

Lesson	Glossary Terms	Check Your Readiness	Standards		
			Building Toward	Addressing	Building On
Unit 1, Lesson 1	<ul style="list-style-type: none"> region 	<ul style="list-style-type: none"> CYR A, Item #1 CYR B, Item #1 	6.G.A.1		3.G.A
Unit 1, Lesson 2	<ul style="list-style-type: none"> area 	<ul style="list-style-type: none"> CYR A, Item #2 CYR B, Item #2 	6.G.A	6.G.A.1	3.MD.C.5.b
Unit 1, Lesson 3		<ul style="list-style-type: none"> CYR A, Item #7 CYR B, Item #7 CYR A, Item #3 CYR B, Item #3 		6.G.A.1	3.MD.C.7.d
Unit 1, Lesson 4		<ul style="list-style-type: none"> CYR A, Item #4 CYR B, Item #4 		6.G.A.1	4.G.A.2 5.G.B
Unit 1, Lesson 5	<ul style="list-style-type: none"> base (of a parallelogram or triangle) height (of a parallelogram or triangle) 	<ul style="list-style-type: none"> CYR A, Item #5 CYR B, Item #5 		6.EE.A.2.a 6.EE.A.2.c 6.G.A.1	
Unit 1, Lesson 6				6.EE.A.2.c 6.G.A.1	3.OA.A



Lesson	Glossary Terms	Check Your Readiness	Standards		
			Building Toward	Addressing	Building On
Unit 1, Lesson 7			6.G.A.1	6.G.A.1	
Unit 1, Lesson 8				6.G.A.1	
Unit 1, Lesson 9	<ul style="list-style-type: none"> • opposite vertex 		6.G.A.1	6.EE.A.2.a 6.G.A.1	6.EE.A.2.c
Unit 1, Lesson 10	<ul style="list-style-type: none"> • edge • vertex 			6.EE.A.2.c 6.G.A.1	
Unit 1, Lesson 11	<ul style="list-style-type: none"> • polygon 		6.G.A.1	6.G.A.1	4.G.A.2 5.G.B
Unit 1, Lesson 12	<ul style="list-style-type: none"> • face • surface area 		6.G.A.4	6.G.A.4	
Unit 1, Lesson 13	<ul style="list-style-type: none"> • base (of a prism or pyramid) • net • polyhedron • prism • pyramid 		6.G.A.4	6.G.A.4	
Unit 1, Lesson 14				6.G.A.4	
Unit 1, Lesson 15				6.G.A.2 6.G.A.4	4.NBT.B.5 5.MD.C.5
Unit 1, Lesson 16	<ul style="list-style-type: none"> • volume 			6.G.A.4	3.MD.C.5 4.MD.A.1 5.MD.C 5.MD.C.3.b 5.MD.C.4 5.MD.C.5.a



Lesson	Glossary Terms	Check Your Readiness	Standards		
			Building Toward	Addressing	Building On
Unit 1, Lesson 17	<ul style="list-style-type: none"> cubed exponent squared 	<ul style="list-style-type: none"> CYR A, Item #6 CYR B, Item #6 	6.EE.A.1	6.EE.A 6.EE.A.1	4.MD.A.3 5.MD.C.5.a
Unit 1, Lesson 18			6.EE.A.2.b	6.EE.A.1 6.EE.A.2.a 6.G.A.4	
Unit 1, Lesson 19			6.G.A.1 6.G.A.4	6.G.A.1 6.G.A.4	



Lesson	Instructional Routines	Materials to Gather	Materials to Copy
Unit 1, Lesson 1	<ul style="list-style-type: none"> 5 Practices Which Three Go Together? 	<ul style="list-style-type: none"> Chart paper: Activity 1 Sticky notes: Activity 1 Geometry toolkits: Activity 2 	<ul style="list-style-type: none"> 6–12 Blank Math Community Chart (1 copy for every 30 students): Activity 1
Unit 1, Lesson 2	<ul style="list-style-type: none"> MLR2: Collect and Display Notice and Wonder 	<ul style="list-style-type: none"> Geometry toolkits: Lesson, Activity 4 Pre-assembled or commercially produced tangrams: Lesson, Activity 3, Activity 4 Math Community Chart: Activity 1, Cool-down Sticky notes: Activity 1 	<ul style="list-style-type: none"> Composing Shapes Cutouts (1 copy for every 2 students): Activity 3
Unit 1, Lesson 3	<ul style="list-style-type: none"> 5 Practices MLR8: Discussion Supports 	<ul style="list-style-type: none"> Geometry toolkits: Lesson, Activity 1, Activity 2, Activity 3 	<ul style="list-style-type: none"> Comparing Regions Handout (1 copy for every 1 students): Activity 1
Unit 1, Lesson 4	<ul style="list-style-type: none"> MLR7: Compare and Connect 	<ul style="list-style-type: none"> Geometry toolkits: Activity 1, Activity 2, Activity 3 	<ul style="list-style-type: none"> Area of a Parallelogram Cutouts (1 copy for every 1 students): Activity 2
Unit 1, Lesson 5	<ul style="list-style-type: none"> MLR8: Discussion Supports 	<ul style="list-style-type: none"> Geometry toolkits: Lesson, Activity 1, Activity 3 Math Community Chart: Activity 1, Cool-down 	
Unit 1, Lesson 6	<ul style="list-style-type: none"> MLR8: Discussion Supports Take Turns Which Three Go Together? 	<ul style="list-style-type: none"> Geometry toolkits: Activity 2, Cool-down 	
Unit 1, Lesson 7	<ul style="list-style-type: none"> MLR2: Collect and Display 	<ul style="list-style-type: none"> Geometry toolkits: Activity 1, Activity 2 Rulers: Activity 2 	<ul style="list-style-type: none"> A Tale of Two Triangles (Part 2) Cutouts (1 copy for every 3 students): Activity 3



Lesson	Instructional Routines	Materials to Gather	Materials to Copy
Unit 1, Lesson 8	<ul style="list-style-type: none"> • 5 Practices • MLR7: Compare and Connect • Notice and Wonder 	<ul style="list-style-type: none"> • Math Community Chart: Lesson, Activity 1, Cool-down • Geometry toolkits: Activity 1, Activity 2 • Sticky notes: Activity 1 • Glue or glue sticks: Activity 3 • Tape: Activity 3 	<ul style="list-style-type: none"> • Decomposing a Parallelogram Cutouts (1 copy for every 4 students): Activity 3
Unit 1, Lesson 9	<ul style="list-style-type: none"> • MLR8: Discussion Supports 	<ul style="list-style-type: none"> • Geometry toolkits: Activity 2 	
Unit 1, Lesson 10	<ul style="list-style-type: none"> • MLR3: Critique, Correct, Clarify • MLR8: Discussion Supports 	<ul style="list-style-type: none"> • Geometry toolkits: Activity 1, Activity 3 • Index cards: Activity 2, Activity 3 	
Unit 1, Lesson 11	<ul style="list-style-type: none"> • MLR2: Collect and Display • MLR7: Compare and Connect • MLR8: Discussion Supports • Which Three Go Together? 	<ul style="list-style-type: none"> • Math Community Chart: Activity 1, Cool-down • Geometry toolkits: Activity 3, Activity 4 	<ul style="list-style-type: none"> • Pinwheel Handout (1 copy for every 4 students): Activity 4
Unit 1, Lesson 12	<ul style="list-style-type: none"> • MLR7: Compare and Connect • Notice and Wonder • Poll the Class 	<ul style="list-style-type: none"> • Snap cubes: Activity 3, Cool-down 	



Lesson	Instructional Routines	Materials to Gather	Materials to Copy
Unit 1, Lesson 13	<ul style="list-style-type: none"> MLR2: Collect and Display 	<ul style="list-style-type: none"> Chart paper: Activity 1 Math Community Chart: Activity 1, Cool-down Pre-assembled or commercially produced polyhedra: Activity 1 Nets of polyhedra: Activity 2, Activity 3 Scissors: Activity 2, Activity 3 Tape: Activity 2, Activity 3 Geometry toolkits: Activity 3 Glue or glue sticks: Activity 3 	<ul style="list-style-type: none"> Assembling Polyhedra Cutouts (1 copy for every 12 students): Activity 1 Prisms and Pyramids Cutouts (1 copy for every 4 students): Activity 2 Assembling Polyhedra Cutouts (1 copy for every 6 students): Activity 3
Unit 1, Lesson 14	<ul style="list-style-type: none"> 5 Practices MLR8: Discussion Supports 	<ul style="list-style-type: none"> Nets of polyhedra: Activity 1, Activity 2 Scissors: Activity 1, Activity 2 Geometry toolkits: Activity 2 Glue or glue sticks: Activity 2 Tape: Activity 2 	<ul style="list-style-type: none"> Matching Nets Cutouts (1 copy for every 2 students): Activity 1 Using Nets to Find Surface Area Cutouts (1 copy for every 3 students): Activity 2
Unit 1, Lesson 15	<ul style="list-style-type: none"> Math Talk MLR7: Compare and Connect 	<ul style="list-style-type: none"> Demonstration nets with and without flaps: Activity 2 Geometry toolkits: Activity 2 Glue or glue sticks: Activity 2 Scissors: Activity 2 Tape: Activity 2 	<ul style="list-style-type: none"> Building Prisms and Pyramids Cards (1 copy for every 9 students): Activity 2
Unit 1, Lesson 16	<ul style="list-style-type: none"> MLR3: Critique, Correct, Clarify MLR8: Discussion Supports 	<ul style="list-style-type: none"> Snap cubes: Activity 2, Activity 3 Sticky notes: Activity 2 Geometry toolkits: Activity 3 	
Unit 1, Lesson 17	<ul style="list-style-type: none"> 5 Practices MLR2: Collect and Display 	<ul style="list-style-type: none"> Math Community Chart: Activity 1, Cool-down Snap cubes: Activity 2 	



Lesson	Instructional Routines	Materials to Gather	Materials to Copy
Unit 1, Lesson 18	<ul style="list-style-type: none"> • 5 Practices • Math Talk • MLR8: Discussion Supports 	<ul style="list-style-type: none"> • Math Community Chart: Activity 1, Cool-down • Geometry toolkits: Activity 2, Activity 3 	
Unit 1, Lesson 19	<ul style="list-style-type: none"> • MLR5: Co-Craft Questions • MLR8: Discussion Supports • Notice and Wonder 	<ul style="list-style-type: none"> • Geometry toolkits: Activity 3 	



Tiling the Plane

Goals

- Compare (orally) areas of the shapes that make up a geometric pattern.
- Comprehend that the word “area” (orally and in writing) refers to how much of the plane a shape covers.

Student Facing Learning Goals

Let’s look at tiling patterns and think about area.

Learning Targets

- I can explain the meaning of “area.”

Required Preparation

Activity 1:

Make a space for students to place their sticky notes at the end of the *Warm-up*. For example, hang a sheet of chart paper on a wall near the door.

Activity 2:

Assemble geometry toolkits. Toolkits include tracing paper, graph paper, colored pencils, scissors, and an index card to use as a straightedge or to mark right angles.

Prepare pattern blocks (with triangles, rhombuses, and trapezoids), if available.

For the digital version of the activity, acquire devices that can run the applet.

Lesson:

Assemble geometry toolkits. Toolkits include tracing paper, graph paper, colored pencils, scissors, and an index card to use as a straightedge or to mark right angles.

Cool Down

Think about your work today, and write your best definition of “area.”

Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.



Finding Area by Decomposing and Rearranging

Goals

- Calculate the area of a region by decomposing it and rearranging the pieces, and explain (orally and in writing) the solution method.
- Recognize and explain (orally) that if two figures can be placed one on top of the other so that they match up exactly, they must have the same area.
- Show that area is additive by composing polygons with a given area.

Student Facing Learning Goals

Let's create shapes and find their areas.

Learning Targets

- I can explain how to find the area of a figure that is composed of other shapes.
- I know how to find the area of a figure by decomposing it and rearranging the parts.
- I know what it means for two figures to have the same area.

Required Preparation

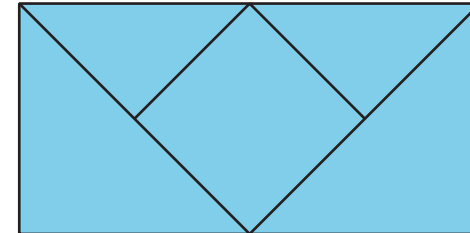
Activity 3:

For every group of 2 students, prepare 1 set of tangrams that contains 1 square, 4 small triangles, 1 medium triangle, and 2 large triangles. Print and cut out the blackline master (printing on card stock is recommended), or use commercially-available tangrams.

Note that the tangram pieces used here differ from a standard set in that two

Cool Down

The square in the middle has an area of 1 square unit. What is the area of the entire rectangle in square units? Explain your reasoning.



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.



additional small triangles are used instead of a parallelogram.

For the digital version of the activity, acquire devices that can run the applet.

Activity 4:

For the digital version of the activity, acquire devices that can run the applet.

Lesson:

Make sure that students have access to their geometry toolkits, which should include tracing paper, graph paper, colored pencils, scissors, and an index card to use as a straightedge or to mark right angles.



Reasoning to Find Area

Goals

- Compare and contrast (orally) different strategies for calculating the area of a polygon.
- Find the area of a polygon by decomposing, rearranging, subtracting, or enclosing shapes, and explain (orally and in writing) the solution method.
- Include appropriate units (in spoken and written language) when stating the area of a polygon.

Student Facing Learning Goals

Let's decompose and rearrange shapes to find their areas.

Learning Targets

- I can use different reasoning strategies to find the area of shapes.

Required Preparation

Activity 1:

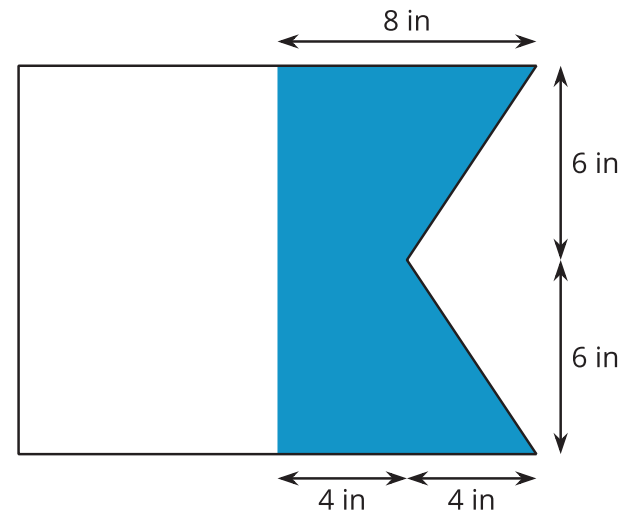
Prepare several copies of the pair of figures on the blackline master, in case students propose cutting them out to compare the areas.

Lesson:

Make sure students have access to items in their geometry toolkits: tracing paper, graph paper, colored pencils, scissors, and an index card to use as a straightedge or to mark right angles.

Cool Down

A maritime flag is shown. What is the area of the shaded part of the flag? Explain or show your reasoning.



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Parallelograms

Goals

- Compare and contrast (orally) different strategies for determining the area of a parallelogram.
- Describe (orally and in writing) observations about the opposite side and opposite angles of parallelograms.
- Explain (orally and in writing) how to find the area of a parallelogram by rearranging its parts or by enclosing it in a rectangle.

Student Facing Learning Goals

Let's investigate the characteristics and area of parallelograms.

Learning Targets

- I can use reasoning strategies and what I know about the area of a rectangle to find the area of a parallelogram.
- I know how to describe the characteristics of a parallelogram using mathematical vocabulary.

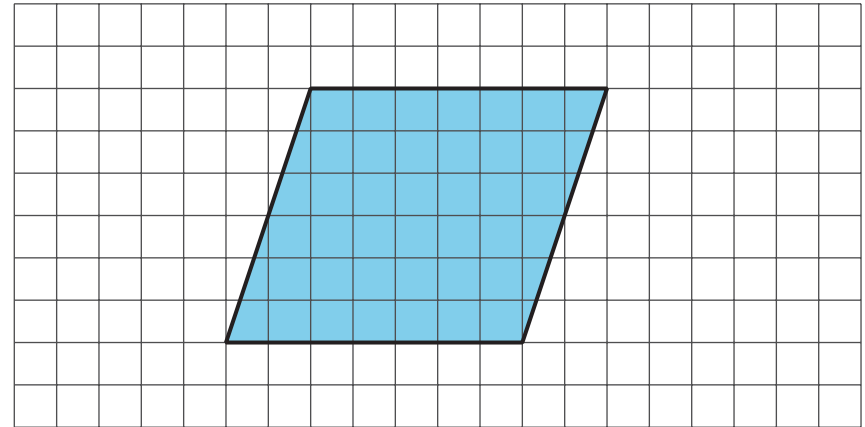
Required Preparation

Activity 2:

For the digital version of the activity, acquire devices that can run the applet.

Cool Down

How would you find the area of this parallelogram? Describe your strategy.



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Bases and Heights of Parallelograms

Goals

- Comprehend that the terms “base” and “height” refer to one side of a parallelogram and the perpendicular distance between that side and the opposite side.
- Generalize (orally) a process for finding the area of a parallelogram, using the length of a base and the corresponding height.
- Identify a base and the corresponding height for a parallelogram, and understand that there are two different base-height pairs for any parallelogram.

Student Facing Learning Goals

Let's investigate the area of parallelograms some more.

Learning Targets

- I can identify pairs of base and height of a parallelogram.
- I can write and explain the formula for the area of a parallelogram.
- I know what the terms "base" and "height" refer to in a parallelogram.

Required Preparation

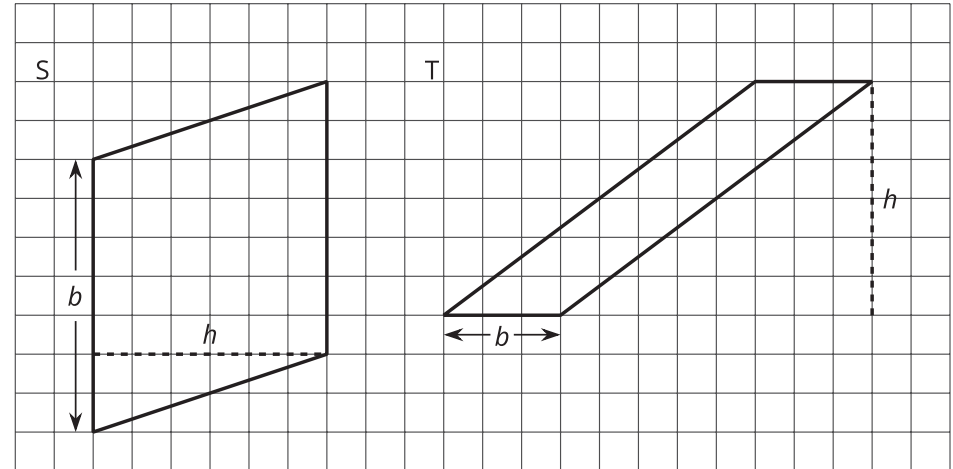
Activity 1:

For the digital version of the activity, acquire devices that can run the applet.

In the “Doing Math” teacher section of the Math Community Chart, add 2–5 commitments you have for what your teaching practice “looks like” and “sounds

Cool Down

Parallelograms S and T are each labeled with a base and a corresponding height.



1. What are the values of b and h for each parallelogram?
 - Parallelogram S: $b = \underline{\hspace{1cm}}$, $h = \underline{\hspace{1cm}}$
 - Parallelogram T: $b = \underline{\hspace{1cm}}$, $h = \underline{\hspace{1cm}}$
2. Use the values of b and h to find the area of each parallelogram.
 - Area of Parallelogram S:
 - Area of Parallelogram T:

Responding to Student Thinking

Points to Emphasize

If students struggle with finding the areas of the parallelograms, highlight ways to decompose and rearrange a parallelogram into a rectangle with a known base and height. For example, in this activity, emphasize that each parallelogram can be decomposed and rearranged into a rectangle with the same pair of base and height measurements:

like" this year.

Activity 2:

For the digital version of the activity, acquire devices that can run the applet.



Area of Parallelograms

Goals

- Apply the formula for the area of a parallelogram to find the area, the length of the base, or the height, and explain (orally and in writing) the solution method.
- Choose which measurements to use for calculating the area of a parallelogram when more than one base or height measurement is given, and explain (orally and in writing) the choice.

Student Facing Learning Goals

Let's practice finding the area of parallelograms.

Learning Targets

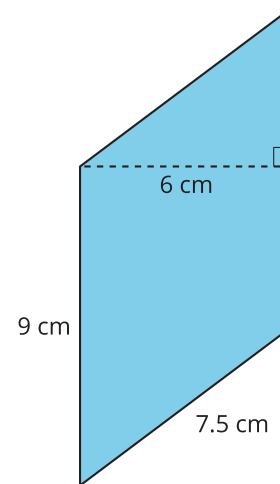
- I can use the area formula to find the area of any parallelogram.

Required Preparation

Activity 2:

For the digital version of the activity, acquire devices that can run the applet.

Cool Down



1. Find the area of the parallelogram. Explain or show your reasoning.
2. Was there a length measurement you did not use to find the area? If so, explain why it was not used.

Responding to Student Thinking

Points to Emphasize

If students struggle with finding the area of a parallelogram that is not on a grid, integrate discussions about how to find the area of a parallelogram more generally. For example, when students find the areas of parallelograms in the practice problems of the lesson referred to here, encourage them to decompose and rearrange the parallelograms into rectangles, reason about the bases and heights, and notice regularity in the process.

Grade 6, Unit 1, Lesson 7 From Parallelograms to Triangles

From Parallelograms to Triangles

Goals

- Describe (orally and in writing) ways in which two identical triangles can be composed, i.e., into a parallelogram or into a rectangle.
- Show how any parallelogram can be decomposed into two identical triangles by drawing a diagonal, and generalize (in writing) that this property applies to all parallelograms, but not all quadrilaterals.

Student Facing Learning Goals

Let's compare parallelograms and triangles.

Learning Targets

- I can explain the special relationship between a pair of identical triangles and a parallelogram.

Required Preparation

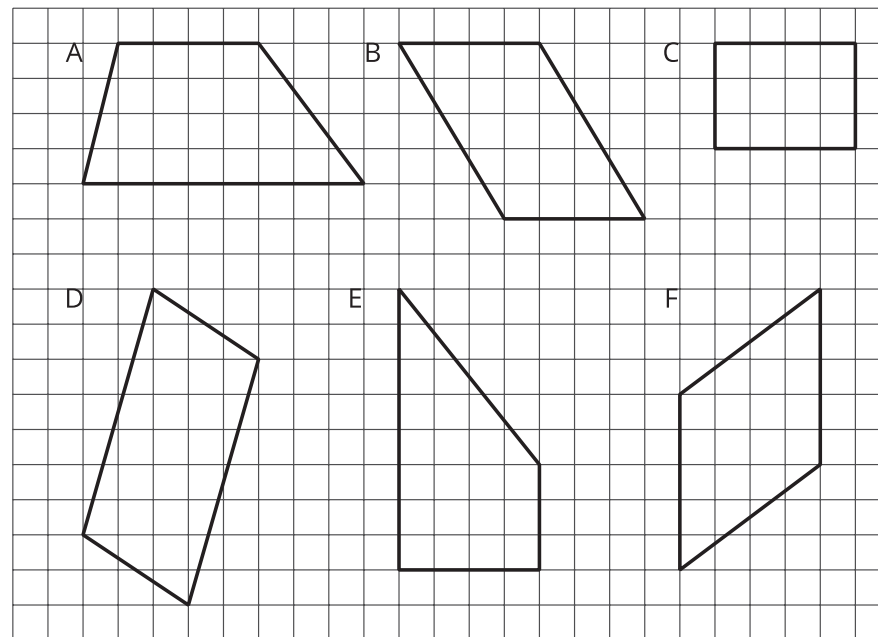
Activity 3:

Print pairs of triangles from the blackline master. If students are cutting out the triangles, use the first page only. If the triangles are to be pre-cut by the teacher, print the second and third pages. Prepare enough sets so that each group of 3–4 students has a complete set of 6 pairs of triangles labeled P, Q, R, S, T, and U (2 copies of each).

For the digital version of the activity, acquire devices that can run the applet.

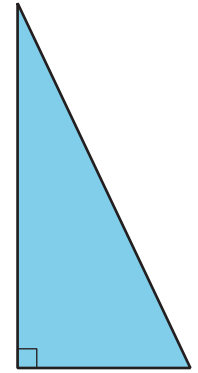
Cool Down

- Here are some quadrilaterals.



- Circle all quadrilaterals that you think can be decomposed into two identical triangles using only one line.
- What characteristics do the quadrilaterals that you circled have in common?

2. Here is a right triangle. Show or briefly describe how two copies of it can be composed into a parallelogram.



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Area of Triangles

Goals

- Draw a diagram to show that the area of a triangle is half the area of an associated parallelogram.
- Explain (orally and in writing) strategies for using the base and height of an associated parallelogram to determine the area of a triangle.

Student Facing Learning Goals

Let's use what we know about parallelograms to find the area of triangles.

Learning Targets

- I can use what I know about parallelograms to reason about the area of triangles.

Required Preparation

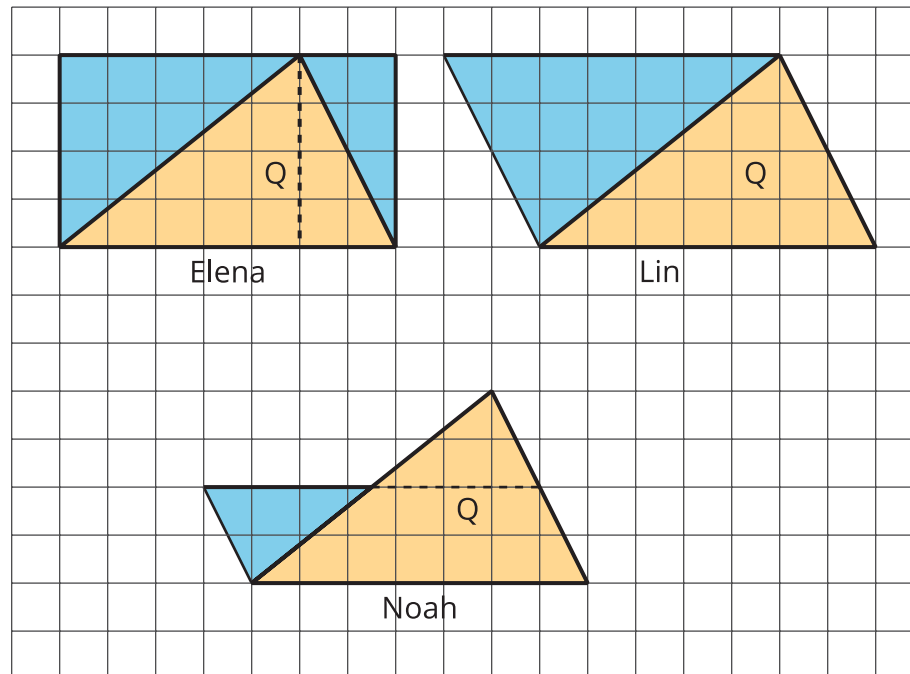
Activity 3:

Each copy of the blackline master contains two copies of each of Parallelograms A, B, C, and D. Prepare enough copies so that each student receives two copies of a parallelogram.

Students need access to tape *or* glue; it is not necessary to have both.

Cool Down

Elena, Lin, and Noah all found the area of Triangle Q to be 14 square units but reasoned about it differently, as shown in the diagrams. Explain *at least one* student's way of thinking and why his or her answer is correct.



Responding to Student Thinking

Points to Emphasize

If students struggle with explaining the area of the triangle, give students opportunities to justify the areas of triangles over the next several lessons. For example, in this activity, after students find the areas of Triangles A–D and before discussing a general formula for area, encourage students to verbally explain the area of one or more triangles:

Grade 6, Unit 1, Lesson 9, Activity 2 Finding a Formula for the Area of a Triangle

Formula for the Area of a Triangle

Goals

- Compare, contrast, and critique (orally) different strategies for determining the area of a triangle.
- Generalize a process for finding the area of a triangle, and justify (orally and in writing) why this can be abstracted as $\frac{1}{2} \cdot b \cdot h$.
- Recognize that any side of a triangle can be considered its base, choose a side to use as the base when calculating the area of a triangle, and identify the corresponding height.

Student Facing Learning Goals

Let's write and use a formula to find the area of a triangle.

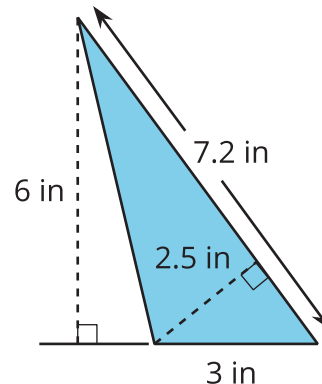
Learning Targets

- I can use the area formula to find the area of any triangle.
- I can write and explain the formula for the area of a triangle.
- I know what the terms "base" and "height" refer to in a triangle.

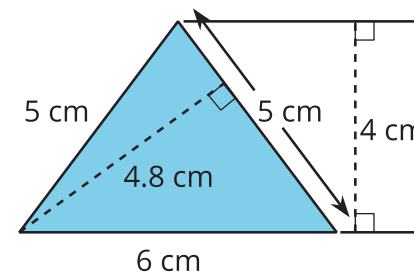
Cool Down

For each triangle, identify a base and a corresponding height. Use them to find the area. Show your reasoning.

A



B



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Bases and Heights of Triangles

Goals

- Draw and label the height that corresponds to a given base of a triangle, making sure it is perpendicular to the base and the correct length.
- Evaluate (orally) the usefulness of different base-height pairs for finding the area of a given triangle.

Student Facing Learning Goals

Let's use different base-height pairs to find the area of a triangle.

Learning Targets

- I can identify pairs of base and corresponding height of any triangle.
- When given information about a base of a triangle, I can identify and draw a corresponding height.

Required Preparation

Activity 1:

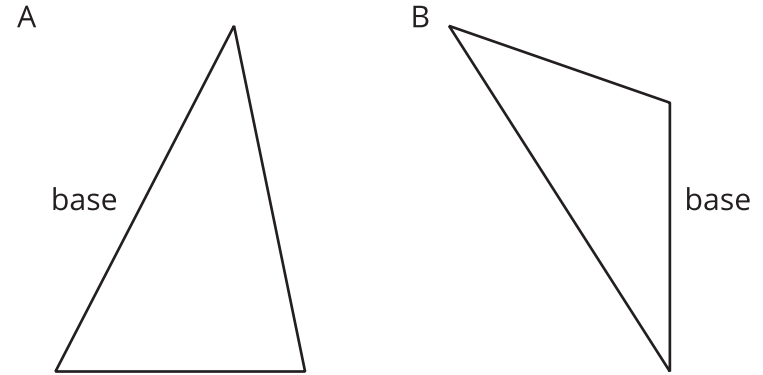
For the digital version of the activity, acquire devices that can run the applet.

Activity 2:

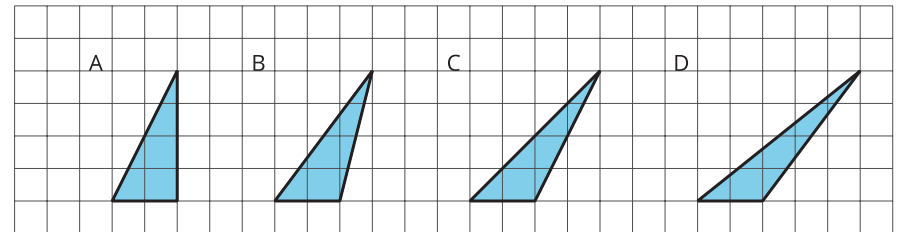
Each student especially needs an index card.

Cool Down

1. For each triangle, draw a height segment that corresponds to the given base, and label it h . Use an index card if needed.



2. Which triangle has the greatest area? The least area? Explain your reasoning.



Responding to Student Thinking

Points to Emphasize

If students struggle with identifying bases and corresponding heights or with calculating areas, revisit this idea when opportunities arise over the next several lessons. For example, these practice problems require students to identify the bases and corresponding heights of triangles and to calculate their areas:





Polygons

Goals

- Compare and contrast (orally) different strategies for finding the area of a polygon.
- Describe (orally and in writing) the defining characteristics of polygons.
- Find the area of a polygon, by decomposing it into rectangles and triangles, and present the solution method (using words and other representations).

Student Facing Learning Goals

Let's investigate polygons and their areas.

Learning Targets

- I can describe the characteristics of a polygon using mathematical vocabulary.
- I can reason about the area of any polygon by decomposing and rearranging it, and by using what I know about rectangles and triangles.

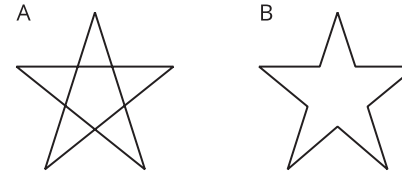
Required Preparation

Activity 4:

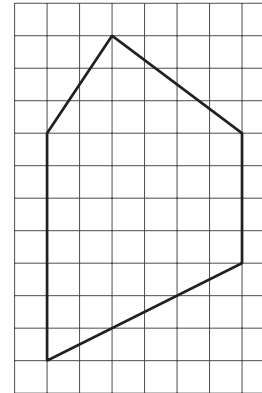
For this optional activity, if larger paper (and a photocopier that can accommodate it) is available, it would be helpful to have larger-format copies of the blackline master

Cool Down

1. Here are two five-pointed stars. A student said, "Both figures A and B are polygons. They are both composed of line segments and are two-dimensional. Neither have curves." Do you agree with the statement? Explain your reasoning.



2. Here is a five-sided polygon. Describe or show the strategy you would use to find its area. Mark up and label the diagram to show your reasoning so that it can be followed by others. (It is not necessary to actually calculate the area.)



Responding to Student Thinking

Points to Emphasize

If students struggle with decomposing a polygon into parallelograms and triangles whose areas can be calculated, integrate discussions about different ways to find the area of a polygon. For example, ask students to analyze Lin's and Andre's ways of decomposing the hexagon in this practice problem and explain how its area can be found using each method:



What Is Surface Area?

Goals

- Calculate the surface area of a rectangular prism and explain (orally and in writing) the solution method.
- Comprehend that the term “surface area” (in written and spoken language) refers to how many square units it takes to cover all the faces of a three-dimensional object.

Student Facing Learning Goals

Let’s cover the surfaces of some three-dimensional objects.

Learning Targets

- I know what the surface area of a three-dimensional object means.

Required Preparation

Activity 3:

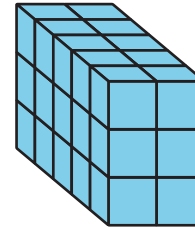
Prepare 12 cubes per student and extra copies of isometric dot paper.

Lesson:

Build several rectangular prisms that are each 2 cubes by 3 cubes by 5 cubes for the *Cool-down*.

Cool Down

A rectangular prism is 3 units high, 2 units wide, and 5 units long. What is its surface area in square units? Explain or show your reasoning.



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Polyhedra

Goals

- Compare and contrast (orally and in writing) features of prisms and pyramids.
- Comprehend and use the words “face”, “edge”, “vertex”, and “base” to describe polyhedra (in spoken and written language).
- Understand that the word “net” refers to a two-dimensional figure that can be assembled into a polyhedron, and create a net for a given polyhedron.

Student Facing Learning Goals

Let’s investigate polyhedra.

Learning Targets

- I can describe the features of a polyhedron using mathematical vocabulary.
- I can explain the difference between prisms and pyramids.
- I understand the relationship between a polyhedron and its net.

Required Preparation

Activity 1:

Assemble collections of geometric figures that each contains at least 2 familiar polyhedra, 2 unfamiliar polyhedra, and 2 non-polyhedra. Prepare one collection for each group of 3–4 students. If pre-made polyhedra are unavailable, assemble some from the nets in the blackline master.

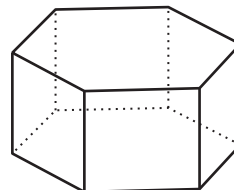
Activity 2:

Print and pre-cut the nets and polygons in the blackline master. Prepare 1 set per group of 3–4 students, along with tape to join the polygons into a net.

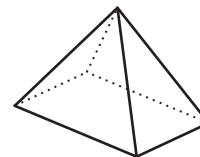
Cool Down

1. Write your best definition or description of a polyhedron. If possible, use the terms you learned in this lesson.
2. Which of these five polyhedra are prisms? Which are pyramids?

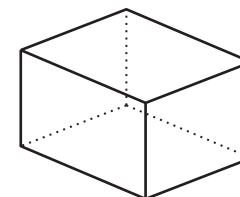
A



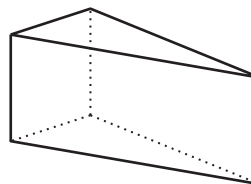
B



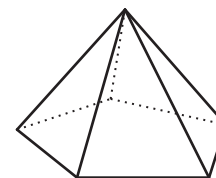
C



D



E



Responding to Student Thinking

Points to Emphasize

If students struggle with identifying polyhedra, revisit this idea when opportunities arise over the next several lessons. For example, in this activity, emphasize the properties of polyhedra when students are asked to match nets with their respective polyhedra:

Grade 6, Unit 1, Lesson 14, Activity 1 Matching Nets

Activity 3:

Print the nets from the same blackline master as the one used for the *Warm-up*. For each student, prepare 2 copies of one net and tape or glue to assemble the net.



Nets and Surface Area

Goals

- Match polyhedra with their nets and justify (orally) that they match.
- Use a net with gridlines to calculate the surface area of a prism or pyramid and explain (in writing) the solution method.
- Visualize and identify the polyhedron that can be assembled from a given net.

Student Facing Learning Goals

Let's use nets to find the surface area of polyhedra.

Learning Targets

- I can match polyhedra to their nets and explain how I know.
- When given a net of a prism or a pyramid, I can calculate its surface area.

Required Preparation

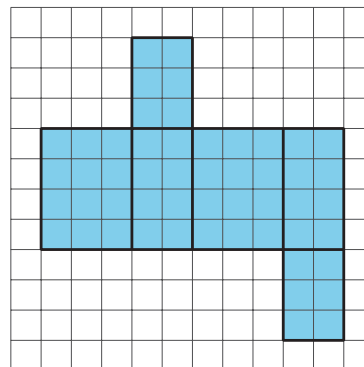
Activity 1:

Prepare physical copies of the nets in the *Warm-up*, in case needed to support students with visualization. The blackline master contains a larger version of these nets.

Activity 2:

Make copies of the nets in the blackline master. Prepare one set of 3 nets (A, B, and C) and provide some glue or tape for each group of 3 students.

Cool Down



1. What kind of polyhedron can be assembled from this net?
2. Find the surface area (in square units) of the polyhedron. Show your reasoning.

Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

More Nets, More Surface Area

Goals

- Draw and assemble a net for the prism or pyramid shown in a given drawing.
- Interpret (using words and other representations) two-dimensional representations of prisms and pyramids.
- Use a net without gridlines to calculate the surface area of a prism or pyramid and explain (in writing) the solution method.

Student Facing Learning Goals

Let's draw nets and find the surface area of polyhedra.

Learning Targets

- I can calculate the surface area of prisms and pyramids.
- I can draw the nets of prisms and pyramids.

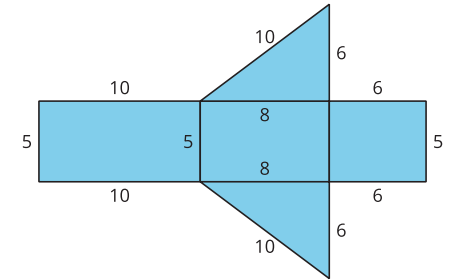
Required Preparation

Activity 2:

Copy and cut the blackline master. Make one copy for every 9 students, so that each student gets one drawing of a polyhedron. Consider assignments of polyhedra in advance.

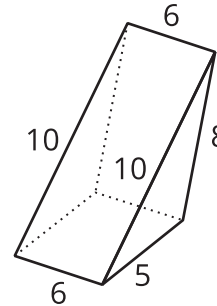
Cool Down

1. In this net, the two triangles are right triangles. All quadrilaterals are rectangles. What is its surface area in square units? Show your reasoning.

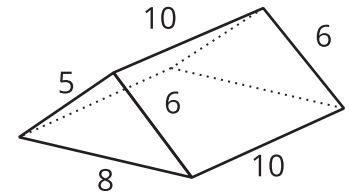


2. If the net is assembled, which of the following polyhedra would it make?

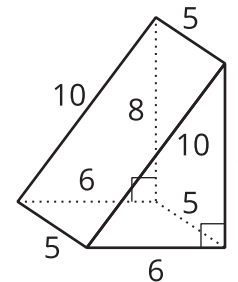
A



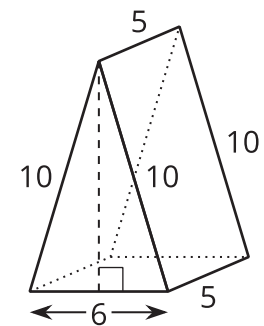
B



C



D



Responding to Student Thinking

Points to Emphasize

If students struggle with relating polyhedra and their nets, discuss the connections between different representations of a polyhedron when opportunities arise in the next lesson. For example, review this practice problem, and discuss how students know the side lengths of the polygons on each net:

Grade 6, Unit 1, Lesson 15, Practice Problem 4



Distinguishing Between Surface Area and Volume

Goals

- Comprehend that surface area and volume are two different attributes of three-dimensional objects and are measured in different units.
- Describe (orally and in writing) shapes built out of cubes, including observations about their surface area and volume.
- Determine the surface area and volume of shapes made out of cubes.

Student Facing Learning Goals

Let's contrast surface area and volume.

Learning Targets

- I can explain how it is possible for two polyhedra to have the same surface area but different volumes, or to have different surface areas but the same volume.
- I know how one-, two-, and three-dimensional measurements and units are different.

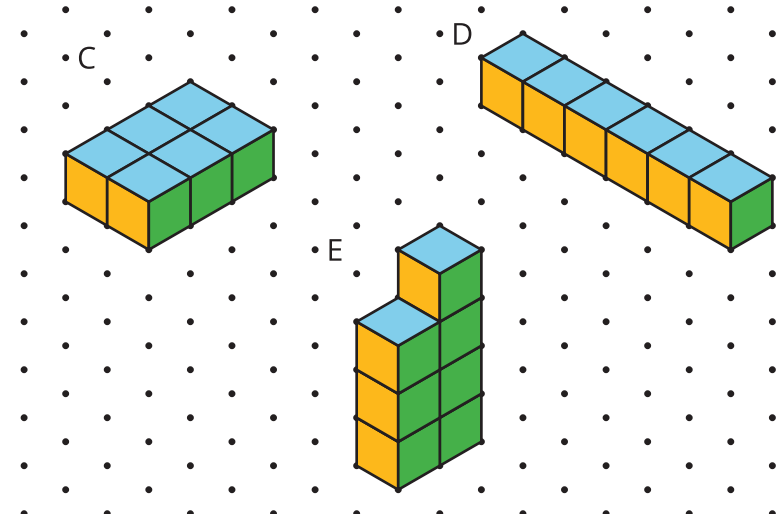
Required Preparation

Activity 1:

Prepare solutions to the first question of the *1-2-3 Dimensional Attributes* activity on a large visual display.

Cool Down

Choose two figures that have the same surface area but different volumes. Show your reasoning.



Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Activity 2:

Prepare sets of 16 snap cubes and two sticky notes for each student.

For the digital version of the activity, acquire devices that can run the applet.



Squares and Cubes

Goals

- Generalize a process for finding the volume of a cube, and justify (orally) why this can be abstracted as s^3 .
- Include appropriate units (orally and in writing) when reporting lengths, areas, and volumes, e.g., cm, cm^2 , cm^3 .
- Interpret and write expressions with exponents 2 and 3 to represent the area of a square or the volume of a cube.

Student Facing Learning Goals

Let's investigate perfect squares and perfect cubes.

Learning Targets

- I can write and explain the formula for the volume of a cube, including the meaning of the exponent.
- When I know the edge length of a cube, I can find the volume and express it using appropriate units.

Required Preparation

Activity 2:

Prepare sets of 32 snap cubes for each group of 2 students.

For the digital version of the activity, acquire devices that can run the applet.

Cool Down

1. Which is larger, 5^2 or 3^3 ?
2. A cube has an edge length of 21 cm. Use an exponent to express its volume.

Responding to Student Thinking

More Chances

Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Surface Area of a Cube

Goals

- Generalize a process for finding the surface area of a cube, and justify (orally) why this can be abstracted as $6 \cdot s^2$.
- Interpret (orally) expressions that include repeated addition, multiplication, repeated multiplication, or exponents.
- Write expressions, with or without exponents, to represent the surface area of a given cube.

Student Facing Learning Goals

Let's write a formula to find the surface area of a cube.

Learning Targets

- I can write and explain the formula for the surface area of a cube.
- When I know the edge length of a cube, I can find its surface area and express it using appropriate units.

Cool Down

1. A cube has an edge length of 11 inches. Write an expression for its volume and an expression for its surface area.
2. A cube has a volume of 7^3 cubic centimeters. What is its surface area?

Responding to Student Thinking

Points to Emphasize

If students struggle with interpreting or writing expressions for the surface area or the volume of a cube, as opportunities arise, highlight the distinctions between these geometric attributes and ways to quantify them. For example, encourage students to draw a sketch, label the edge lengths, and write expressions for the volume and surface area of each cube described in this practice problem:

Grade 6, Unit 1, Lesson 18, Practice Problem 1

All about Tents

Goals

- Apply understanding of surface area to estimate the amount of material in a tent, and explain (orally and in writing) the estimation strategy.
- Compare and contrast (orally) different tent designs.
- Interpret information (presented in writing and through other representations) about tents and sleeping bags.

Student Facing Learning Goals

Let's find out how much material is needed to build some tents.

Learning Targets

- I can apply what I know about the area of polygons to find the surface area of three-dimensional objects.
- I can use surface area to reason about real-world objects.

