Name: …………………………….   Date: ………………..
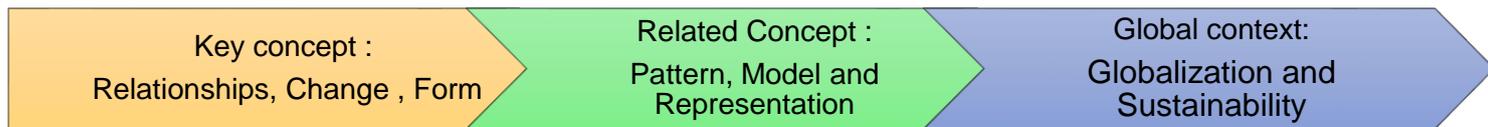
Spatial Reasoning _ Cosine Rule

Investigation Task: The Triangular Race Challenge   Assessment Criterion: D and C

Key concept : Relationships, Change , Form	Related Concept : Pattern, Model and Representation	Global context: Globalization and Sustainability

Inquiry Question

How can mathematics help athletes and planners choose the most efficient route in a race?

Objective: Students will able Students will Model a real-life race route using a triangle, Apply the cosine rule to determine unknown distances, Interpret results in context ,Justify whether a shortcut is realistic and beneficial

Context: In this task, students explore how trigonometry (cosine rule) can be used to model and solve real-life problems in race planning. They investigate how distances and angles determine efficient routes and evaluate whether a shortcut is practical in a competitive race setting.

Tasks:

Find	Identify	Frame a general rule	Verify	Reflect
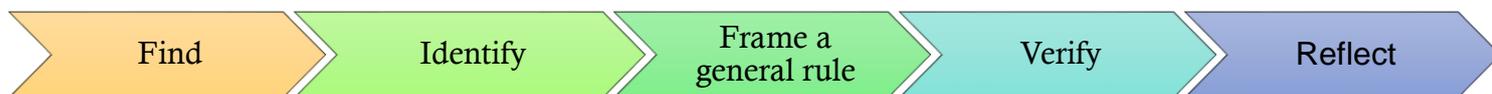
ATL Skills:

Thinking Skills: Explaining reasoning clearly using mathematical language.

Research Skills: Interpreting given data and selecting relevant information..

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

Name: …………………………… Date: ……………..

Investigation Task: The Triangular Race Challenge   Assessment Criterion: D and C

Context:

During a charity triathlon, participants must travel between three checkpoints: **A (Start), B, and C (Finish)**.

- The distance from **A to B** is **5 km**.
- The distance from **A to C** is **7 km**.
- The angle between the two paths at point A is **60°**.

However, a new rule allows elite racers to go **directly from B to C** if they know the distance.

You are part of the race planning team and must determine whether this shortcut is realistic.

i.   **Sketch** triangle ABC representing the race route.

ii. Apply the **Cosine Rule** to find the direct distance from checkpoint B to C.

iii. **Calculate** the distance BC. Round your answer to **2 decimal places**.

iv. **Explain** clearly why the Cosine Rule is the correct method to use in this situation.(Think: What information is given? Why not Pythagoras?)

v.   The organizers claim that the shortcut saves distance and time. **Compare** the original route (A → B → C) with the shortcut (B → C).Does your answer support their claim? Does the result make sense in a real race context? **Explain** your reasoning.

Curriculum framework

Key Concepts

1. Relationships: Understanding how distances and angles are connected in a triangle and how changing one affects others.

2. Logic: Using mathematical reasoning to select formulas and justify conclusions.

3. Model: Representing a real-life race situation as a mathematical triangle.

Related Concepts

1. Measurement: Quantifying distances and angles accurately.

2. Representation: Displaying information through diagrams, symbols, and formulas.

3. Space: Understanding the geometric arrangement of routes in a physical space**.**

Global Contexts

1. **Globalization and Sustainability**

   considering efficient routes to save time and energy in events.

2. **Scientific and Technical Innovation**

   Exploring how mathematics improves planning and efficiency.

3. **Identities and Relationships**

   how individuals (racers) make decisions to improve performance.

Statements of Inquiry (SOI)

1. **SOI 1:**

   Logical thinking and models help people design efficient routes and make better decisions.

2. **SOI 2:**

   Careful planning can reduce effort, time, and wasted energy..

3. **SOI 3:**

   Decisions based on reasoning can improve performance in competitive situations.

GRASPS Framework – Dock Alignment at a Port

G — Goal

To determine whether a direct shortcut between race checkpoints is shorter and worth including in the race.

R — Role

You are a race route planner responsible for advising organizers on the best route.

A — Audience

Race organizers and athletes who need reliable route information.

S — Situation

A race route connects three checkpoints. The organizers are considering allowing runners to take a direct shortcut but need evidence that it is beneficial.

P — Product / Performance

- A solution that includes:
- A labeled triangle diagram
- Clear calculations
- A written explanation justifying if the shortcut makes sense

S — Success Criteria

- Success will be judged by:
- Correct diagram and method
- Accurate calculations
- Clear explanation
- Logical justification in the race context
- Meeting MYP Criterion C & D expectations