

a WOW Lab

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The Human Sundial - Math

Achievements and Competencies

Learning Outcomes

Grades 10-12
Trigonometry
Geometry and Graphing
Compass, Map Reading and Orienteering
Astronomy
Technical Drawing and Planning

Achievements and Competencies are based on the Canadian Provincial Math Curriculums.

Specific Expectations

Grade 11

Trigonometry

Pose problems involving right triangles and oblique triangles in two-dimensional settings, and solve these and other such problems using the primary trigonometric ratios, the cosine law, and the sine law (including the ambiguous case).

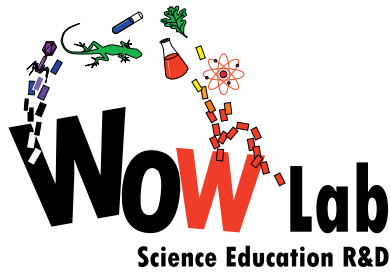
The second method of drawing an ellipse requires a thorough understanding of the trigonometric ratios: tangent, cosine and sine. The sundial experiment can be used as a visual method to reinforce the concept of right angled triangles, similar triangles, sine and cosine ratios, and geometry. Students could identify angles within the ellipse, expanding on the idea of time as an angle, looking at the angles of the sun and examining latitude and longitude in terms of angles.

Grade 12

Geometry and Graphing

Use Cartesian coordinates and other coordinate systems, such as navigational, polar, or spherical systems, to analyze geometric situations.

Ideas that can be expanded on include the geometry of circles, ellipses and other conic sections such as hyperbolas and parabolas. Other points that could be introduced include the history and use of Cartesian and polar coordinates.



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Compasses, Map Reading and Orienteering

Solve problems involving the addition and subtraction of vectors, including problems arising from real-world applications (e.g., surveying, statics, orienteering).

The sundial can be part of an outdoor education program, focusing on using the natural environment. Aspects of constructing the sundial include reading a compass, determining the position of true north and understanding the difference between true north and magnetic north. The activity also encourages outdoor education, observing and analyzing the surrounding environment and independence from modern technology.

Astronomy

Solve problems involving the volumes and surface areas of spheres, right prisms, and cylinders, and of related composite figures, in situations arising from real-world applications.

The study of the sun and celestial orbits can be discussed as part of the sundial experiment. Points to highlight include the orbit of the sun, the angle of declination of the sun, the latitude and longitude of the Earth's sphere, and other planetary motion.

Technical Drawing and Planning

Develop and apply reasoning skills (e.g., use of inductive reasoning, deductive reasoning, and count examples; construction of proofs) to make mathematical conjectures, assess conjectures, and justify conclusions, and plan and construct organized mathematical arguments.

To be accurate, the sundial must be carefully planned. Highlight the importance of planning, drawing and scaling before the activity. Explain the benefits of a detailed plan and a consistent notation system.