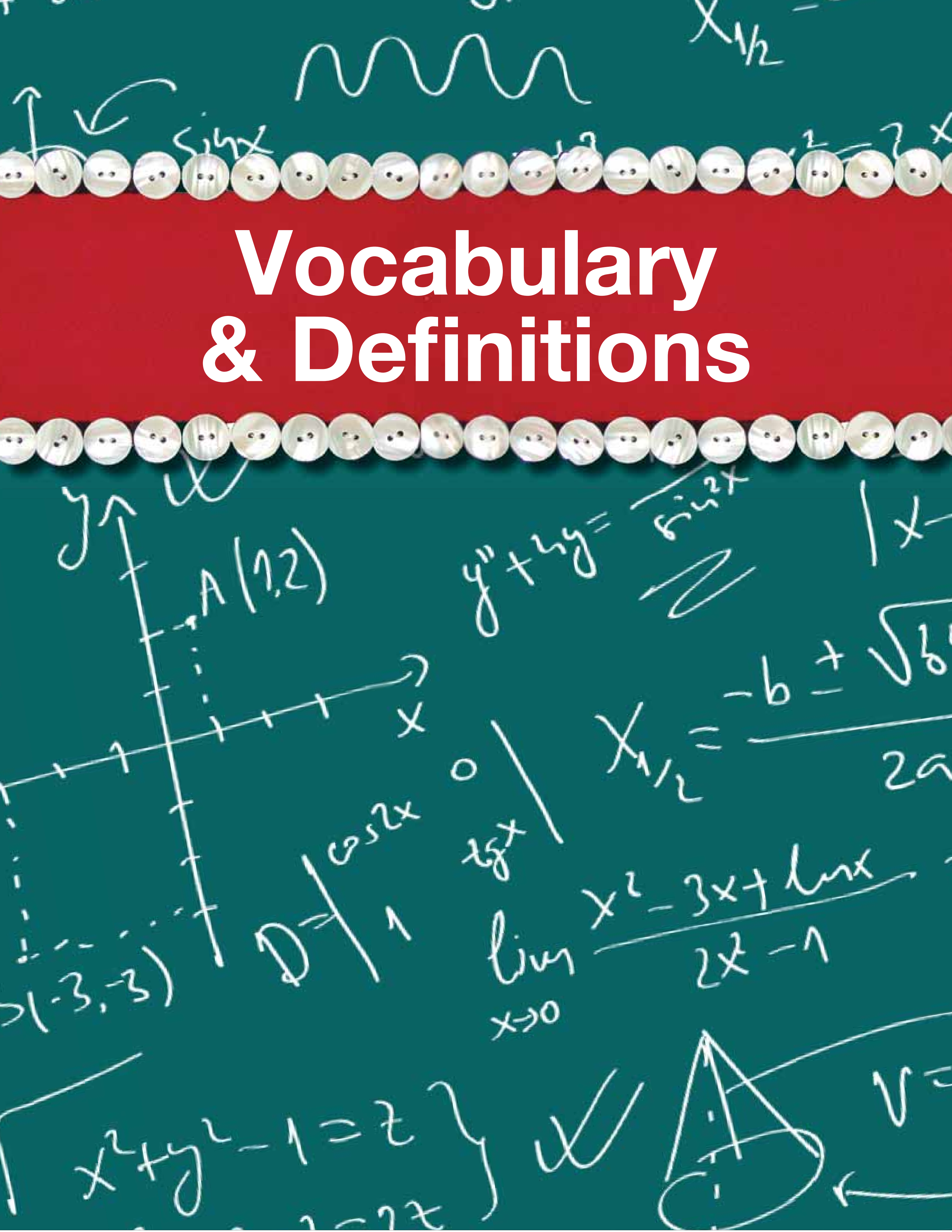
C2) relate mathematical terms to everyday language;

**GLEs**
The student communicates his or her mathematical thinking by

[9] PS-3 representing mathematical problems numerically, graphically, and/ or symbolically, translating among these alternative representations; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

[10] PS-3 representing mathematical problems numerically, graphically, and/ or symbolically, communicating math ideas in writing; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions

# Vocabulary & Definitions



# Introduction of Math Vocabulary

Review from previous units: congruent, base, vertex, polygon, and prefixes such as penta-, hexa-, hepta-, octa-, etc.

## Solid

a solid (short for geometric solid or solid geometric figure) is a three-dimensional closed figure that has a boundary.

Buildings and poles, like the ones in this picture of a Chief's house in Wrangell, represent geometric solids.

## Cone

A cone is a solid with a single base that is a circle, tapering to a vertex. It consists of a circle, its interior, a given point not on the plane of the circle, and all the segments from the point to the circle. Familiar examples of cones are ice cream cones and traffic cones (traffic cones are often cut off at the top so that they are not complete cones). Volcanoes are shaped like cones. Point out to students that as volcanoes erode, they begin to lose their conical shape.

## Sphere

A sphere is a three dimensional solid consisting of all points equidistant from a given point. Globes, scoops of ice cream, and ball bearings are examples of spheres, and we often think of the earth as a sphere even though it is not perfectly spherical.

A basketball is one example of a sphere:

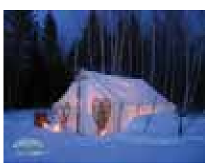
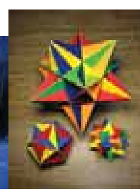
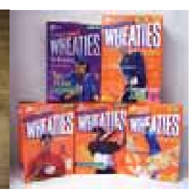
# Introduction of Math Vocabulary

## Hemisphere

A hemisphere is half of a sphere.  We've all heard of the Northern hemisphere (the half of the earth north of the Equator), and the Southern hemisphere. Since the earth is not a perfect sphere, its hemispheres are also not perfect hemispheres. The word hemisphere might be used for other things that are not really spheres, such as the right and left hemispheres of the brain. In geometry, the term hemisphere means half of a perfect sphere.

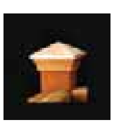
## Polyhedron

A solid with no curved surfaces or edges. All faces are polygons and all edges are line segments. Wall tents, paper stars, and cereal boxes are just some examples of polyhedra.

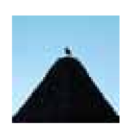

## Pyramid

A pyramid is a polyhedron with a single base that is a polygon, tapering to a vertex.    The Egyptians built pyramids, but there are examples of pyramids closer to home, such as pointed roofs or radio towers.  Sometimes the caps on fence posts are shaped like pyramids.



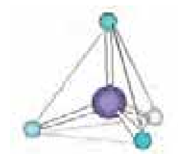
## Apex

An apex is the vertex or top point of a cone or pyramid. In the photo, a bird is at the apex of a pyramid.



# Introduction of Math Vocabulary

## Tetrahedron



A tetrahedron is a pyramid with a triangular base. It has four triangular surfaces. The tetrahedron shape is seen in nature in the structure of a very common molecule, methane (CH4). The four hydrogen atoms lie in each corner of a tetrahedron with the carbon atom in the centre. One of the leading journals in organic chemistry is called "Tetrahedron"!

## Cylinder

A cylinder is a solid that has two congruent circles in parallel planes as its bases. The cylinder is composed of the two circles, all the points in their interiors, and all of the segments parallel to the axis that connect the circles. Common examples of cylinders are straws, batteries, or tanks.

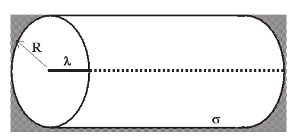
Cans of salmon (and lots of other kinds of food!) are shaped like cylinders.

## Prism

A prism is a solid whose bases are congruent polygons in parallel planes. Segments connect the corresponding vertices of the polygons, so that all of the prism's side surfaces are parallelograms. Triangular prisms have triangles as bases and rectangular prisms have rectangles as bases. This Swiss chocolate bar is shaped like a triangular prism.


## Axis

The axis of a cylinder is the line formed by the centers of the bases of a cylinder.



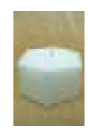
# Introduction of Math Vocabulary

## Parallelepiped

A parallelepiped is a prism with six rectangular surfaces.  Each surface is parallel to its opposite surface. The shape of a parallelepiped makes it easy to stack.  Most boxes are shaped like parallelepipeds. Cheese, butter, and other packaged food items often come in the shape of a parallelepiped.

## Regular

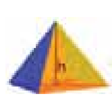
A regular solid is a solid with regular polygonal base(s). Each side of the base is congruent to every other side and each angle is congruent to every other angle. This candle has two regular hexagons as bases.



If the solid is a polyhedron, it is regular only if all the sides are congruent regular polygons.  (See platonic solid)

## Right

Right solids “straight up and down”.  Right cylinders and prisms have bases aligned directly one above the other so that the sides are perpendicular to the bases.  Right pyramids and cones in which the apex is aligned directly above the center of the base.



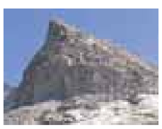
This stack of coins is shaped like a right cylinder.

# Introduction of Math Vocabulary

## Oblique

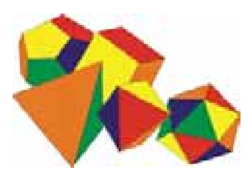
Oblique solids are "slanted". They are cylinders, pyramids, and cones that are not right solids, so that the bases are not aligned directly one above the other, or, the apex is not directly above the center of the base.


This mountain has the shape of an oblique pyramid.



## Platonic solid

A platonic solid is a regular polyhedron. Its surfaces are congruent regular polygons, and all of its angles are congruent. There are only five possible shapes of platonic solids: Tetrahedron (4 triangular surfaces), Hexahedron (6 square surfaces), Octahedron (8 triangular surfaces), Dodecahedron (12 pentagonal surfaces), Icosahedron (20 triangular surfaces).



The platonic solids were discovered by the ancient Greeks and named after the ancient Greek philosopher Plato; Plato speculated that these five solids were the shapes of the basic components of the universe. Cubes, octahedra, and tetrahedra appear in molecules and crystals, and dodecahedra and icosahedra appear in some viruses and tiny marine animals.

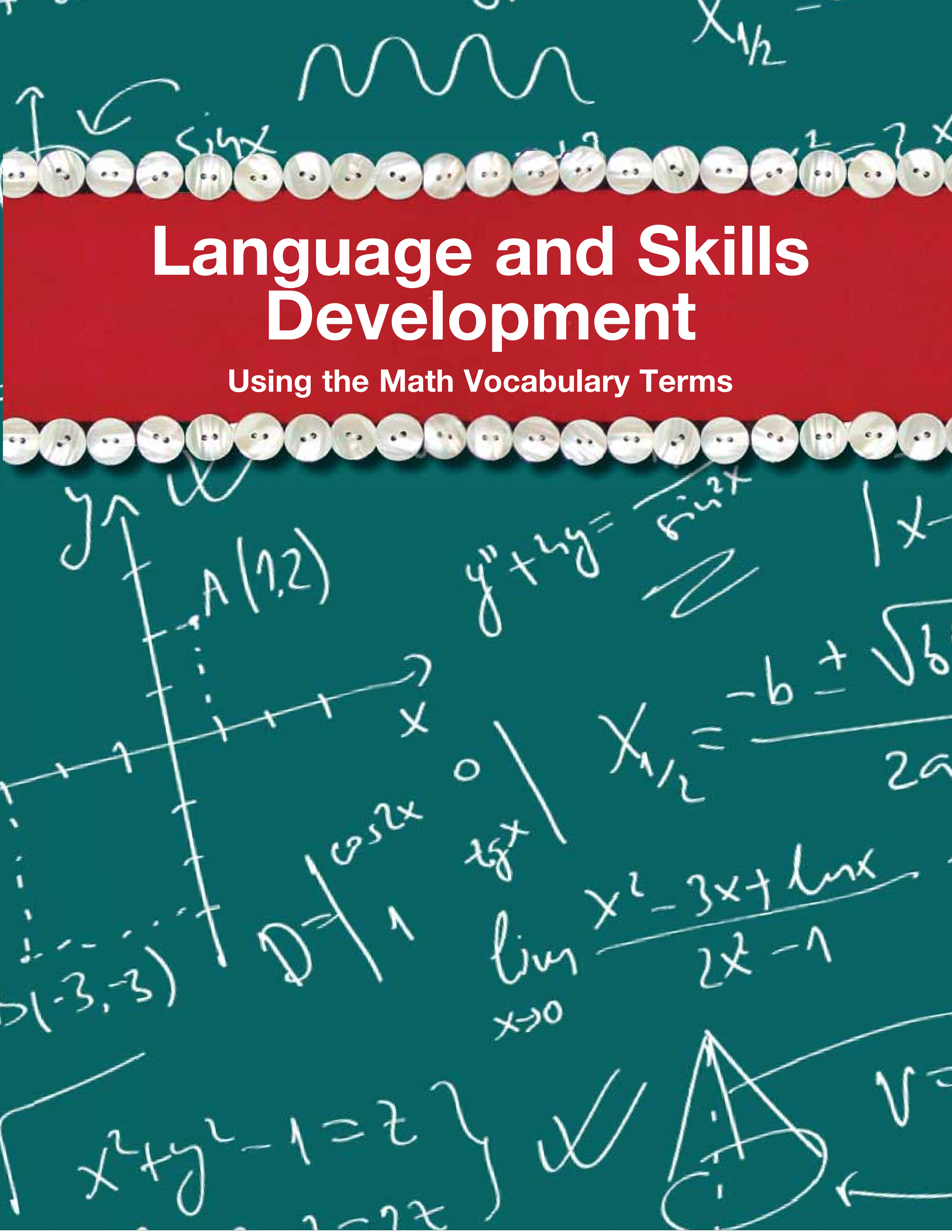
## Cube

A cube is the common name for a regular hexahedron. Its six surfaces are all squares, and all of the angles are right angles. A common cube is a sugar cube. Ask students to come up with other common examples (dice, Rubik's cube, etc.)

# Introduction of Math Vocabulary

## Similar solids

Similar solids are identical in shape but not necessarily the same size. Remind students that they have already learned about similar triangles and other similar polygons. Balls come in all kinds of types and sizes, and are examples of similar solids.



# Language and Skills Development

## Using the Math Vocabulary Terms

# Language & Skills Development

**LISTENING**

Use the activity pages from the Student Support Materials.

### Does It Fit?

Mount the vocabulary illustrations on the chalkboard. Provide each student with writing paper and a pen. Point to an illustration and say a sentence. If the sentence you say goes with the illustration, the students should make checkmarks on their papers. However, if the sentence you say does not go with the illustration, the students should make an "X" on their papers. Repeat this process with other illustrations and sentences. Rather than having the students write their responses, you may have them "clap" for sentences which do not go with illustrations and "nod" for sentences which do go with the illustrations you point to.

**SPEAKING**

### Calendar Bingo

Before the activity begins, prepare a page that contains a calendar page (complete with days and dates). Provide each student with a copy of the calendar page. Also, provide each student with 10 small markers. Each student should place the markers on different dates on his/her calendar page. Mount the vocabulary illustrations on the chalkboard. Call a student's name and say a date in the month. If a marker is not on the date you named, he/she should say a complete sentence about a vocabulary illustration you point to. However, if a marker is on the date you called, he/she may "pass" to the next player. Repeat this process until all students have participated. You may wish to provide each student with more than one marker for this activity.

**READING**

Use the activity pages from the Student Support Materials.

### Mixed-up Sentences

Before the activity begins, prepare a number of "mixed-up sentences," relating to the concept being studied and using the sight words. Write the mixed-up sentences on the chalkboard. Call upon individual students to read the sentences, saying the words of the sentences in their correct order. An alternative approach to the one above is to have the mixed-up sentences written on sentence strips. Group the students into two teams. Show the first player in each team one of the mixed-up sentences. The first player to correctly read the sentence with the words in their correct order wins the round. Repeat until all players have participated. Rather than having the players merely read the mixed-up sentences, you may wish to lay the sentence strips on the floor at the front of the classroom. Place two pairs of scissors beside the sentence strips. When you say "Go," the first player in each team must rush to the scissors, select one of the sentence strips and cut each word out. Then, the player must rearrange the words to create the sentence. Repeat until all players have played. Of course, this activity can also be done as an *activity sheet* with the students.

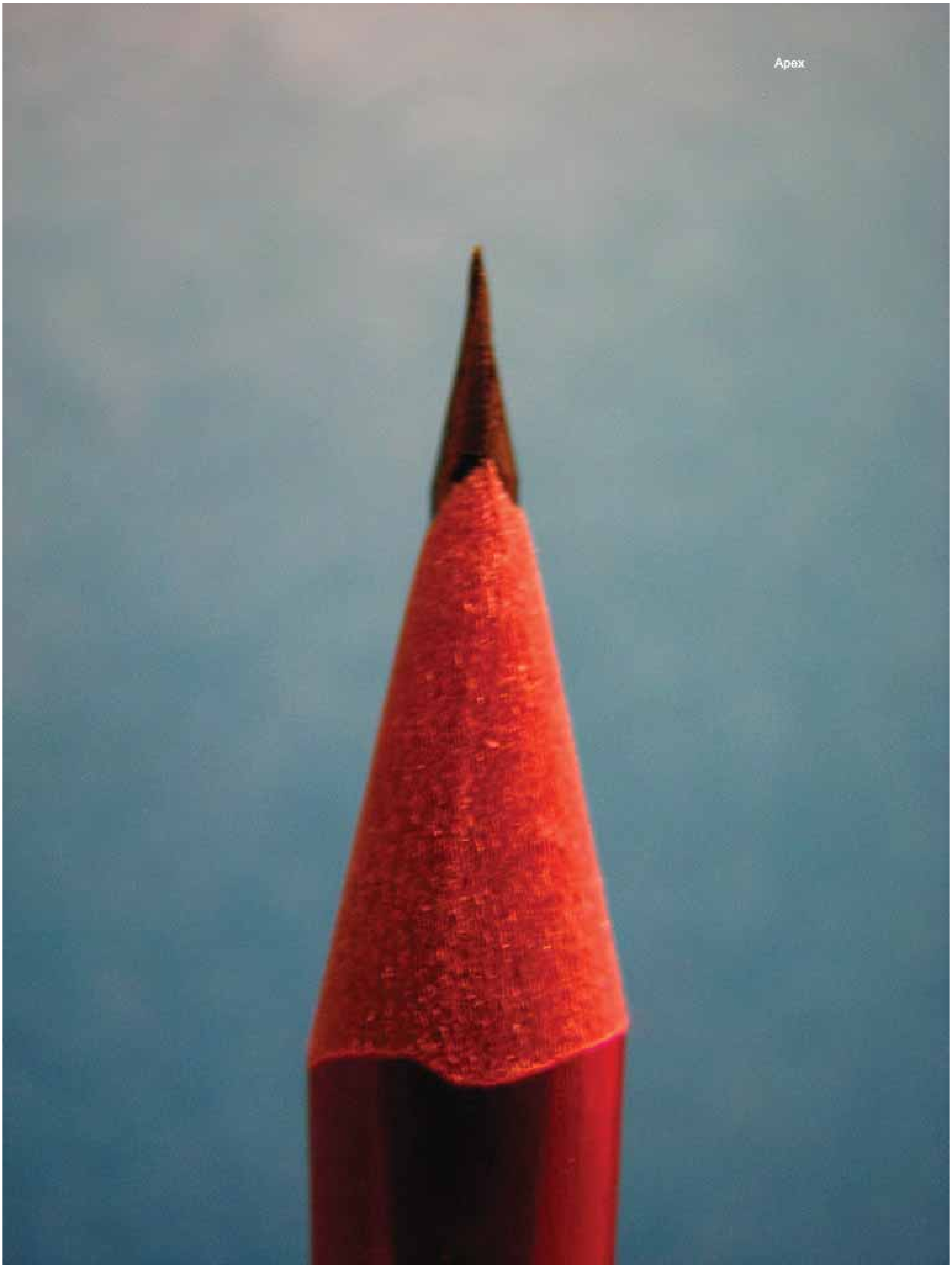
**WRITING**

Use the activity pages from the Student Support Materials.

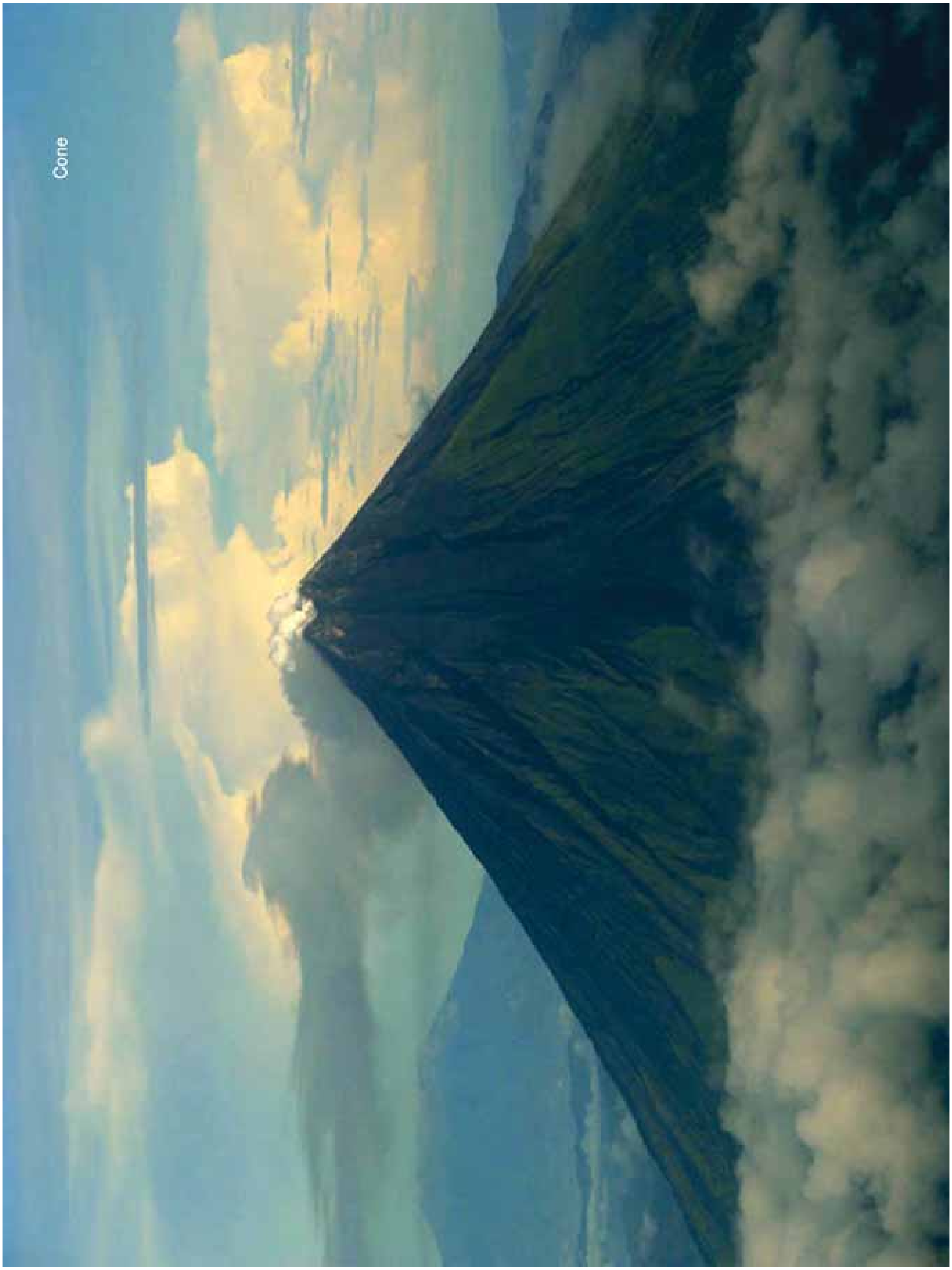
### The Other Half

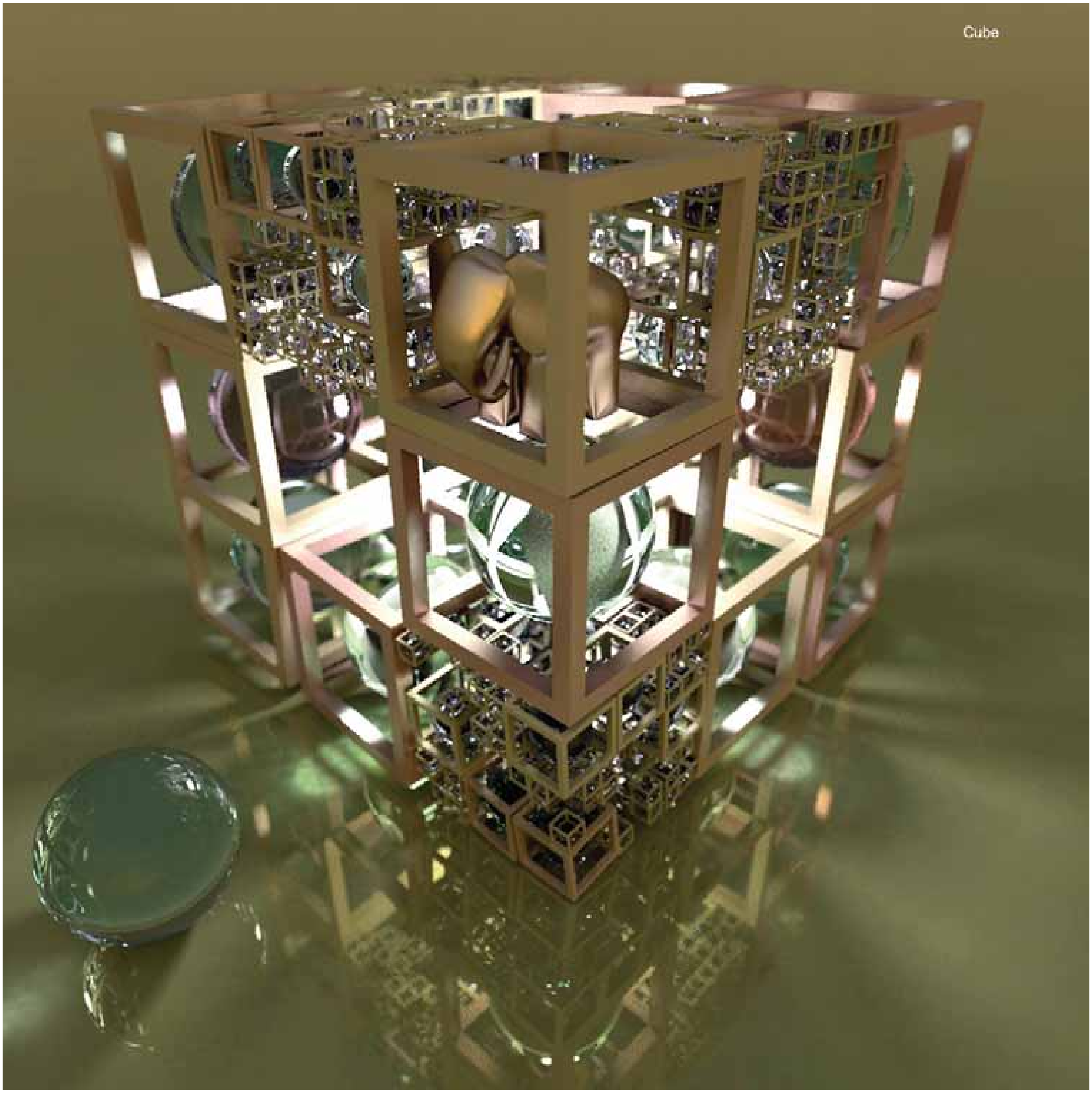
Cut each of the sight words in half. Give each student a sheet of writing paper, a pen and one of the word-halves. Each student should glue the word-half on his/her writing paper and then complete the spelling of the word. You may wish to have enough word-halves prepared so that each student completes more than one word. Afterwards, review the students' responses.

# Student Support Materials


Apex


Axis

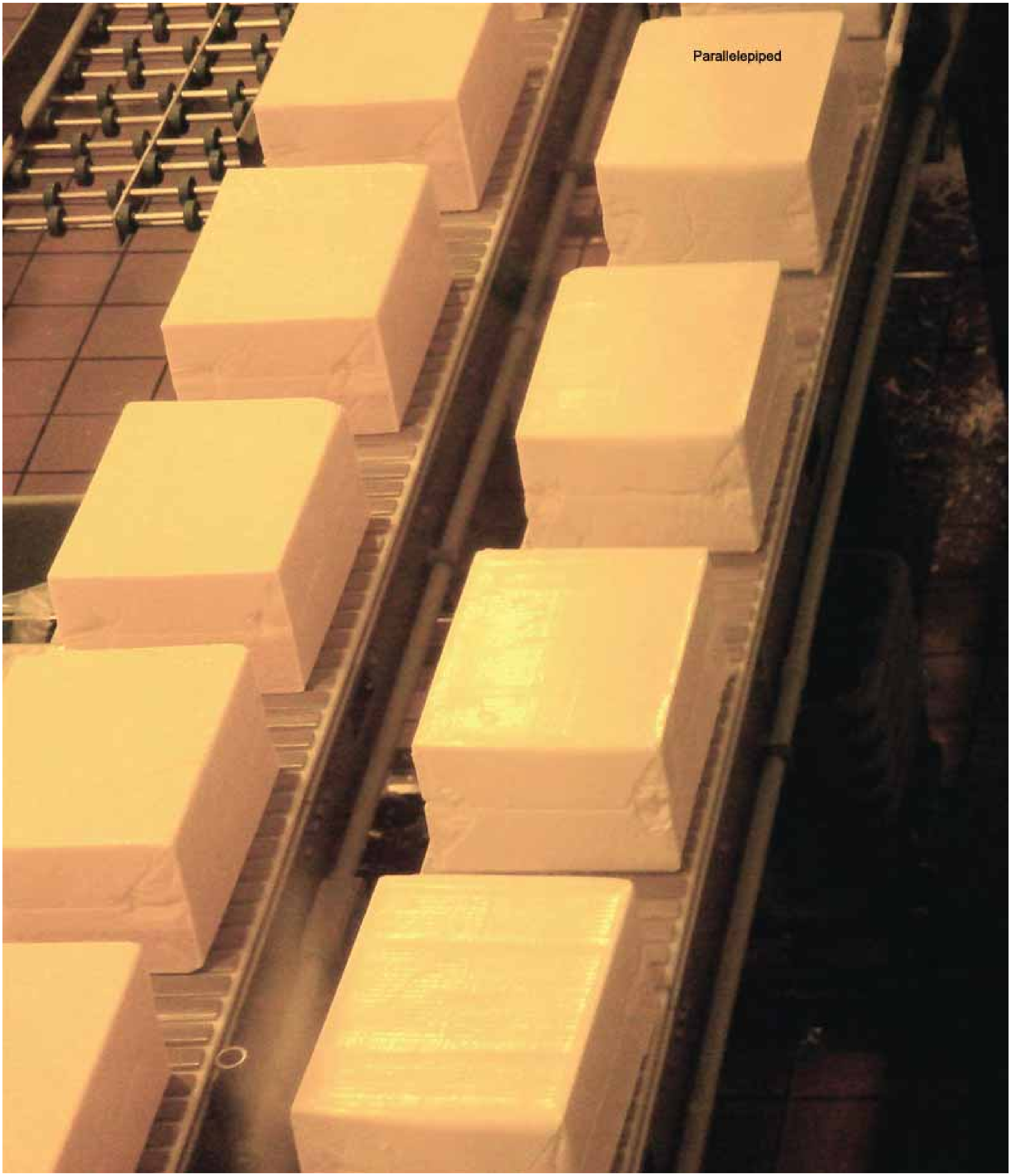

Cone


Cube

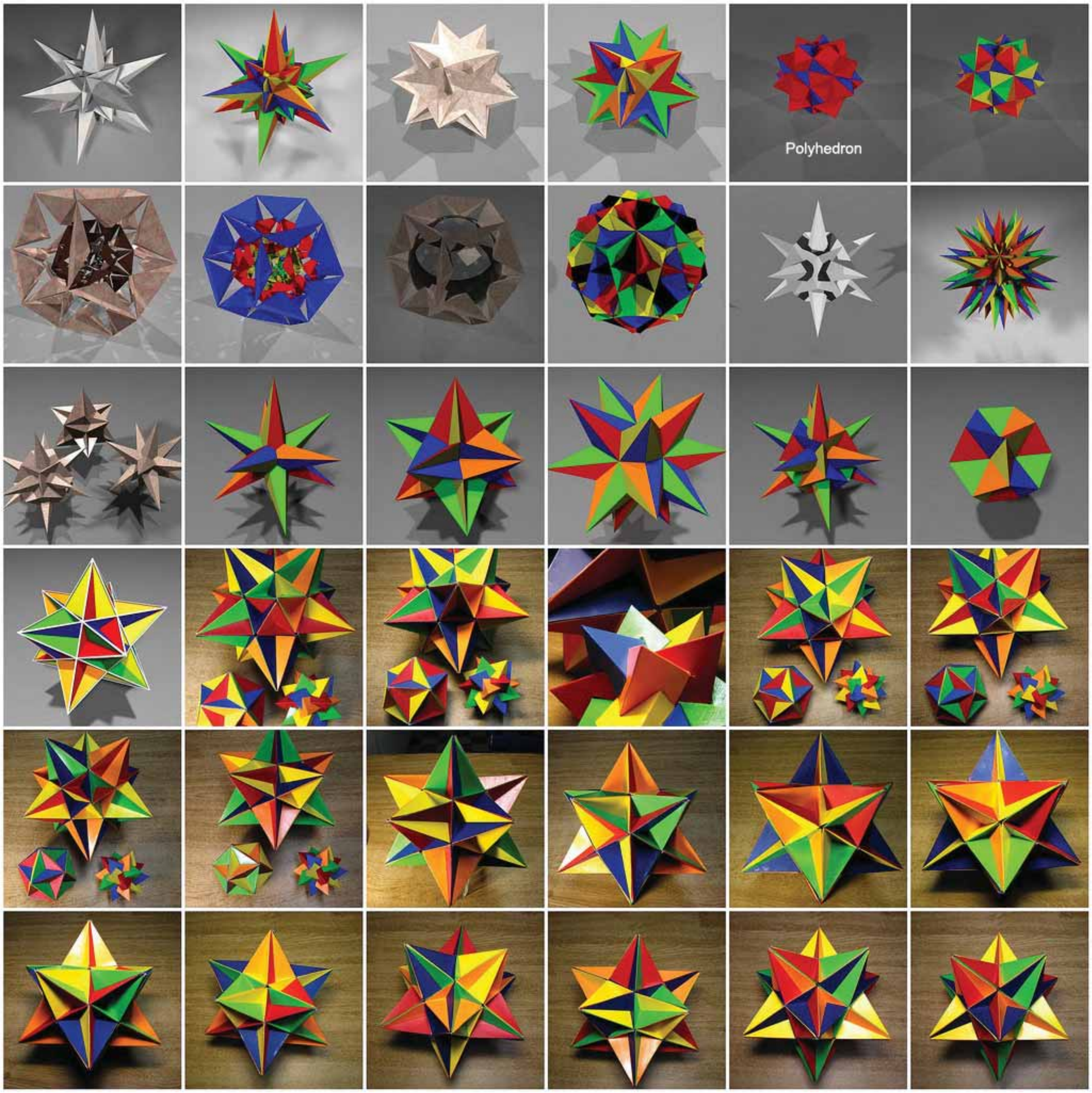

Cylinder

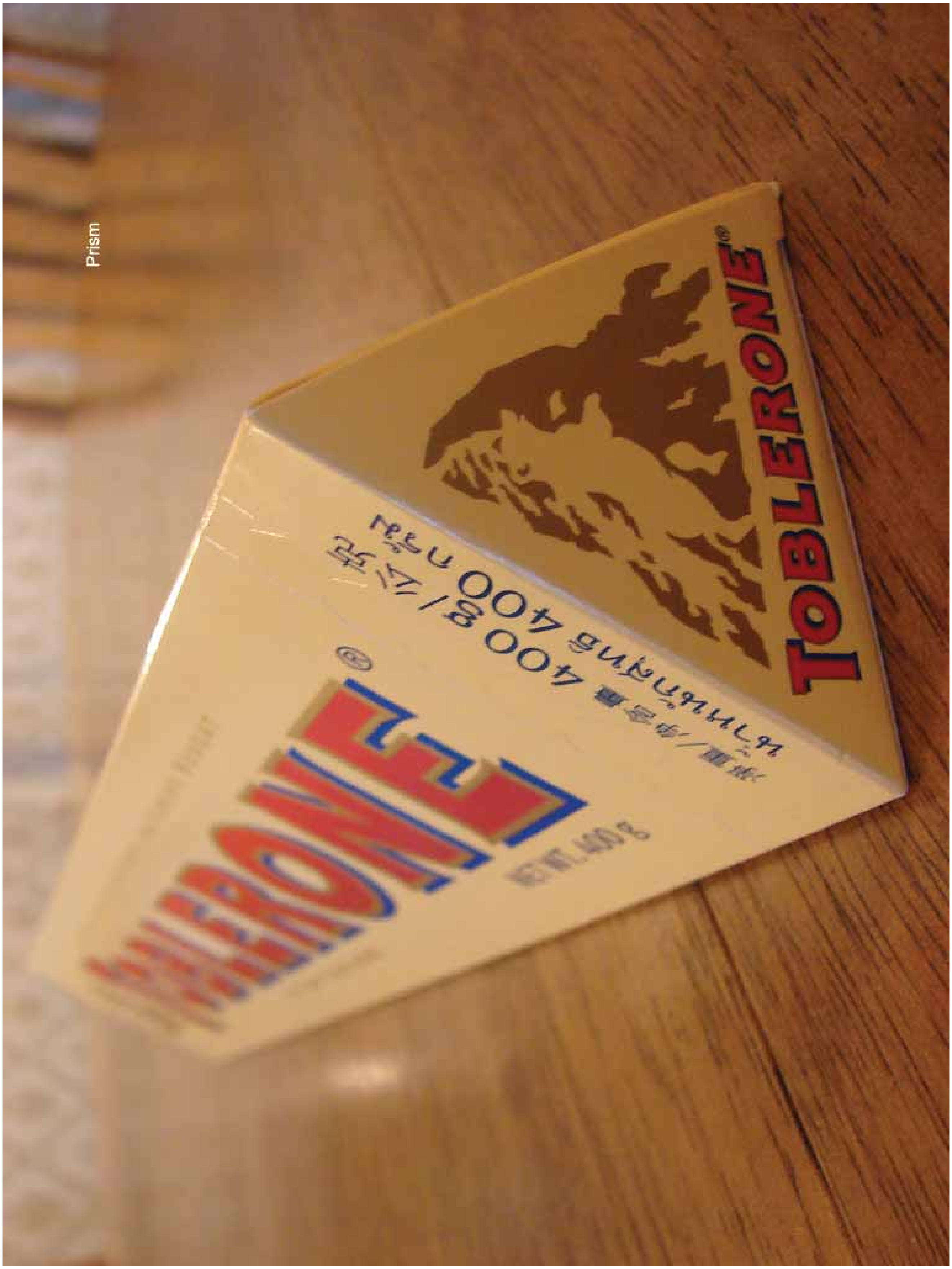

Hemisphere

Oblique

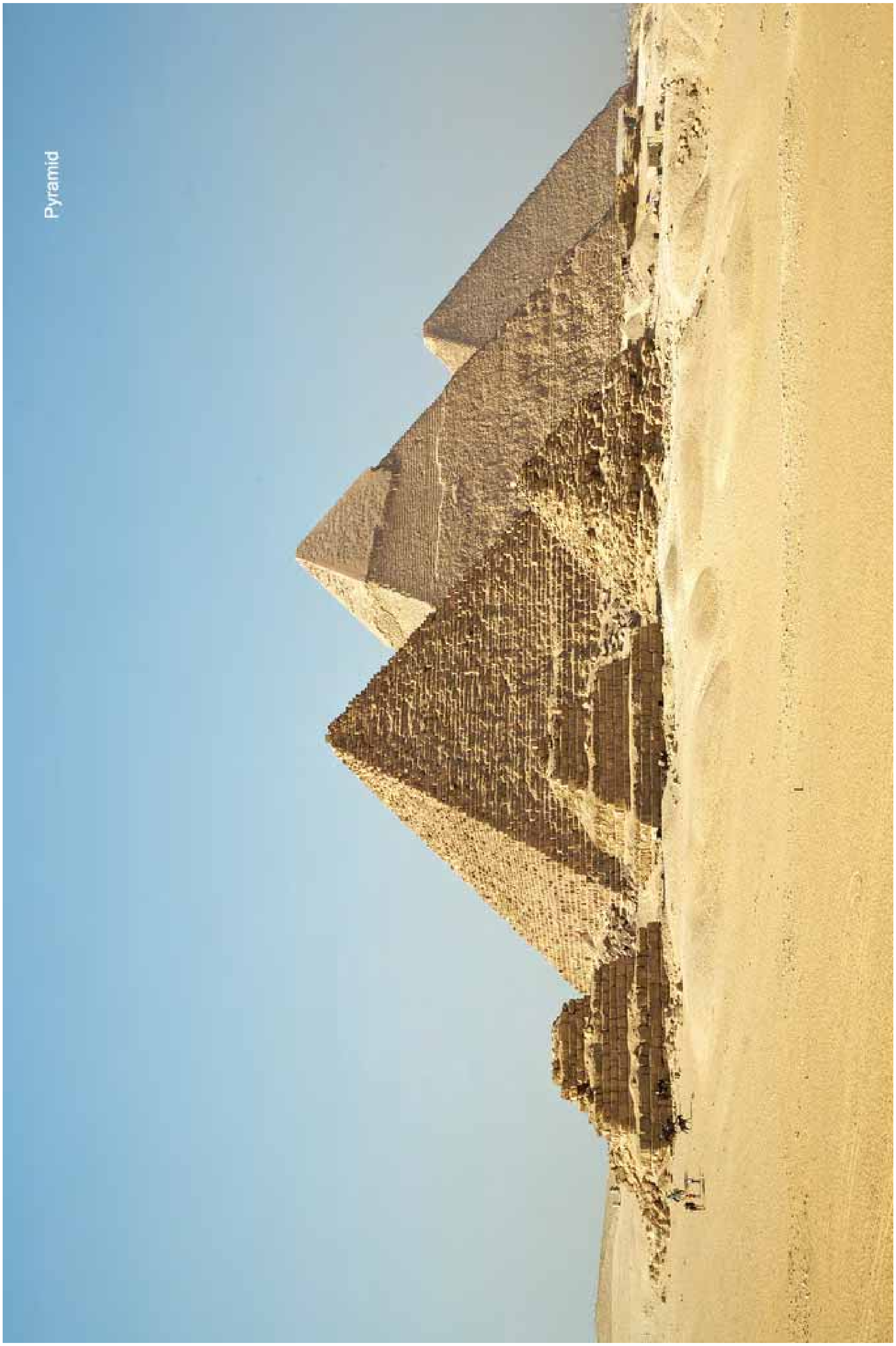

Parallelepiped


Platonic Solid

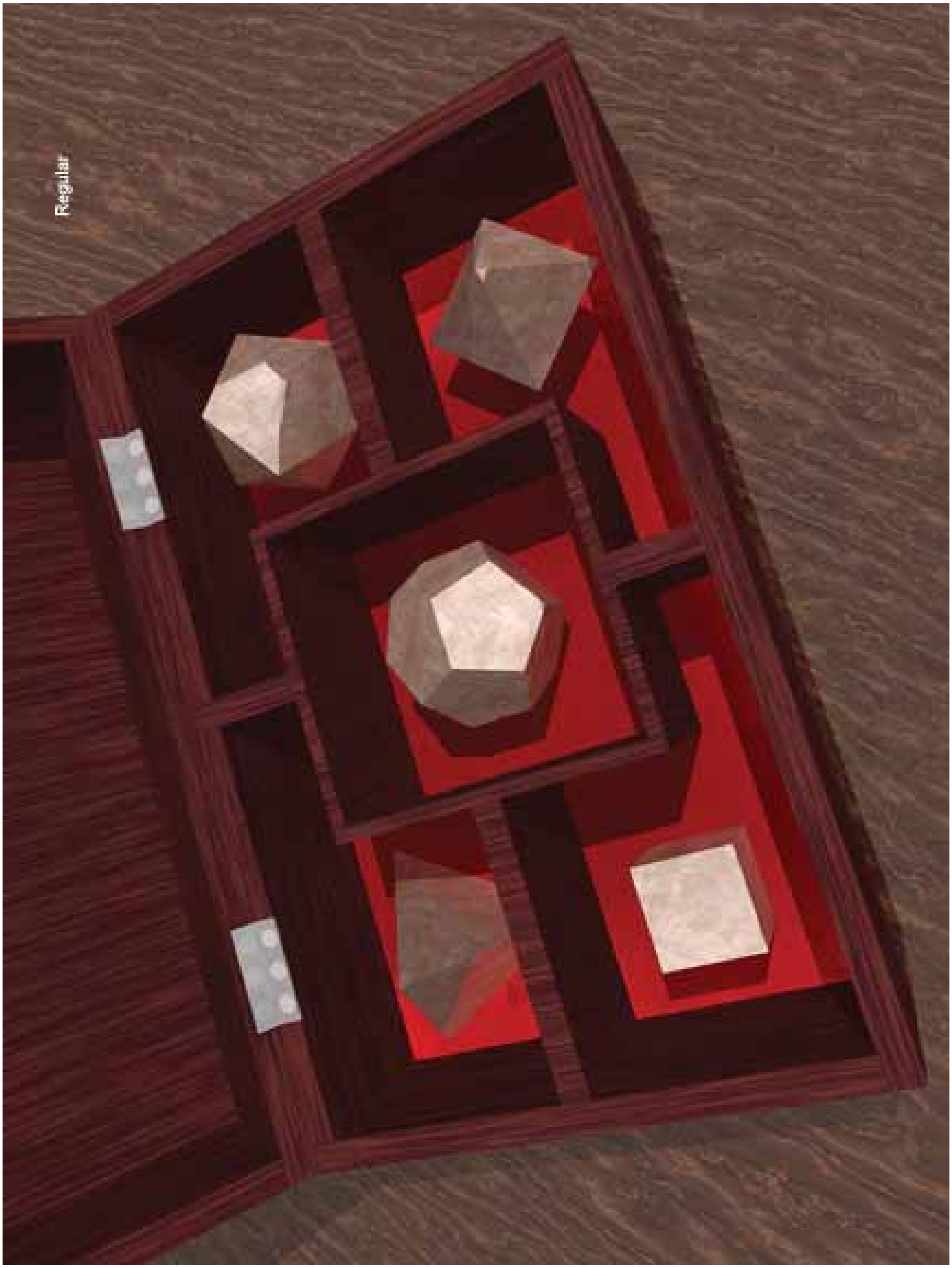

Polyhedron




Prism



Pyramid


Regular


Right


DIORITE formed into sphere, polished
Vermont
Donor: Frank Paulich
SPHERE MACHINE HEAD POLISHER
(leather covered)
Donor: Frank Paulich

Sphere


Tetrahedr

# True-False Sentences

**(Listening and/or Reading Comprehension)**

1. A **solid** is a three dimensional shape enclosed by a boundary.
2. Soda cans are almost always shaped like **cones**.
3. A **sphere** might have an oblong shape.
4. The southern **hemisphere** is half of the earth.
5. A cone is one type of **polyhedron**.
6. The base of a **pyramid** has at least three sides, but may have many more.
7. An **apex** is the top point of a cone or a pyramid.
8. A **tetrahedron** is a type of polyhedron with four surfaces.
9. **Cylinders** can have square bases.
10. The height of a **prism** is always greater than its width.
11. The **axis** of a cylinder connects the centers of the bases.
12. A **parallelepiped** might have eight surfaces.
13. A **regular** solid has a base with all sides congruent and all angles congruent.
14. In a **right** prism, the bases are situated directly one above the other.
15. If the base of a prism is not a regular polygon, it is an **oblique** prism.
16. There are exactly five kinds of **platonic solids.**
17. It is possible for a **cube** to be oblique.
18. A cereal box and shoe box are **similar solids.**

Answers: 1T, 2F, 3F, 4T, 5F, 6T, 7T, 8T, 9F, 10F, 11T, 12F, 13T, 14T, 15F, 16T, 17F, 18F

1. A circle is one type of **solid**.
2. A **cone** has a circle as a base, tapering to a point.
3. Most globes are shaped like **spheres**.
4. A **hemisphere** is a sphere that is not quite round.
5. A **polyhedron** does not have any curved edges.
6. **Pyramids** always have four sides.
7. The **apex** of a cone is always directly over the center of the base.
8. Every **tetrahedron** is a platonic solid.
9. If a solid has two congruent circles in parallel planes as bases, it is a **cylinder.**
10. A **prism** is a like a cylinder except that its bases are polygons.
11. An edge might also be an **axis.**
12. In a **parallelepiped,** each surface is parallel to the opposite surface.
13. A **regular** pyramid might have a star-shaped base.
14. If the base of a prism has right angles, it is a **right** prism.
15. **Oblique** solids are slanted; the apex is not over the center of the base or the two bases are offset.
16. A **platonic solid** might have sides that are heptagons.
17. A **cube** is a regular hexahedron.
18. **Similar solids** have the same shape but different sizes.

Answers: 1F, 2T, 3T, 4F, 5T, 6F, 7F, 8F, 9T,10T,11F, 12T, 13F, 14F, 15T, 16F, 17T, 18T

# Match the Halves

| | |
|---|---|
| 1. A polyhedron is a solid with | A. a tetrahedron. |
| 2. A traffic cone is cut off at the top so it is | B. a circle |
| 3. The base(s) of a regular solid | C. six quadrilateral surfaces. |
| 4. A three-dimensional figure is called | D. is directly over the center of the base. |
| 5. Four triangular surfaces join to make | E. the same distance from the center. |
| 6. A parallelepiped has | F. similar solids. |
| 7. A cube is a | G. a polygonal base. |
| 8. A solid with two parallel congruent polygons as bases is | H. straight edges and surfaces. |
| 9. Every point on a sphere is | I. congruent circles |
| 10. A sugar cube and a Rubik's cube are | J. a solid. |
| 11. A cylinder has bases that are | K. a prism |
| 12. If a sphere is divided in two by a plane through its center, each part is | L. one base aligned directly over the other. |
| 13. All of the edges are congruent on a | M. regular hexahedron. |
| 14. The centers of a cylinder's bases | N. missing its apex. |
| 15. The apex of a right pyramid | O. platonic solid. |
| 16. A cone tapers to a point from | P. are intersected by its axis. |
| 17. An oblique cylinder does not have | Q. a hemisphere. |
| 18. A pyramid tapers to an apex from | R. are regular polygons |

Answers: 1H, 2N, 3R, 4J, 5A, 6C, 7M, 8K, 9E, 10F.11I, 12Q, 13O, 14P, 15D, 16B, 17L, 18G

## Definitions

**Solid** - a three-dimensional figure enclosed by a boundary.

**Cone** - a solid with a circular base tapering to a point that is not on the same plane as the base.

**Sphere** - a three dimensional solid consisting of all points equidistant from a given point.

**Hemisphere** - half of a sphere.

**Polyhedron** - a solid with surfaces that are all polygons and edges that are all line segments.

**Pyramid** - a polyhedron with a single polygonal base, tapering to a vertex.

**Apex** - the vertex or top point of a cone or pyramid.

**Tetrahedron** - a pyramid with a triangular base.

**Cylinder** - a solid whose two bases are congruent circles in parallel planes

**Prism** - a cylinder whose bases are polygons.

**Axis** (of a cylinder) - the line that passes through the centers of the bases of a cylinder.

**Parallelepiped** - a prism with six rectangular surfaces, each parallel to its opposite surface.

**Regular** (solid) - a pyramid or prism with a regular polygon as a base, or a polyhedron with congruent regular polygons on all sides.

**Right** (solid) - cylinders and prisms that have bases aligned directly one above the other, or pyramids and cones in which the apex is aligned directly above the center of the base.

**Oblique** (solid) - A cylinder, pyramid, or cones that is not a right solid.

**Platonic solid** - a platonic solid is one of five possible regular polyhedra.

**Cube** - a regular hexahedron or a solid with six square surfaces.

**Similar solids** - solids that are identical in shape but not necessarily the same size.

## Which Belongs

1. A pyramid with a triangular base is called a (trihedron, cube, tetrahedron.)

2. An (axis, apex, axle) is a line that passes through the centers of the bases of a cylinder.

3. Antarctica and Canada are in different (spheres, dimensions, hemispheres).

4. The bases of a (cylinder, prism, cube) are circles.

5. If the base of a pyramid or prism has all sides congruent and all angles congruent, it is a (right, regular, platonic) solid.

6. Polyhedra, prisms, cylinders, pyramids, and cubes are types of (spheres, parallelepipeds, solids).

7. A (cone, pyramid, cylinder) is a type of solid with an apex and a circular base.

8. The shape of a box, a paperback book, or a butter cube is a(n) (oblique prism, parallelepiped, tetrahedron).

9. A (cone, polyhedron, cylinder) has surfaces that are all polygons.

10. The vertex of a cone or a pyramid is its (apex, base, endpoint).

11. The set of all the points in space that are one mile from a radio transmitter has the shape of a (platonic solid, circle, sphere).

12. If the bases of a cylinder are aligned directly one above the other, it is a (regular, right, oblique) cylinder.

13. A solid with six square sides is a (cube, tetrahedron, quadrihedron).

14. A ping-pong ball and a volleyball are (cylinders, platonic solids, similar solids.)

15. A (pyramid, prism, polyhedron) is a solid that has one polygon as a base, tapering to a point.

16. A solid with two congruent parallel polygons as bases is a (cone, pyramid, prism).

17. If the sides of a prism are not perpendicular to its base, it is (oblique, right, regular.)

18. A dodecahedron is one kind of (prism, platonic solid, oblique solid)

1. tetrahedron
2. axis
3. hemisphere
4. cylinder
5. regular
6. solids
7. cone
8. parallelepiped
9. polyhedron
10. apex
11. sphere
12. right
13. cube
14. similar solids
15. pyramid
16. prism
17. oblique
18. platonic solid

# Multiple Choice

1. Which of the following is <u>not</u> shaped like a cone?
    a) an ice cream holder
    b) a funnel
    c) a witch's hat
    d) an orange juice can

2. What is the name for half of a globe or a sphere?
    a) hemisphere
    b) semisphere
    c) holosphere
    d) halfosphere

3. Which is true of a tetrahedron?
    a) it is a regular polyhedron and a platonic solid
    b) its four surfaces are equilateral triangles
    c) a and b are both true
    d) neither a nor b is true

4. How many sides are possible for the base of a pyramid?
    a) the base of a pyramid always has four sides
    b) the base of a pyramid always has three sides
    c) the base of a pyramid can have any number of sides greater than or equal to 3
    d) the base of a pyramid always has an even number of sides

5. A cube is also a
    a) hexahedron
    b) parallelepiped
    c) prism
    d) all of the above

6. Which of the following has an apex?
    a) a cylinder or a cone
    b) a cone or a pyramid
    c) a pyramid or a prism
    d) a parallelepiped or a pyramid

7. A prism might also be a
    a) parallelepiped
    b) pyramid
    c) tetrahedron
    d) none of the above

8. Which of the following are solids?
    a) cubes, polyhedrons, rectangles, and cones
    b) octahedrons, cylinders, pyramids, and spheres
    c) dodecahedrons, triangles, parallelepipeds, and prisms
    d) hexahedrons, tetrahedrons, cubes, and parallelograms

9. If two objects are similar solids
    a) they have exactly the same shape
    b) they have exactly the same shape and size
    c) they can never have the same size
    d) they are the same size but not the same shape

10. In order to find the axis of a cylinder, it is necessary to find
    a) the length of each side
    b) the diameter of the base
    c) the angle of each corner
    d) the center of each base

11. A parallelepiped might also be classified as
    a) a cube, a tetrahedron, and a prism
    b) a prism, a polyhedron, and a hexahedron
    c) a regular prism, a cylinder, and a pyramid
    d) a hemisphere, a hexahedron, and a prism

12. What type of base does a regular prism of pyramid have?
    a) a regular polyhedron
    b) a regular polygon
    c) a perfect circle
    d) any polygon with three sides or more

13. Which of the following have bases that are congruent and in parallel planes?
    a) right circular cylinders, prisms, and cubes
    b) right circular cones, parallelepipeds, and hemispheres
    c) prisms, cubes, and platonic solids
    d) regular right prisms, pyramids, and tubes

14. If the apex of a cone is not aligned directly over the center of the base, the cone is:
    a) regular
    b) circular
    c) oblique
    d) right

15. Which of the following is a true statement about a sphere?
    a) the earth is a perfect sphere
    b) any three-dimensional curved figure is a sphere
    c) a sphere has two bases
    d) every point on a sphere is the same distance from its center

16. If the two bases of a prism are aligned directly one over the other, it is a
    a) regular prism
    b) oblique prism
    c) right prism
    d) triangular prism

17. Regular polyhedrons are also called
    a) platonic solids
    b) right cylinders
    c) regular prisms
    d) similar solids

18. A polyhedron might have the shape of a
    a) cone
    b) pyramid
    c) sphere
    d) hemisphere

Answers:

1D, 2A, 3C, 4C, 5D, 6B, 7A, 8B, 9A, 10D, 11B, 12B, 13A, 14C, 15D, 16C, 17A, 18B

## Complete the Sentence

1. A six-sided prism with each side parallel to its opposite is a ______________.
2. If two objects are __________________, they have the same shape but not always the same size.
3. _________________ prisms and pyramids have regular polygons as bases.
4. There are only five types of regular polyhedra and they are called _________________.
5. A ____________________ is a solid with every point equidistant from its center.
6. If a solid has curved edges, it can't be a ________________________.
7. A(n) ________________is found on a cone or a pyramid.
8. A solid with four surfaces is called a ___________________________.
9. If a solid has two congruent parallel circles as bases, it is a _____________________.
10. A sphere, a pyramid, or an icosahedron is a type of ____________.
11. One base of a(n) ____________________ prism is not aligned directly over the other one.
12. A solid with congruent, parallel bases of any polygonal shape is a(n) ____________________.
13. A(n) ________________is a line that passes through the centers of both bases of a cylinder.
14. The apex of a(n) _____________________pyramid is directly over the center of its base.
15. If a solid tapers to a point from a circular base, it is called a(n) _________________.
16. If a sphere is divided into two equal parts, each part is a(n) ____________________.
17. A _______________________ is a polyhedron that has one base tapering to a point.
18. Another name for a regular hexahedron is ___________________.

Answers:

1. Parallelepiped
2. Similar solids
3. regular
4. Platonic solid
5. sphere
6. Polyhedron
7. Apex
8. tetrahedron
9. Cylinder
10. Solid
11. Oblique
12. Prism
13. axis
14. right
15. Cone
16. hemisphere
17. Pyramid
18. Cube

# Creative Writing

Describe the geometric solids in this 1942 picture of the Aleut relocation camp at Killisnoo.

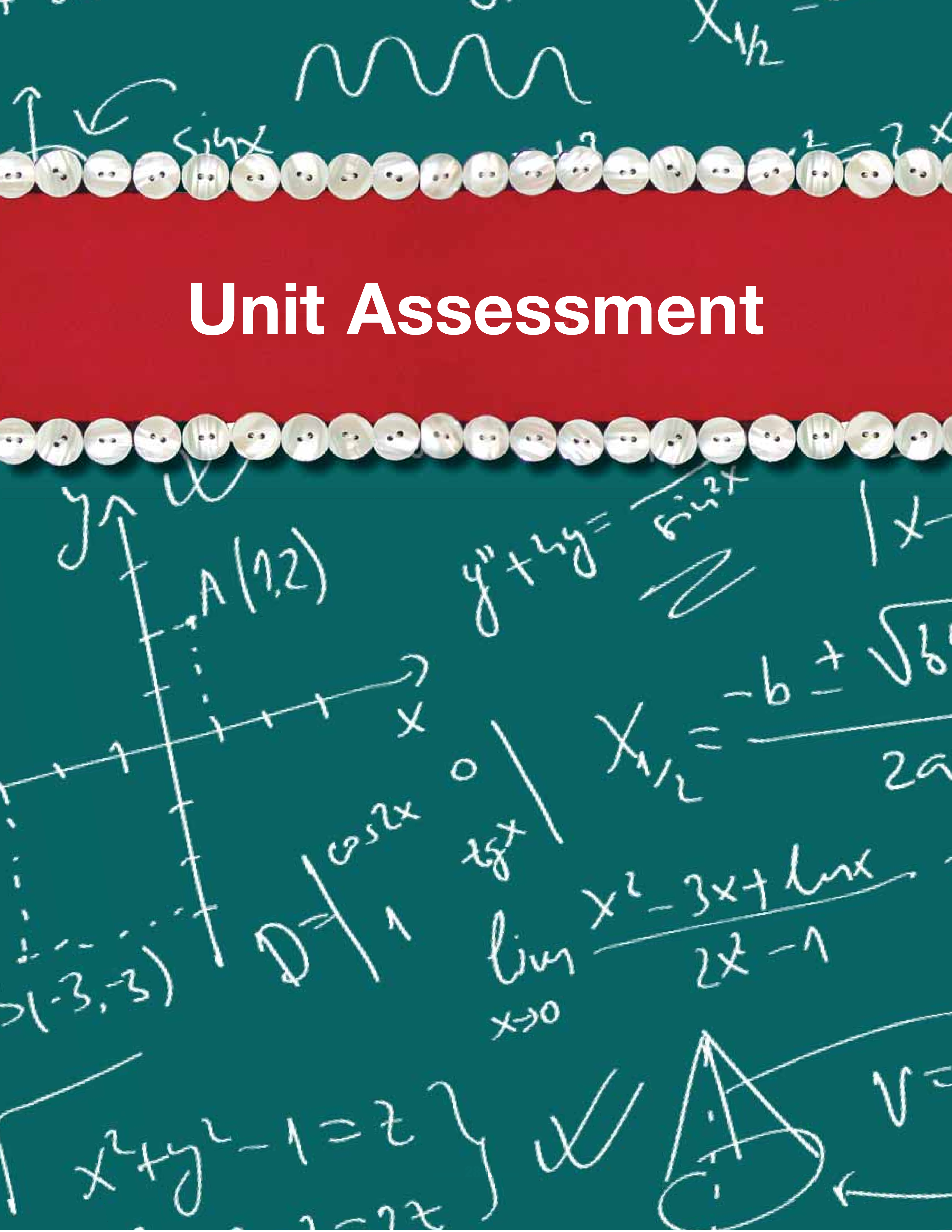

Alaska State Library - Historical Collections

## Place-Based Practice Activity

1. Construct solids using construction paper, toothpicks and gumdrops, or other materials. Make ornaments or decorations shaped like platonic solids and/or other polyhedrons, and donate them to a local event, Pioneer Home, or preschool.

2. Discuss the utility of different shapes for buildings, tanks, packaging, and other uses that are relevant to your town. Which are easier to build? Which would waste space in a shipping container? Which would shed rain and snow? Ask small groups of students to choose an appropriate shape and design a house, school, teen center, tank, or other object, based on the discussion.

# Unit Assessment



## Geometry: Unit 9-Three Dimensional Figures

Name: ___________________

Date: ___________________

**Illustrations: In items 1-4, draw the geometric figure listed for each item and give two examples from everyday life that are the shape of this figure.**

1) Draw a **cone.** List two examples from everyday life that are shaped like a cone.

   Example 1_______________________

   Example 2_______________________

2) Draw a **sphere**. List two examples from everyday life that are shaped like a sphere.

   Example 1_______________________

   Example 2_______________________

3) Draw a **pyramid.** List two examples from everyday like that are shaped like a pyramid.

Example 1.________________________

Example 2.________________________

4) Draw a polyhedra**.** List two examples from everyday like that are shaped like a polyhedra.

Example 1.________________________

Example 2.________________________

**Fill in the Blank. Complete each statement below with the word that fits best. Choose the words from the Word Bank.**

| **Word Bank** | | |
|---|---|---|
| apex | cube | oblique solids |
| prism | regular solid | Right solids |
| solid | | |

5) A/an ________ is the vertex or top point of a cone or pyramid.

6) A/an ________ is a solid whose bases are congruent polygons in parallel planes. Segments connect the corresponding vertices of the polygons, so that all of the side surfaces are parallelograms.

7) A ________ is a regular hexahedron with six surfaces that are all squares and all right angles.

8) 15. ________ are slanted; cylinders, pyramids, and cones that are not right solids, and the bases are not aligned directly one above the other, or the apex is not directly above the center of the base.

9) ________ Are straight up and down with cylinders and prisms that have bases aligned directly one above the other so that the sides are perpendicular to the base, and the apex is aligned directly above the center of the base.

10) A/an ________ has a regular polygonal base(s); each side of the base is congruent to every other side and each angle is congruent to every other angle.

11) A geometric ________ figure is a three-dimensional closed figure that has a boundary.

12) **True/False: Read the following statements carefully to decide if they are true or false. Circle the correct answer.**

13) A platonic solid is a regular polyhedron; its surfaces are congruent regular polygons, and all of its angles are congruent

a) True

b) False

14) Platonic solids come in only 3 shapes- Tetrahedron (4 triangular surfaces), Hexahedron (6 square surfaces), Octahedron (8 triangular surfaces).

a) True

b) False

15) Similar solids are identical in shape but not necessarily the same size.

a) True

b) False

16) A parallelepiped is a prism with six rectangular surfaces. Each surface is parallel to its opposite surface. Its shape makes things easy to stack, so most boxes are shaped like parallelepipeds.

a) True

b) False

## Geometry: Unit 9-Three Dimensional Figures

Name: ____________________
Date: ____________________

**Illustrations: In items 1-4, draw the geometric figure listed for each item and give two examples from everyday life that are the shape of this figure.**

1) Draw a **cone.** List two examples from everyday life that are shaped like a cone.

Example 1________________________

Example 2________________________

Real life examples of a cone include: a volcano, some ice cream cones (not the ice cream), traffic cones that are used during highway construction.

2) Draw a **sphere**. List two examples from everyday life that are shaped like a sphere.

Example 1________________________

Example 2________________________

Real life examples of a sphere include: scoops of ice cream, ball bearings on a car, the earth (almost)

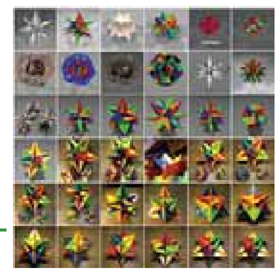
3) Draw a **pyramid.** List two examples from everyday like that are shaped like a pyramid.

Example 1.________________________

Example 2.________________________

Examples of pyramids include: the Egyptian pyramids, some radio towers, some pointed roofs

4) Draw a polyhedra**.** List two examples from everyday like that are shaped like a polyhedra.



Example 1.________________________

Example 2.________________________

Examples of polyhedras include: wall tents, cereal boxes and paper stars because they do not have curved surfaces or edges.

**Fill in the Blank. Complete each statement below with the word that fits best. Choose the words from the Word Bank.**

| **Word Bank** | | |
|---|---|---|
| apex | cube | oblique solids |
| prism | regular solid | Right solids |
| solid | | |

5) A/an **apex** is the vertex or top point of a cone or pyramid.

6) A/an **prism** is a solid whose bases are congruent polygons in parallel planes. Segments connect the corresponding vertices of the polygons, so that all of the side surfaces are parallelograms.

7) A **cube** is a regular hexahedron with six surfaces that are all squares and all right angles.

8) **oblique solids** are slanted; cylinders, pyramids, and cones that are not right solids, and the bases are not aligned directly one above the other, or the apex is not directly above the center of the base.

9) **Right solids** are straight up and down with cylinders and prisms that have bases aligned directly one above the other so that the sides are perpendicular to the base, and the apex is aligned directly above the center of the base.

10) A/an **regular solid** has a regular polygonal base(s); each side of the base is congruent to every other side and each angle is congruent to every other angle.

11) A geometric **solid** figure is a three-dimensional closed figure that has a boundary.

12) **True/False: Read the following statements carefully to decide if they are true or false. Circle the correct answer.**

13) A platonic solid is a regular polyhedron; its surfaces are congruent regular polygons, and all of its angles are congruent

a) True

b) False

14) Platonic solids come in only 3 shapes- Tetrahedron (4 triangular surfaces), Hexahedron (6 square surfaces), Octahedron (8 triangular surfaces).

a) True

b) False

15) Similar solids are identical in shape but not necessarily the same size.

a) True

b) False

16) A parallelepiped is a prism with six rectangular surfaces. Each surface is parallel to its opposite surface. Its shape makes things easy to stack, so most boxes are shaped like parallelepipeds.

a) True

b) False