

Quebec - Achievements and Competencies

Learning Outcomes

Cycle 1 (Gr. 7-8)	Cycle 2 (Gr. 9-10)	TS and S Options (Sec. 4-5)
Astronomical phenomena	Metric or trigonometric relations	Metric or trigonometric relations
Time		Geometric loci

The Quebec Achievements and Competencies are based on the Progression of Learning Outcomes derived from the Quebec Education Plan set by the Ministère de l'Éducation, du Loisir et du Sport.

Specific Expectations

SCIENCE

CYCLE 1 (Gr. 7-8) — Secondary 1 and 2

EARTH AND SPACE

- C. Astronomical Phenomena
 - 2. Solar system
 - b. Cycles of day and night
 - i) Explains the alternation of day and night in terms of the Earth's rotation
 - e. Seasons
 - i) Explains the phenomenon of seasons in terms of the position of the Earth with respect to the Sun (tilt, revolution)

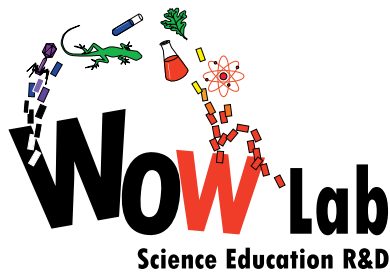
In *The Human Sundial*, students create a sundial outdoors using two different methods. This activity can be used to teach students about cycles of day and night. Students should recognize that it is the Earth's rotation that causes these cycles. Students can engage in discussions about the seasons and what causes them to change.

MATHEMATICS

CYCLE 1 (Gr. 7-8) — Secondary 1 and 2

GEOMETRY: Analyzing situations involving measurements

- B. Time
 - 3. Establishes relationships between units of time: second, minute, hour, day, daily cycle, weekly cycle, yearly cycle
 - 4. Distinguishes between duration and position in time



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The Human Sundial - Quebec - Achievements and Competencies

In this activity, students will examine how the sundial can be used to measure time. There are two methods which students will follow to build the sundial. In the first method, students will calculate the correct position to stand in on the sundial for different months of the year. In the second method, students will use angles which correspond to each hour of the day. In both methods, students will develop a deeper understanding of time in relation to the Earth's rotation.

MATHEMATICS

CYCLE 2 (Gr. 9-10) — Secondary 4

GEOMETRY: Analyzing situations involving measurements

- G. Metric or trigonometric relations
 - 2. Finds unknown measurements in various situations
 - a. in a right triangle rectangle using
 - iii) trigonometric ratios: sine, cosine, tangent

When students are constructing their sundial using the second method, the angles on the sundial correspond to each hour of the day. The shape of the sundial will be that of an ellipse. Students can use trigonometric ratios to calculate the accuracy of their sundials.

MATHEMATICS - Technical and Scientific Option

Secondary 5

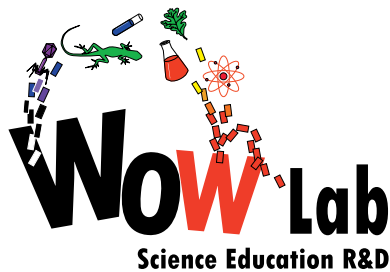
GEOMETRY: Analyzing situations involving measurements

- G. Metric or trigonometric relations
 - 2. Finds unknown measurements in various situations
 - b. in any triangle using
 - i) sine law
 - ii) cosine law

When students are constructing their sundial using the second method, the angles on the sundial correspond to each hour of the day. The shape of the sundial will be that of an ellipse. Students can use trigonometric ratios to calculate the accuracy of their sundials by finding the x- and y-coordinates of the ellipse.

ANALYTIC GEOMETRY: Analyzing situations using analytic geometry

- D. Geometric loci
 - 3. Analyzes and models situations using conics
 - b. circle, ellipse and hyperbola centered at the origin



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This activity can be used as a visual method to reinforce understanding of various geometric concepts, such as circles, parabolas, hyperbolas, and right angle triangles. Students are given the opportunity to model real-world applications of math concepts. Students can discuss why an ellipse makes a better sundial than a circle, and can even go further to provide mathematical justifications using the sundials they created.

MATHEMATICS - Science Option

Secondary 5

GEOMETRY: Analyzing situations involving measurements

- G. Metric or trigonometric relations
 - 2. Finds unknown measurements in various situations
 - b. in any triangle using
 - i) sine law
 - ii) cosine law

When students are constructing their sundial using the second method, the angles on the sundial correspond to each hour of the day. The shape of the sundial will be that of an ellipse. Students can use trigonometric ratios to calculate the accuracy of their sundials.

ANALYTIC GEOMETRY: Analyzing situations using analytic geometry

- D. Geometric loci
 - 3. Analyzes and models situations using conics
 - b. circle, ellipse and hyperbola centred at the origin

This activity can be used as a visual method to reinforce understanding of various concepts, such as circles, parabolas, hyperbolas, and right angle triangles. Students are given the opportunity to model real-world applications of math concepts. Students can discuss why an ellipse makes a better sundial than a circle, and can even go further to provide mathematical justifications using the sundials they created.