

Improving sport performance with maths

Secondary: (ages 11 – 14)

Mathematics

The connection between sports and maths do not seem obvious at first sight. However in this activity students see that looking for unusual ways in which mathematics can be applied to everyday life and personal areas of interest can lead to an improvement in both domains.

Time allocation 3 lesson periods

Subject content Apply mathematical concepts to everyday life
Calculate averages, angles, distances, velocity etc.
Create graphs, charts, and tables

Creative and critical thinking This unit has a **creativity** and **critical thinking** focus:

- Generate ideas for connections between maths and sports
- Pose and envision how to solve meaningfully a maths problem in a personally novel way
- Consider several perspectives and explain strengths and limitations of maths strategies to improve performance

Other skills Communication, Collaboration, Persistence/Perseverance

Key words Geometry; trigonometry; arithmetic; angles; distances; measuring; charts; tables; graphs; velocity; speed; distance; percentage; average

Products and processes to assess

Students generate and present a number of strategies for using maths to improve sporting performance. Areas that best lend themselves to assessment include the willingness of students to actively explore connections, the quality and accuracy of the rationale and evidence presented for how we can use maths in sports, as well as the ability to use existing maths knowledge to generate, apply and synthesize complex ideas and topics. At the highest levels of achievement, students present a specific position to a clearly formulated problem,

justify the position with good evidence, and acknowledge the strengths and limitations of this position, whilst being open to the ideas and feedback of others.

Teaching and Learning plan

This plan suggests potential steps for implementing the activity. Teachers can introduce as many modifications as they see fit to adapt the activity to their teaching context.

Step	Duration	Teacher and student roles	Subject content	Creativity and critical thinking
1	Lesson period 1	<p>The teacher introduces the lesson with a brief story of a man, who was able to improve his business by applying mathematical principles to calculate the necessary speed to deliver cargo faster.</p> <p>Teacher explains that the driving question for this unit of activities is ‘how can we use maths to improve sporting performance?’ As needed, they give some examples or show a short video about the relationship between a specific sport and maths (available by searching on YouTube)</p> <p>Students organize themselves into teams of 4-5 according to their favourite sports. Each group has to choose at least 2 sports.</p> <p>Students work in groups and write down the ideas of each member concerning the ways in which math is relevant to the selected sports.</p>	Using existing maths knowledge to generate and investigate ideas for how maths might apply to sports (e.g. angles, distances, speed, acceleration, velocity etc.)	<p>Making connections between maths and performance in a range of sports</p> <p>Generating and playing with unusual ideas for the relevancy of maths to sport</p> <p>Considering several perspectives on how maths is helpful in sport</p>
2	Lesson period 2	Students play online games of their chosen sport. They try to apply the principles they identified during the previous lesson and they experiment, observe, and record/chart various manipulations and how they affect their performance. They try to come up with some principles and formulas for winning a game.	<p>Applying principles identified above</p> <p>Collecting data and creating graphs, tables, and charts</p>	Posing and envisioning how to solve meaningfully a maths problem in a personally novel way
3	Lesson period 3	<p>Students calculate and design various strategies (verification) for winning the game in a real setting. Now they have to take into account the real conditions, such as air resistance, wind, etc.</p> <p>At the end, they write down their findings and present their results to the rest of the class, discussing several solutions for how to improve one’s performance as much as possible using maths. Teacher reminds students that they need to support their proposed strategies with evidence and discuss their strengths and limitations.</p> <p>The teacher may choose to close the lesson with a reflective discussion about what the students have learned, and what they are certain about and what is still uncertain about how maths can help improve performance in various sports.</p>	<p>Designing and verifying mathematical strategies</p> <p>Presenting mathematical strategies to improve performance in sport</p>	<p>Posing and envisioning how to solve a maths problem</p> <p>Explaining both strengths and limitations of different ways of solving a maths problem</p> <p>Reflecting on chosen maths approach and solution relative to possible alternatives</p>

Resources and examples for inspiration

Web and print

- Access to the internet
- There are several videos available online regarding the relationship between different sports and maths that could be shown to students in step 1 as inspiration before they start work

Other

- Projector, poster board, markers/pencils, lined/graph paper

Opportunities to adapt, extend, and enrich

- Potential links could be made with physics, biology and physical education.
- Further activities relating to mathematics and sports can be found on the University of Cambridge website here <https://sport.maths.org/content/KS3>

Creativity and critical thinking rubric for mathematics

- Mapping of the different steps of the lesson plan against the OECD rubric to identify the creative and/or critical thinking skills the different parts of the lesson aim to develop

	CREATIVITY Coming up with new ideas and solutions	Steps	CRITICAL THINKING Questioning and evaluating ideas and solutions	Steps
INQUIRING	Make connections to other maths concepts or to ideas from other disciplines	1-3	Identify and question assumptions and generally accepted ways to pose or solve a maths problem	
IMAGINING	Generate and play with several approaches to pose or solve a maths problem	1,3	Consider several perspectives on approaching a maths problem	1-3
DOING	Pose and envision how to solve meaningfully a maths problem in a personally novel way	2,3	Explain both strengths and limitations of different ways of posing or solving a math problem based on logical and possibly other criteria	3
REFLECTING	Reflect on steps taken to pose and solve a maths problem	3	Reflect on the chosen maths approach and solution relative to possible alternatives	3