

Lesson Plan: Exploring Trigonometric Functions at the Festival of Functions

Objective: Students will delve into the world of trigonometric functions, exploring the properties, domains, and ranges of sine, cosine, tangent, and their inverses. They will apply their understanding to create interactive displays for the Festival of Functions in Mathematica.

Grade Level: IB Diploma Programme Mathematics Applications and Interpretation SL/HL and Analysis and Approaches SL/HL.

Duration: 60 minutes

Warm-up Activity (5 minutes)

- Inquiry Question: What role do trigonometric functions play in understanding the world around us?
- Activity: Brief discussion on the significance of trigonometric functions in real-world applications, such as navigation, engineering, and physics.

Introduction to Trigonometric Functions (10 minutes)

- Presentation: Introduce the annual Festival of Functions in Mathematica, focusing on this year's theme: trigonometry.
- Objective: Explain that as Mathemagicians-in-training, students will explore sine, cosine, tangent, and their inverses to prepare for the festival.

Unraveling the Sine and Cosine (10 minutes)

- Interactive Exploration: Use graphing calculators or software to explore the periodic nature of sine and cosine functions.
- Discussion: Identify the domain and range of these functions, explaining their significance in practical applications.

Tackling the Tangent and Cotangent (10 minutes)

- Group Activity: Students investigate the tangent and cotangent functions, focusing on their graphs, domains, and ranges.
- Analysis: Discuss how the properties of these functions differ from sine and cosine and their unique applications.

Discovering the Arcs and Inverses (10 minutes)

- Research and Presentation: Students delve into inverse trigonometric functions, understanding their restricted domains and ranges.

- Group Presentation: Each group explains one inverse function, highlighting its importance and practical applications.

Applying Knowledge at the Festival (10 minutes)

- Creative Application: Students brainstorm and plan interactive displays or games for the festival that demonstrate the utility and beauty of trigonometric functions.
- Collaboration: Encourage collaboration and creativity in designing engaging activities for festival-goers.

Reflection and Festival Preparation (5 minutes)

- Reflection: Students reflect on how exploring trigonometric functions deepens their understanding of mathematics and its real-world connections.
- Festival Preparation: Discuss the logistics of implementing the planned interactive displays at the festival.

Questions for Investigation and Homework

- Homework Assignment: Students design a game or activity involving trigonometric functions for the Festival of Functions, preparing a brief presentation on its educational value.
- Investigation Question: Explore how the symmetry of sine and cosine functions is represented in their graphs and its mathematical significance.

Materials Needed:

- Graphing calculators or computer software for exploring trigonometric functions
- Whiteboard and markers for group presentations
- Materials for creating festival displays (optional for extension activity)

Assessment:

- Formative Assessment: Participation in discussions, exploration activities, and group presentations.
- Summative Assessment: The design and explanation of a festival game or activity that effectively demonstrates the application of trigonometric functions.