



# Composite Figures in Architecture

## Perimeter and Area of Composite Figures



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<b>Grade Level</b>	7th Grade	<b>Time Frame</b>	2-3 class period(s)
<b>Subject</b>	Mathematics	<b>Duration</b>	120 minutes
<b>Course</b>	Middle School Mathematics		

### Essential Question

How can I use formulas to find the area and perimeter of an object with an unusual shape? How do the dimensions of a figure affect area and perimeter?

### Summary

The lesson focuses on solving for perimeter and area of composite figures. Students will explore area and perimeter using pattern blocks to create unusual shapes, and then try to calculate the areas of these shapes. Next, students will learn about the real-life application of mathematics by watching a video about life as an architect. Students will then step into the role of an architect, creating the floor plans of their dream homes using basic shapes before calculating the area and perimeter of their peers' floor plans. This lesson includes optional modifications for distance learning. Resources for use in Google Classroom are included.

### Snapshot

#### Engage

Students complete the "What I Know" and "What I Want to Know" columns of an area and perimeter KWL chart.

#### Explore

Students use pattern blocks to find the area and perimeter of one of three unusual shapes.

#### Explain

Students explain how they arrived at the area and perimeter of each unusual shape. As a class, they learn and work through the formula for the area of a trapezoid.

#### Extend

Students create a house floor plan using rectangles, triangles, circles, and trapezoids. Students find the area and perimeter of their floor plans.

#### Evaluate

Students pass their floor plans to their group members, and then find the areas and perimeters of other students' floor plans.

## Standards

*Oklahoma Academic Standards for Mathematics (Grade 7)*

**7.GM.2.1:** Develop and use the formula to determine the area of a trapezoid to solve problems.

**7.GM.2.2:** Find the area and perimeter of composite figures to solve real-world and mathematical problems.

## Attachments

- [Design-a-House-Composite-Figures-in-Architecture - Spanish.docx](#)
- [Design-a-House-Composite-Figures-in-Architecture - Spanish.pdf](#)
- [Design-a-House-Composite-Figures-in-Architecture.docx](#)
- [Design-a-House-Composite-Figures-in-Architecture.pdf](#)
- [KWL-Chart-Composite-Figures-in-Architecture - Spanish.docx](#)
- [KWL-Chart-Composite-Figures-in-Architecture - Spanish.pdf](#)
- [KWL-Chart-Composite-Figures-in-Architecture.docx](#)
- [KWL-Chart-Composite-Figures-in-Architecture.pdf](#)
- [Lesson-Slides-Composite-Figures-in-Architecture.pptx](#)
- [Student-Record-Sheet-Composite-Figures-in-Architecture - Spanish.docx](#)
- [Student-Record-Sheet-Composite-Figures-in-Architecture - Spanish.pdf](#)
- [Student-Record-Sheet-Composite-Figures-in-Architecture.docx](#)
- [Student-Record-Sheet-Composite-Figures-in-Architecture.pdf](#)

## Materials

- Lesson Slides (attached)
- KWL Chart handouts (attached, one per student)
- Student Record Sheet handouts (attached, one per pair of students)
- Rulers
- Pattern blocks (optional)
- Design a House handouts (attached, one per student)
- Sticky notes
- Colored pencils or similar art supplies (optional)
- [Google Classroom](#) (optional)

# Engage

Use the attached Lesson Slides to guide the lesson. Begin with **slide 2** and introduce the essential questions to students: *How can you use formulas to find the perimeter and area of an object with an unusual shape? How do the dimensions of a figure affect the perimeter and area?* Move to **slide 3** to share the lesson objective: *By the end of the lesson, students will be able to find the perimeter and area of composite figures using both pattern blocks and architecture designs.*

Go to **slide 4**. Introduce students to the [KWL Graphic Organizer](#) strategy to activate prior knowledge about perimeter and area. Give each student a copy of the attached KWL Chart handout. Have students complete the K ("What I Know") and W ("What I Want to Know") columns. Ask volunteers to share a few things they wrote and facilitate a brief class discussion. Document what students share on a class chart.

## Teacher's Note: The "I" Column

Have students put away their KWL charts for now but keep track of them to use again later in the lesson. The L ("What I Learned") column will be completed during the Explain activity.

## Optional Modification For Distance Learning

To make use of this lesson in a distance learning environment, consider converting the attached KWL Chart into a [Google Doc](#). Students can add notes to the document and collaborate as a group using the "chat" feature in the document. You may also consider making this activity a discussion board post to which your students can respond directly. [Download all attachments to use this lesson in Google Classroom.](#)

## Explore

Move to **slide 5**. Sort students into pairs, and give each pair a set of pattern blocks, one copy (including all three unique shapes) of the attached Student Record Sheet handout, and a ruler. Invite students to create block figures based on the pictures. After they create their figures with the pattern blocks, have students use rulers to measure the figures. Students should record the perimeter and area of each figure on their handout. Formulas for calculating the perimeters and areas of various shapes are included on the slide as reminders.

### Teacher's Note: Pattern Blocks

Using pattern blocks can make this activity more tactile and manipulable for students, but the calculations can be done with or without the pattern blocks, using the images on the Student Record Sheet handout. You might also choose to cut out shapes for students to use as manipulatives if you don't have access to pattern blocks.

### Sample Student Responses

Students' approaches might be incorrect at this point in the lesson. This is acceptable as they explore calculating perimeter and area. Encourage them to think critically and try and figure things out. There will be time for formal explanations later in the lesson.

### Optional Modification For Distance Learning

If conducting this lesson in an online or distance learning environment, you may choose to upload the "Student Record Sheet" handout to Google Draw and make a copy for each student or group. Instruct students to turn on rulers and guides (Select "View", and then select "Show Ruler" and "Show Guides" to enable students to digitally measure different pieces of the pattern). [Download all attachments to use this lesson in Google Classroom.](#)

# Explain

On **slides 6-8**, review the "butterfly," "lollipop," and "fish" pictures as a class and invite students to explain how they solved for each picture. Solicit a few answers from different members of the class to compare answers.

## Sample Student Responses

Correct answers for the perimeters and areas of the shapes on slides 7 through 9 will vary depending on whether your students are using the images on the handout, the pattern blocks, or cut-outs you've made to complete their calculations. Be sure to work the problems yourself prior to the lesson to be able to gauge students' accuracy.

## Optional Modification For Distance Learning

If conducting this lesson in an online or distance learning environment, you may choose to allow students to explain how they solved for each picture with a website such as [VoiceThread](#). With [VoiceThread](#), you can upload the images to the site beforehand. Then, students can choose whether they would like to make a quick video, a voice memo, or a written note to explain their reasoning. [Download all attachments to use this lesson in Google Classroom.](#)

Move to **slide 9**. Using the diagram on the slide, show students how to solve for the area of a trapezoid with the provided formula. Select numbers to represent  $a$ ,  $b$ , and  $h$ , and then work a sample problem with the students using those numbers. It is likely that students calculated the area of trapezoids in the Explore by splitting them into two triangles and a rectangle, but now they have a single calculation—as opposed to three—to arrive at the same answer.

Go to **slide 10**. Invite students to retrieve their KWL Charts and complete the L ("What I Learned") column. Allow enough time for students to do so, and then invite volunteers to share what they learned. As with the Engage part of the activity, document what students share on your class chart.

Ask students if they can think of a real-life scenario in which they could use what they learned about area and perimeter. Solicit a few answers from the class. Transition into the next activity by telling students that one real-life application for perimeter and area is in architecture and that they will be using area and perimeter to design their dream homes.

## Extend

Go to **slide 11**. Use the video link on the slide ([or here](#)), or the embedded version of the video below to show students the video "I Wanna Be an Architect: A Day In The Life Of An Architect."

### Embedded video

<https://www.youtube.com/watch?v=asdgRAjGK-M>



*Jesse from Student Edge goes behind the scenes with Sophie Giles to find out what being an architect is all about.*

### Teacher's Note: Educational Requirements

Because the video above is coming from Australia, some of the educational requirements to become an architect might be a bit different from what is required where you live. You might want to briefly address the potential differences across locations after watching the video with students.

Move to **slide 12**. Give each student a copy of the attached Design a House handout and a sticky note. Invite students to step into the role of an architect to design a floor plan for their dream house. This floor plan should use the following shapes: rectangles, squares, triangles, trapezoids, and circles. Allow students to create their designs. Ask students to find the area and perimeter of their entire floor plan they design and write those calculations on their sticky notes (not on the Design a House handout).

### Teacher's Note: Floor Plans

You might choose to show the students an example of what a floor plan looks like in case they haven't seen one, but encourage students to be creative in their designs. An example is included on slide 12.

**Optional Modification For Distance Learning**

To optimize this activity for distance learning, you may choose to allow students to create their floor plan using a design site such as [Canva](#). [Download all attachments to use this lesson in Google Classroom.](#)

# Evaluate

Move to **slide 13**. Organize students into groups of three, and tell them they will now calculate the dimensions of their peers' floor plans by using the [Pass the Problem](#) strategy.

For the first round, ask students to pass their floor plans to the group member to their right and find the **perimeter** of the design they received. Allow enough time for students to do so.

For the second round, ask students to pass to the right again and this time find the **area** of the design they received.

For the third round, ask students to pass to the right again. Students should now be holding their original designs. During this round, ask students to check the answers of their group members.

## Optional Modification For Distance Learning

To make the Pass the Problem activity accessible for distance learners, you may choose to assign each student the whole task of solving for the area and perimeter of another student's floor plan using a website such as [VoiceThread](#). To do so, upload students' work ahead of time onto the site. Students can choose whether they would like to make a quick video, a voice memo, or a written note to explain how they solved the problems. [Download all attachments to use this lesson in Google Classroom.](#)



## Resources

- K20 Center. (n.d.). KWHL Graphic Organizer. Strategies. <https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505dd47>
- K20 Center. (n.d.). Pass the Problem. Strategies. <https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f506c28b>
- K20 Center. (n.d.). Google Classroom. Tech Tools. <https://learn.k20center.ou.edu/tech-tool/628>
- K20 Center. (n.d.). Canva. Tech Tools. <https://learn.k20center.ou.edu/tech-tool/612>
- Student Edge. (2014, May 13). I wanna be an architect - A day in the life of an architect [Video]. YouTube. <https://youtu.be/asdgRAjGK-M>