

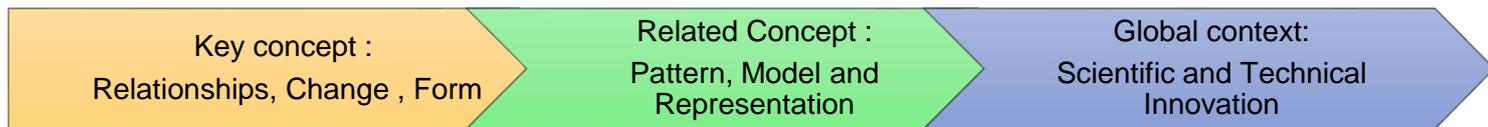
Name: .....

Date: .....

### Spatial Reasoning \_ Sine Rule

Investigation Task: Road Safety

Assessment Criterion: D and C



#### Inquiry Question

How can understanding relationships and measurements help improve safety in shared environments?



**Objective:** Students to apply the Sine Rule to a real-life road safety scenario to determine unknown distances. Through this investigation, students develop problem-solving and reasoning skills by selecting appropriate strategies, performing accurate calculations, and interpreting results in context. They also learn to justify the accuracy and reasonableness of their solutions while communicating their mathematical thinking clearly.

**Context:** In this investigation, students act as road safety engineers who must determine distances between traffic cameras and a pedestrian crossing. Using given angle measurements and the distance between cameras, students model the situation as a triangle and apply the Sine Rule to find unknown distances. They then interpret their results in the context of road safety and monitoring.



#### Command Terms:



#### ATL Skills:

**Thinking Skills:**  
Analyzing information, selecting appropriate methods, and evaluating the reasonableness of results..

**Transfer Skills:** Applying knowledge and skills learned in one context to new and real-life situations.

**Communication Skills:** Explaining mathematical thinking clearly using appropriate language and representations.

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Spatial Reasoning \_ Sine Rule

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Context:

Two traffic safety cameras A and B are placed 60 m apart along a straight road. Both focus on the same pedestrian crossing point P on the opposite side of the road.

- Angle from Camera A to P =  $48^\circ$
- Angle from Camera B to P =  $67^\circ$
- Triangle formed is  $\triangle ABP$

a) **Identify** the known and unknown values in triangle ABP and state which trigonometric rule is suitable.

b) **Find** the distance from Camera A to crossing point P using the Sine Rule.

c) **Find** the distance from Camera B to crossing point P.

d) **Solve and justify the degree of accuracy:**

If angle measurements may have an error of  $\pm 1^\circ$ , explain how this affects your calculated distances.

e) **Justify whether your solution makes sense in the context of road safety.**

Are these distances reasonable for monitoring a pedestrian crossing? Explain.

## Curriculum framework

### Key Concepts

#### 1. Relationships:

Understanding how quantities (angles and sides) are connected. In this task, the relationship between angles and sides in a triangle helps find unknown distances.

#### 2. Logic:

Using clear reasoning and mathematical rules to reach conclusions. Students logically apply the Sine Rule to solve a real-life problem.

#### 3. Measure:

Determining lengths, distances, and angles using appropriate tools. Students measure and calculate road distances and angles for safety.

### Related Concepts

#### 1. Model:

A mathematical representation of a real-world situation. The triangle formed by cameras and crossing point is a model.

#### 2. Generalization

Applying a rule that works in many situations. The Sine Rule works for any triangle with known angle–side data.

#### 3. Quantity

Numerical values used in mathematics. Distances (meters) and angles (degrees) are quantities here.

### Global Contexts

#### 1. Scientific and Technical Innovation

Exploring how math improves systems and safety. Trigonometry helps design safe road monitoring systems.

#### 2. Globalization and Sustainability

Understanding how systems impact communities. Safe road design supports sustainable and safe cities.

#### 3. Identities and Relationships

Understanding human interaction with environments. Road safety protects pedestrians and drivers

## Statements of Inquiry (SOI)

1. **SOI 1:**

Understanding relationships and models helps improve systems that protect people in shared environments.

2. **SOI 2:**

Using logical thinking and generalizations can support safer and more sustainable communities..

3. **SOI 3:**

Measurement and understanding quantities influence how people safely interact in shared spaces.

## GRASPS – Road Safety Investigation (Sine Rule)

### **G – Goal**

To determine safe distances for monitoring a pedestrian crossing by calculating unknown distances using given measurements.

### **R – Role**

You are a **road safety engineer** responsible for advising where monitoring cameras should be placed.

### **A – Audience**

Your report is for the **local road safety committee** and school community.

### **S – Situation**

Two safety cameras are placed along a road and focused on a pedestrian crossing. The committee needs accurate distance information to ensure the crossing is properly monitored and safe for pedestrians.

### **P – Product/Performance**

You will create:

A labeled triangle diagram, Clear calculations, Final distance results, A short explanation of how your findings support road safety

### **S – Success Criteria**

Your work will be successful if you: Correctly identify known and unknown values, Apply the Sine Rule correctly, Show clear working steps, Use correct units and rounding, Explain why your solution is reasonable for road safety