reSolve MATHS BY INQUIRY Rule of Twelfths

Y10

Summary of learning goals

- Students learn that tidal patterns closely match a sine curve and use a well-known rule of thumb to approximate tidal heights. They develop a deeper understanding and appreciation of the properties of the sine curve and its real-life occurrences.

Australian Curriculum: Mathematics (Year 10A)

ACMMG274: Use the unit circle to define trigonometric functions, and graph them with and without the use of digital technologies.

Summary of lessons

Who is this sequence for?

- Students should be familiar with the unit circle and should have examined how the vertical distance from the circle to the x-axis varies to plot a sine curve. They should understand that the sine of an angle can be evaluated for angles greater than 90°.

Lesson 1: Rule of Twelfths

Students learn about the rule of twelfths: a practical way to calculate tidal heights that is used by many sailors. Students apply the rule to graph tidal heights and observe that the graph resembles a sinusoidal curve. They extend their knowledge by comparing the results obtained from using the rule of twelfths with the actual values of the sine of various angles.

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Australian Academy of Science

Reflection on this sequence

Rationale

The focus of this lesson is on modelling the real world with mathematics. A key element of Year 10 and 10A mathematics is developing and consolidating an understanding of functions as mathematical entities, and of how different types of functions model different real-world situations. Although transformations of the sine curve are not explicitly introduced until Year 11 mathematics, students' experiences with sine curves in the real world help set the scene for this further work. Appropriate levels of accuracy for real-life purposes are also examined.

reSolve mathematics is purposeful

- Through the use and analysis of a real-life context, students see mathematics as a way of modelling the real world, and use mathematical ideas to make decisions of practical importance.

reSolve tasks are inclusive and challenging

- Students work on a meaningful task that builds on existing knowledge of trigonometric functions, and builds deeper knowledge of the properties and shape of the sine curve.

reSolve classrooms have a knowledge-building culture

- Students use technologies to see how well the rule of twelfths approximates a sine curve and work together to develop better approximations.