

Lesson Title: Trigonometric Ratios

Total Time: 60 Minutes

Brief Description: In this lesson, students will watch *The House That STEM Built* video titled “*Trigonometric Ratios*”. This video demonstrates using sine, cosine, and tangent functions to solve for angles in right angled triangles. The video is followed by a scavenger hunt activity where students will search for right angle triangles in their classroom/school. Students will find the triangles and solve for a missing angle.

Curriculum Outcomes: Taken from the New Brunswick Geometry, Measurement, and Finance 10 curriculum

General Curriculum Outcomes: Develop Spatial Sense

Specific Curriculum Outcomes: G3: Demonstrate an understanding of primary trigonometric ratios

New Brunswick Global Competencies Achieved:

https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/curric/competencies/NBCompetencies.pdf?fbclid=IwAR1ldrZs1gFgiNm8rC4oz7Fmx6mSn-6t_QJkenev0eD33rZ-foYYn6bmdmc

Critical Thinking and Problem Solving

- Learners see patterns, make connections, and transfer their learning from one situation to another, including real-world applications.
- Learners select strategies, resources, and tools to support their learning, thinking, and problem-solving and evaluate the effectiveness of their choices.

Learning Objectives:

The learner will be able to:

- Solve for missing angles in right angle triangles
- Solve missing side lengths in right angle triangles
- Accurately use and demonstrate their knowledge of sine, cosine, and tangent

Materials: Loose Leaf Paper

- Scientific Calculator
- Pencil/Pen
- Ruler
- Trigonometric Ratio Worksheet
- Chart Paper (optional)
- Whiteboard marker

Before Class:

- Print out **one** copy of the Trigonometric Ratio Worksheet for **each** student

Warm-up: 5 Minutes

- To get students thinking about homes, construction, and triangles, ask them the following question “where do you usually see triangles and/or right angles in a home?”
 - Be sure to also write the question on the board so students have a reference while they are thinking
- Give students some time to think of a response and then ask for volunteers to share their answers
 - Some possible answers could be:
 - Stairs
 - Roof trusses
 - Chairs
 - Baseboard, door and window trim
 - Legs of a table
- As students are sharing their answers, write their ideas on a piece of paper so it can be hung in the classroom. Or write them on the whiteboard
- Alternative: If students are able to use technology in the classroom, a Jamboard could be used for students to post their answers for the class to see. The Jamboard can then be saved for future use.

Activity: 35 Minutes

- Watch the **House That STEM Built** video titled “*Trigonometric Ratios*” all the way through **without** any pauses.
- Watch the video again but this time there will be specific points to pause the video
- At minute 2:03, pause the video and have students copy the triangle in their notes. Be sure that they include the labels for angle, hypotenuse, opposite, and adjacent.
- At minute 2:18, pause the video and have students copy the equation for sine in their notes
- At minute 2:25, pause the video and have students copy the equation for cosine in their notes
- At minute 2:32, pause the video and have students copy the equation for tangent in their notes
- Introduce the trick to help students remember the equations for sine, cosine, and tangent. Write the following information on the whiteboard
 - Provide students with SOH, CAH, and TOA. Where O = opposite, A= adjacent, H= hypotenuse, S= sine, C= cosine, and T= tangent
 - To help students remember the equation for sine, they can use SOH. Sine= opposite / hypotenuse
 - To help students remember the equation for cosine, they can use CAH. Cosine = adjacent / hypotenuse
 - To help students remember the equation for tangent, they can use TOA. Tangent = opposite / adjacent

- Students should write the trick in their notes
- At minute 4:31, pause the video and have students input the math problem that is displayed in the video into their calculators. It is important to make sure that the students are using the **inverse tangent** function of their calculators correctly and getting the answer for the angle in degrees. This should last **approx. 7 minutes**
 - The video mentions that students need to press the second function button on their calculator. Some students may struggle with finding the second function button. The teacher should take time to show students where this button is located and note that it will look different on different calculators. For example, on a CASIO calculator, the button looks like this:



- At minute 6:17, pause the video and have students solve the math problem in the video. This should take **approx. 5 minutes**
 - While students are working on the problem, the teacher should be circulating the room to make sure that students are using their calculator properly and getting the correct answer
 - Ask for a student to share their answer verbally.

Conclusion: 20 Minutes

- For the remainder of class, students will have a right angle scavenger hunt
- The scavenger hunt can take place in the classroom or around the school. This decision is up to the teacher
- This activity can be done individually or in groups. This decision is up to the teacher
- The task for students is to find a **minimum** of 5 right angle triangles around the classroom/school (whatever boundary the teacher has chosen)

- Students will use sine, cosine, or tangent to solve for the missing angle of the triangle that they found
- They will show their drawings and calculations on the **Trigonometric Ratio Worksheet**.
 - This worksheet will be handed into the teacher at the end of class. The teacher can decide if they will use this worksheet as a formative assessment to check students' understanding or as an assignment that will be marked.

Differentiation:

Content:

- Use *The House That STEM Built* video to discuss other examples and jobs that Trigonometry is used
 - For example
 - Jobs in the medical field (Pharmacists)
 - Astronauts
 - Sailors
 - Crime Scene Investigators

Practice:

- Some students may struggle with identifying right angle triangles in their environment. If students struggle, the teacher can draw right angle triangles on the worksheet and have the student solve the angle using the already drawn triangles. It is important that the drawings have side lengths written down.

Product:

- Students who struggle with identifying right angle triangles may not be able to draw their own examples. Therefore, the examples drawn by the teacher can be used for the final product

Extension:

- The teacher can make the scavenger hunt more difficult by providing a length or angle and asking students to find a right angle triangle with that specific length or angle
- Students can take a picture of the triangles they find and upload it to the classrooms Microsoft TEAMS or the preferred platform of your school

Name: _____ Class: _____ Date: _____

Trigonometric Ratios Worksheet

Directions:

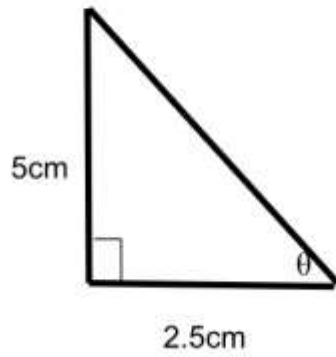
- Find a minimum of **5** right angle triangles around the classroom/school
 - For the purpose of this assignment, if you find a square with a right angle you can create a triangle by drawing the hypotenuse to half the width of the square
- Draw the triangle
- Measure the sides of the triangle and label your drawing
- Use sine, cosine, or tangent to solve the angle of interest of the triangles
- Remember:
 - Sine = opposite / hypotenuse
 - Cosine = adjacent / hypotenuse
 - Tangent = opposite / adjacent
- Extension: Upload a picture of the triangle you have found to Microsoft TEAMS or your schools preferred platform

Please Show All Calculations:

Name: _____ Class: _____ Date: _____

Trigonometric Ratios Worksheet Exemplar

1.



$$\tan \theta = \text{Opposite/Adjacent}$$

$$\tan \theta = 5 \text{ cm} / 2.5 \text{ cm}$$

$$\tan \theta = 2$$

$$\theta = \tan^{-1}(2)$$

$$\theta = 63^\circ$$

Reference Photos:



