Reading Public Schools

Instilling a joy of learning and inspiring the innovative leaders of tomorrow

Course Description

This is a one-semester course that enables students to accelerate to a calculus course senior year after taking Algebra I during their freshman year at RMHS. This course introduces topics in trigonometry including the trigonometry of triangles, trigonometric identities, radian measure, inverse trigonometric functions, solving trigonometric equations, and graphs and transformations of the six trigonometric functions.

Content Standards

Trigonometric Functions

- Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
- Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for x, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.
- Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.
- Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

Interpreting Functions

- Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- Compare properties of two functions each represented in a different way.
- For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship

Building Functions

- Identify the effect on a graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Mathematical Practice Standards

- Making sense of problems and persevering in solving them
- Reasoning abstractly and quantitatively
- Constructing viable arguments and critiquing the reasoning of others
- Modeling with mathematics
- Using appropriate tools strategically
- Attending to precision
- Looking for and making use of structure
- Looking for and expressing regularity in repeated reasoning

| Units	Essential Questions
Trigonometric Functions	• How are trigonometric functions used to solve real-world problems? • How can ratios of lengths of sides within right triangles help determine other lengths and angle measures in the triangles? • How can we extend the trigonometric ratios to angles greater than 90°? • How is the unit circle related to trigonometric functions? • How can you identify key features of sine and cosine functions? • How do key features of one trigonometric function relate to key features of other trigonometric functions? • How can you find and use translations of graphs of trigonometric functions?
Trigonometric Equations and Identities	• How do trigonometric identities and equations help you solve problems involving real or complex numbers? • How can you use an inverse function to find all the solutions of a trigonometric equation? • How can you use the sine and cosine functions with non-right triangles? • How can you verify and apply relationships between trigonometric functions?

Classroom Structures & Key Learning   Whole class instruction, small group instruction, formative assessments, summative assessments, performance tasks, group projects, explorations with technology, real-world application problems
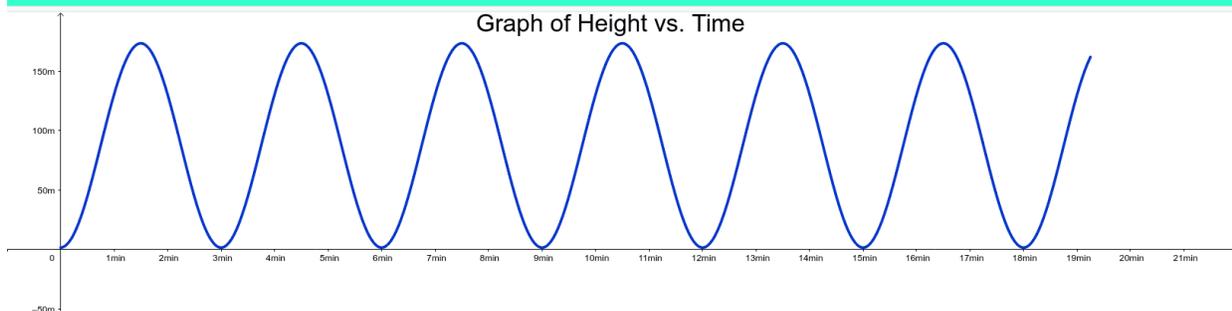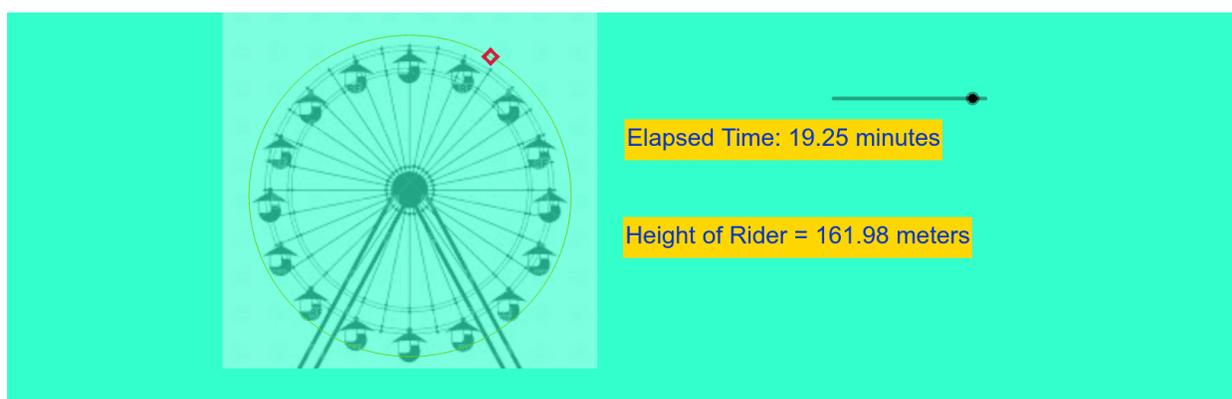
Elapsed Time: 19.25 minutes

Height of Rider = 161.98 meters

Graph of Height vs. Time

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Curriculum Guide	Curriculum guides are public documents aligned with the Massachusetts Department of Education Curriculum Frameworks. They focus on the set of standards that students will learn within certain disciplines at appropriate grade levels. Each area of the curriculum is divided into general strands (broad categories) under which the standards fall. When we discuss "standards-based education" we mean that students are measured against their proficiency and growth towards meeting these standards. Curriculum guides are intended for teachers, parents, and the wider school community as an overview document of the course of study for the year.
Curriculum Map	Curriculum maps are internal documents utilized as planning tools for teachers. Curriculum maps keep a focus on the end-of-year standards and chart a course for the teaching and learning over the year. They are typically organized in a grade-level overview organized by month or marking period. Curriculum maps typically include: standards and expectations for the grade/content, essential skills/concepts, methods of assessment, and major content resources. Maps are never "done" as ongoing work of educators include revisions, additions, and revisits to the maps. They provide an overview for the year while also allowing educators to see a vertical picture of how the content develops as students progress through each grade.
Content Standards	The standards used as the foundation of our curriculum come directly from the Massachusetts Department of Education Curriculum Frameworks. State standards may be viewed here: http://www.doe.mass.edu/frameworks/
Mathematical Practice Standards	Mathematical Practice Standards are a set of skills/behaviors that are replicated in grades preK-12. These standards describe ways in which students engage with the mathematical content and the level of application grows increasingly complex as students progress vertically throughout their education.
Units	Units are the learning themes for the course. They are generally cumulative in nature, meaning that new units are based upon knowledge from previous units.
Essential Questions	Essential questions are questions that are not answerable with an easy answer or a simple instruction. The purpose of essential questions is to provide opportunities for inquiry into the learning and act as an umbrella to anchor the unit/lesson.
Activities	Activities identified in Curriculum Guides are not intended to be exhaustive, nor are they intended to be prescriptive. The activities identified may function as a menu of curriculum resources from which educators identify the most appropriate tools to utilize in their classrooms.