re(Solve) MATHS BY INQUIRY Circumference

Y8

Summary of learning goals

- Students develop a strong intuitive sense that the ratio of circumference to diameter is the same for all circles and use a variety of approaches to find a more accurate value for the ratio. They then apply their knowledge by making a diameter measuring tape, from which they can read off the diameter of a cylindrical object.

Australian Curriculum: Mathematics (Year 8)

ACMMG197: Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference (and area).

Summary of lessons

Who is this sequence for?

- These lessons assume only elementary knowledge of circles—that all the points on the circumference are the same distance from the centre—and an intuitive understanding of ratio.

Lesson 1: Spheres in a Cylinder

Students compare the height of a cylinder containing three tennis balls to its circumference. They ask what would happen if the balls were smaller or larger and conclude that it is always the case that the circumference is a little more than three times the diameter. They apply this to estimations relating to real-world circular objects.

Lesson 2: A Better Value for π

Students are reminded of the conclusion from the previous lesson: the ratio of circumference to diameter is '3 and a bit'. Students use a variety of contexts to find the ratio of circumference to diameter and, hence, find a better value for π. They discuss how the accuracy of the value they find could be improved.

Lesson 3: Measuring Tree Trunks

Students apply their knowledge of the ratio of circumference to diameter to make a d-tape, which can be wrapped around a cylindrical object, such as a tree trunk, to instantly measure its diameter.

Australian Academy of Science

Reflection on this sequence

Rationale

This sequence introduces properties of circles, focusing on the relationship between the circumference and the diameter (and radius) rather than on calculation. An initial value of 'a bit more than 3' is refined through measurements in a range of contexts to introduce the concept of π as the ratio of circumference to diameter. Students apply their knowledge to the practical problem of measuring the diameter of a tree.

reSolve mathematics is purposeful

- The sequence emphasises real-world applications of mathematics, encouraging students to estimate and consider issues of accuracy in measurement.

reSolve tasks are challenging yet accessible

- The initial activity provides a common experience that allows all students to access subsequent tasks.
- Physical materials and measurements in a range of contexts provide all students with the opportunity to refine and consolidate their understanding

reSolve classrooms have a knowledge-building culture

- The emphasis on sense-making rather than on measurement or calculation lays the foundation for a deep understanding of the relationship between the circumference and diameter of a circle.
- The use of a range of contexts develops understanding of the circle as a geometric shape, as a limit of polygons, and as a locus of points equidistant from the centre.