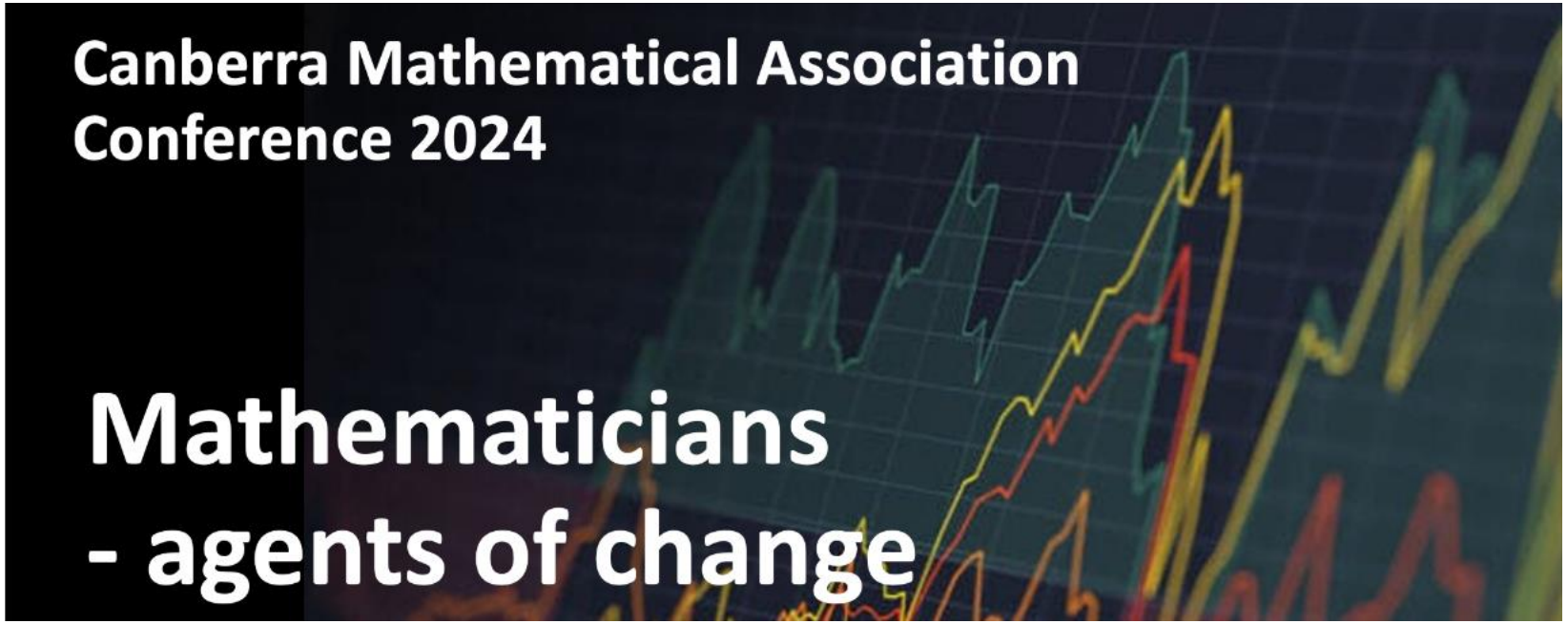


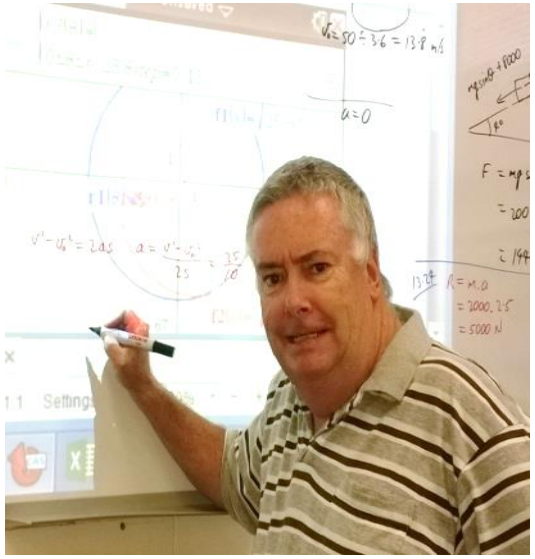
Changing maths tasks and problems – Developing rich tasks and investigations

Brian Lannen murray.math@bigpond.com

Warm up problem

Evaluate 6 x 4 =

- Discuss with a delegate next to you ways in which this problem could be changed to promote deeper learning.



Brian Lannen

Murray Mathematics Curriculum Services

T³ National Instructor

Changing maths tasks and problems – Developing rich tasks and investigations

There is certainly a satisfying sense of achievement in finding the solution to a clearly defined task or problem. Let's firstly look at the problem-solving process and how we can help students with that. Then let's look at how we can further challenge and extend students by making subtle changes to problems, setting the course for rich tasks and open investigations. We will not only examine the underlying pedagogy of these things, but the presenter will share a suite of favourite problems & investigations and point to places to find more.

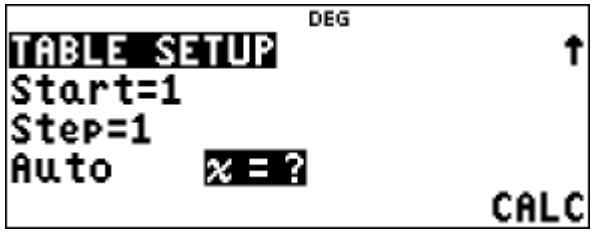
Warm up problem

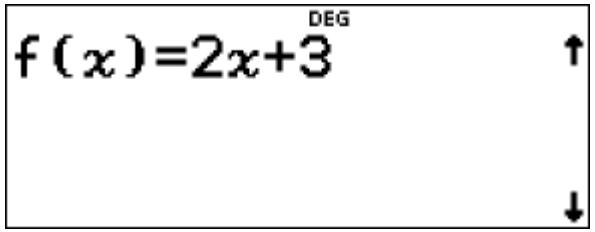
Evaluate 6 x 4 =

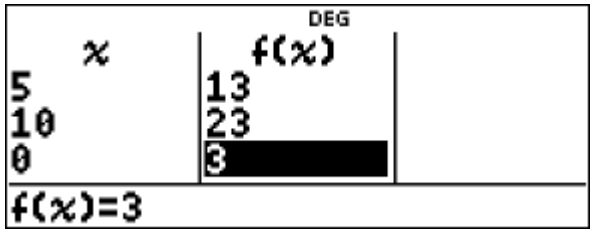
- 6 x 8 =
- Solve for x: $6x = 24$
- List the factors of 24
- If two numbers multiply together to produce 24, what could these numbers be?
- 48 x ½, -6 x -4, $6i \times (-4)i$

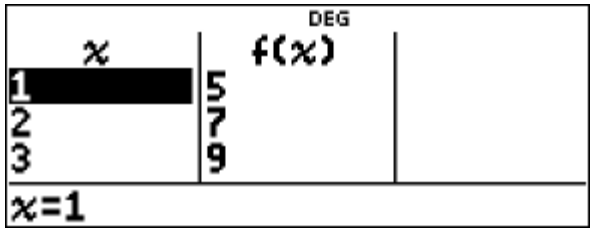
Find the function game

Evaluate f(*x*) = 2*x* +3 when *x* = 5









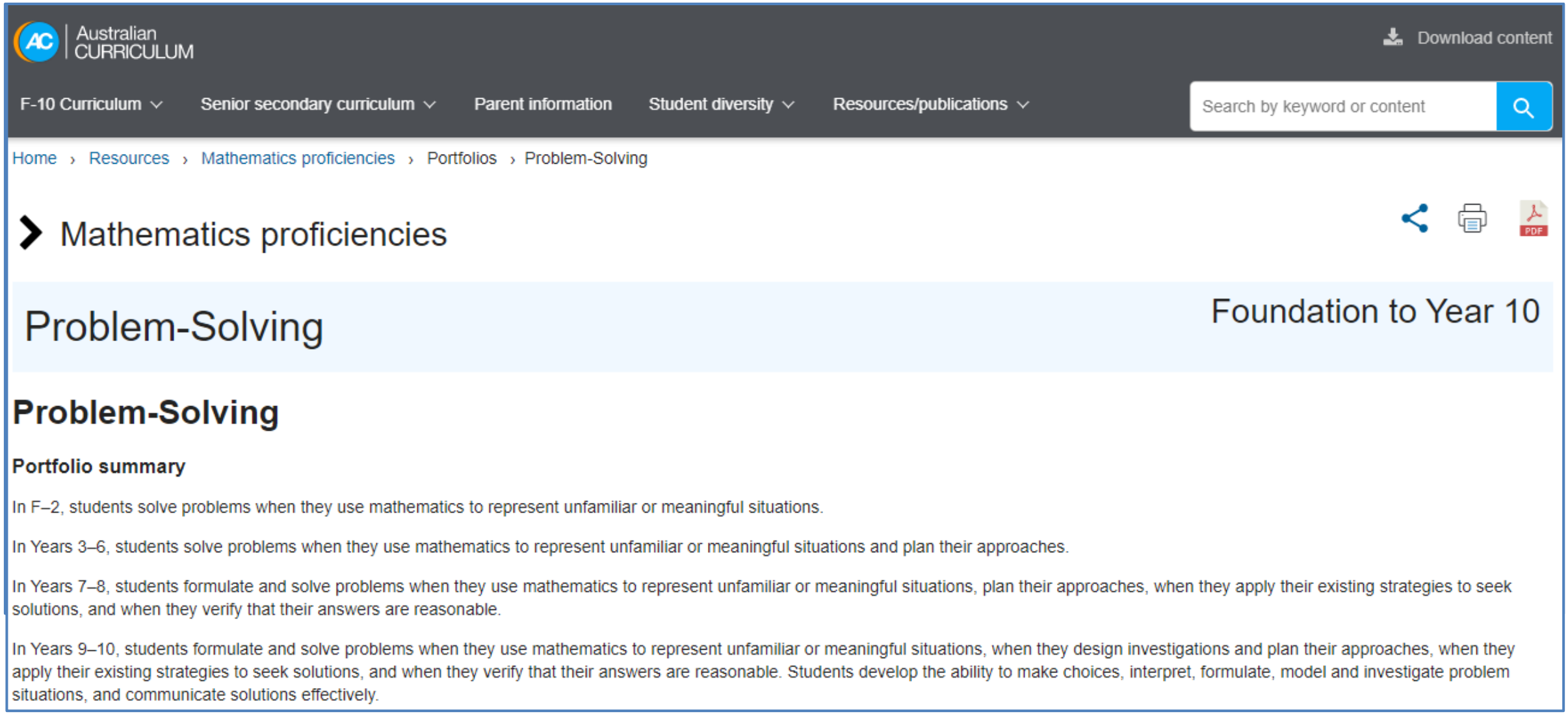
What is (mathematical) Problem-Solving?

Does Problem-Solving need to be explicity taught?

Yes, it does. Here's my Year 9 story

- Polya 4 steps
- Problem-Solving Process
- Problem-Solving Strategies
- Rich Problems to engage with and practise

Some definitions of Problem-Solving



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Mathematics proficiencies

Problem-Solving

Foundation to Year 10

Problem-Solving

Portfolio summary

In F–2, students solve problems when they use mathematics to represent unfamiliar or meaningful situations.

In Years 3–6, students solve problems when they use mathematics to represent unfamiliar or meaningful situations and plan their approaches.

In Years 7–8, students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable.

In Years 9–10, students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations, when they design investigations and plan their approaches, when they apply their existing strategies to seek solutions, and when they verify that their answers are reasonable. Students develop the ability to make choices, interpret, formulate, model and investigate problem situations, and communicate solutions effectively.

Some definitions of Problem-Solving

Collins

English: problem-solving | Example sentences | Tren

Definition of 'problem-solving'

problem-solving

in British English

(ˈprɒbləmsɒlvɪŋ)

NOUN

the act or process of finding solutions to problems, esp by using a scientific or analytical approach

Problem-solving is often carried on by processes of visualization.
an approach to problem-solving

Derived forms

problem-solver **NOUN**

OVERVIEW

problem solving

Oxford Reference

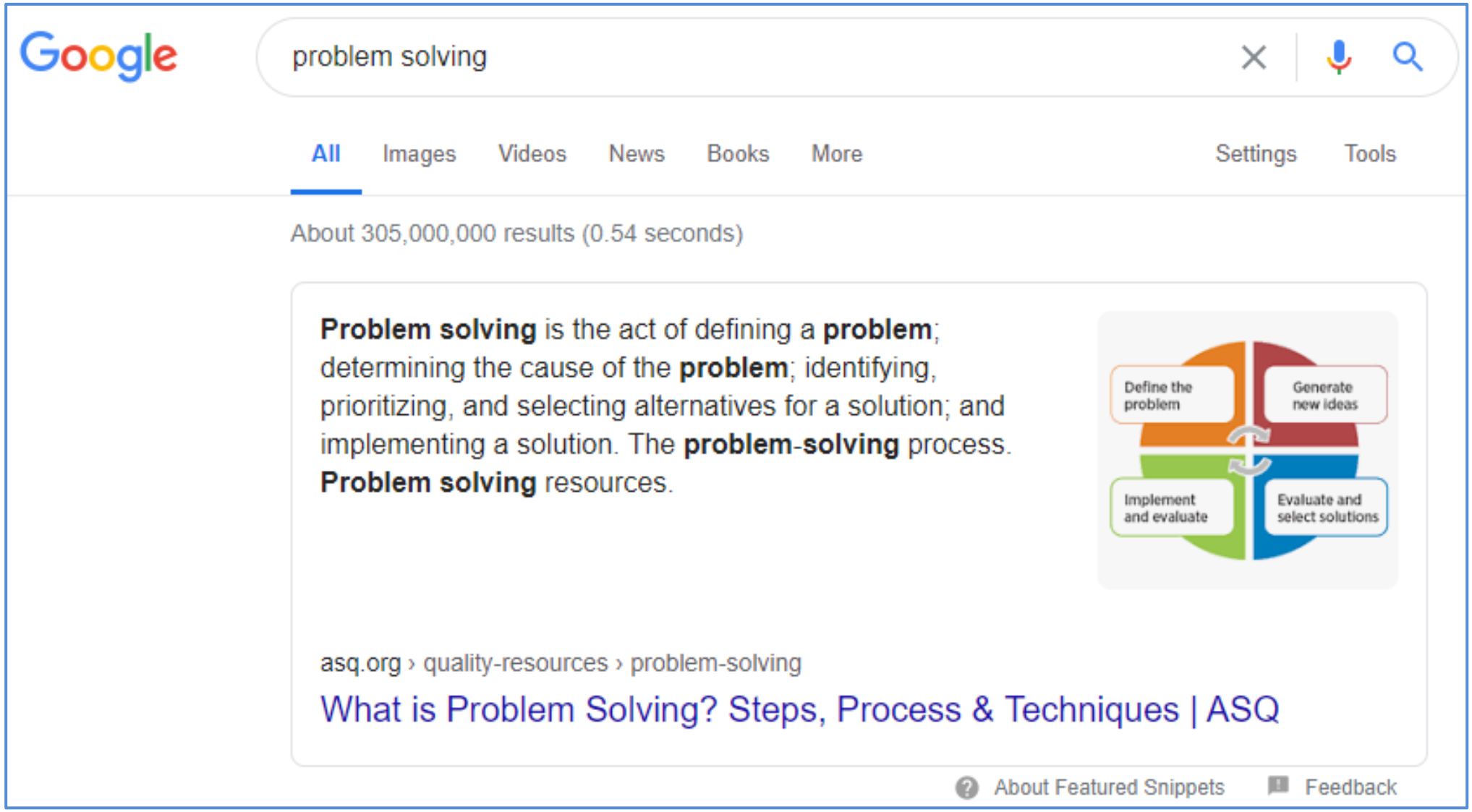
QUICK REFERENCE

Cognitive processing directed at finding solutions to well-defined problems, such as the Tower of Hanoi, Wason selection task, or a water-jar problem, by performing a sequence of operations. Problem solving by means of logic or logical analysis is usually called reasoning. See also 2-4-6 problem, algorithm, brute force algorithm, convergence-divergence, functional fixedness, General Problem Solver, ill-defined problem, insight (2), intelligence, lateral thinking, Monty Hall problem, muddy children problem, Newcomb's problem, nine-dot problem, oddity problem, problem-solving stages, taxicab problem, travelling salesman problem, well-defined problem. [From Latin *problema*, something put forward, from Greek *pro* before or forward + *ballein* to throw]

From: problem solving in A Dictionary of Psychology »

Subjects: Science and technology — Psychology

Some definitions of Problem-Solving



George Polya – 4 Step Process

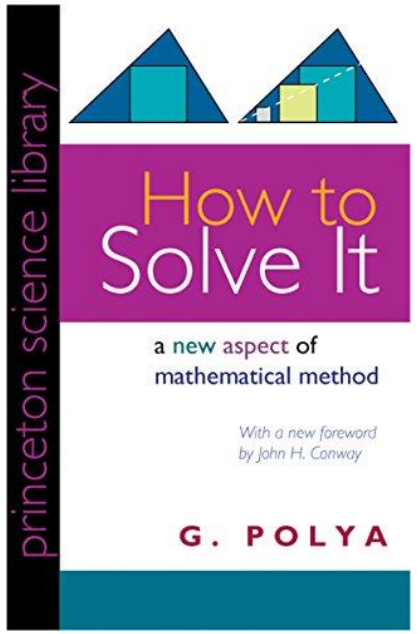
The 4 stages of problem solving (Polya)

- **Find Out** what the problem is asking for
  - ~ identify relevant data
  - ~ look for the question or verb in the problem
- **Select** a strategy
- **Apply** the strategy
- **Look Back** ~ Does your solution make sense?
  - ~ Reread the original question
  - ~ Should your solution include units?

A demonstration problem

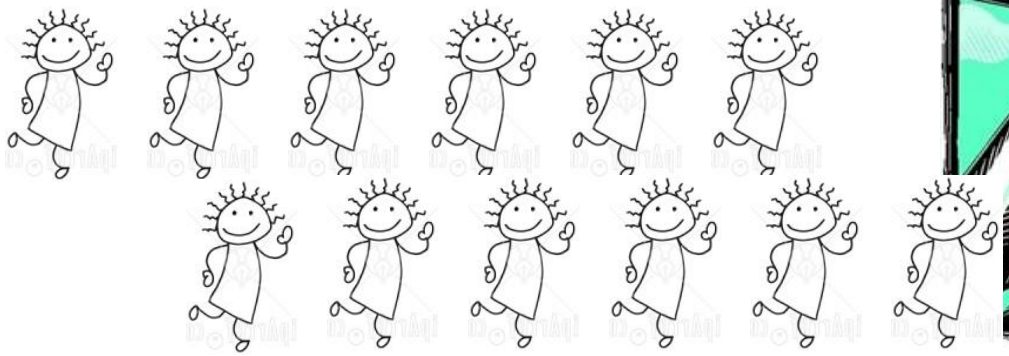
List of problem-solving strategies

Some problems for you to practise



Demonstration Problem– handshakes

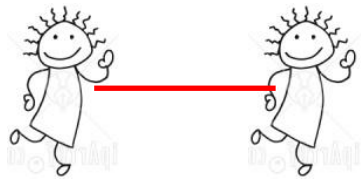
If there are 12 people at a party and each person shakes hands with each other person, then how many handshakes are there in total?

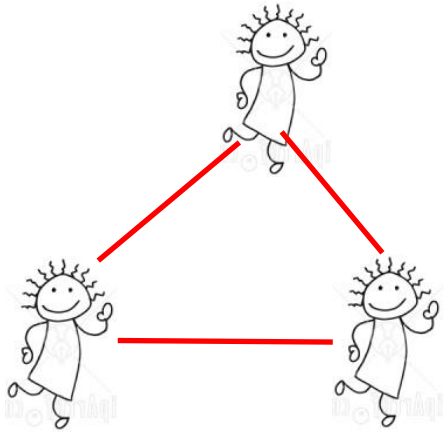


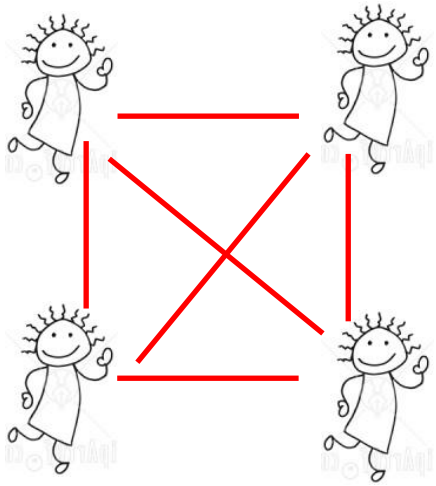
Problem-Solving Strategies

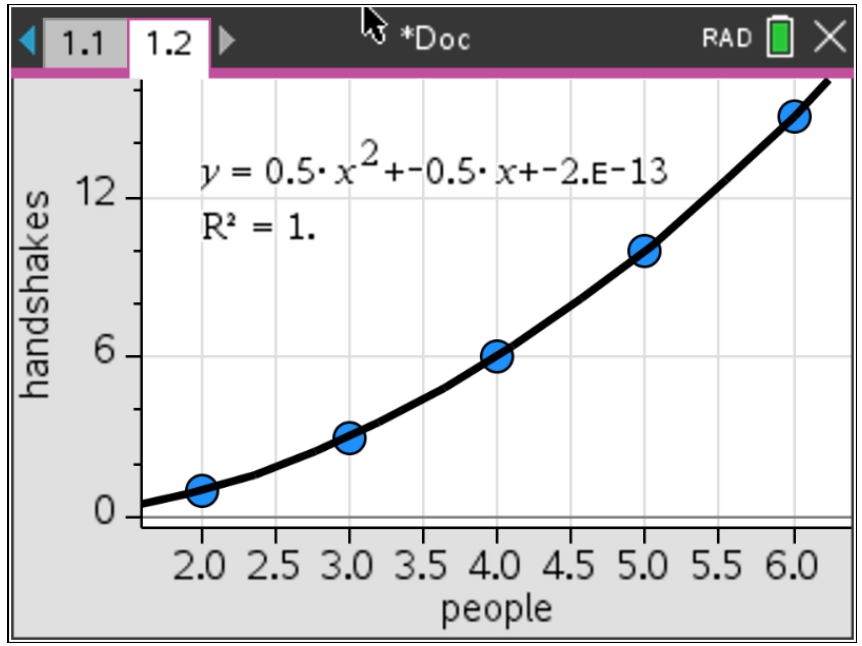
.Find a Pattern
. Make a Table, Graph, or Chart
.Make an Organized List
.Draw a Picture or Diagram
.Guess, Check, and Revise
.Logical Reasoning
.WORK BACKWARD
.Write an Equation
.Solve a Simpler Problem
.Use Multiple Strategies
.Simulate a Problem
.Choose a Formula

Demonstration Problem– handshakes









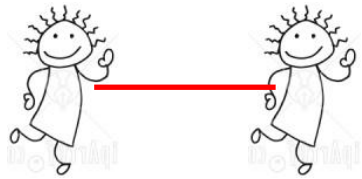
people	handshakes
1	
2	1
3	3
4	6
5	10
12	?

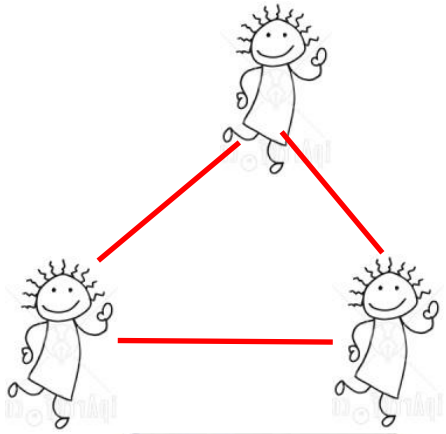
+2

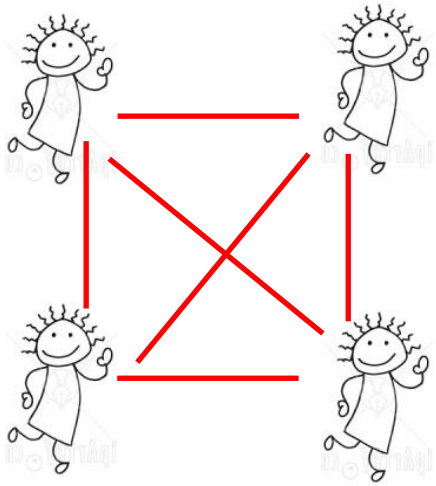
+3

+4

Demonstration Problem– handshakes





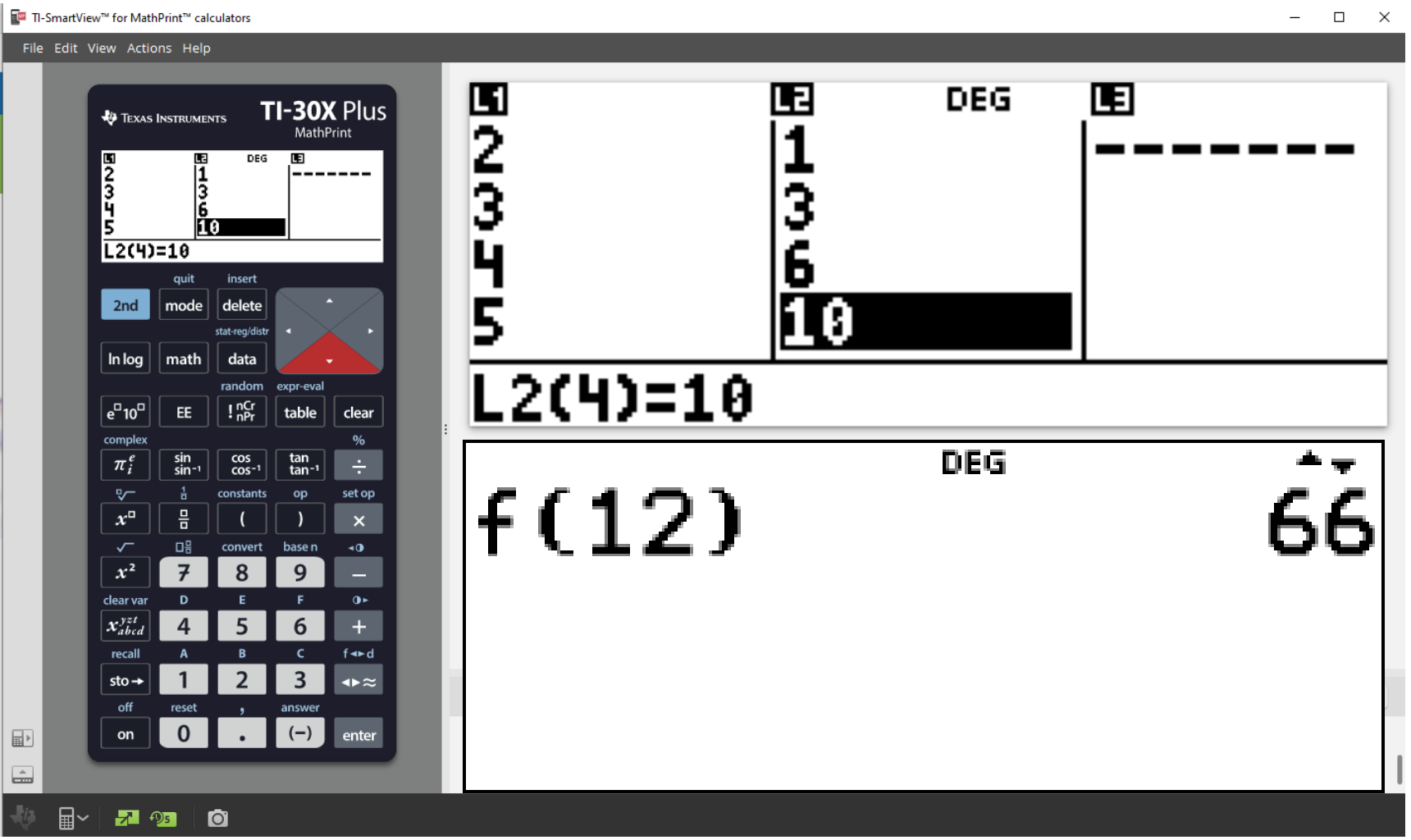


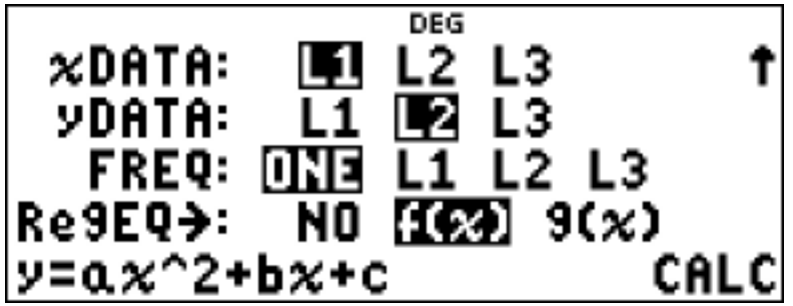
people	handshakes
1	
2	1
3	3
4	6
5	10
12	?

+2 +3 +4

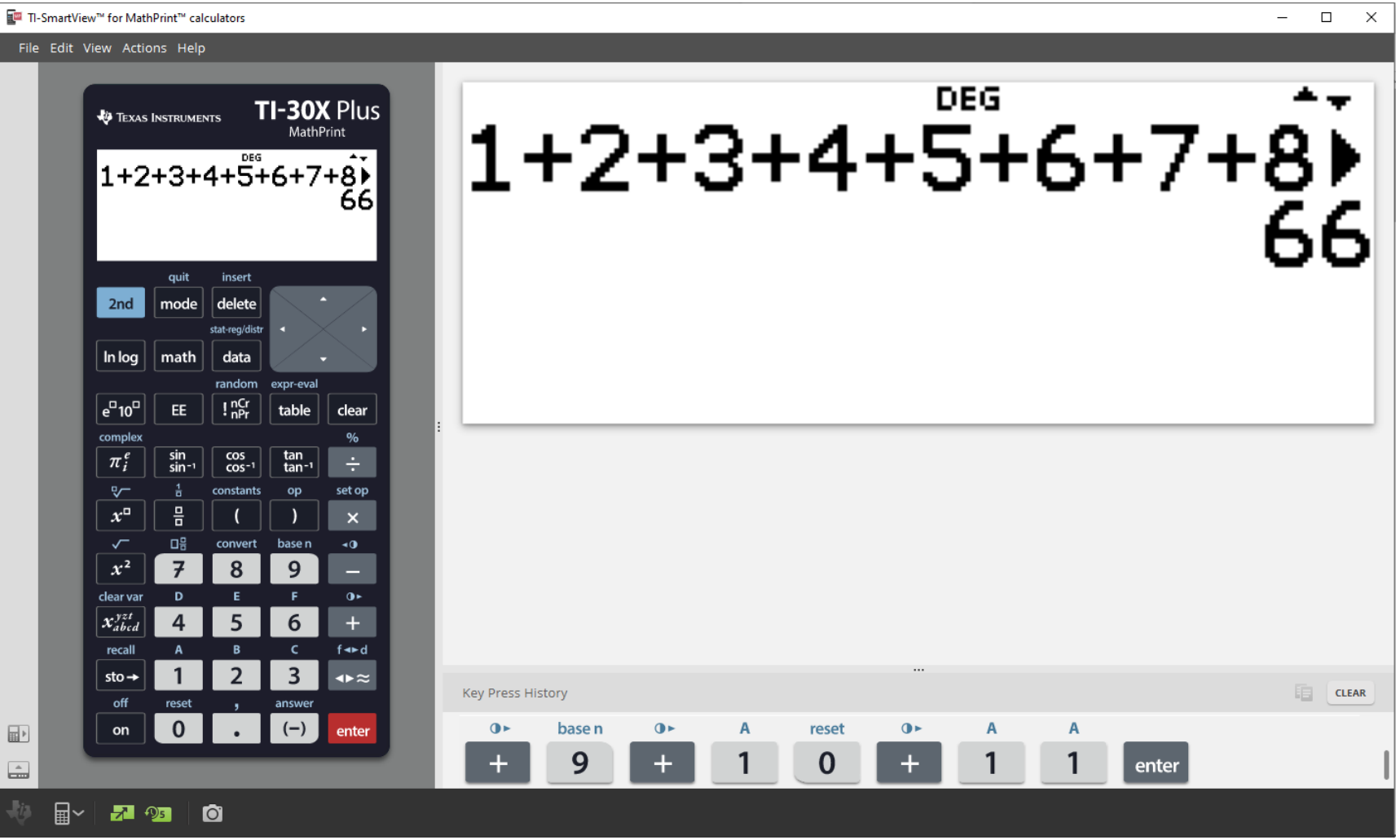
$$h(12) = \frac{12(12-1)}{2} = 66$$

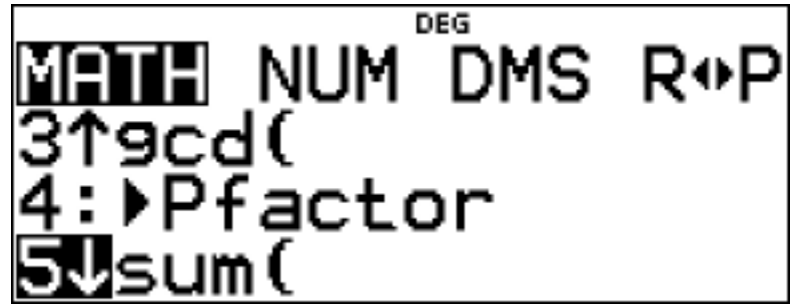
Demonstration Problem– handshakes



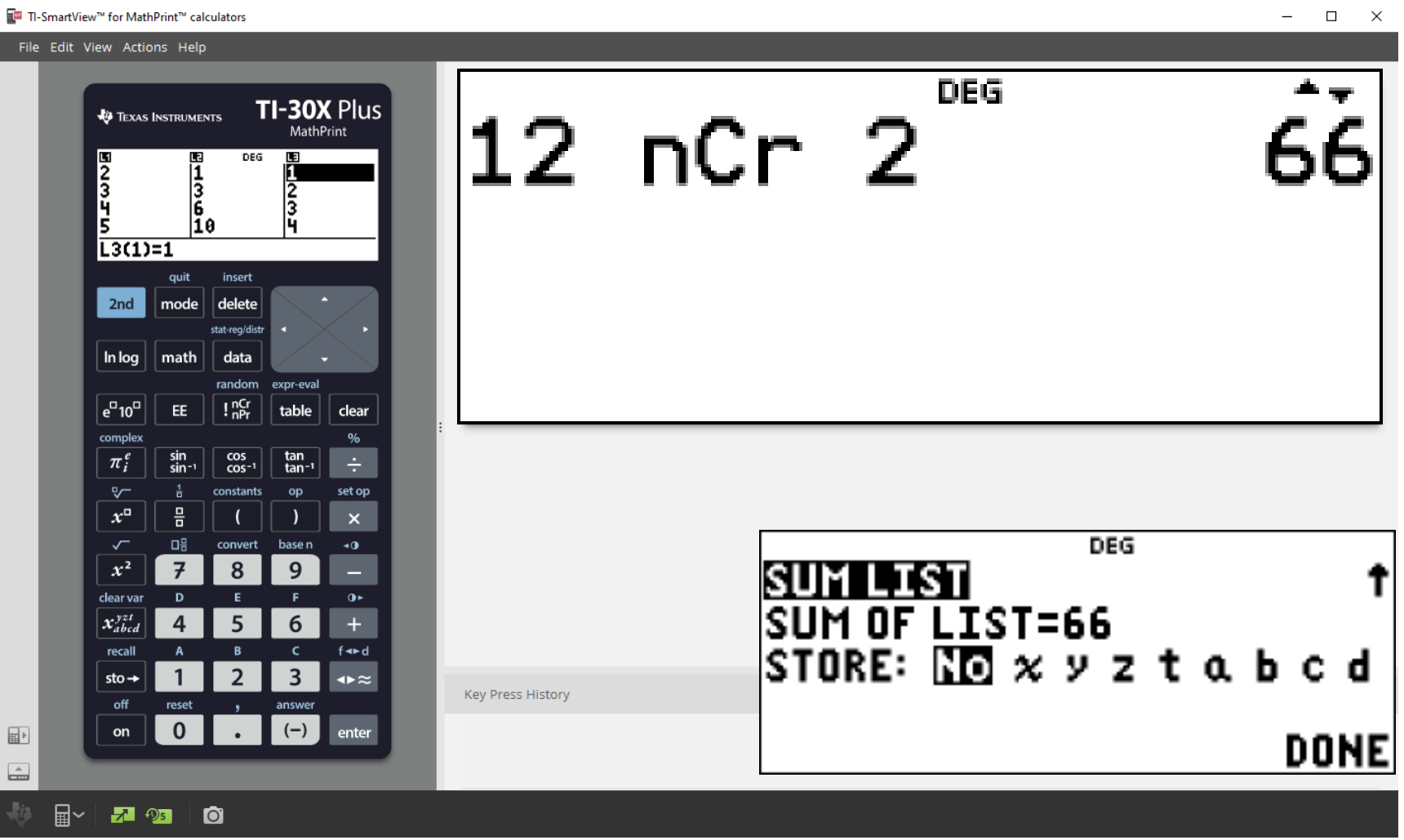


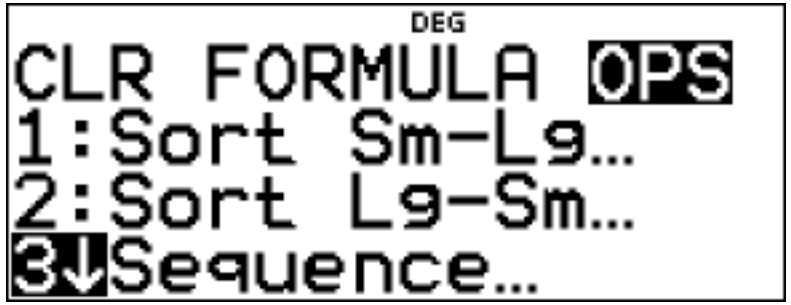
Demonstration Problem– handshakes

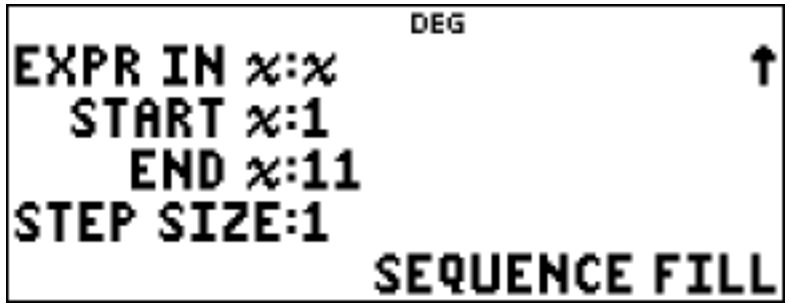




Demonstration Problem– handshakes







Resources from Mathematics Task Centre

Mathematics Task Centre

Mathematics Task Centre

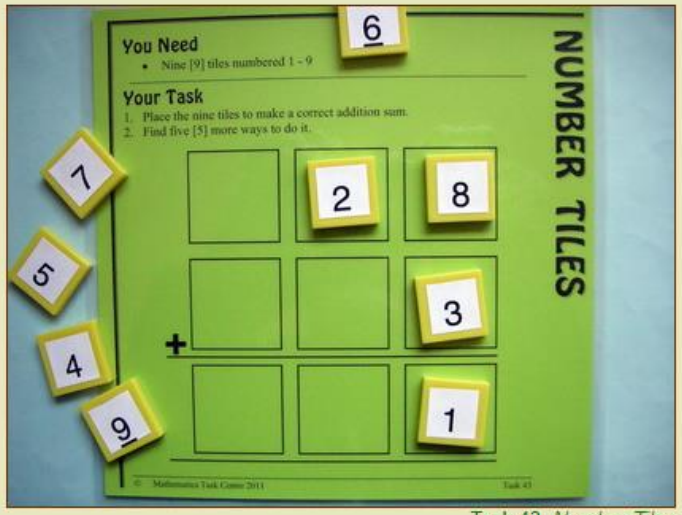
Hands-on Problem Solving

Tasks invite students to work like a mathematician.

Use the links below to explore the wisdom of practice collected here from more than 40 years of using tasks in classrooms around the world. Tasks are designed for Years 2-10.

In Sweden, Maths Tasks are called Mattegömmor...
a place where mathematics is hidden.
Mattegömmor på Svenska, klicka här.

Build your own Task Library using our eTasks and your equipment.

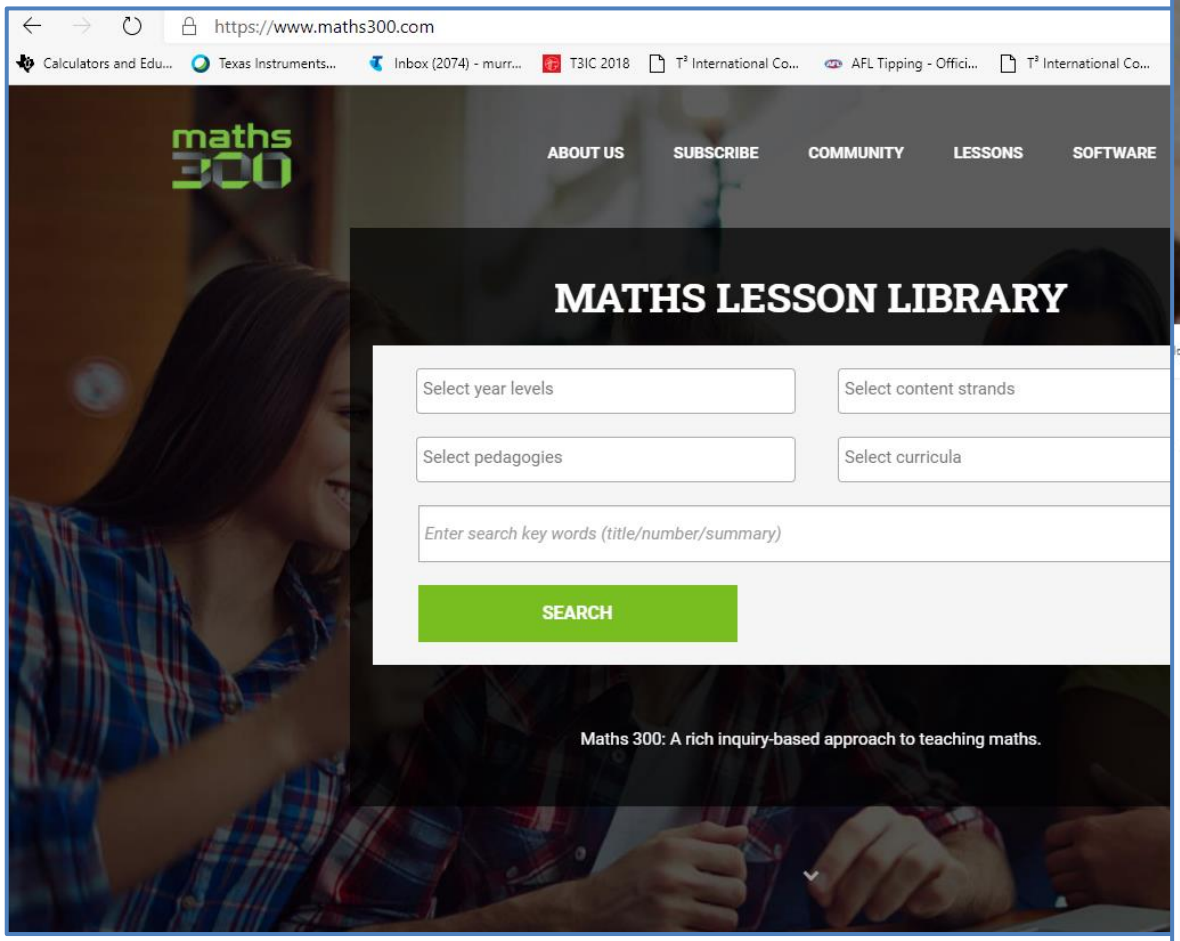


Task 43, *Number Tiles*

There is no reason for mathematics to be taught the way it always has been.

http://www.mathematicscentre.com/taskcentre/

Resources from Maths 300



https://www.maths300.com/

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Year 7

Year 8

Year 9

Measurement and Geometry

Number and Algebra ▶

Statistics and Probability

STEM

Year 10

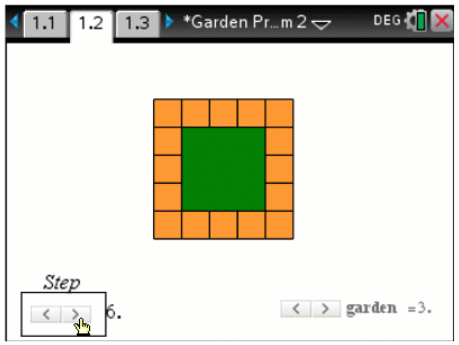
Year 10A

Year 9: Paving Problem

by Texas Instruments

Objectives

- **ACMNA213**: Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate.



Vocabulary

- Factorise
- Expand
- Simplify

About the Lesson

A square garden bed is surrounded by pavers, how many pavers are required for a 1m x 1m garden? What about a 2m x 2m or n x n garden. Students use animations that support the development of the rules followed by algebraic techniques such as factorise, expand and simply to illustrate that these abstract algebraic representations are equivalent. Students take this knowledge and experience and apply it to a different style of garden bed.

Download
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TInspire Activity File 2
TInspire Activity File 3
TInspire Activity File 4
Student Activity
Teacher Notes and Answers

Device
TI-Nspire™ CX
TI-Nspire™ CX CAS

Software
TI-Nspire™
TI-Nspire™ CAS

Standards
ACMNA213

TI-Nspire Version
4.5

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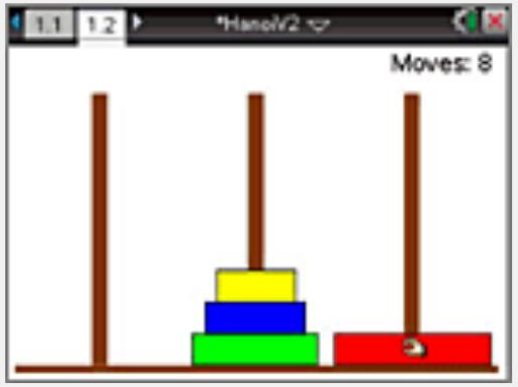
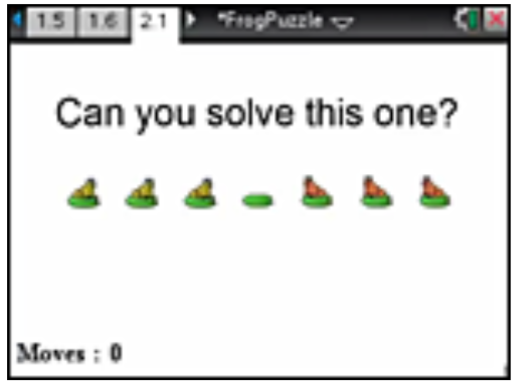


Standard ACMNA296

Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations

Activity: Towering Mathematics

The classic "Towe
discs of different s
restrictions that la
discs and discs ca
challenge is to mo
another. This activ
problem and to fir
of moves and the
contains a virtual



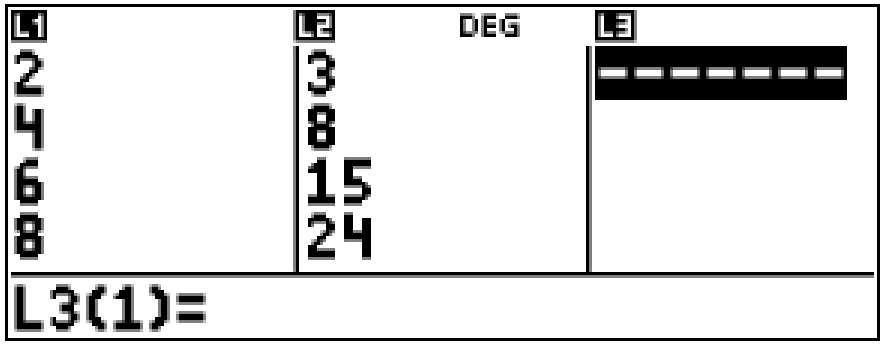
Standard ACMNA296

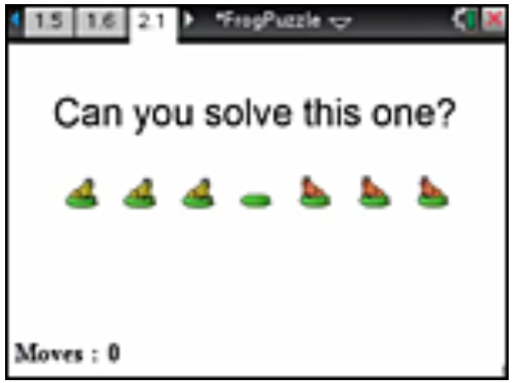
Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations

Activity: Leap Frog

This classic puzzle requires all the frogs on the left side of the pond to reach the right side and vice versa. How many moves does it take to solve the puzzle? What if there were more frogs? Click on the frogs in this TI-Nspire document to make them move, the moves are counted automatically. Set the number of frogs on each side and start solving!

Resources from Texas Instruments





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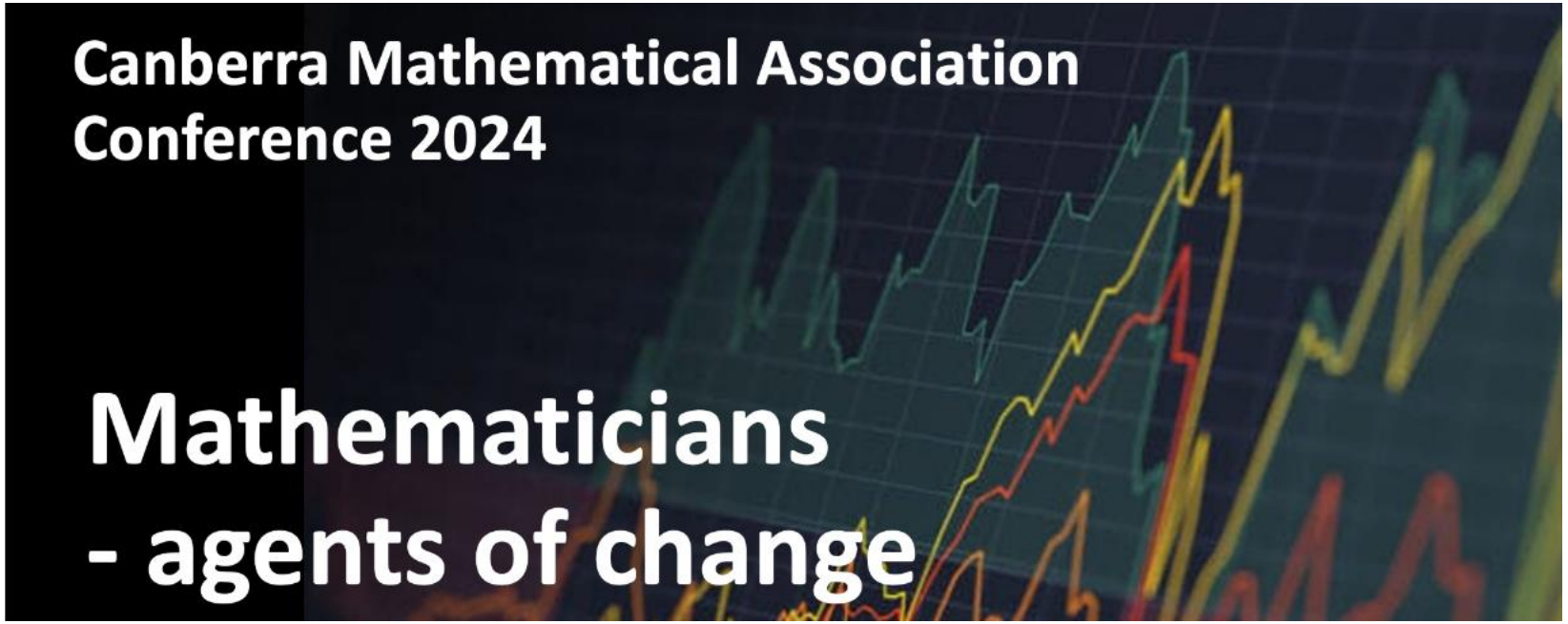

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