

## LESSON PLAN: HOW TO FIND THE AREA OF A HEXAGON

<b>Subject</b>	Secondary School Level (Grades 7-12) – Mathematics
<b>Developed by</b>	<b>Ehisann Elbirani</b> (Mathematics Major at the Werklund School of Education, University of Calgary 2023 Graduate) - in consultation with the research team (Nicole Langevin & Miwa Takeuchi)

### Overview

This lesson plan will help students develop spatial sense. The purpose is to allow students to use the knowledge they already know (areas of the standard shapes I.e., triangles, squares, rectangles...etc.) to help them understand something new (the area of a hexagon).

The information below is taken from the Alberta program of studies, however these learning outcomes are universal and can be adapted across educational contexts.

It is expected that students will:

1. Analyze puzzles and games that involve spatial reasoning, using problem-solving strategies.
2. Demonstrate an understanding of the Pythagorean theorem by:
  - identifying situations that involve right triangles
  - verifying the formula
  - applying the formula
  - solving problems.
3. Demonstrate an understanding of similarity of convex polygons like the hexagon.

<b>Objective in student-friendly language</b> What will students understand/experience/appreciate as a result of this lesson?	<b>Assessment Strategies</b> What will I accept as evidence of learning/development? Have I employed formative assessment? Do I make use of prior assessments in this lesson?
By the end of this lesson students will... <ul style="list-style-type: none"> <li>- Be more familiar with solving complex mathematical problems using the Pythagorean theorem, and areas of different shapes.</li> <li>- Have a better understanding of the Pythagorean Theorem and what it can be used for.</li> <li>- Have a better understanding of the concept or area when it comes to different shapes.</li> </ul>	What will I accept as evidence of learning: <ul style="list-style-type: none"> <li>- Are students engaged?</li> <li>- Are most students able to answer the question provided?</li> </ul> Have I employed formative assessment: <ul style="list-style-type: none"> <li>- In-class discussions are encouraged throughout the entirety of the lesson.</li> <li>- Having students oversee their own learning.</li> <li>- Providing feedback that encourages students to keep learning.</li> </ul>

	<p>Do I make use of prior assessment in this lesson?</p> <ul style="list-style-type: none"> <li>- Students must recall knowledge they've learnt in the previous classes.</li> </ul> <p>Summative assessment:</p> <ul style="list-style-type: none"> <li>- Completed Worksheet</li> </ul>
<p><b>Resources</b></p> <p>What materials/resources/technology will be required?</p>	<p><b>Multimodality</b></p>
<ul style="list-style-type: none"> <li>- Printed hexagon worksheet</li> <li>- Formula sheet</li> </ul>	<ul style="list-style-type: none"> <li>- Attend to the needs of all learners by allowing students to demonstrate their knowledge verbally, visually, and formally through the worksheet.</li> <li>- Provide multiple forms of instruction using discussion, group work and applications.</li> </ul>

### LESSON PLAN SEQUENCE

<p><b>Introduction</b></p>	
<p>Introduce the lesson by asking students to use prior knowledge.</p> <p>Draw a hexagon on the board and ask the students: How can we use what we already know and learnt in the past to discover the area of a hexagon?</p>	
<p><b>Learning/Activity Sequence</b></p> <p>How will students ENGAGE, EXPLORE, EXPLAIN, ELABORATE, and/OT EVALUATE their understandings of the outcomes.</p>	
<p><b>What is the TEACHER doing? What is your plan for the body of the lesson? What steps are taken during the lesson?</b></p>	<p><b>What are the STUDENTS doing? How are they engaged while you are teaching the lesson?</b></p>
<p>Teacher will introduce the introduction question to the class and provide students a sheet of paper with a hexagon on it.</p>	<p>Students have the freedom to work in either groups to collaborate or work independently if they choose to.</p>

Teacher will walk around the classroom and answer student questions and/or help students get to the correct answer.

Students are provided with a sheet of paper stating all the different area formulas of shapes they have already learnt to help them come up with a formula for the hexagon.

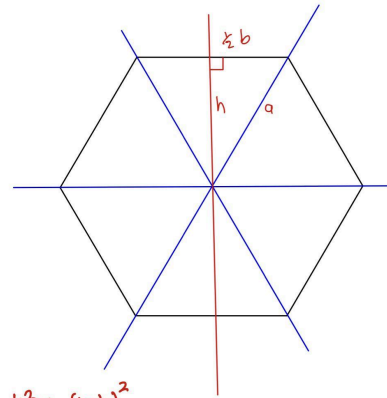
Prompt's to help students get started:

- What is the area of a triangle? How do we get that equation? ( $b \cdot h / 2$ )
  - Guide the students through shapes that we have broken up to get an area equation with the intention of showing how to break up a hexagon into 12 equal right triangles.

Students will be working on discovering a formula that works for the area of a hexagon. Once students come up with a formula, they will be encouraged to try it out with different hexagons.

An example of student's work could look like:

Area of a triangle:  $A = \frac{hb}{2}$   
we don't know the height. (use pythagorean theorem)



$$a^2 = h^2 + \left(\frac{1}{2}b\right)^2$$

if we find the lengths of  $h$  and  $b$ . We would be able to discover the area of the hexagon by finding the area of a triangle and multiply it by 6.

Class will regroup and teacher will go over the formula with the class, using students' feedback and knowledge they have gathered through the class.

Students will be listening to the teacher and participating/helping teacher by using what they have discovered about the area of a hexagon.

#### EXTENSIONS:

- Refer to the [Honeycomb Conjecture](#) to evoke curiosity from students.
- Extend 2D to 3D. Explore the volume of hexagonal prisms similarly breaking it up into smaller prisms.

Note: Lesson plan template used here was developed by a collective of WSE instructors, based on Wiggins, G. & McTighe, J (1998). *Understanding by Design*. Association for Supervision and Curriculum Development.