A G.A.T.E.WAYS JOURNEYS PROGRAM

for gifted Year 5 and 6 children with a love of maths

'PROOFS, PARADOXES

PRIMES & PUZZLES'

G.A.T.E.WAYS is an independent organization offering challenging, enriching activities and experiences to develop and extend highly able children This program will run over four half days. Students learn the most when they are having fun. Problem solving in mathematics is a very creative process. Coming up with solutions involves the use of imagination, ideas, questions and a certain rhythm to the answer. Using a wide range of puzzles and paradoxes, this journey explores the thinking and creativity behind the solving of problems, including understanding the problem and finding a suitable plan of attack. In mathematics, being able to prove something is true (or false) is sometimes more important than being able to solve a problem. We explore a wide range of mathematical proofs and conjectures. Using logic, infinity, prime numbers, geometry and algebra, we cover some fundamental but essential techniques that are required by any person interested in numbers, maths and problem solving. Sessions begin with warm up paradoxes and problem solving activities, before delving into the day's proofs.

Session 1.

We begin our search for mathematical truth with the help of whole numbers. We know there are an infinite number of numbers, but how do we prove it? Easy? What about a proof for the existence of an infinite number of prime numbers? We take a look at patterns in prime numbers, including twin primes, and how we may set about proving such patterns go on forever. This week we also discover GIMPS and Fermat numbers.

Session 2.

Sometimes it is very true that a picture is worth a thousand words. In the case of mathematics, it may be worth a thousand numbers! We see how geometry can be used to easily prove some difficult ideas. In mathematics, language is very important. We look at some logical statements, as well as finding a few 'tricks of the trade' that mathematicians use in their proofs, including using contradictions! We also explore some very irrational statements.

Session 3.

Addition and division are simple enough to do, but what happens when these are put into a statement to prove? For example, if you take three consecutive numbers (such as 4, 5, 6) and add them together, their sum (15) is divisible by three. Does this happen with all numbers? Does it happen with four consecutive numbers? Or five? Six? Forty-two? We explore this pattern and more patterns in number addition and division, and find ways to prove that they are true (or false) for all numbers.

Session 4.

Sequences (lists) of numbers are interesting things. Take the sequence of decreasing fractions ½, 1/3, ¼, and so on, and add all the fractions in the list. What do you get? Now try the same with this sequence: ½, ¼, 1/8, 1/16, and so on. How similar are your answers? Today we look at these two sequences, and some other interesting lists of numbers that add up to some very strange answers. Lastly, we recap all that we have done over the four classes and create some strategies for examining and solving problems in mathematics.

Work Requirements

Homework will be set each week, and it is expected that students attempt all questions.

About the presenter:

Anne Eastaugh has a Bachelor of Science in Psychology and Physiology, a Diploma of Education and a First Class Honours degree in Pure Mathematics and Astrophysics from Monash University. She has worked as a study skills trainer, teaching advanced study and memory techniques to students of all ages, in both Australia and New Zealand. She believes that young students can learn even the most in depth topics, especially when they are taught with enthusiasm and inspiration. Anne also tutors mathematics, plays Celtic violin and writes creative stories.

Requirements: Bring pens and coloured pencils (or textas), scissors, a ruler, an eraser, sticky tape and a lined note pad; a snack (no nuts please); a small labelled photograph and a stamped, self-addressed DL envelope for your report..   © G.A.T.E.WAYS