# PROJECT MATHS TRAIL AT OUTDOOR ACTIVITY INSTITUTE

## Introduction:

The ***Project Maths Trail*** is a great resource for schools and teachers of a variety of subjects.

Teachers can take their students to our various centres for a two and a half hour “Hands on” experience comprising of around 40 challenges followed by some fun activities including Archery, Orienteering, Team Games and Grass Sledges.

The day runs from 10am-3pm.

There are challenges to suit all levels from 6$^{th}$ class right up to Leaving Certificate. Challenges are location sensitive, as challenges are built around the environment and incorporate the natural and physical amenities on site.

Although the ***Project Maths Trail*** is focused in the Mathematics discipline, it is 'far more reaching' in that it acts as a conduit for many personal, life and work skills. Whether in the home, in work, in business or at play the Challenges provided mimic many life skills such as problem solving, estimation, strategy of checking, practical mathematics, teamwork and group coping skills.

The ***Project Maths Trail*** locations provide a unique environment for learning in a practical way and the experience will bring to life and strengthen many aspects of the Project Maths Syllabus including geometry, trigonometry, area, volume, distance-time-speed, statistics, ratio-proportion and more, with your students working in teams of four encouraging confidence and teamwork. Students, right up to leaving certificate level, will be challenged. We expect each group to complete at least 3 challenges in the time and so a class of 24 could complete an assortment of 18+ challenges.

Under your care, but with the assistance of our facilitators and a well structured system, the natural resources of the locations, additional equipment and resource packs for every challenge, your students will enjoy an exceptional maths learning experience and gain other life and work skills.

## Overview:

The ***Project Maths Trail*** is a resource for schools, colleges and others whereby learning mathematics is facilitated in an active, practical, hands-on, experiential, problem solving and novel manner, under the supervision of teachers/leaders from the partaking establishment/s and with the help and guidance of the personnel presenting the ***Project Maths Trail*** (Facilitators). It includes all the resources, physical and intellectual, required to provide the mathematics learning outcomes for groups working through the "Challenges" associated with the location. Many Challenges are location sensitive.

Teachers/Leaders arrive with their groups/students that have been assigned to their 'Challenge' group of 4 in advance and are met by the facilitators. Following a short introduction the facilitators distribute the first round of challenges complete with instructions, resources and directions to the location where the challenge will be carried out.

Teachers supervise the activities and may intervene if they see the need to do so, remembering that these are CHALLENGES and reasonable instructions are given. It is important that every effort is praised – this is a new experience for groups and an unfamiliar environment. We would hope however that teachers would point out good work and effort, specific outcomes reflecting past class work or intended future work and possible alternate methods and approaches. To date many teachers have found the ***Project Maths Trail*** an experience that was so different to classroom work that it took them some time to get accustomed to the methodologies and techniques

Our Facilitators will visit as many groups as possible to explain the finer points, the workings of particular resources, some expected outcomes, some tips, reflection on the values of the principles and skills employed for exams, work and life, and other aspects and values of specific challenges. It is important that the groups do not become frustrated so facilitators will point to a procedure or congratulate them on getting so far, explain what was hoped for and recommend a new challenge.

We expect each group to complete a minimum of 3 challenges and experience has shown that 4 challenges are very achievable and a few have managed 5 or 6. We recommend groups to request help when really unsure and to spend between 20 and 30 minutes maximum on each challenge. Each group is responsible for the resources and must return them, in good order, before receiving their next challenge. Usually the groups require less and less assistance as they work through the challenges. In some instances it can take up to 5 minutes to get to the challenge area and this adds a little time to the 30 minutes mentioned.

A short break can be allowed at the discretion of the leaders but we recommend a main lunch break only after the session has ended.

## Teachers:

The ***Project Maths Trail*** is a unique and wonderful resource for teachers whose subject requires practical 'Hands on" mathematics. We expect it will be a fun mathematics learning experience for your students who will be involved in learning activities that will include many learning outcomes. They will have ‘hands on’ to practical mathematics that will introduce and/or reinforce knowledge.

They will work in groups of four where the benefits of teamwork will be rewarded. Many of the tasks will involve problem solving skills and techniques in discovery learning situations. In many activities real life skills will be employed. Students will be able to display leadership, show initiative and take responsibility. Many of the activities have integration possibilities with other subjects – following written instructions - reporting back (language and communications) – technical drawing and technical subjects – science – business studies etc. We hope that participants will be facilitated with reflection time soon after returning to base and perhaps share some of the things they learned with each other.

Teachers are fully responsible for students and we provide the Challenges, Resources and some mentoring. We ask that participants be advised on basic requirements and care for other users, themselves and their team, the special environments that exists in the various locations, general outdoor safety and safety around water and lakes and on cycle lanes, pedestrian paths and the public roads.

Students will take responsibility for the use of special equipment and instruments and for their safe return. We will try to allocate the activities that are suitable and still challenge the group.

**To maximise the benefits for students some advance work on the Challenges should be undertaken.** There are also a few elements that might be explained – a Spirit Level for checking the horizontal status of edges – a Plum Bob for checking the vertical status of a line or edge and a Clinometer.

We would like to draw attention to the notes below on ‘Strategy of checking’, ‘Recording’ and ‘Group activities’.

***List of Challenges:*** A list of challenges for the chosen centre will be sent to the leader of all groups following the payment of the deposit.

***Please note that new challenges are being constructed and will be introduce shortly. We continually plan to add more challenges.***

***Strategy of Checking*** There are many strategies for checking when doing mathematics and in the activities on the ***Projects Maths Trail***. These include observation by a second member of the group, repeating the element by another member of the group, double checking, trying a different method, using estimations, visual inspection, querying if the

solution is sensible, is the solution in the realms of possibility, reverse procedure etc. (See separate page)

***Group Activities*** There are many benefits from group activities. These can include planning, sharing the workload, sharing knowledge, sharing ideas, keeping records, reporting, problem solving, sharing ideas, standing up for ones own proposals, accepting others, listening and how to be listened to, checks and interactive social skills. Please advise students to fully read the challenge sheet so they can plan or visualise what lies ahead. Could the challenge be divided and shared? Could the recording be planned and co-ordinated?

***Recording*** The value of good recording and use of best techniques in making notes will last a lifetime, using shorthand ways and key points is a skill that can be developed with practise, the use of tables and charts can add clarity, sketches and drawings can illustrate what may be very difficult to put in words and tallying can save time and effort.

***Integration***

Apart from what has been mentioned teachers and leaders may see opportunities for integration with their own programmes.

***Problem Solving*** See the separate page.

***Follow up*** A de-briefing, back home, where participants can review their challenges, share information and experience, co-relate with other activities, discuss their learning experience, review different approaches, have gaps filled in, continue the themes from the activities, and add further learning. How well did the groups follow the instructions?

Respectful suggestions:

* Meet as soon as possible after the event
* Each group reports on their challenges
* Discussion on methods, results, outcomes likes and dislikes
* Reinforce learning, fill in gaps and tie to other mathematics
* Congratulate on behaviour, attitude and application
* Feedback to Project Maths Trail

We will provide some feedback suggestions to all teachers who take a group to the ***Project Maths Trail***.

We welcome everyone who enters our ***Project Maths Trail***. We invite you to have fun with the challenges we present.

We challenge you to complete activities using your knowledge and skills and employing many learning methods we feel you will enjoy. Even though it is open to individuals, we have based all our challenges on groups of four. We feel this intensifies the experience especially when the group works as a team in competition with other groups. Everything you do in the challenges will mean you have achieved something for yourself and your team.

On your visit to a ***Project Maths Trail*** we ask that you be aware of and care for other users, yourself and your team, the special environment that exists in most of the locations, general outdoor safety and safety around water and lakes. There can be activities near the sides of public roads and cycle and pedestrian ways where you must take extreme caution. Students will take responsibility for the use of special equipment and instruments and for their safe return.

You will be required to have a pencil, eraser, ruler, biro/pen and calculator. Please note that most challenges are outdoor and in grassy areas and you should dress accordingly and it can be much colder in the open so bring extra warm clothes.

When you return to your base we hope that this experience will have been meaningful and will have given you confidence to explore further. We wish you well with your studies.

***Strategy of Checking***

In all our ***Project Maths Trail*** challenges we highly recommend a 'Strategy of Checking'. There can be many ways of using strategies of checking and the more they are used the more efficient one becomes with them and the ones most effective in given situations. As most of our challenges are done in groups the strategies can be enhanced.

***On receipt of the challenge***

**1.** Each person in the group reads the challenge and if unsure re-reads it. (Analyses)

**2.** A discussion on the meaning of the challenge takes place. This can include paraphrasing - stating in one's own words. (Interpretation)

**3.** A plan is proposed, for working out the challenge, and agreed. This can be written briefly and aided with a sketch or step by step sequence chart. (Visualise)

**4.** The group makes an estimate or predicts a likely outcome/expectation. (Share)

**5.** The group completes the challenge using strategies of checking as they proceed and view the outcome in relation to their stated estimate or expectation. (Accomplishment)

***General Strategies of Checking***

**Estimation**: This can involve rounding and testing; asking what one could expect; looking at what is reasonable and does it make sense.

**Trial and Error** (guess and check): Have a guess and work it out, if it is too high or too low take a second and third guess if this can be done quickly. 23 multiplied by this number is 276, because it ends in 6 a good start is with 2, 12 or 22 and 2 can quickly be ruled out.

**Shared:** Members of the group discuss and check on each other's inputs as the process continues and discuss as required.

**Reversal:** Reverse the procedure as in 3+2=5 so 5-2=3 or 3*2=6 so 6÷2=3

**Patterns:** Looking out for patterns. 13, 11, 9, 7, ……

**Logic (reasoning):** Mindful of previous knowledge and whether a process or outcome is reasonable and makes sense.

**Alternative:** Is there an alternative process/procedure/formula or method to check outcome during and at the end of the challenge.

***Sequence Chart Example***

*Step 1* ***Analyse*** *Step 2* ***Interpret*** *Step 3* ***Visualise*** *Step 4* ***Share*** *Step 5* ***Complete***

**PROBLEM SOLVING IDEAS**

Keep up and/or revise your mathematics. Keep your brain active. Enjoy the challenge and the success. Use and practice "PROBLEM SOLVING SKILLS".

**Problem solving skills include:-**

**Using previous knowledge:** ***Project Maths Trail*** requires some mathematics knowledge.

**Applying knowledge:** Using basic mathematics principles to find solutions.

**Searching out new knowledge:** Learning by doing and through group challenges.

**Awareness of available materials:** Familiarise oneself with resources in *Project Maths Challenges*.

**Looking at various options:** Thinking out all the various ways the group can tackle the challenge.

**Assessing options:** Some options are more likely to give a good result whilst others are just not in the running. Can the group make a good decision?

**Using options in a constructive way:** Make notes of possible options and don't discard them until you have exhausted the options.

**Looking at combinations:** There can be many combinations when approaching a challenge so don't rule anything out initially.

**Applying combinations:** Getting the step by step process in the most productive sequence.

**Using known concepts:** Being able to understand basic concepts and apply them in the group to tackle the challenge.

**Using estimations:** Estimations is a key method for the strategy of checking and can help steer one in the proper direction.

**Testing possible solutions:** To be sure it is often necessary to test the possible solution.

**Seeking out patterns:** Very useful at times to indicate direction and possible solutions.

**Looking for similarities:** What worked previously – is it close to what is now required?

**Evaluating previous solutions:** Is there a possibility from a previous solution?

**Finding alternative solutions:** 'When at first you don't succeed'

The *'**Project Maths Trail**'* calls for the use of imagination, reasoning, ingenuity and common sense.