LESSON TITLE: CALCULATING AREA

TOTAL TIME: ONE 45-MINUTE PERIOD

BRIEF DESCRIPTION

In this *The House That STEM Built* lesson plan, students will get the chance to practice calculating the area of rectangles and triangles. They will also have the opportunity to see why area calculations are important and where they can be used on a construction site before they measure and calculate area on their own in the classroom.

Students will watch *The House That STEM Built: Calculating Area* video before tackling the "Classroom Area Scavenger Hunt".

CURRICULUM OUTCOMES

Taken from the New Brunswick Grade 7 Math curriculum.

GENERAL CURRICULUM OUTCOMES

GCO Shape and Space (SS): Use direct and indirect measurement to solve problems.

SPECIFIC CURRICULUM OUTCOMES

SCO SS2: Develop and apply a formula for determining the area of

- → triangles,
- → parallelograms, and
- → circles.

NEW BRUNSWICK GLOBAL COMPETENCIES ACHIEVED[1]

- Critical Thinking and Problem-Solving
    - Learners engage in an inquiry process to solve problems, as well as acquire, process, interpret, synthesize, and critically analyze information to make informed decisions.
    - Learners construct, relate and apply knowledge to all domains of life, such as school, home, work, friends, and community.
    - Learners formulate and express questions to further their understanding, thinking, and problem-solving.
- Collaboration
    - Learners participate in teams by establishing positive and respectful relationships, developing trust, and acting interdependently and with integrity.
    - Learners learn from and contribute to the learning of others by co-constructing knowledge, meaning, and content.

LEARNING OBJECTIVES

Learners will

- calculate the area of a rectangle,
- calculate the area of a triangle,
- calculate the area of an irregular shape, and
- identify where the use of area calculations are used on the construction site as well as in their own lives.

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1 https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/curric/competencies/NBCompetencies.pdf?fbclid=IwAR1ldrZs1gFgiNm8rC4oz7Fmx6mSn-6t_QJkenev0eD33rZfoYYn6bmdmc *also available at* https://tinyurl.com/nb-competencies

MATERIALS

- Video: *The House That STEM Built: Calculating Area*.
- Whiteboard and markers.
- Measuring instruments (rulers, measuring tapes, metre sticks etc.).
- Copies of "Classroom Area Scavenger Hunt".

MINDS ON: 5 MINUTES

GROUPING: PAIRS

Today we are going to be talking about calculating area. Before we get started though, let's talk about units since they are going to be important when we are calculating area. What is a unit? What units for the measurement of lengths are we familiar with? In pairs, ask students to measure the length of something in the classroom using non-traditional units (no rulers!). This could be anything, a shoe, a pencil piece of string, a finger, an entire person. See what groups come up with.

WARM UP: 15 MINUTES

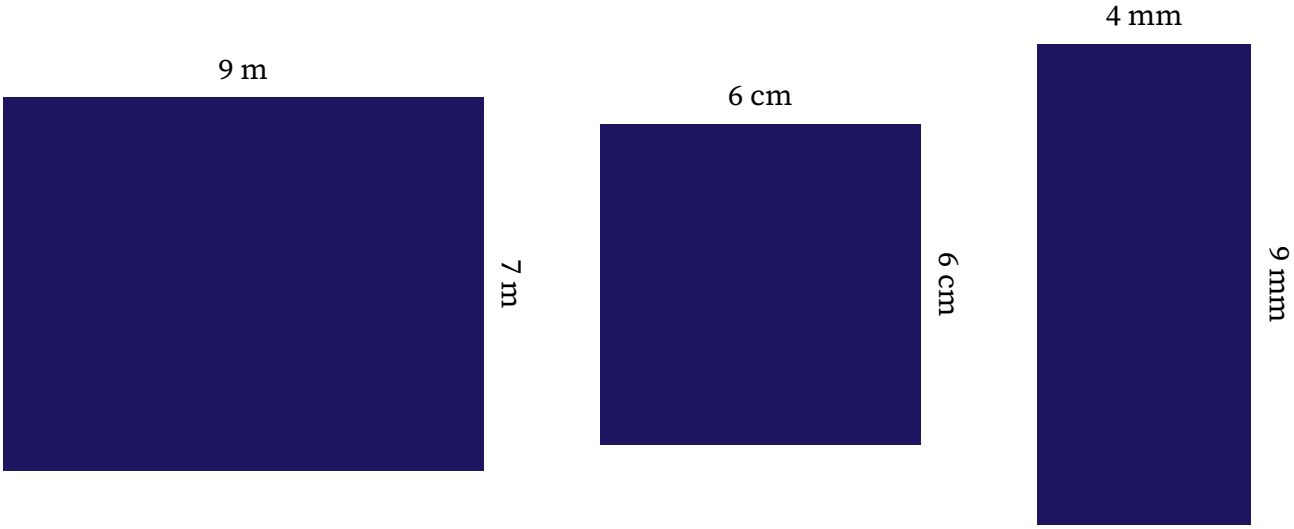
GROUPING: ENTIRE CLASS

Watch *The House That STEM Built: Calculating Area* video. Feel free to pause the video and ask some or all of the following questions to prompt discussions.

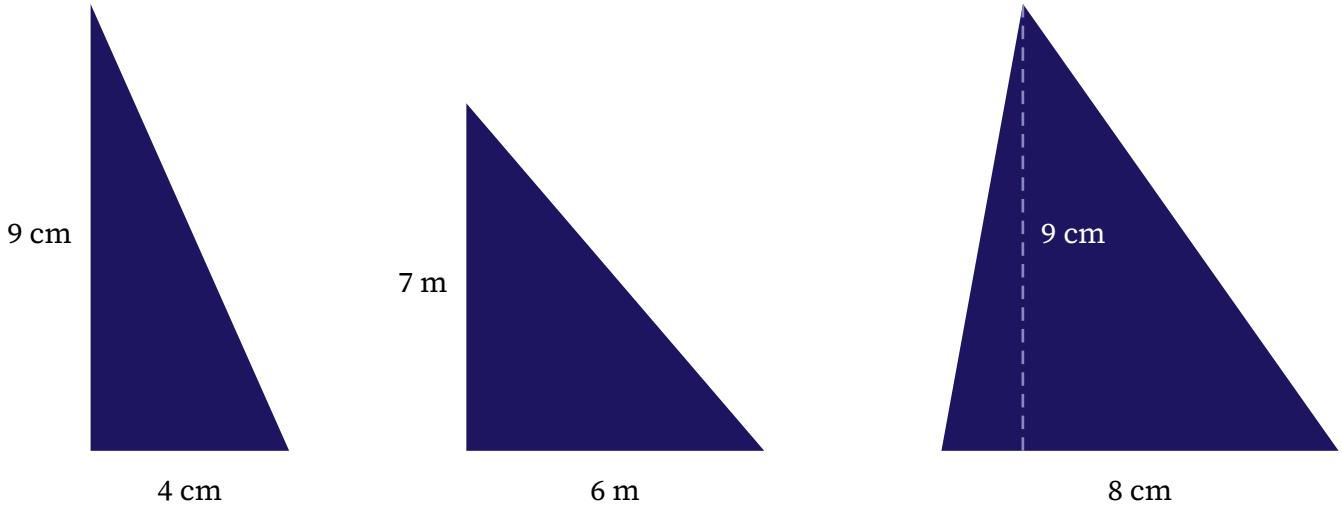
- 0:55 – Can anyone remember what the formula was to calculate the area of a rectangle? What sort of units do we use when we are calculating area?
- 1:13 – This might be a good spot to stop and do an example on the board of calculating the area of a rectangle. Using different units can be helpful so that students see units can change but the

answers will always remain squared. *Area* = $l \times w$.

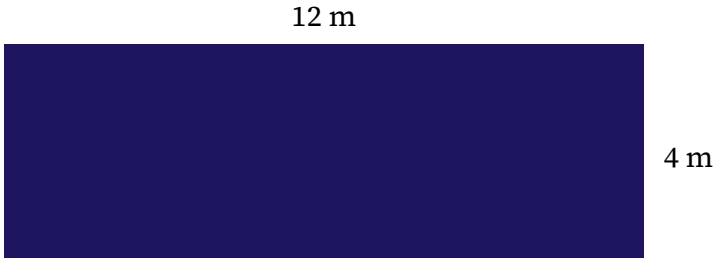
- 1:28 – How might we use a rectangle to help us calculate the area of a right-angle triangle?
- 2:02 – So, we have determined that if you cut a rectangle diagonally into two pieces we get two right-angle triangles. This tells us that the area of a triangle is ½($l \times w$) or ($l \times w$)/2. Let's try a couple of examples together. *Area* = ½($l \times w$).



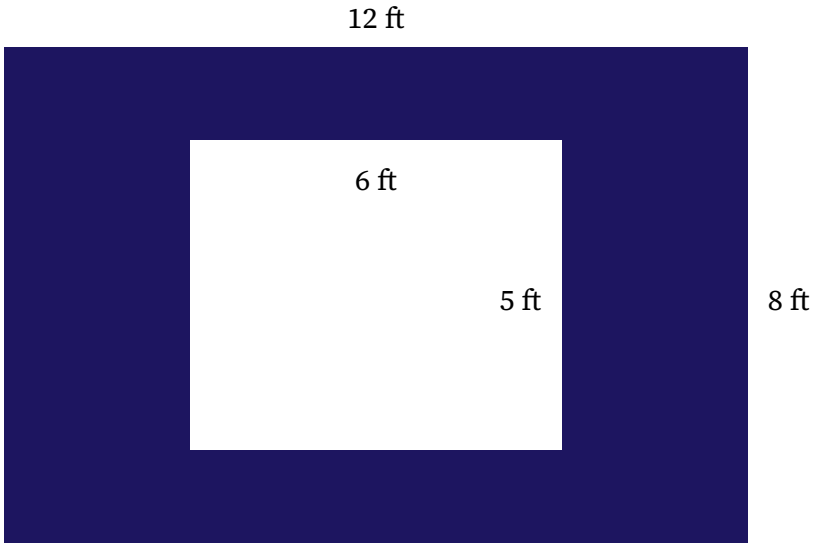
- In the last example, we are no longer dealing with a right-angle triangle. From where do you think we should measure the length of the triangle?



- 2:19 – Where would you use area calculation in the building/ construction process?
- 3:07 – What would be the area of the roof? *Area* = $l \times w$.
- 4:33 – When installing drywall we have to take into consideration the windows and the doors that are going to be in the room. How do you think we would calculate the amount of drywall we would need for a wall with a window?



- 4:59 – Let's do an example. *Area* = $l \times w$.



Total Area = (12 ft × 8 ft) – (6 ft × 5 ft)
Total Area = 96 ft^2 – 30 ft^2
Total Area = 66 ft^2

ACTIVITY: 20 MINUTES

GROUPING: PAIRS

Okay, now that we have taken a look at calculating the area of rectangles and triangles on a construction site, what do you think we could calculate the area of in the classroom?

Hand out copies of the "Classroom Area Scavenger Hunt", one per pair. Hand out measuring utensils (rulers, measuring tapes, or metre sticks). Allow students to take some time, make some measurements, and fill out their scavenger hunt.

CONCLUSION: 5 MINUTES

GROUPING: ENTIRE CLASS

Ask students to return their measuring instruments and ask for suggestions of where they found examples of the shapes in the scavenger hunt in the classroom.

If you have a word wall, feel free to add the equations from today to the wall.

DIFFERENTIATION

CONTENT

Use *The House That STEM Built* video to spark a conversation about careers other than construction that would require knowledge of area equations (e.g., farming, fashion design, urban planning, land surveying, etc.).

Do your students take a shop/building technology class? Are there any opportunities for a cross-subject project?

PRACTICE

Using painter's tape, outline different shapes on the floor. Have students measure and calculate the area of the shapes.

Take the class outside and ask students to do an area scavenger hunt on the playground. Playgrounds are made up of many geometric shapes that can be measured and that students can calculate the area of.

What is the area of certain parts of your school or classroom? In teams, ask students to calculate the area of the windows and doors of one side of your school building or the walls inside of your classroom. It might be difficult to measure the exact height of the building, so, using metre sticks or measuring tapes, make an estimate of how tall it is. After you have got the height of the building, the length can be measured and the area of the wall calculated. With all of this information together (area of the wall and area of the doors and windows), as a class, you can calculate the total area of the wall.

PRODUCT

On graph paper, ask students to draw out a room in their house or a hypothetical house including the furniture. Using the grid as a reference, ask students to calculate the floor area occupied by all the furniture in the room.

Using small pieces of paper of multiple colours, ask students to create a pixelated self-portrait of themselves on a piece of chart paper. Once they have done a self-portrait, ask them to calculate their total area.

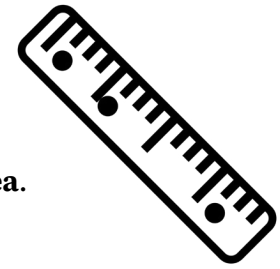
Ask students to create a blueprint of their dream house. What is the total area of each of the rooms? What about the roof? Deck? Blueprints can be created on graph paper or by using programs like Minecraft Education (https://education.minecraft.net/en-us/homepage) or RoomSketcher (https://www.roomsketcher.com/) which allow students to create their visions digitally.

EXTENSION

If you have already covered circles and parallelograms in class, feel free to add them to the area scavenger hunt.

As a larger class project, figure out the surface area of the outside walls of the school. In teams, students can be responsible for different walls of the building that include windows, doors, and other objects. After they have done their calculations, calculate the total surface area of the building together.

CLASSROOM AREA SCAVENGER HUNT



What sort of shapes do you see around the classroom? Can you calculate their area? Your task is to find an example of each of the below objects, **measure them**, **draw them**, and **calculate their area**. Good luck, and show all of your work!

Area of a rectangle = $l \times w$

Area of a triangle = $\frac{1}{2}(l \times w)$

A rectangle that is larger than your hand. Object:	A rectangle that is smaller than your hand. Object:
A right-angle triangle. Object:	A non-right-angle triangle. Object:
A shape that can be made up of rectangles and triangles. Object:	An object of your choice. Object: